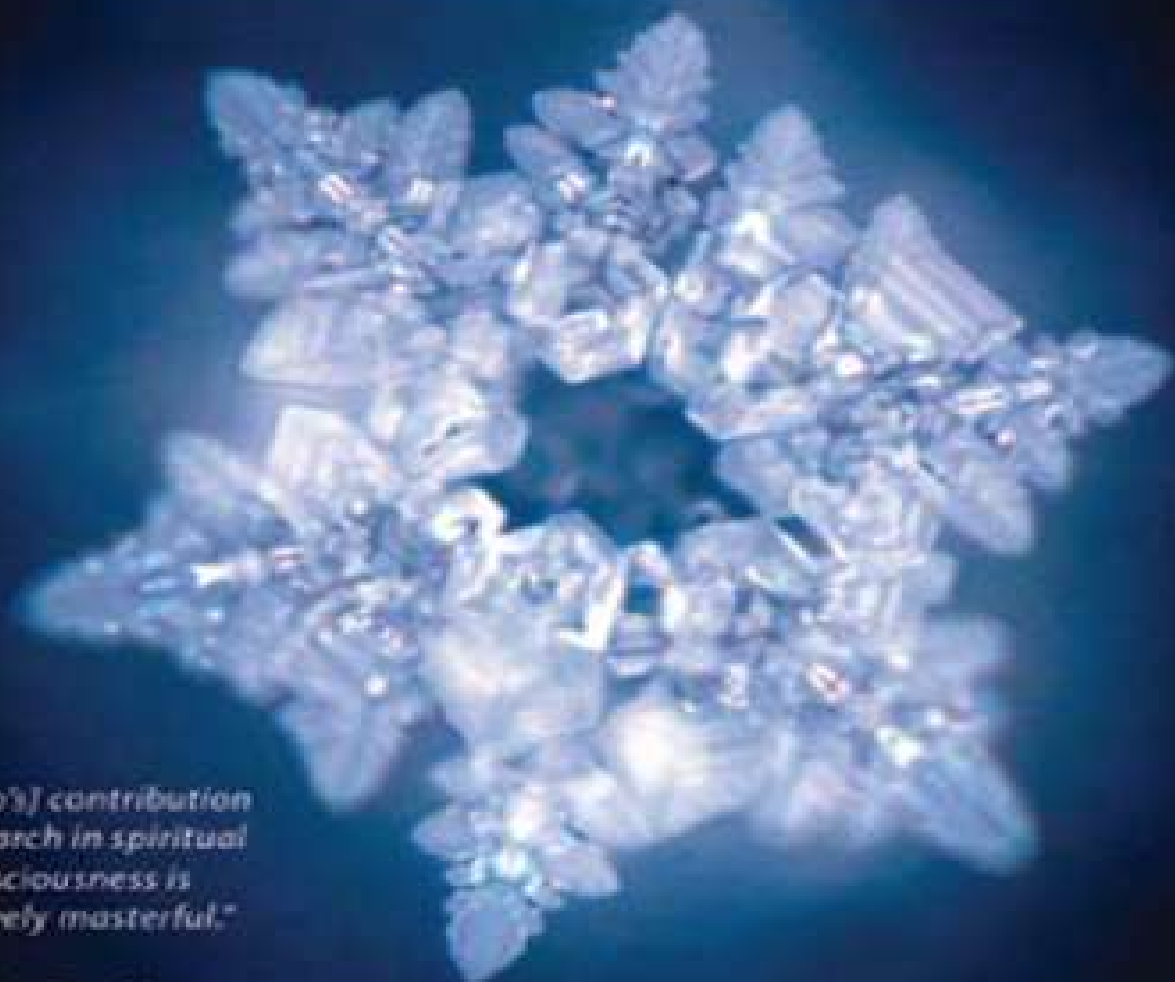


MASARU EMOTO

The author of *THE MESSAGE FROM WATER*

The Healing Power of

Water



"[Emoto's] contribution to research in spiritual consciousness is positively masterful."

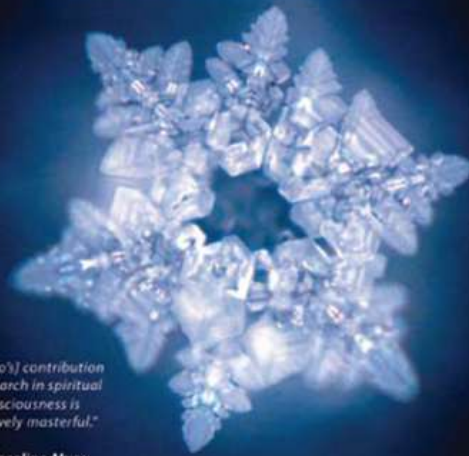
—Caroline Myss

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Power of
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The Healing Power of WATER

Masaru Emoto

Consultant Editor: Elizabeth Puttick



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CONTENTS

Foreword by Louise Hay

Introduction

PART I: SCIENTIFIC PERSPECTIVES

Introduction to Part I

Chapter 1: Psychoenergetic Science: Expanding Today's Science to Include Human Consciousness, by William A. Tiller, Ph.D.

Chapter 2: The Structure of Liquid Water: Its Relevance to Homeopathy, Ultradilute Sols (or Colloids), and Imprinted Waters, by Rustum Roy

Chapter 3: Water: Its Clinical and Scientific Depths, by Cyril W. Smith

Chapter 4: Water: Nature's Miracle—Beyond Scientific Explanation, by Dolly Knight and Jonathan Stromberg

Chapter 5: Snow, It Has Six Edges, by Maximilian Glas

PART II: HEALTH AND HEALING PERSPECTIVES

Introduction to Part II

Chapter 6: Water as a Source of Health, by Petra Bracht, M.D.

Chapter 7: Water: The Fusion of Science and Spirit, by Dr. Darren R. Weissman

Chapter 8: Dowsing for Water, by Sig Lonegren

Chapter 9: Listening to Water, by Miranda Alcott

Chapter 10: The Waters of Life, by Carrie Jost

**PART III: SPIRITUAL AND MYTHOLOGICAL
PERSPECTIVES**

Introduction to Part III

Chapter 11: Water in Christianity, by Alan Walker

Chapter 12: Mikvah: Gateway to Purity, by Rivkah Slonim

Chapter 13: Waters of the World, by Starhawk

**Chapter 14: The Spirit of Water in the World of Shamanism, by José Luis
Stevens, Ph.D.**

**Chapter 15: Water Lore and Ritual in World Mythology, by Terri
Windling**

**Chapter 16: Lourdes and Other Healing Wells and Springs Associated with
Goddesses and Female Saints, by Doreen Virtue, Ph.D.**

Chapter 17: Chalice Well, Glastonbury, by William Bloom, Ph.D.

Chapter 18: The Dreaming Pool of Bath, by Richard Beaumont

**Chapter 19: Mother Ganges, India's Sacred River, by Elizabeth Puttick,
Ph.D.**

Chapter 20: Water, the Moon, and the Sound of the Planets, by Sayama

**Chapter 21: Rituals for Celebrating the Sacred Gift of Water, by Maril
Crabtree**

About the Author

About the Contributors

FOREWORD

So many people all over the world have been touched and impressed by the research and findings of the work of Dr. Masaru Emoto. His groundbreaking first book, *The Message from Water*, awakened us to the simple but profound connection between our thoughts and the effect they have not only on our own bodies, but on water itself. Wow! What a novel idea.

This information gave me a new respect for water. I began blessing with love every glass of water I drank. Labels appeared on my faucets, showerhead, garden watering cans, the toilets, every other water source I had, and all the many bottles of water I carried everywhere.

I heard more and more from others who were using Dr. Emoto's information to expand and change their own work to include respect for water. It was only a natural progression to gather this information into a book to share with the world.

Dr. Emoto has taken all that he knows about the magic of water and utilized the current brilliant minds of people from the scientific, health, and spiritual worlds, combined with the mythological realms, to give you the most comprehensive study of water and its powers. Personally, I think *The Healing Power of Water* may be his best work to date. If you want to know, for instance, the myths of water (such as the healing power of the waters at Lourdes), you can read that section of the book. You can also discover what scientists say comprises the structure of water. For me, I jumped right to the information pertaining to health. How often have we heard the advice to drink eight glasses of water a day? These chapters delve deeper into the questions of water and its power to heal.

Dr. Emoto and I have visited with each other on a number of occasions, most recently at my 80th birthday party. At that lovely celebration, he presented me with a beautifully framed photograph of a magnificent water crystal, which had been formed out of the words *You can heal your life*. It brought tears of joy to my eyes to see what a beautiful water crystal looked

like based on the title of my best-selling book. I've always believed in the healing power of words, and this very learned gentleman presented this very simple lady with a precious gift. I will treasure it always.

You have in your hands Masaru Emoto's latest endeavor, *The Healing Power of Water*, and it's my honor to be writing this Foreword. Dr. Emoto's work has sparked a revolution! It's heartening to have so many authors studying and sharing their thoughts about the healing power of water. I hope you find what you are looking for in these pages.

— Louise L. Hay



You can heal your life crystal.

INTRODUCTION

I first had the idea of freezing water and photographing the crystals thus formed in 1994. Since then, several books have come out on my work, featuring both visual images of water crystals and the insights that I've gained from my research. These volumes have been translated into many languages, and I regularly travel all over the world to give lectures about my experiences with water. And every time, I'm touched anew by how people can *intuitively* relate to the images of the water crystals.

For both my colleagues and myself, this last decade has involved years of intensive development and research. Although the technique of water-crystal photography has to be further refined to meet the strict demands of the scientific community, it's inspiring to witness the interest with which the pictures are examined and the immediate understanding of their meaning at a lay level. We hope that you, too, will gain a new awareness of the wonderful and miraculous world of water.



Masaru Emoto

WATER: THE HEALER IN US

Why are we so fascinated by water? Since the beginning of time, it has been seen as a symbol of the soul and regarded as the *prima materia*, the

prime substance, of the universe. Life itself developed out of the sea, the human fetus is surrounded and protected by the amniotic fluid, and our body consists of at least 70 percent water—the examples could go on and on.

Water as a physical substance possesses some of the features that made life possible on Earth. We all learned about its anomalies in our physics classes. For instance, frozen water is lighter than the liquid. Without this quality, rivers would freeze completely from top to bottom in winter; but because a lighter, protective layer of ice forms on the surface, creatures can still exist underneath.

Water also has the ability to levitate. It can flow against gravity, as in the case of artesian springs and wells. The healing power of water from these sources, for both external and internal use, has been known for generations.

In my book *Die Antwort des Wassers (Water Knows the Answer)*, I described the amazing journey of one drop of water. I'd like to look at this journey once again, but from a different point of view, using it as an analogy for human life.

EVERYTHING IS IN A STATE OF CHANGE

In Buddhism and Shintoism, two religions that have significantly influenced our way of thinking in Japan, reincarnation is an absolutely integral component. This idea of cyclic development, of spiraling, corresponds well with the journey of a drop of water. A drop might start its journey as water, then evaporate, changing its form. It's still water, but it's not the same as before. However, the same knowledge, the same information, is still there. The same applies even when it's frozen.

I would say that the process of evaporating is equivalent to dying. Then we, too, change our shape, our form. The body dissolves, but the information that the soul has acquired—all the experiences and everything that we've learned—is maintained. Now the soul sets out on its own journey. It develops further and matures until it's time for it to incarnate again on Earth—just as the water drop rises as steam, falls back as a raindrop out of a cloud, trickles away into the earth, and after a very long

time (100 to 1,000 years), appears again on the surface of the earth as an artesian spring.

We don't know exactly what processes a drop of water goes through inside the earth before the astonishing power of levitation finally sets in and it rises up hundreds of feet. But we do know that artesian springs have enormous healing power.

WATER-CRYSTAL PHOTOGRAPHY

For many years now I've been studying the healing power of water. I was the first scientist in Japan to use a device that made it possible to transfer vibrations into this substance. Thanks to this water, which was charged with "healing" information, many people who came to see me in my practice were restored to health.

Water has played a central role in my life for a long time. I've often noticed that as long as we're receptive and open, we can often uncover very valuable clues in even the smallest things around us. This happened to me one day when I read: "No two snow crystals are the same." Of course, I'd learned that as a child in school. I knew that each snowflake was unique. But at that very moment, the sentence had a completely new meaning to me. Suddenly I realized that the snowflake state revealed the individual face of each water drop, and that it might be possible to take photographs of it. My hypothesis was that the ice crystals would give me information about the *state* of the water. This idea gripped me—I wanted to freeze water and then try to take pictures of the crystals. So I rented a high-resolution microscope and started some experiments with the assistance of a young researcher from my company.

Two long months went by with no results whatsoever, but one day my radiant co-worker presented me with the first photo of a water crystal. Looking back now, it seems a miracle that we even managed to get pictures, considering the conditions under which the experiment was first carried out!

We started by putting a single drop of water in each of the 50 petri dishes we'd prepared. We then froze them at a temperature of -13° F and took

pictures under the microscope of the crystals that had formed. The temperature in the laboratory where we took the photographs was constantly kept at 23° F; even so, the average lifetime of a crystal under the microscope was just two minutes because of the light that was needed—this had a warming effect, which melted the subject.

In my other books, I've already explained that we normally chose just one out of some 50 pictures. Usually we decided on one that was representative of the shape that appeared most frequently.

THE MEMORY OF MEMORY

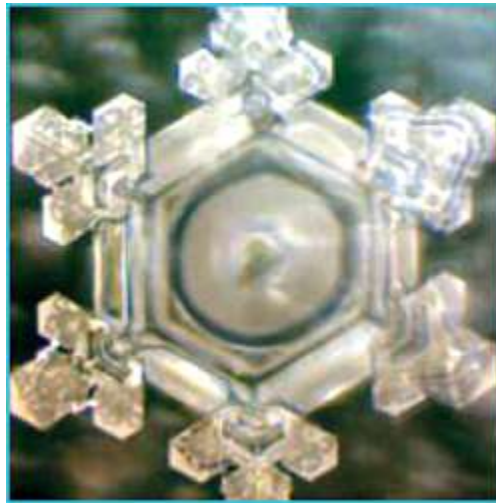
When Water freezes, its molecules systematically connect and form the nucleons of a crystal; it becomes stable when it has the structure of a hexagon. Then it starts to grow and a visible crystal appears. This is the natural course of the procedure. However, if unnatural information is forced upon it, it's not able to form a harmonic hexagonal crystal.



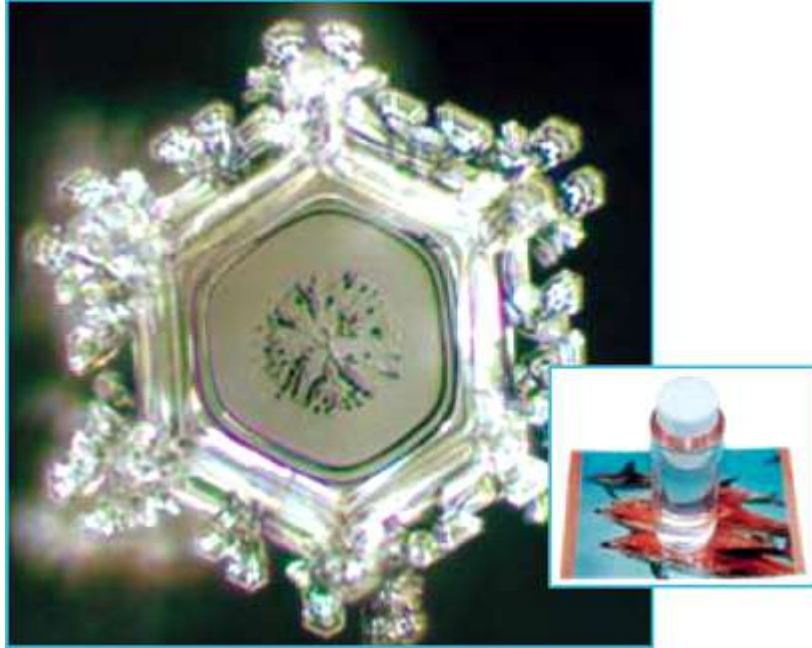
Above: This is how the crystal pictures are produced. The temperature is kept constant at -5° C in the laboratory. The photo must be taken very fast, because the beautiful crystal structure only lasts for two minutes.

Once our initial hypothesis had been confirmed by the data, I started to investigate water from different places. Our experiments went well and we managed to produce reliable pictures. The question we asked ourselves was: *Do water crystals look different under different circumstances?*

All my expectations were surpassed. The photographs clearly showed that depending on its origins (that is, whether it came from a natural spring or from the kitchen tap), water would take on a completely different shape. This was visible proof that not all water was the same—it reacted to the “experiences” it went through during its journey and stored that information. Water from a spring formed breathtakingly beautiful regular hexagons, while water from the lower course of a river or from a dam hardly achieved a complete crystal. The most shocking results came from chloride-ridden drinking water. It can be really painful to see water that has been mistreated in such a way if you know what marvelous crystals natural water can form. . . .



This picture shows a water crystal, which was “given a soul” by labeling it with the word *thanks*. The result is this beautifully formed crystal.



This crystal was formed after the water has seen the picture with the jumping dolphins. The dolphin has a similar—or even higher—intelligence than the human being, and it's said that dolphins can heal us.

In light of these experiments, we can say that water has a memory. Each molecule of it carries some information, and when we drink it, that data becomes part of our body. Looking at these pictures, ask yourself: “Which information do I want to take in?”

WATER LISTENS TO MUSIC

One day, Dr. Ishibashi, the chemist and scientist who took the photographs of the water crystals, came to see me and asked, “What if we played some music to the water?” I found the idea terrific and that's how some of the most impressive pictures came into being (see the following photos).



Schubert's interpretation of "Ave Maria." This picture shows a very beautiful, symmetric crystal, which radiates deep love.



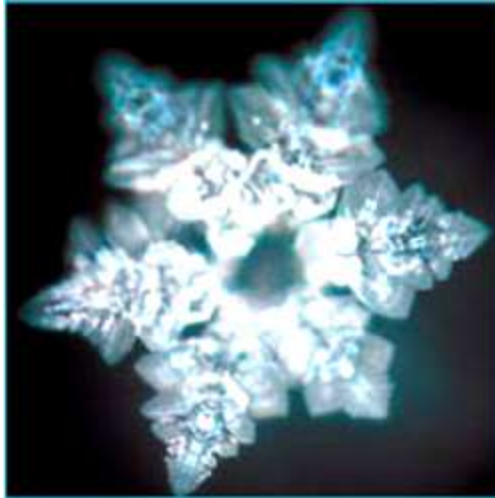
Water listens to *Swan Lake* by Tchaikovsky and a crystal is formed with delicate branches, reminiscent of swans' necks.



This water listened to the CD *Message from Water*. If you look into the center, you can see another small crystal trying to form itself.



Crystals responding to the *Four Seasons* music.



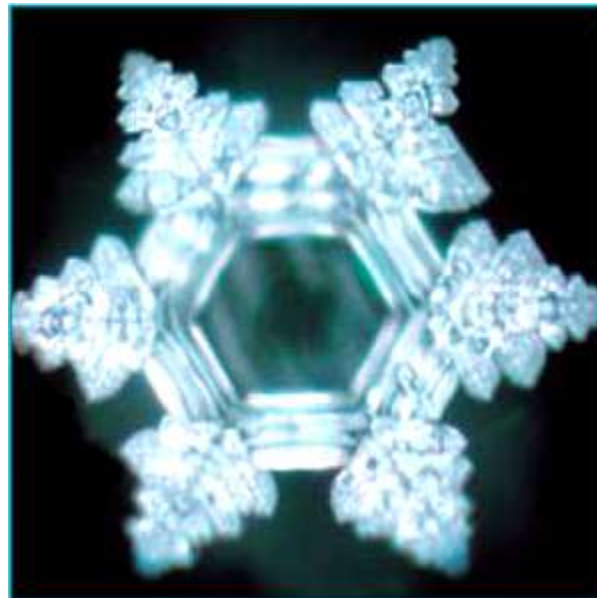
Above: Spring: The plants starting to sprout.



Right, top to bottom: Summer: They reach full blossom, Autumn: The seeds have developed and start to drop from the plant, Winter: The seeds rest hidden away in the winter. It's the time for retreat and silence.



The Beatles, “Yesterday”: A beautiful crystal has formed. The structure of the turtle shell shows that this music strengthens the immune system.



“Edelweiss” from *The Sound of Music*: *Edelweiss* means “precious white.” In correspondence with this name, a very clear white crystal has formed. The center seems like a mirror.

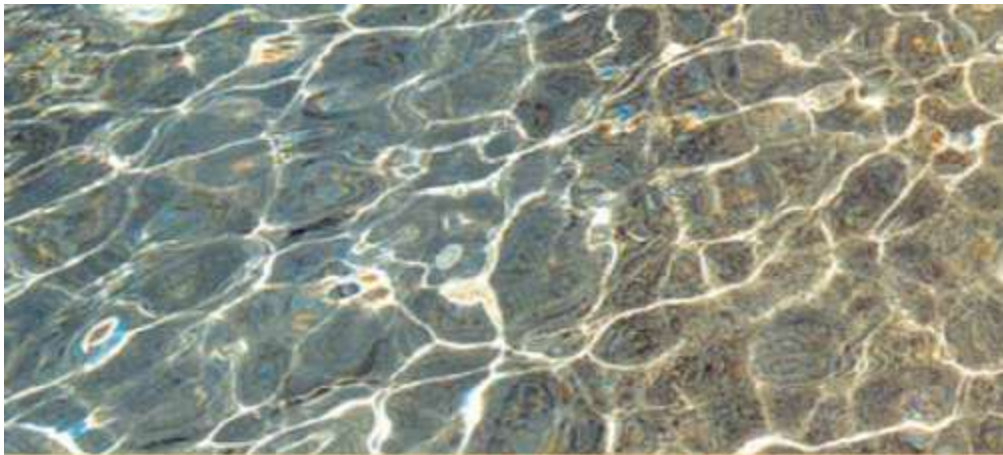
The method was fairly simple: A small bottle of distilled water was placed between two loudspeakers, and music was then played. We discovered that if we knocked gently on the bottle before and after playing the music, we got clearer pictures.

We chose classical music for our first attempts and later on used popular contemporary music. Our choices ranged from Gregorian chants and Buddhist sutras to heavy metal. We also experimented with healing melodies. We discovered, for example, that some pieces of music supported the immune system. Sound is vibration, so we now know that water is able to react to vibrations and can store them in its own very specific way. You can find out more about this in my other books.

When we started to act on the idea of playing music to water, we abandoned our role as passive observers for good.

IS WATER ABLE TO READ?

This question seemed absurd at first. However, I had the idea of showing some Japanese characters to water. In Japan, we think that every single word possesses a soul. I'll try to explain this by means of an example. Let's take the word *gratitude*. When I say it, I haven't just given sound to a string of phonemes, but have expressed a meaning and a feeling. We believe that a word possesses this power of transmission because it has a share of the word soul and is its messenger or, more accurately, its representative. By saying "Thank you," I step into resonance with this word *soul* and vibrate in unison with it. And, as I'd expected, water shown a range of different Japanese characters formed completely different crystals.

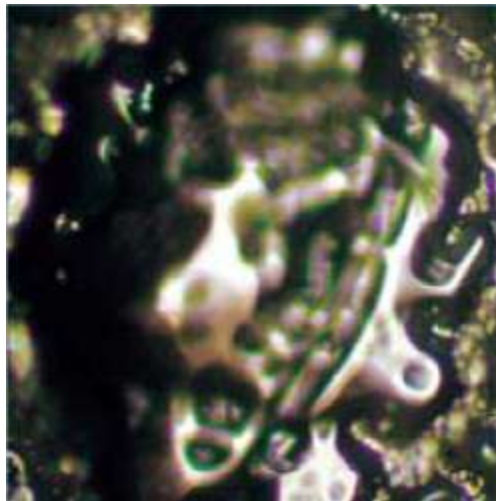


THE WORD SOUL AND MORPHOGENETIC FIELDS

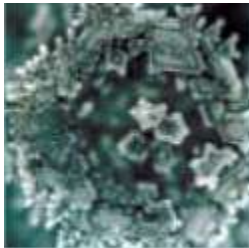
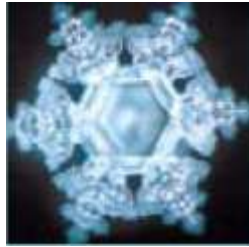
I'm always fascinated to see how ancient wisdom is being rediscovered by some brave scientists of our time. Biologist Rupert Sheldrake speaks about a morphogenetic field, in which all information is stored in the shape of vibrations. The morphogenetic field for "Thank you" is increased if somebody says the words—or just even thinks them. The stronger a morphogenetic field, the easier it becomes for everybody else to say those particular words and the more likely it is that this will happen.¹

An example of this is the phenomenon of the hundredth monkey, as first observed in the late 1950s on a northern Japanese island. A group of behavioral scientists observed that monkeys on the island would wash their potatoes before they ate them. It's likely that one of them started it by chance, and then others copied its behavior. They must have found out that the taste of a washed potato was far better than one that hadn't been cleaned. Eventually, there were 100 monkeys on that island who were eating in this fashion. Then something fascinating happened: Suddenly, monkeys on another island started to wash their potatoes; but they didn't start one by one, as had been the case on the first island, but all at once, as if the animals on the first island had told them about their discovery. However, there had been no contact between the two groups.

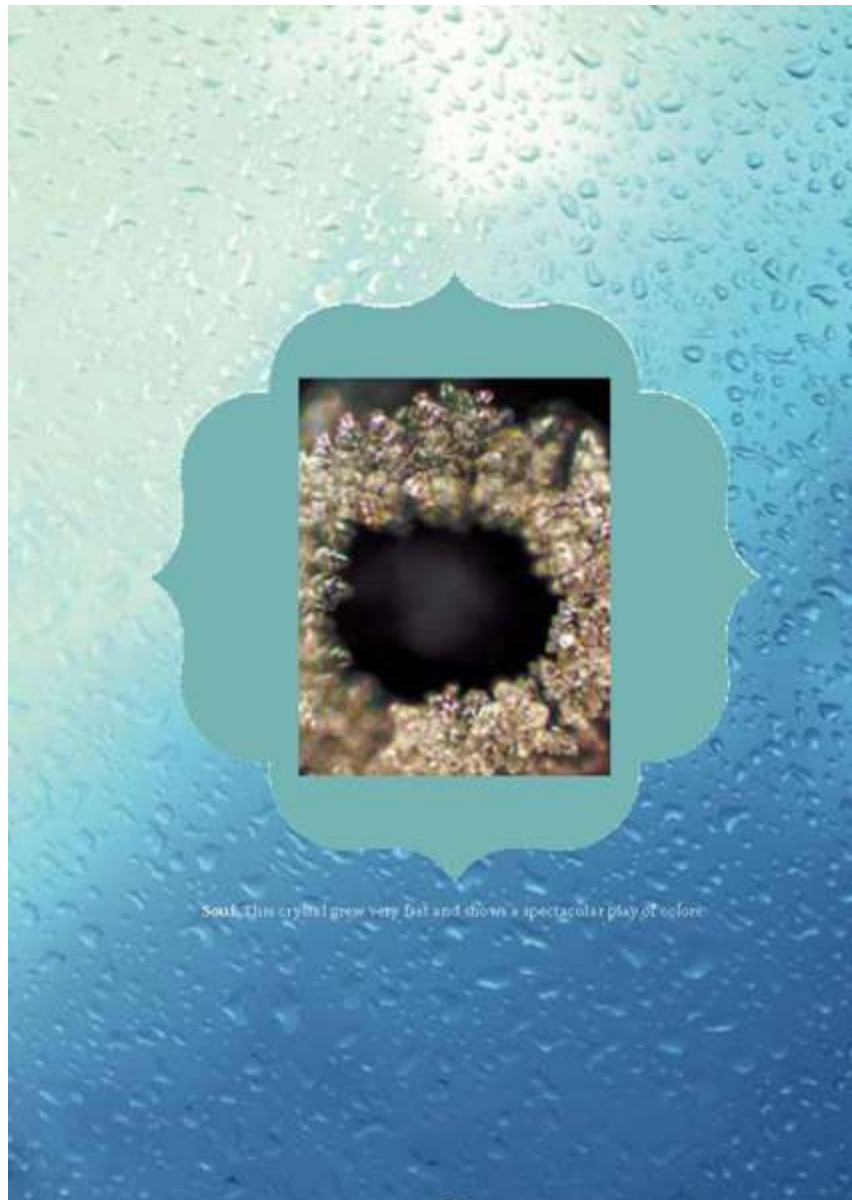
This phenomenon can be used to explain the theory behind the morphogenetic field. Through the behavior of the first group of monkeys, a field of vibrations was created that contained the information "Washed potatoes taste good." At a certain critical mass (the hundredth monkey), the field developed an intensity that allowed others to have a share in this information.



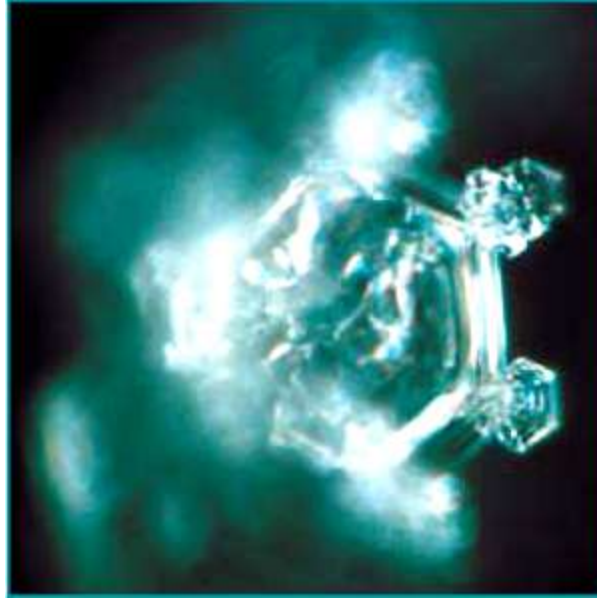
Above: This water was given a label with the word demon. Judge for yourself how this word affected the water.



*Right, top to bottom: Om Namah Shivaya is a Sanskrit mantra. This beautiful crystal looks like a mandala. Next: This crystal was formed using a label with the words “This is really beautiful.” One can wholeheartedly agree! Last: **Power:** Here you can see that power on its own can’t achieve anything—no ordered crystal structure has formed.*



Soul: This crystal grew very fast and shows a spectacular play of colors.



Water with the label “bad luck.” A very weak crystal has formed, which is trying unsuccessfully to bring itself into balance.



Lucky: This is perfect beauty and harmony. Like a fine-cut diamond. Maybe harmony is a necessity for luck. . . .

In the same way that actions originate a morphogenetic field, so do words; and each word makes its own individual contribution. We can imagine this as similar to a hologram in which every single piece describes the whole picture.

A professor from Yale University wanted to test Rupert Sheldrake's theory. He put together a range of Hebrew words and a similar number of meaningless, invented words. He then mixed these two sets and showed them to some students, one word at a time. (None of the subjects could speak Hebrew.) He asked them to try to guess the meaning of each word and didn't tell them that some of them were totally meaningless.² With the Hebrew words, there was a statistical approximation of the correct meaning, while it was obvious (by means of the statistical distribution of the answers) that the students had used guesswork on the words without any meaning. This was a confirmation of Sheldrake's theory of the morphogenetic field, or what I described as the "word soul."

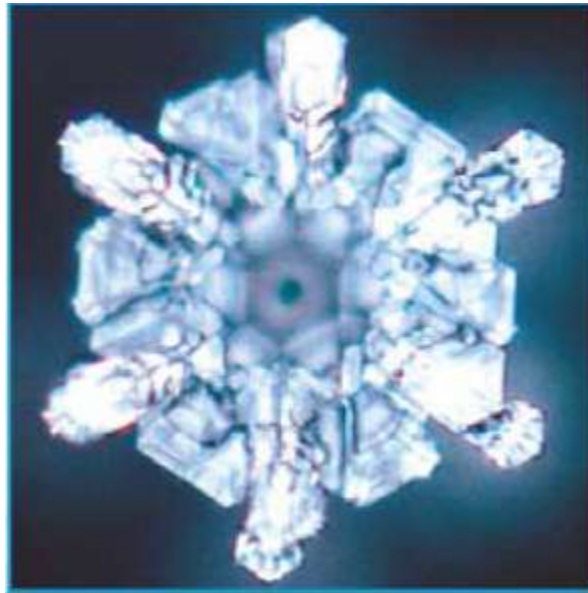
I believe it's this word *soul*, this vibrational information, that the water reads and tunes in to. The results of this tuning in are then visible in the different water crystals. Actually, we can see the pattern of vibration of the specific word soul, and it feels to me as if a window opens up and we can get a glimpse of the universe.

THE POWER OF THE WORD SOUL

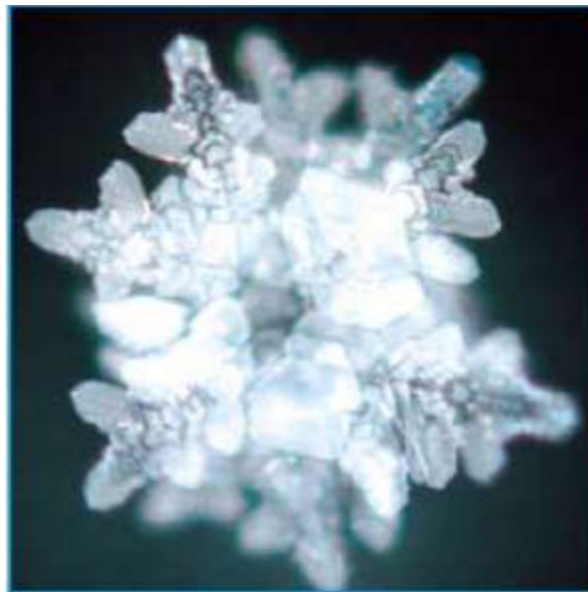
When we're thinking a thought and give it energy by imagining it as real or speaking it, we're storing the pattern of vibration in the water of our bodies, and it shows as the corresponding vibration all around us and further out, beyond our physical selves. In this way, we influence our surroundings and others react to it, so we receive the appropriate feedback that again reinforces both our vibrations and the morphogenetic field. This shows how important it is to think and speak with purity of intent.

My esteemed teacher Dr. Nobuo Shioya made me aware of this a long time ago; and now, thanks to the water-crystal images, we can actually see it in solid form. In his book, *Der Jungbrunnen des Dr. Shioya (Dr. Shioya's Fountain of Youth)*, Dr. Shioya describes the three "correct states of mind" that can help each of us live a happier life. Although very ill from birth, he developed a breathing technique that he combined with visualization. This method of "creative power thoughts and correct breathing" made it possible for him to live a healthier and longer life. From his 60th birthday onward,

he really started to rejuvenate. For example, he won a golf tournament at the venerable age of 100 years.



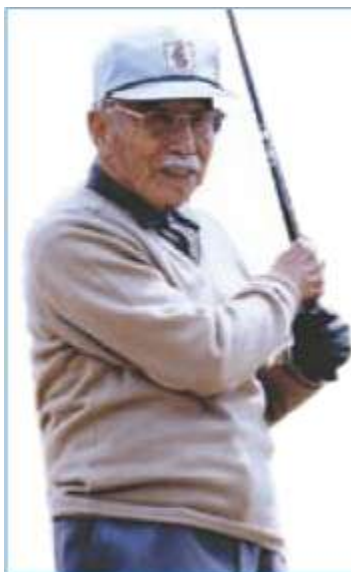
The healing hands of the mother: This powerful crystal shows a slight pink coloring. Pink is assigned to love and the energy of friendliness, which comes from the heart. It's also said that this color helps activate the life energy.



Giving birth: This picture shows that giving birth is more than simply delivering a baby. It feels as if a decision has been made to weave its own pattern of life. This picture shows a dynamic, developing movement.

DR. SHIOYA'S THREE GOLDEN RULES

Dr. Shioya's three correct states of mind are fundamental attitudes that are easy to adopt and can bring about an enormous change in our everyday life. Their meaning and use will become even more apparent in the light of our knowledge about the power of the word soul.



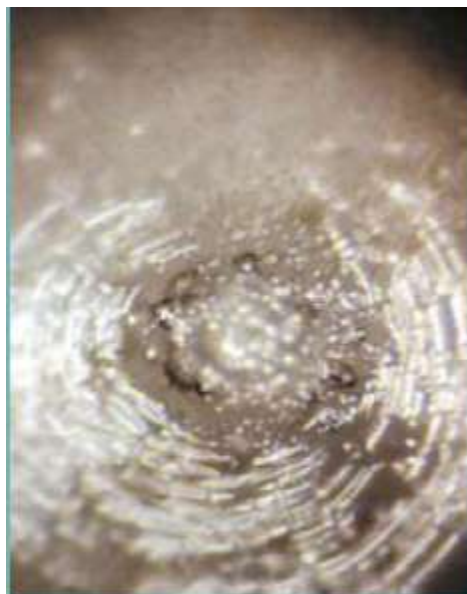
Dr. Nobu Shioya: With the help of his simple method of “creative power of the thoughts and the right way of breathing,” it’s possible to rejuvenate the body and mind.

1. *Be positive.* It’s proven that positive thoughts influence our physical health. For example, they can strengthen the immune system. This state of mind isn’t an instruction to lead a “better” life (in a religious or moral sense), but a powerful aid to maintaining good health in both body and mind. By having a positive attitude and being open to all situations, we’re prepared to recognize opportunities and take them. This has nothing to do with superficial politeness or trite “seeing life through rose-tinted glasses”—quite the opposite, actually. Instead of focusing just on the negative, we look at *both sides* of the proverbial coin. By doing so, we learn to recognize the possibilities available to us.
2. *Don’t forget to say thank you.* Gratitude can be a core feeling, and it’s important to always remind ourselves of it. Awareness generates

energy. If we're consciously grateful, we send out corresponding vibrations and attract similar vibrations. This means that we'll find ourselves in more and more situations where we have a good reason to give thanks. Anyone who lacks this basic attitude should turn their attention to things they can be grateful for, however small they are. Some people might claim that there's absolutely nothing in their lives that falls into this category, but actually we can give thanks that we are alive every day.

3. *Don't nag*. If we find fault with everything instead of being grateful, these thoughts and feelings become vibrations that are sent out and in turn attract situations that will lead to more nagging. Thoughts such as *I'm in trouble, I don't like this, I can't do it, This is hard, or This is laborious* will attract difficult, unpleasant, hard, and laborious situations.

The water-crystal images show us the effect on water of, for example, the word *fool* or a phrase like "We have done this really well." The same vibration is created when we say to somebody, "You are a fool." This isn't just a statement per se; by uttering the words we create, or rather reinforce, the negative vibration, and thus the very pattern of behavior. These disharmonic patterns of vibration are "stamped" on water in general and on the bodily waters of the person in question.



This is the effect of the word *fool*. Water can't form a crystal structure if words are hurtful and belittling.

The main reason why I always argue that we should praise our children (and friends and colleagues) is because we thereby reinforce their positive qualities. I'm certain that we'd all benefit from this kind of consciousness in speech and thought, especially as words and thoughts that are aimed at somebody else always have an impact on us first. If I were to give out the word *fool* into the world, my own system would be filled with this vibration first and would come into step with its disharmonic content.

The time-honored principle "Do unto others as you would have them do unto you" acquires a completely new meaning in the light of the theory of the morphogenetic field. Even the most self-centered person has the ability to speak, act, and think considerately—and should do so, because it should be clear by now that we are responsible for what happens to us.

Another mental habit that hinders self-development is the practice of running ourselves down, both verbally and internally. Every one of us has the ability (and perhaps I should also say the *duty* to ourselves) to speak and act in such a way that nurtures, rather than poisons, our microcosm. I'm always saddened by the realization that so many people invest so much of their inner energy running themselves down both verbally and internally, just because something didn't happen in the way that they'd hoped. By doing this we don't create the flow of positive energy that can help us learn from our mistakes. If we look at water crystals, the message is clear: We poison ourselves with all this negative chatter.

The time is now ripe to put this realization into practice and break the habit of a lifetime. It's not my intention to preach here: Water itself speaks a distinct and clear language. Life isn't really that complicated, and we all carry that knowledge inside ourselves; we just have to rediscover it. The pictures of the water crystals can help us in the search for our own truth. They can guide us.

THE NEW HEALING POWER: THE DIALOGUE WITH WATER

The healing power of water and its ability to carry information has been known for centuries, and many therapies have been based on this knowledge. What's new is that these "hidden" properties can now be made visible. The information carried by the water can be seen as a picture, and this changes our view of it from a mere chemical molecule into a living creature.

In former times there was nothing unusual in holding conversations with nature and nature spirits, even in the Western world. Nowadays, our increasingly mechanistic view of things prevents us from acknowledging these organic perceptions, even if they come into our consciousness. Nothing can be what it's not allowed to be.

The water-crystal images act as mediators between those of us who are still caught in this mechanistic view of the world and the holographic reality. By "holographic" I mean that you can see the whole of the picture in every part. The images of the water crystals are ambassadors, giving us an insight into the real connections of the universe.

People want to feel safe—that's why a clear philosophy of the life of the world was developed. A new age has now come into being. We can no longer close ourselves to a broader philosophy of life, and we can now find that longed-for safety at a higher level. If we learn how to tune in to this elevated vibration, we can become one with it.

Water is a very honest mirror. The pictures of the water crystals show clearly the effects that different environmental factors have on living systems. But what these images show as well is that we're not helplessly exposed to these negative influences. Through love and gratitude, we have the ability to improve our world. By thinking and feeling "love and gratitude," we can actively put a healing process into motion.

When we look at the water-crystal pictures of negative ideas, the numinous fear that most of us feel disappears. Instead, we empathize with the malformed water. It didn't choose to suffer in such a manner. In this way, a new state of mind comes into being inside us. We want to do something good for the water and, consequently, for ourselves. We're not at war anymore with the pollution of negativity. Conflict just produces more harmful energy, which in turn gives rise to more adversity. We don't want to close our eyes to the negative—on the contrary, we're visually and

intellectually aware of it—but we use love and gratitude to transform it in a positive way.

From this it follows that we have the ability to take an active part in the creation of our world. This realization gives us not only power but also responsibility. We are no longer helpless “playthings.” What kind of existence do we want to create? What do we want to put into being? *Each* of us is called on to answer this basic question in thought, word, and deed. If I yearn for peace but nag and scold and condemn all the time, then how can my dream come into being, either in myself or anywhere else?

The pictures of the water crystals stimulate our imagination. We’re so controlled by the left side of our brain, but images affect the right side, and many have the effect of mandalas. I would have preferred to show only beautiful photos, but I thought it was also important to give the left part of the brain some good stuff to ponder, and therefore to question old thinking patterns. In this way the pictures of the water crystals have an effect on our whole mental structure. Simply reading something is one-sided, as is just looking at pictures. It’s only from the combination of both that new realizations can grow and be put into practice in our everyday lives. These images carry a message that reaches us at the mental, soul, and physical levels through the water in our bodies that vibrates in harmony with them.

Like children going through the “Why?” phase of development, we, too, can ask water everything that’s important to us. In this way we can gain an insight into reality as it truly is. Water is a messenger— it brings us information about the world and the universe.

LIFE IS MOVEMENT

Ancient wisdom shows itself clearly in the crystals. Water from a free-flowing river creates incredibly beautiful shapes. If we examine the formations from the stagnating area of a dam, we don’t find any crystal structures—the pictures here are similar to looking through a hole dug in a swamp. By not being allowed to flow, water loses its vitality, its charisma. It’s cut off from the river of life. And the same applies to us as human

beings: It's vital for us, too, to move with the universal current. Each stagnation brings a dying off.

We know this at a physical level. For example, when the blood becomes too thick and clots form in our arteries and veins, the risk of a heart attack or stroke increases. We know this at an emotional level, too. If a person is holding on to a feeling—say, grief—he or she will one day stiffen with the pain. The same happens mentally, as there are those who become rigid with fear, dogma, and prejudice. The water crystals show us very clearly how we should live—what's good for the water in nature is also good for that element in our bodies. Being in constant motion at all levels contributes significantly to our well-being.

By doing this, we're not only helping ourselves, but also water in general. By giving the water in our bodies the necessary attention, we honor the water of Earth, too, because everything is connected. We're aquatic beings, and I can't stress enough the importance of becoming aware of it. The consequence should be that we treat the gift of the universe respectfully and attentively and honor its wisdom.

OFFERING LOVE AND GRATITUDE TO WATER

I firmly believe that it's our duty as human beings to contribute to the healing of the earth and its waters. For many of us this has been a need for a long time. Now we know that together we can make big things happen, as the law of the hundredth monkey teaches us.

One of the most important messages that we receive from the water crystals is that each of our thoughts, words, and actions represents information that we send out. Our consciousness has a real influence on water, which becomes particularly powerful when many of us become one and aim for the same goal. In this lies the power of joint prayer. Let's use this energy to give love and gratitude to water.

Let's declare July 25 of each year a "World Day of Love and Thanks to Water." We'll start this event with a ceremony to send out our feelings to the life-giving liquid and in this way gradually raise our consciousness. Take part in it on your own or with others, and direct your thoughts and

prayers to water. Every single person counts; each loving word matters. All drops that are treated with love and respect carry those vibrations out into the world.

To increase the power of the message, I suggest sending out the vibrations three times during the day, say at 7 A.M., 1 P.M., and 7 P.M. (your local time). Please direct love and thanks to water at one or all of these times and pass this information on to all those who are interested.

How you arrange the ceremony is completely up to you. You can say prayers from your own religion, or you can do a visualization. I, for instance, imagine silver/golden light filling water and the earth and flowing out of the heart of each and every person.

In addition to this World Day of Love and Thanks to Water, let's send out our affection and gratitude at the same times on the 25th of each month. By doing so, you're also benefitting yourself: You're lifting your own vibration. And by thanking the water that, for example, runs over your hands while you're washing up, you're appreciating the same substance in your body, in your cells. In that way you're contributing actively to your own well-being.

The health of each and every person is one of my most heartfelt wishes. But an even more important desire is for healing the natural world, Earth, and humanity as a whole. My dream is one of world peace, and I know that I'm not alone in this.



NOTES

1. The morphogenetic field, or morphic resonance, is a name given to a form of action at a distance proposed by Rupert Sheldrake. However, the idea that vision is a two-way process has been held by a great many minds in the past. The theory states that things of the same “form” tend to “resonate” with each other, so that, for example:

When crystals of a newly synthesized chemical substance, for example a new kind of drug, arise for the first time they have no exact precedent, but as the same compound is crystallized again and again, the crystals should tend to form more readily all over the world, just because they

have already formed somewhere else. (Rupert Sheldrake, *The Presence of the Past*, HarperCollins, 1988)

This concept defies, among other things, the theory of special relativity—all crystals, all over the universe, regardless of distance in space/time, will be affected.

The theory of the morphogenetic field, first conceptualized by developmental biologists (beginning in the mid-1980s), seems to be accumulating evidence that it's closely linked to the quantum gravitational field:

- A. The field pervades all space.
- B. The field interacts with all matter and energy, irrespective of whether or not that matter/energy is magnetically charged.
- C. And, most significantly, the field is what's known mathematically as a “symmetric second-rank tensor.”

All three properties are characteristic of gravity, and it was proven some years ago that the only self-consistent nonlinear theory of a symmetric second-rank tensor field is, at least at low energies, precisely Einstein's general relativity. Thus, if the evidence for A, B, and C becomes validated, we can infer that the morphogenetic field is the quantum counterpart of Einstein's gravitational field.

2. See the Website www.co-intelligence.org/P-moreonmorphgenicflds.html for more information on Gary Schwartz's experiment with Hebrew words.





PART I

SCIENTIFIC PERSPECTIVES



INTRODUCTION

Anyone who can remember their science lessons—whether in chemistry, physics, or biology—may recall that water was largely ignored or taken for granted as an inert, simple substance with the formula H_2O . Of course it had a few other properties, such as a boiling point of $100^{\circ}C$, and a unique way of expanding and contracting as it froze and unfroze. We knew it as central, not only to all life on Earth, but also to the planet's many geological processes. The unspoken message was: *That's just the way things are—no need to ask why!*

In recent years, a few brave scientists, risking ridicule and ruin, have been pioneers in discovering a whole new world with respect to the properties of water. Among the first of these was the French immunologist Jacques Benveniste, who attempted to prove that water had memory and could retain information about complex chemicals, even if there was no trace left of them. This was seen as scientific heresy, and for his trouble, Benveniste was dismissed from his job, and his laboratory was closed down. He died in 2004, but his conclusions proved so intriguing that many claim to have successfully repeated his experiments.

Other scientists followed in his footsteps, and some of the most distinguished of these have contributed to this book. In most cases, the authors have done much to simplify technical papers so that lay readers can follow them, and it's well worth a little extra time and effort to digest the contents. Having done so, you, the reader, will see something amazing—the beginnings of a whole new understanding of the world and life on it, going far beyond the limitations of the current materialist scientific era. In this new vision, thought and consciousness profoundly affect not only the structure of water, but also many other substances, even playing a critical role in the way DNA decodes itself in new life. We stand at the dawn of a new era, one that will profoundly change not only science, but also our spirituality, and indeed our whole culture.

I'm profoundly honored that my own books have been able to reach out to a wider readership around the world, demonstrating the power of thought, prayer, and intention to change water for the benefit of us all.

— **Masaru Emoto**



CHAPTER 1

PSYCHOENERGETIC SCIENCE: EXPANDING TODAY'S SCIENCE TO INCLUDE HUMAN CONSCIOUSNESS

by William A. Tiller, Ph.D.

Psychoenergetic science is an expansion of today's conventional science, which for 400 years has dealt with the following metaphorical reaction equation:



Psychoenergetic science deals with this expanded reaction equation:



Experience shows that human consciousness readily manipulates **information** of all kinds (numbers to sums, language letters to make words and sentences, jigsaw-puzzle pieces to make maps and pictures, and symbols to make equations) to produce order out of disorder([1-5](#)). From our psychoenergetics research, which is outlined in the first part of this article, we have discovered a second, unique level of physical reality that is quite different from our normal electric atom/molecule level. This new level functions in the physical vacuum within the “empty” space between the fundamental particles that make up atoms and molecules. The stuff of this physical vacuum consists of magnetic information waves; and we've observed that the physics of this new level is modulatable by the human mind, intentions, and consciousness in general.

About eight years ago, we discovered a reliable, repeatable procedure for lifting the electromagnetic symmetry state of a room or other large space higher than that of our normal atom/molecule level to one wherein commercial instrument measurements became capable of accessing these two unique levels of physical reality. In addition, this procedure allowed us to tune this large space so that a specific intention could be manifested in that place via the physics of this vacuum level of physical reality. From our research, we have found that a specific material property consists of two parts: one from the electric atom/molecule level of physical reality (which is all our normal world can presently measure), and one from the magnetic information wave level of physical reality. The instrumentally accessed magnitude of this second contribution depends on the magnitude of a special coupling coefficient material connecting these two levels. This coupling coefficient can be of negligible magnitude, as in our normal level of physical reality, or, via utilizing the aforementioned intention procedure, can be caused to be of large magnitude. We have utilized this new procedure to:

1. Substantially change the pH of the same type of water in equilibrium with air either up or down by one full pH unit (~100 times our measurement accuracy)
2. Increase by ~25% ($p < 0.001$) the in vitro thermodynamic activity of a specific human liver enzyme, alkaline phosphatase
3. Increase by ~20% ($p < 0.001$) the in vivo [ATP]/[ADP] ratio in the cells of fruit-fly larvae so that they would be fitter and have a much shorter (~20% at $p < 0.001$) development time to the adult fly stage; here, ATP is the energy storage molecule in all cells while ADP is its chemical precursor

In addition to the foregoing, we've discovered that humans, and perhaps all vertebrates, have their acupuncture meridian/ chakra system at this higher electromagnetic symmetry state, so humans have the basic capability to do what our intention-device does—though perhaps not to such a significant degree unless they're at a master or avatar level of self-

development. We hoped to be able to convert our detection device into a stand-alone engineered system for use as an individual or group biofeedback device to enhance individual (or group) self-development to higher and higher levels of inner self-management.

Finally, in the second part of this article, I provide a brief theoretical overview of what controls ice-crystal shape during the freezing of water, both without and with the application of human intention.

PART I: KEY BACKGROUND EXPERIMENTAL DATA

References 7 to 9 cover my psychoenergetics research books over the past 35 years. In the first contribution,⁷ the work clearly showed that human consciousness could enhance the radiation spectra of the human biofield sufficiently to have a robust impact on a wide variety of physical processes. Table 1 provides a summary of these key experimental findings. The second contribution⁸ covers the period from 1997 to 2001, and Table 2 provides a summary of our key experimental findings during that period.

TABLE 1: SUMMARY OF KEY EXPERIMENTAL FINDINGS FROM “SCIENCE AND HUMAN TRANSFORMATION”

1. A highly developed human biofield can alter the properties of materials and the functioning of devices so as to reveal deeper levels of nature not anticipated from our normal, everyday observations. The radiations from such levels of nature pass through materials that are optically opaque to EM radiations in the visible range.
2. Non-EM emissions from the biofields of normal humans, when modulated by their attention and directed intention, can enhance or not enhance electron microavalanches in a simple gas discharge device, depending upon the actual focus of the humans’ intention.
3. Some humans emit bursts of subtle energy from various body chakras; and via a subtle energy/electrical energy conversion process

involving the acupuncture meridian system, large voltage pulses appear both on the body and at sites remote from the body.

4. When focusing on the heart with loving intent, the human EKG becomes harmonic at the baroreflex frequency, 0.14 hertz, where the heart entrains the brain, and simultaneously all the other major electrophysiological systems of the body. In this heart-entrainment mode of functioning, body-chemical production becomes healthier, and focused intent can psychokinetically influence molecular structures both inside and outside the body.
5. Most young children perceive both EM and subtle energies. Lens and prism experiments indicate that the latter travel at velocities, $v > c$, the EM light velocity, and speed up on entering denser matter.
6. Dowsing is a natural human body response mechanism for those who give it meaning, wherein the unconscious communicates valuable information to the conscious via involuntary small muscle movements or the creation of localized heat patterns.

TABLE 2: SUMMARY OF KEY EXPERIMENTAL FINDINGS FROM “CONSCIOUS ACTS OF CREATION”

1. Human consciousness, in the form of a specific intention, can be imprinted into a simple, low-tech electronic device from a deep meditative state by highly inner self-managed humans. Such a device, now called an IIED (intention imprinted electrical device), can act as an effective surrogate to robustly influence a unique target experiment in physical reality.
2. The four unique target experiments studied involved (a) an inorganic material (water) with property changes 100 times larger than measurement accuracy, (b) an organic in vitro material with property changes of $\sim 20\%$ at $p < 0.001$, and (c) a living in vivo material with property changes of $\sim 20\%$ at $p < 0.001$, both of the latter having a built-in control.

3. A unique intelligence was present in an IIED after imprinting so that the measured material property changes were (a) always in the direction of the IIED's intention imprint and (b) always specific to the particular IIED utilized.
4. An unshielded IIED in the electrically "off" state, and physically separated from a UED (unimprinted electrical device) in the electrically "off" state by ~100 meters, still has a communication channel available to it for transferring the imprint statement to the UED within a week. Thus, the carrier for such information exchange is not conventional electromagnetism.
5. This new field, although not EM, can be dissipated through EM-leakage pathways. Thus, wrapping an IIED in aluminum foil and storing it in an electrically grounded Faraday cage prolongs its lifetime of effective use (~3 months before reimprinting is required).
6. Placing a specific IIED in a room and turning it on "conditions" the room to a state wherein Item 2 in this table naturally manifests. Without the presence of this "conditioned" state in the room housing the target experiment equipment, these material property changes don't occur.
7. One characteristic of a "conditioned" space is that a DC magnetic field polarity effect on the pH of water occurs. Such an effect is thought to require the accessing of magnetic monopoles, a property usually associated with a higher EM gauge symmetry state than our normal, everyday reality. Such a higher EM gauge symmetry state is also a higher thermodynamic free energy per unit volume state.
8. Another characteristic of a "conditioned" space is the spontaneous appearance of material property oscillations of very large amplitude (air and water temperature, pH, electrical conductivity of water, etc.) that are (a) global throughout the room, (b) all exhibit the same Fourier spectral components, and (c) all are in the frequency range $\sim 10^{-2}$ to 10^{-3} hertz.

9. A third important characteristic of a “conditioned” space is that it’s sensitive to the presence of an active IIED at separation distances of at least ~150 feet. Oscillations generated in the locale of the IIED spontaneously appear (at high correlation coefficient) in a “conditioned” space but not in an unconditioned space.
10. If the degree of “conditioning” in a space is low and the IIED is removed from the space, the “conditioning” decays slowly with a time constant of ~1 month. If the degree of “conditioning” in a space is sufficiently high, the IIED can be completely removed from the space and stored properly and the level of “conditioning” in the room doesn’t appear to change (at least for 1–2 years).
11. The cause of the air temperature oscillations in a “conditioned” space near an apparent source was shown not to depend upon movements of the air molecules in the space, but rather thought to depend on changes at the vacuum level of physical reality.
12. Removal of the apparent air temperature oscillation source revealed that this vacuum level “phantom” source had a very slow relaxation time (~1–2 months) back to zero amplitude.
13. While in the phantom temperature oscillation source mode of reality, abrupt changes in the orientation of a large natural quartz crystal placed in the initial source region showed abrupt changes in overall oscillation wave shape, amplitude, and frequency. Thus, a quartz crystal appears to be a type of “tuner” for this vacuum-source behavior.
14. In a “conditioned” space, spontaneous and abrupt shifts in computer monitoring behavior of a random number generator (RNG) occurred from time to time for no apparent reason.
15. Experimenter effect, specific materials effects, and specific device effects appeared, in the short term, to alter the “tuning” of the oscillations in a conditioned space.

This particular body of work showed that human consciousness, in the form of a specific and detailed intention, could be imprinted into a very simple electronic device from a deep meditative state and then this processed device (now called an IIED, intention imprinted electrical device) could act as a surrogate for the specific intention and thereafter robustly influence a specifically designed target experiment in full accord with the intention imprinted therein. Figure 1 illustrates the general behavior for four distinctly different target experiments.

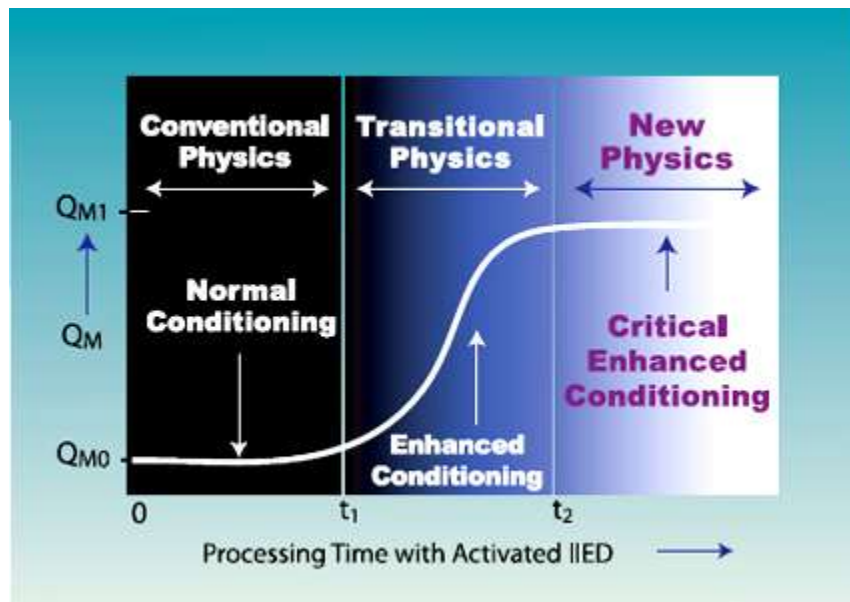


Figure 1: Q_M (some generalized physical measurement) vs. IIED processing time (length of time a space experiences a process leading to enhanced coupling)

Surprisingly, it was found that placing this IIED ~100 meters from a physically identical but unimprinted device, with both in the electrically switched-off state, didn't inhibit transfer of the specific intention imprint from the IIED to the unimprinted device within less than a week. This implies that a new information channel, other than conventional Maxwellian electromagnetism (EM), is present in nature for such an information change to occur. This new information carrier appears to be one that's modulatable by human intent. The basic process of electrically turning on an IIED in a given laboratory space causes this space to be "IIED-conditioned" in such a way as to allow the instrumentation present in that space to access another level of physical reality after an ~3 month

period of such space conditioning. The particular material property targeted by the specific intention imbedded in the device varies over time according to Figure 1 and the following equation:

$$Q_M = Q_{P1} + \infty_{\text{eff}} Q_{P2} \quad (2)$$

In Equation 2, Q_M is the total instrumentally measured value of the property, Q_{P1} is the normal value, Q_{M0} , in Figure 1, Q_{P2} is the expectation value for this second level of physical reality while ∞_{eff} is the coupling coefficient between these two unique levels of physical reality. Relative to Figure 1, $\infty_{\text{eff}} Q_{P2}$ is $(Q_{M1} - Q_{M0})$, the intention magnitude of property change imprinted into the particular IIED. A fully IIED-conditioned laboratory has been observed to exhibit several characteristic signatures:

1. $Q_{P2}(t)$ is responsive to the polarity of a DC magnetic field placed close to the pH-measuring instruments; i.e., Q_{P2} (north-pole up) – Q_{P2} (south pole up) $\neq 0$ as it should for our normal reality (Q_{P1}) because there only magnetic dipoles are present. To yield such an experimental result, magnetic monopoles must also be present and instrumentally accessible.
2. Temporal material property oscillations of very large magnitude appear for $\text{pH}(t)$, $\sigma(t)$, $T_W(t)$, and $T_A(t)$, (where σ = electrical conductivity, T_W is water temperature and T_A is air temperature) are (a) global throughout the room, (b) all exhibit the same Fourier spectral components, and (c) all components are in the frequency range $\sim 10^{-2}$ to 10^{-3} hertz.
3. The $T_A(t)$ oscillations (magnitude $\sim 3^\circ\text{C}$) were shown, via a forced convection experiment, not to be due to any natural convection process in the room's air and remained for weeks to months after the supposed source of the oscillations had been removed from the experimental space.

4. For these phantom $T_A(t)$ oscillations, it was observed that when a large natural quartz crystal was placed with its c-axis pointing upwards in the initial “source” location, it just increased the $T_A(t)$ amplitude slightly and sharpened the spatial $T_A(t)$ profile somewhat. However, when the crystal was rotated 90° so that its c-axis was in the horizontal plane and aligned with the row of thermistors, there was an immediate inversion of the wave shape with reduction of the wave amplitude by a factor of $\sim 2-3$ and an increase of the wave frequency by a factor of $\sim 3-5$.

From these four main experimental observations, it was deduced that such phenomena weren't associated with the electric atom/molecule level of physical reality, but rather the coarse physical vacuum level of reality; i.e., from within the space unoccupied by the nucleons making up the atoms and molecules. Further, it was deduced that magnetic monopoles were intimately involved with the material nature of this coarse physical vacuum level of reality.

Reference 9 was our third major psychoenergetics contribution, and its contents cover the period ~ 2001 through 2004. Table 3 provides a summary of the key experimental findings collected in reference 9. This work largely focused on replication by others of the $\Delta\text{pH} = +1$ units experiments at several laboratories in the U.S. and Europe. Initially, three laboratories (Payson, Missouri, and Kansas) with such IIEDs were utilized; and each had a control site, containing identical pH-measurement equipment plus a UED (no IIED), located within ~ 2 to 20 miles of the IIED site. This experimental replication of the original Minnesota results³ was successfully achieved. At these three sites $\Delta\text{pH}(t)$ grew exponentially with time to levels significantly above the normal theoretical value. However, at their control sites, the same type of behavior occurred, indicating that a macroscopic, room temperature information entanglement process occurred between the IIED sites and their UED sites.

Next, the Baltimore and Bethesda sites were initially used as control sites for the three IIED sites; and within ~ 2 months, the same large increase in ΔpH with exponential time-dependence for $\text{pH}(t)$ occurred at these sites. Finally, the U.K. and Milan site (three months later) were initially used as

control sites for the system; and within three weeks for the U.K. site and one week for the Milan site, $\text{pH}(t)$ was exponentially increasing with time and ΔpH reached ~ 1 pH units. Now the information entanglement process between sites had been proven to reach $\sim 6,000$ miles.

TABLE 3: SUMMARY OF KEY EXPERIMENTAL FINDINGS FROM SOME SCIENCE ADVENTURES WITH REAL MAGIC

1. The original Minnesota water pH results have been substantially replicated by others.
2. At all remote IIED sites, the digitally recorded pH for purified water in equilibrium with air increased exponentially with time, with the ΔpH increasing cycle by cycle of water change until it reached ~ 1.0 pH units.
3. At all control sites (non-IIED sites), the same type of pH-behavior was observed via an information entanglement process except that (1) for below-ground sites, ΔpH achieved ~ 1.7 pH units and (2) for well-above-ground sites, ΔpH achieved only ~ 0.8 pH units.
4. This information entanglement process between IIED and non-IIED control sites of the overall experimental system occurred over distances from ~ 2 miles to $\sim 6,000$ miles. The carrier wave for this information transfer couldn't have been electromagnetic.
5. A litmus paper pH-detector only responded to the purely chemical level of the H^+ content present in the water, while digital pH-detectors responded to both this level plus an information level associated with the H^+ content.
6. All sites, both IIED and non-IIED, exhibited substantial values of $\Delta\Psi'_{\text{H}^+} = \Psi'_{\text{H}} - \eta_{\text{H}^+}$ after a short time, indicating a raised thermodynamic-free energy per unit volume for all sites.
7. The time required to reach $\Delta\text{pH} \sim 1.0$ pH units appears to be less for below-ground control sites than for aboveground control sites and

also appears to be relatively independent of distance.

8. Strong experimenter and equipment potentization effects were noted.
9. The optimum reimprinting time for an IIED presently appears to be ~3 months.
10. Mu-metal screening does not shield water from this new information entanglement field.
11. For humans, and perhaps all vertebrates, bioelectromagnetism is quite different from Maxwellian electromagnetism, because the human acupuncture meridian system is observed to be at an EM gauge symmetry level where magnetic monopole charge is experimentally accessible.
12. A laboratory space and equipment raised to an EM gauge symmetry state wherein magnetic monopole currents are experimentally accessible is found to be a very sensitive detector of subtle energy emissions by humans (subtle energies are defined as all those beyond the energy aspects of the accepted four fundamental forces).
13. Large bursts of subtle energy emissions during healing steps in humans located in a “conditioned” laboratory act analogously to earthquakes with reverberating aftershocks that last for a long time. Thus, the detailed character of the laboratory’s energy signature is significantly altered for a long time (greater than three months).

For those remote sites at ground level, the experimental data yielded $\Delta\text{pH}_\infty = +1$ pH unit; for those remote sites located three stories above ground level, only $\Delta\text{pH} = +0.8$ pH units occurred; and for those remote sites below ground level (in a basement), $\Delta\text{pH} = +1.7$ pH units occurred. Whatever this new type of energy is, it prefers to travel through the ground rather than through the air, in opposition to EM energy, which prefers to travel through the air.

During this replication experiment, we discovered both a theoretical and an experimental procedure for measuring $Q_{p2}(t)$ in Equation 2 for the hydrated proton and labeled it the magnetic monopole contribution to the magnetoelectrochemical potential energy for the hydrated proton $\Delta\Psi'_{H^+}$.⁴ Continuous values for this magnetic monopole contribution were determined for all sites, IIED and control, in the overall experimental system with initial magnitudes in the $\sim\pm 5$ me V to ± 40 me V range. By mid-2005, some of these values had grown to the ~ 80 me V range.

Finally, to close out this section, simple physical chemistry instruments located in an IIED-conditioned laboratory appear to be very sensitive detectors of biofield emissions from humans; and via kinesiological testing, various muscle groups were all shown to exhibit DC magnetic field polarity effects. This indicates that in all humans, and probably in all vertebrates, the acupuncture meridian/chakra system is at a significantly higher EM gauge symmetry level than the rest of the body. This means that human bioelectromagnetism is different from Maxwellian EM. This also means that the human mind can modulate this higher EM gauge state carrier wave, which is probably what is presently called Qi (Chi), and this in turn can thermodynamically drive all varieties of processes at the electric atom/molecule level of the physical body.

THEORETICAL MODELING

The current formal description of quantum mechanics (QM) is completely inadequate to account for any psychoenergetic phenomenon.⁹ However, if one assumes the simultaneous existence of particle and wave properties for physical matter, all QM phenomena can be quantitatively calculated and yield good agreement with experiment. Simultaneous QM and relativistic behavior calculations for the de Broglie particle/pilot wave concept yield the following¹⁰:

$$v_p v_w = c^2 \quad (3)$$

Here, v_p = the particle velocity, v_w is the velocity of the wave components making up the total pilot wave, and c is the velocity of

electromagnetic (EM) light. Since relativity theory requires that $v_p < c$, always, Equation 3 requires that $v_w > c$ always. In order to avoid complications with relativity theory, these superluminal velocity wave components were dubbed “information waves” because it was thought that such waves could not transport energy. However, Equation 1b and the surrounding discussion indicate that this isn’t correct. Adding item 7 of Table 2, we’ve labeled these waves as “magnetic information waves,” which leads to the conundrum of how slower-than-light electric particles can interact with faster-than-light magnetic information waves to create the particle/pilot wave entity, a major cornerstone of QM. My resolution to this conundrum has been to postulate the existence of a substance called deltrons, from a domain beyond spacetime, that can travel both more slowly and more quickly than c . The slower-than- c portion of the deltron spectrum can interact with the electric particles while the faster-than- c portion of the deltron spectrum can interact with the magnetic information waves. This situation is illustrated in Figure 2, where one sees that meaningful interaction can occur across the light barrier via deltron-deltron interactions.

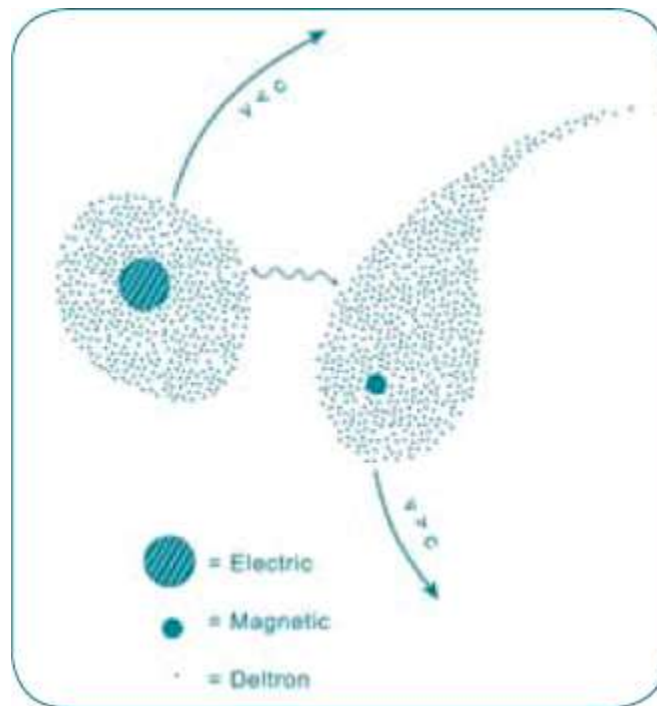


Figure 2: Illustration of deltron sheaths around both $v < c$ and $v > c$ moieties. Deltron-deltron interaction produces the coupling between such moieties.

Thus, the simplest component in physical reality is the electric particle/deltron/magnetic information wave complex. This is proposed to be the basic building block for all physical substances. The proposed new RF for meaningfully viewing such substances is (1) a duplex RF consisting of two reciprocal four-dimensional subspaces (one of which is spacetime) that is (2) embedded in the three higher dimensional domains of emotion (9D), mind (10D), and spirit (11D and above). Two illustrative representations of this new multidimensional RF are presented in Figures 3 and 4. The deltrons of the revisited de Broglie particle/pilot wave concept are proposed to be a natural moiety of the emotion domain, and they also constitute the coupler substance between the two levels P₁ and P₂ of physical reality.

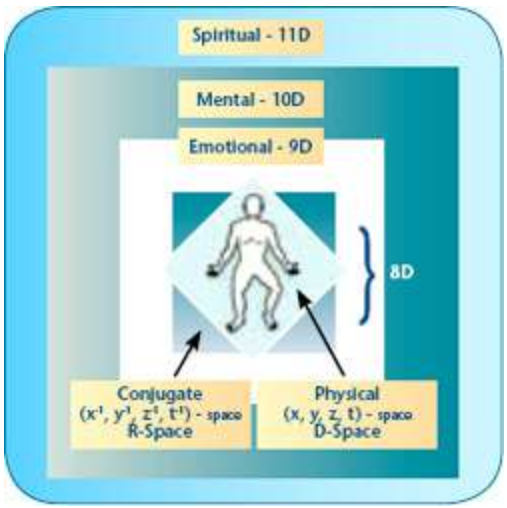


Figure 3: A structural representation of our RF with the duplex space in the center. Counting the duplex space as a unique member of the general 8-space, our RF is eleven-dimensional.

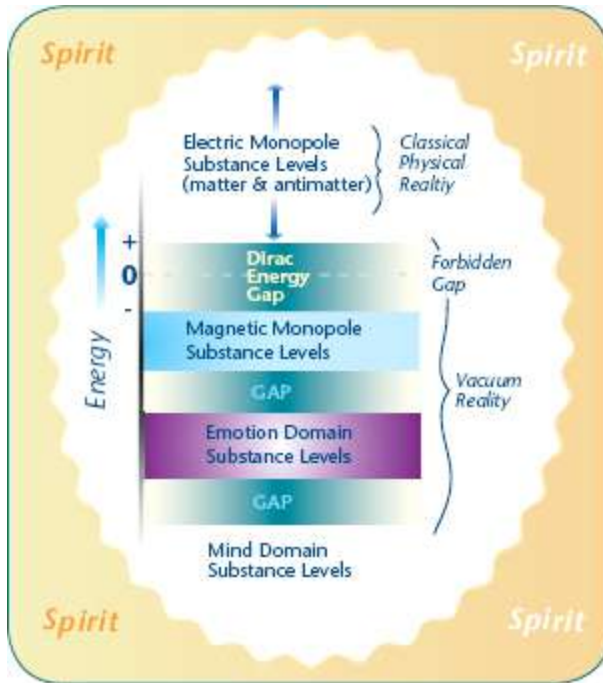


Figure 4: An energy-level diagram embracing both classical physical substances and “unseen” vacuum substances.

Using this proposed multidimensional RF, Figure 5 is the proposed mechanism for explaining how an IIED both (1) conditions a space so that ∞_{eff} in Equation 1, is of a significant magnitude and (2) tunes the space so that a specific material property of Level P₂ changes in magnitude to conform to the specific intention.

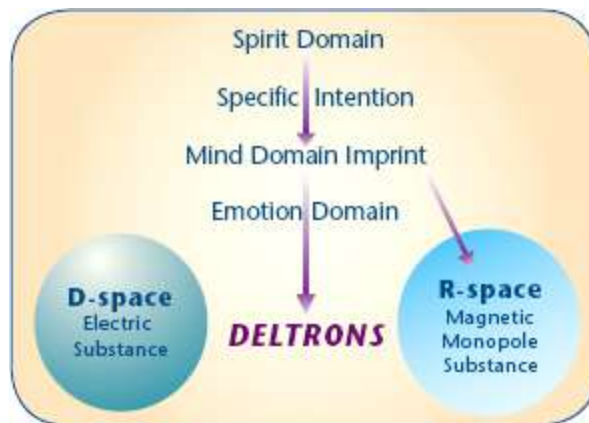


Figure 5: An intention imprint from the domain of spirit imprints a pattern on the domain of mind which, in turn, via a diffraction process, is thought to both activate deltrons and imprint a conjugate

pattern on reciprocal space. The deltron enhancement couples this intent pattern to drive the atom/molecule processes in this level of physical reality.²

Here, the specific intention is generated at the level of spirit and is imprinted as a specific pattern on the domain of mind which, in turn, via a diffraction process, is proposed to both activate deltrons and imprint a conjugate pattern on reciprocal space. The deltron activation couples this intent pattern to drive the electric atom/molecule processes at the P1 level of physical reality. This has been a very, very brief overview of our recent psychoenergetic science perspective; an order of magnitude of additional material on this subject can be found by perusing references 7 through 9.

PART II: SOME CONVENTIONAL SCIENCE, WITH REGARD TO CRYSTALLIZATION FROM AQUEOUS SOLUTIONS

To illustrate what fields of science and what general knowledge must be brought to bear for a reliable analysis of a crystal growth problem, a brief overview will be given here to indicate what controls a crystal's shape during unconstrained crystallization of water. For a more expanded view, the reader should explore references 11 to 13. For this "overview," we will be satisfied with a phenomenological description of the most important simultaneous processes involved in terms of "lumped" material parameters. Table 4 indicates the different areas of study necessary to be considered with the minimum number of involved materials parameters, macroscopic variables, and system constraints.

TABLE 4: CRYSTALLIZATION VARIABLES AND PARAMETERS

Area of Study	Boundary-value problems	Material parameters	Interface variables	Macroscopic variables	Constraints
Phase equilibria		$\Delta H, T_0, k_0, m_L$		$T_L (C_\infty)$	
Nucleation		$N_0, \Delta T_C$		\dot{t}	
Solute partitioning	Diffusion equation (C)	D_s, D_L, k_i	$C_i, T_i(C_i), V, S$	C_∞	
Fluid motion	Hydrodynamic equation (u)	ν	δ_c	u_∞	C_∞
Excess solid free energy		$\gamma, \Delta S, \Sigma_i \gamma_i^f, \Sigma_i N_i^f$	T_f		\dot{t}
Interface attachment kinetics		μ_1, μ_2	T_i		
Heat transport	Heat equation (T)	$K_s, K_L, \mu_s, \alpha_s$		T_∞	
Interface morphology	Perturbation response & coupling equations				
Defect generation	Stress equation				

ΔH is the latent heat of fusion, T_0 is the melting temperature of solvent, k_0 is the solute distribution coefficient, m_L is the liquidus slope, N_0 is a parameter related to area of nucleation catalyst surface, ΔT_C is a parameter related to potency of nucleation catalyst, k_i is the interface partition coefficient, D is the solute diffusivity, ν is the kinematic viscosity, γ is the solid-to-liquid interfacial energy, ΔS is the entropy of fusion, γ_i^f is the fault energy, N_i^f is the number of faults of type I, μ is a parameter related to interface attachment kinetics, K is the thermal conductivity, and α is the heat diffusivity.

The conventional macroscopic variables that one either sets or controls are (1) the water chemical composition, C_∞ , (2) the water cooling rate, \dot{t} , and (3) the shape of the container holding the fluid. Let us proceed with the process description by stages.

1. As the liquid is being cooled, we need to know the magnitude of the thermodynamic driving force for solid formation ΔG at any bath temperature T . This can be expressed as

$$\Delta G = f_1 [\Delta H, T_L (C_\infty)] \quad (4a)$$

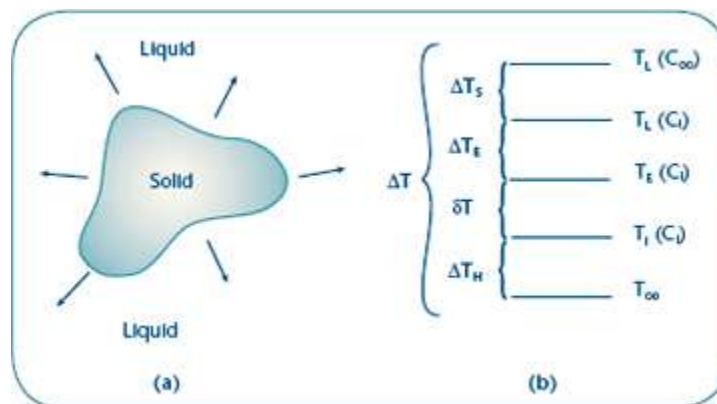
where f_1 refers to the appropriate mathematical functional relationship between the latent heat of fusion, ΔH , and the liquidus temperature $T_L(C_\infty)$. Thus we see that phase equilibria data is one prerequisite. The material parameters needed for this area of study are listed and defined in Table 4.

- As the bath undercooling, ΔT , increases with time, t , we need to know the undercooling at which particles of solid begin to form and also their density. Thus we must evaluate the nucleation frequency I , which can be most simply expressed as

$$I = f_2(N_0, \Delta T_C, \dot{T}, t, C_\infty) \quad (4b)$$

where f_2 represents the appropriate functional relationship, N_0 is the number of atoms in contact with the foreign substrates that catalyzes the nucleation event, and ΔT_C is a parameter that defines the potency of the catalyst (the undercooling at which solid formation is initiated).

- When the crystal illustrated in Figure 6 begins to grow at some velocity V , solute partitioning will occur at the interface since the equilibrium concentration of solute in the solid C_S is different from the concentration in the liquid at the interface.



Left: Illustration of a crystal growing from a super-cooled liquid. *Right:* The important temperatures in a growth process. The magnitudes of the temperature differences indicate the degree of solute diffusion, capillarity, kinetic, or heat transport control.

Thus the concentration of solute in the liquid at the interface C_i must be determined and can be represented by a functional relationship of the form

$$\frac{C_i}{C_\infty} = f_3 (v, k_i, D, \delta_C, S^*, t) \quad (4c)$$

where k_i refers to an interface solute partition coefficient that is generally different from k_0 the phase diagram value, D is the solute diffusion coefficient, δ_C refers to the solute boundary layer thickness at the crystal surface, and S^* refers to the shape of the crystal.

4. In order to evaluate δ_C in Equation 4c, it is necessary to consider the hydrodynamics of the fluid. The fluid will generally exist in some state of motion, whether the driving force is applied by external means or arises naturally due to density variations in the fluid. We can consider the fluid far from the crystal-liquid interface to be moving with some relative stream velocity u_∞ due to the average fluid body forces. The fluid motion will aid in the matter transport of solute away from the crystal into the bulk liquid and cause a lowering of C_i . We find that δ_C can be expressed as

$$\delta_C = f_4 (V, v, D, S^*, u_\infty, t) \quad (4d)$$

where v is the kinematic viscosity of the fluid.

5. The portion of the total undercooling consumed in driving the solute transport ΔT_S is given by:

$$\Delta T_S = T_L(C_\infty) - T_L(C_i) \quad (4e)$$

Because the growing crystal is small in size, has curved surfaces, and often contains nonequilibrium defects, the solid contains a higher free energy than the solid considered in generating a phase diagram that we use as our standard state in the overall treatment. Thus the equilibrium

melting temperature for such a solid is lowered by an amount ΔT_E compared to that for the equilibrium solid. We find that the portion of the total undercooling consumed in the production of nonequilibrium solid ΔT_E can be expressed as

$$\Delta T_E = T_L(C_i) - T_E(C_i) = f_s(\gamma, \Delta S, S^*, \Sigma_i, \gamma_i^f, \Sigma_v, N_i^f) \quad (4f)$$

where $T_E(C_i)$ is the equilibrium interface temperature for interface liquid concentration C_i , γ is the solid-liquid interfacial energy, ΔS is the entropy of fusion, γ_i^f is the fault energy for defects of type i , and N_i^f is the number of type i . (See Figure 7.)

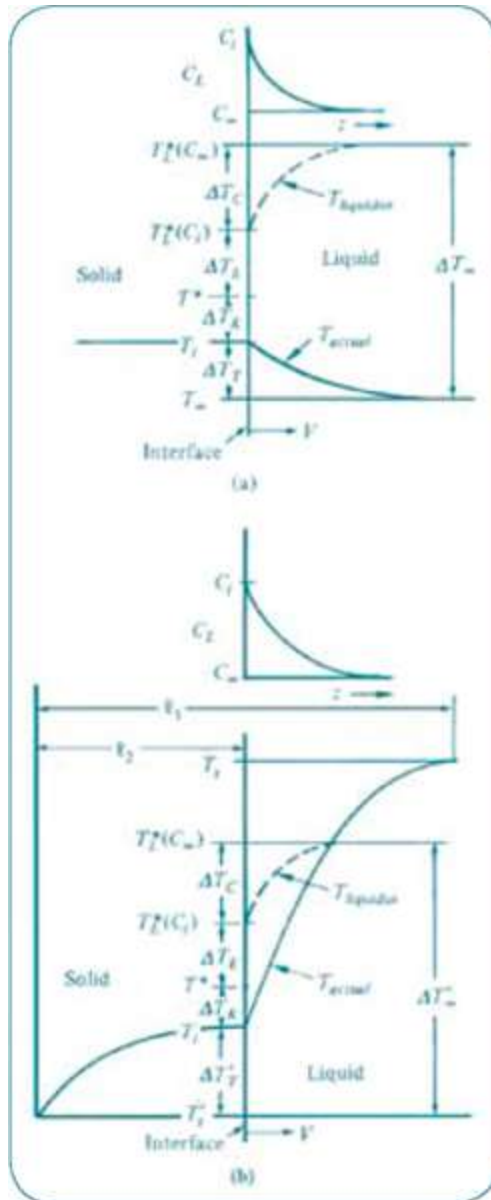


Figure 7: Solute and temperature distributions plus key temperatures for (a) unconstrained crystallization and (b) constrained crystallization.

6. Next, because the crystal is growing, a departure from the equilibrium temperature ΔT_K must exist at the interface in order to produce a net thermodynamic driving force for molecular attachment to the growing solid. At sufficiently large departures from equilibrium, the molecules can attach at any interface site and lower the free energy of the system. However, at small departures from equilibrium, molecular attachment at random interface sites generally leads to an increase in the free

energy of the system; and thus, such interface attachment will not occur as a spontaneous process. Rather, in such an instance molecules become a part of the solid only by attachment at layer edge sites on the interface, and one must consider the various mechanisms of layer generation on the crystal surface. The portion of the total undercooling consumed in driving this interface process ΔT_K can be expressed as

$$\Delta T_K = T_E(C_i) - T_i = f_6(V, \mu_1, \mu_2, S^*, t) \quad (4g)$$

where T_i is the actual interface temperature and where μ_1 and μ_2 are lumped parameters needed to specify the interface attachment kinetics for the various attachment mechanisms.

7. Finally, since the crystal is growing, it must be evolving latent heat and the interface temperature T_i must be sufficiently far above the bath temperature T_∞ to provide the potential for heat dissipation to the bath. That portion of the total undercooling consumed in driving the heat dissipation, ΔT_H can be expressed as

$$\Delta T_H = T_i - T_\infty = f_7(K, \alpha, \Delta H, V, S^*, t) \quad (4h)$$

where K refers to the thermal conductivity and α refers to the thermal diffusivity. The foregoing has been a description of the subdivision of the total bath undercooling, ΔT , into its four component parts, i.e.,

$$\Delta T = \Delta T_S + \Delta T_E + \Delta T_K + \Delta T_H \quad (4i)$$

Equation 4i is called the “coupling equation” and illustrates the fact that these four basic elements of physics enter every crystal growth situation and are intimately coupled through this constraint. However, for different materials, certain components of Equation 4i tend to dominate the phase transformation. In the growth of metal crystals from a relatively pure melt, $\Delta T_H \sim \Delta T$ so that this case is largely controlled by heat flow. During the growth of an oxide crystal from a melt of steel, e.g., $\Delta T_S \sim \Delta T$, so that the growth is largely diffusion-

controlled. During the growth of a polymer crystal from a well-fractionated polymeric melt, $\Delta T_K \sim \Delta T$ and the growth is largely controlled by the kinetics of interface attachment. Finally, during the growth of a lamellar eutectic crystal, $\Delta T_E \sim \Delta T/2$ and the growth is to a large degree controlled by the excess free energy of the solid (due to the formation of α/β phase boundaries).

By considering Figure 8, which is a plot of crystal growth velocity as a function of time, we find that at small times ΔT_E in Equation 4i dominates the crystal's growth and thus plays an overriding role in its initial morphology.

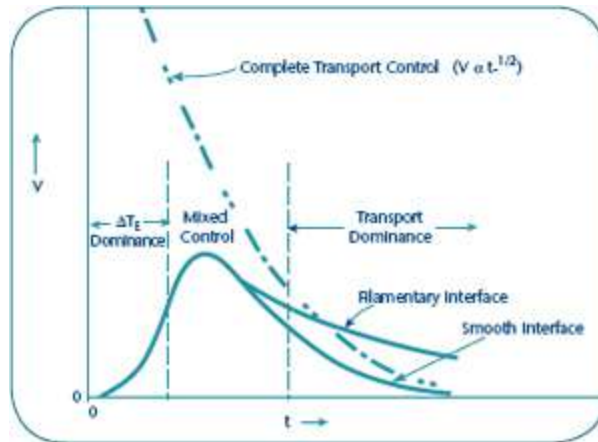


Figure 8: Schematic of particle growth velocity V versus time t , illustrating the regions where various mechanisms are dominant.

At large times ΔT_S and ΔT_H in Equation 4i dominate the crystal's growth and lead to very different morphologies. At intermediate times all four factors play significant roles in the shape adopted by the crystal.

There is little doubt that crystal morphology plays a significant role in the resultant crystal perfection, and that this morphology is largely determined by the subtle interplay of the factors already discussed. However, the prediction of crystal shape with time is a problem that only recently can be solved in any general way. This arises because the problem thus far stated is, in general, not completely specified. Knowing V and S^* , C_i and T_i can

be completely determined in terms of C_∞ and T_∞ , respectively; and ΔT_S , ΔT_E , ΔT_K , and ΔT_H are completely determined in the general mathematical sense. However, we don't know either V or S^* . If $S^*(t)$ is specified, Equation 4i can be used to determine $V(t)$. We are in need of an additional condition to completely specify the problem and thus provide simultaneous prediction of both $V(S)$ and $S^*(t)$.

We shall find that our extra condition is generated by considering the response of the growing crystal to shape perturbations. It can be easily shown that the various elements of the interface will always be subjected to fluctuations in ΔT and in its component ΔT_i 's. Thus, given sufficient time we should always expect that shape distortions will have a finite probability of forming on the crystal surface and that the crystal will evolve to that shape which is most stable in the environment that allows such perturbations. With the addition of our perturbation response equation in the general form

$$V^*(S) = f_g(S^*, \Delta T_S, \Delta T_E, \Delta T_K, \Delta T_H) \quad (4j)$$

the most stable crystal shape, S^* , and the corresponding growth velocity at various points on the crystal surface, V^* , may be evaluated from equations 4i and 4j. From the experimental side of the picture, unconstrained crystallization of water containing various solutes has been well studied via the conventional variables since the late 1950s with cinemaphotography used to see the ice-crystal morphological changes depending on the variable changes invoked. In particular, the entire range of crystal morphologies shown in reference 6 has been observed for constant ΔT and T by adjusting both the concentration and type of added solute and ΔT_C , the undercooling at which the ice-crystal nucleation is initiated. Thus, one can conclude that, in reference 6, one is dealing with the normal crystallization process perturbed perhaps somewhat by the human consciousness invoked.

In the first section of this chapter, our IIED-experiments clearly confirmed robust effects of human intention on various processes of physical reality. Some of this psychoenergetic effect has been shown to be directly correlated with the raising of the thermodynamic free-energy state

of the system when the two unique levels of physical reality, P_1 and P_2 , become significantly coupled together. In addition, a quantitative measure of this change has been demonstrated using an H^+ ion probe.¹⁴ If such a coupled system was generated in the Emoto experiments, then this would alter the thermodynamic driving force, ΔG , up or down for the water-crystallization process; and one could expect significant changes thereby. However, before jumping to such a conclusion, there is an experimental difficulty that first must be resolved.

In the Emoto experimental protocol,⁶ one starts with a cold chamber at $0^\circ\text{C} - \Delta T_\infty$ where ΔT_∞ is presumed to be sufficiently large that most if not all of his water samples are well below their liquidus temperature and thus should eventually freeze. However, one can't be completely sure of this because he doesn't specify C_∞ and the solute type/types. Nevertheless, let us presume that ΔT_∞ is sufficiently large that ΔT_∞ is greater than $\{0^\circ\text{C} - \Delta T_\infty(C_\infty) - \Delta T_c\}$ so his samples will all freeze. Let us suppose that he uses a tray with 25 water-sample holders at room temperature well above 0°C and places them into his cold chamber. The water samples will begin to lose heat to the chamber so they cool at a rate \dot{T} , which slows down with time. At a melt undercooling of ΔT_c , they begin to nucleate ice crystals, probably on the top surface of the water (because the heat transfer rate is greatest there). These small crystals will float, because water expands upon freezing; and the value of N_0 becomes important here in determining the ultimate crystal size and perfection. To determine if there is a significant correlation between ice-crystal morphology and a written intention message pasted on the tray, one would need to see more than 20 of the 25 cups providing the same crystal morphology, and in a repeatable way. If this level of replicability or better isn't achieved, one shouldn't take the result to be a very significant one. As a more refined experiment, one should start with purified water and add a specific solute to a concentration, C_∞ , and let this be the sample water for the written messages. In addition, between uses, the sample tray should be heated to a temperature well above room temperature and vacuum dried so that all previous ice fragments are removed from microscopic crevasses in the tray.

CONCLUSIONS

1. Information is the connecting bridge between energy and all forms of consciousness.
2. Experiments associated with IIED conditioning of laboratory spaces have led to the discovery of a second unique level of physical reality beyond our normal electric atom/molecule level of physical reality.
3. Experiments carried out in an IIED-conditioned space allow digital measuring instruments to gain accessibility to this new magnetic vacuum information wave domain, so that any material property measurement magnitude is now given by Equation 2 of the text.
4. If ∞_{eff} in Equation 2 is negligible, then these two domains of physical reality are uncoupled so the property magnitude is unchanged from that given by standard experimentation in an “unconditioned” space. If ∞_{eff} is of significant magnitude ($\sim 0.1 < \infty_{\text{eff}} < 1$), then applied human consciousness can modulate a physical property magnitude either upwards or downwards relative to that observed for an “unconditioned” space.
5. The human acupuncture meridian/chakra system is experimentally found to be at the same EM symmetry state as an IIED-conditioned space, so focused human intent can either temporarily or continuously increase the magnitude of ∞_{eff} into the significant range.
6. Standard science of crystallization theory for our normal electric atom/molecule level of physical reality shows that all ice-crystal morphologies displayed in the Emoto research have been reproduced earlier by others.
7. For similar research carried out in an IIED-conditioned space, a new, additional, contribution labeled “the magnetoelectrochemical potential contribution” needs to be added to the thermodynamic free-energy driving force, ΔG , for the water-to-ice phase transition, which will, in

turn, alter the form of the dominant ice-crystal morphology observed during this phase transition.

8. This author has not yet seen in the Emoto research clear proof of a strong correlation between a written intention statement and specific ice-crystal morphology result.



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CHAPTER 2

THE STRUCTURE OF LIQUID WATER: ITS RELEVANCE TO HOMEOPATHY, ULTRADILUTE SOLS (OR COLLOIDS), AND IMPRINTED WATERS

by Rustum Roy

ABSTRACT

Water is the single most important material for the existence and support of human life and health. It has been almost totally neglected by post-World War II biochemical medicine, in spite of the latter's incredibly generous research budgets. The signal failure of such research—as demonstrated daily in its outcome statistics and the U.S. healthcare system's unenviable track record as the leading vector of death among all illnesses—is in no small measure due to the peculiar shortsighted focus on organic biochemistry, which has no place in the study of the role of water in human health.

This unique relationship—water and health—has been emphasized in many concrete and symbolic ways in virtually every ancient tradition. The scientific study of water has been carried out so far by the chemistry community, with an approach emphasizing the molecular level of structure. According to a recent major review, physicists and materials scientists find water to exist in a nearly infinite set of structures, which are uniquely labile, changeable among themselves.

The core argument of this paper is that the materials-science literature establishes that common highly covalent liquids, including water, exist in many, many very different structures, even thermodynamically stable ones.

The paper establishes the *plausibility* of causing structural changes in water—imprinting it, so to speak—by many common vectors, which include not only temperature and pressure, but also epitaxy, succussing, electric and magnetic fields, and the like, and possibly human intention. Among these are three specific vectors used in the preparation of homeopathic remedies:

1. Epitaxy, a phenomenon very little known even by scientists but used daily worldwide in materials technologies, which involves the transference of structural information (not any composition whatsoever) from one solid (or liquid) to a liquid
2. Succussing, which can generate substantial pressures that are known to change the structure of similar liquids
3. The creation of nanobubbles, which would be distributed as in a colloid (like milk) and definitely change the structure

This argument demolishes the 150-year-old argument used against homeopathy—that since the compositional dilution is beyond the Avogadro limit and has excluded any of the original molecules of the additives, there can be no difference between the succussed remedy and the original water. Water *can* be changed in structure without any change in composition.

INTRODUCTION

The entire field of water-structure research by scientists—so far, conducted essentially only by chemists—has focused largely on its composition and, within that, the composition and structure of “molecules” or small oligomers, and often not even on *liquid* water at all. There has been almost no state-of-the-art research on the 3-D structure or arrangement of the units in space. This has resulted in a neglect of the most directly connected science of (inorganic) materials and physics. In addition, of course, insofar as the structure of water relates to human health, it has also led to the total exclusion of the human mind and spirit (an absolute part of the reality of a whole person).

A new and comprehensive view of the structure of water from the materials-science perspective was published only in December 2005 by Roy, Bell, Tiller, and Hoover (RBTH). This paper is the major source of data for this essay and contains dozens of useful references to which the reader is referred. This essay attempts to point out the links, in less technical terms than that paper, to various procedures or interventions involving water in whole-person healing. It does not provide any research or data to validate any particular approach or healing procedure related to water.

HOW THIS REDUCTIONIST SCIENCE FITS INTO THE WHOLIST PERSPECTIVE OF THIS BOOK

This book is concerned with a vast range of observations on healing by various procedures, agencies, practices, and so on— especially those involving water. Regrettably, in an era dominated by fundamentalism (defined very accurately simply as the conviction that *only my way* leads to truth), some in the scientific community have taken on the coloration of the religious fundamentalists whom they vigorously oppose. But science is the very antithesis of a guarantee of the permanent truth of our *current* views. Its accurate motto is, of course, that taken from the Protestant Reformation: *semper reformanda* (“always changing”). As scientists, we *know* that our truth may always be improved upon or incorporated into a larger truth with some new discovery. Indeed, every topflight scientist hopes to achieve exactly that: to replace or improve a major paradigm by their new insights.

Let me start by citing my own experience to show how pervasive within communities of science—much closer to the heartland of real science than statistical medicine—this proto-fundamentalism is. In the late 1940s, my department head in geosciences at Penn State warned me not to be misled by the American geological establishment. This entire body, he warned me, had rejected Alfred Wegener’s nearly 20-year-old proposal of continental drift. With all the fervor of Southern preachers, the gurus of American geoscience derided Wegener’s view as absurd. Yet, slowly but surely, over a decade or two, their views were totally washed away by the tidal wave of

more and more facts. Without any fanfare or public mea culpa, one “certainly correct” theory was abandoned and another one installed! Scientific “truth” changes, and true scientists worldwide celebrate its ability to do so.

Here’s another example: Within the next decade, the controversy was all about the volcanoes on the moon. When my graduate student Frank Dachille wrote a rather simple, rambling book, *Target Earth*, proposing that the moon was actually pockmarked not by volcanoes but by craters caused by meteor impact, I was advised by leaders of the nation’s major geological professional society to dismiss him from the university! Such a believer in the absurd, they advised me, should not be allowed to get a degree, even though his research with me was totally unrelated to the moon. Ten years later, meteorite impacts on both moon and Earth were a very hot research topic of—yes, the very same orthodox scientists. *Sic transit!*

One community within science, inorganic chemistry, has monopolized the study of the “structure” of water. The biomolecular medical establishment has paid no attention to it. Hence essentially zero scientific work has been done on healing and water by the conventional medical establishment. On the other hand, those intimately involved with human beings in healing—such as Florence Nightingale with her insistence on cleanliness and washing, and Hahnemann and his nearly pure water remedies—have had profound effects on large populations, even on the medical establishment in the case of Nightingale! Today, it’s finally possible to revive more objectively the question of the efficacy of various water-based healing vectors suggested by traditional practices.

In my 60 years of work at the cutting edge of materials science, I’ve always worked with one common approach: Find the most interesting observations, “wild facts,” as William James called them, or “useful truths,” in the words of Ben Franklin (see the Bibliography), which are unexplainable by current theories and hence spurned by almost all scientists. Go after those areas. I did, and I ran across several key data that had this in common: They were all involved with water.

I’ll start here with the most provable data, testable by normal medical procedures: the extraordinary antibacterial (and antiviral) effects obtained with ultradilute metallic sols (or colloids), especially of silver. A sol is merely a permanent suspension, just like, say, milk, of very fine particles of

a different solid or liquid. For anyone advocating the possibility of producing profound health effects with (essentially) pure water, the easy demonstration of such effects is the use of such a silver sol or colloid (easily found in any health-food store) made up of roughly 1 ppm (or one part per million atomic concentration) of metallic particles in the 10 nm range. This is the best proof or “existence theorem” for attention-focusing by the less informed. In any assemblage of petri dishes containing the usual range of test bacteria, the antibacterial effects of these ultradilute sols can be demonstrated in minutes and compare favorably with the best antibiotics. How can essentially pure water do this?

The range of these effects has been and is being demonstrated worldwide, most relevantly these days in the battlefields of Iraq and Afghanistan. This remarkable fact is never reported in the mass media. Most startling to this author is the connection of this water and silver and electric current to some of the most significant medical issues today: the regeneration of human limbs (fingertips), as demonstrated by Becker and Flick many years ago.

If a sol of silver at a 1 ppm concentration can do this, can the structure of different spa waters, and hence their health effects, be different because of the influence of the structurally different suspended particulate colloidal mineral matter? Can radiation—whether electric fields from megavolt overhead wires or microwave magnetic fields—change and even leave an imprint on water? Detailed scientific papers from Japan present data on just such possibilities. In contrast with the multitrillion-dollar sales power of the pharmaceutical industry and a \$30 billion annual research budget for National Institutes of Health (NIH) alone, however, the research in this area receives essentially zero funding.

It will be seen in the RBTH paper that there is no doubt whatsoever that water near our ambient conditions has several different structures. By far the biggest of the scientific issues remaining concerns the *kinetics of change* of one such structure or large cluster to another.

THE ABSOLUTE IMPORTANT OF “STRUCTURE”

This book is about the relation of water to human healing. Water is the largest component of the human body. But what is it about this liquid that can make it a healing vector?

First, of course, water, being the amazing solvent that it is (because of its extraordinarily high dielectric constant), does take into solution a great deal of the other materials that come into contact with it. This fact has tended to emphasize the composition—the “purity,” if you will—of the water as its most important descriptor. *That’s the problem.* Composition, especially slight changes of it, is rarely important in altering the properties of a liquid or solid. One reason is that all such variations are incremental, continuous, and slight. But changes in structure can be dramatic. One example will do to make my point: The element carbon exists in many solid forms, including graphite and diamond, meaning that the nearly softest and the hardest (so far) materials on the planet have an identical composition. Here we have *exactly* the same composition of matter, easily transformed from one structure—in milliseconds—to the other, with this incredible difference in properties. So if you’re interested in water, you’ll have to pay attention to its *structure*.

The paper and this essay start by distinguishing the way materials scientists and chemists define the term *structure*. Essentially, all previous literature on water structure has been dominated by chemists, who equate the term with the identification of the *molecular species* present in the vapor, in the liquid, at its surface, or in some specific environment. Literally dozens of such molecular species have been identified, calculated, or inferred. For hundreds of precise illustrations of proposed structures of the H₂O molecule and the assumed dimers, trimers tetramers, and on and on, the gold standard of references is the Website maintained by Professor Martin Chaplin in London (see Bibliography).

Since nearly 100 percent of the literature deals with the size and shape of the *building blocks* of the condensed matter (liquid), what’s studied very little is the materials scientist’s approach to the structure of condensed matter—the *arrangement* of these building blocks in 3-D space. The two views can be sharply distinguished by using this analogy: Consider the radical differences between the structure of *the building blocks* and *the building itself*. One doesn’t describe the structure of Notre Dame or the Taj

Mahal by saying that they consist of limestone, sandstone, or marble blocks and giving details of the size and shape of these blocks. We know that the structure of these buildings is of the whole, not of the parts. Or consider the pieces or blocks in a Lego set (= molecules) (the chemists' approach) and the "structure" of the house or car or plane (= clusters) that a child builds with the same blocks.

This materials-science approach to the structure of a liquid— any liquid of course—is extremely difficult here, simply because water is a liquid. That means that the units or building blocks do not repeat in any periodic manner in their 3-D arrangement. This periodic-arrangement state is the property of virtually all of Earth's inorganic matter—99.99 percent of it! The units are crystalline. The aperiodic state—the *noncrystalline state*, also called, imprecisely, the "glassy state"—which is the common structure of *all* liquids, poses a nearly insuperable barrier to the main scientific tools for determining structure—all the diffraction methods, x-ray, electrons, neutrons—and water's low viscosity doesn't help. Of course there are other techniques—spectroscopies of all kinds—but they are poor substitutes for diffraction. Also, there are enormous resources available by analogy from the extensive 100-year research on the structure of glasses and other liquidlike phases, especially those of SiO_2 , with its close similarity to H_2O . The nearly ubiquitous structural heterogeneity in similar covalently bonded *liquids*, even of *elements* (such as S, Se, Te, and the like), is also a major hint of the possibilities for a variety of structures in water, however long they last.

Very useful lessons can be learned about the structure of water from the enormous literature on SiO_2 and silicate minerals and glasses. These are slowly being rediscovered. The first major learning is that most common glasses are highly heterogeneous in structure, consisting of 5–50 nm clusters with different structures. Another little-known example is the effect of pressure on liquid structures such as the thoroughly studied SiO_2 -glass, which shows the change of properties and structures with pressure in SiO_2 and related glasses. (These data are largely from my own laboratories in the 1960s and 1970s and the references are all in the Roy, Bell, Tiller, Hoover 2005 paper.)

In the same vein, by the 1980s the most experienced analysts of the structure of glasses had concluded that they nearly all exhibited a mixture of different structures at the few nanometer level. Most glasses—especially those containing SiO_2 , with its close similarity to H_2O —therefore were nanoheterogeneous, consisting of islands of different structure. Glassy water exhibits a whole range of properties very similar to glassy silicates. There is little reason, therefore, to doubt that liquid water carries at least some of the vestiges of this fundamental nanoheterogeneity.



THE KEY ARGUMENT LINKING STRUCTURE TO HEALTH VECTORS

What's presented here simply points out the unchallenged fact that the criticism—nay, ridicule—heaped on homeopathy and “structured” water by chemists is, in fact, itself based on an egregious error caused by a simplistic understanding of the properties of liquids. The critics' argument is, in sum total: The only way to change the properties of water is to add some solute. It is assumed that water can only be changed by controlling the nature and concentration of the solute. This is, of course, sheer heresy to materials scientists, and known to be inaccurate by all informed scientists. The central principle of materials science is that properties are determined largely by *structure* (at every level, from nano to macro) and *not composition*, as described above and illustrated by the diamond/graphite example. This

phenomenon is true of virtually all solids, though not with such spectacular differences as diamond and graphite.

EFFECTING STRUCTURAL CHANGE

We have thus disposed of the 200-year-old mistaken argument; it remains only to establish that even in H₂O it's possible and plausible that such structural changes can be effected. That's what the Roy, Bell, Tiller, Hoover paper attempts. It makes no contribution at all to whether or not homeopathic or ultradilute sol remedies work in the clinic or not.

Three well-known phenomena in materials research are utilized to demonstrate the plausibility of structural change in water: (1) epitaxy, (2) pressure, and (3) nanobubbles.

EPITAXY

A key insight from common experience in materials science that may be relevant to understanding the structure of water and what can affect it easily is “epitaxy.” This term doesn't appear even in most technical dictionaries, but the phenomenon is very well known, studied, and used in dozens of everyday technologies in materials science. Yet, besides the plausible differences in nanostructure, it has *never* been invoked directly in the literature on the various healing traditions, including homeopathy, or in the use of different healing spas, which may have waters with *suspended* (not in solution) mineral matter.

Epitaxy is the transmission of structural information from the surface (hence *epi*) of one material (usually a solid) to another (usually a liquid). Subtleties of terminology appear in various papers, but it's the template of the structure—that is, the information—that's definitely transferred. Recent examples of the subtleties of information that can be so transferred can be found in the literature cited at the end of this essay. *No matter* is transferred in this “imprinting.” Hence, the traditional hackneyed criticism of homeopathy—the discussions of “concentrations of solutes above or below

Avogadro's limit"—are totally irrelevant. By providing a specific structure as a template (usually solid but sometimes liquid), one can induce an entire body of liquid to precipitate or crystallize in that preselected structure or morphology. The seeding of clouds is caused by epitaxial growth of crystalline ice or water on a substrate of AgI, which has the same crystal structure. Seeding and epitaxial growth of semiconductors are universally practiced in major modern technology. Information and "memory" are transmitted from the seed or substrate to the liquid phase, which can completely control the structure of what's formed from it. No chemical transfer whatsoever occurs.

In homeopathy, a specific active agent is added to the liquid (water or water + ethanol). The relevant question is, in what ways can the active agent change, affect, or imprint the liquid? Those unfamiliar with materials science assume that it is only by its presence in solution (as atoms, ions, or molecules) that an "active agent" can affect a liquid. They're wrong. Here again we return to the *structure*, not the *composition*, for explanations. Obviously, the structure of water *can* be influenced by that of solids with which it's in contact.

These, then, are the first well-established learnings from materials science—structural nanoheterogeneity within liquids and the role of epitaxy in propagating structural information without involving composition. In addition to the above, materials scientists deal extensively with other phenomena which are certainly possible, and probably major, factors in the structure of water.

SUCCESSING: GREATING HIGH PRESSURE AND NANOBUBBLES

Pressure, after temperature, is of course the most important of the intensive thermodynamic variables in deciding what structure is stable and/or will form. Pressure is well known to have profound effects on crystalline H₂O. Some 13 different crystalline H₂O structures are known in modest p-t space. In a series of papers in the 1960s, we've already shown that it's well known that all glasses (frozen liquids) change structure (and

their density and refractive index properties) continuously with pressure. Such densified structures survive easily in the oxides studied, which are much more viscous. A reasonable extrapolation will show that under the “normal” succussing procedures, very respectable pressures (say in the 10 kbar range) will be generated on the very small size water droplets that must form. Reasoning from analogy with similar (that is, covalent) liquids, there will, quite reasonably, be many different structures of water formed both by pressures generated in succussing and possibly others in some combination with the epitaxy on any additives.

Finally, the succussing process must necessarily also produce a range of sizes of bubbles in the liquid. The size distribution of the bubbles will certainly include some nanobubbles—that is, nanosize inclusions of gaseous O₂, N₂, CO₂, possibly the active ingredient, and so on. Some of these bubble sizes will no doubt be well below the colloid range, and therefore a colloidal suspension of water + gaseous (or liquid) inclusions would be formed. These could be quite stable for very long periods and would certainly affect the structure of the liquid water.

OTHER VARIABLES RELEVANT TO STRUCTURED WATERS AND SOLS

In addition to these major important variables, which can affect the stability and determine the structure of water, there are the other very common variables: magnetic and electric fields. While such fields contribute very little to the stability of most materials, they become profoundly important when these effects can interact with or be “locked into” a material in, for example, ordered domains or regions that are present in very common ferroelectric or ferromagnetic materials. Indeed, our own very recent work has demonstrated the most spectacular changes in, and even destruction of, the crystal structures of common inorganic phases by magnetic fields of a few gauss at microwave frequencies (see Bibliography). These results were totally unexpected and are still unexplained by the world’s leading theorists.

MATERIALS SCIENCE DATA FROM HOMEOPATHIC LITERATURE

These data and insights from the physical sciences are followed by the increasing data from several researchers in the homeopathic literature, adducing evidence on the effects of various materials-science variables, including weak magnetic fields, which fit very well with our models.

The book by Bellavite and Signorini (see Bibliography) summarizes much of their own work and that of others who have already approached the same problem from the stance of homeopathy. Various investigators have previously proposed a model for the structure of water involving formation of aggregates of water molecules or water clusters, possibly seeded by—but not requiring—the continued presence of molecules from the original source substance (for example, zwitterions or clathrates). Others have proposed the involvement of a coherent electromagnetic radiation field within the solvent that contributes order to the molecular motion. Emerging data on the structure and thermodynamics of water provide a rationale for revisiting the role of the solvent in storing and transmitting the information of homeopathy-prepared agents. The reader is referred again to the paper to avoid overloading on jargon.

SUMMARY OF THE CURRENT VIEW OF THE STRUCTURE OF WATER

The short description of the structure of water that emerges today is that H₂O liquid is indeed a nanoheterogenous statistical- mechanical distribution mainly of several molecular species including both oligomers and polymers and a minority of monomers. The structure is easily affected by epitaxial effects, pressure during succussing, and also the formation of colloidal nanobubbles. This distribution is very labile; and all the intensive and extensive variables, including magnetic and electric fields, can cause substantial changes in the distribution, and hence the structure, and hence the properties. In simple terms: Liquid water consists of a changing aggregate of islands of different size and shape in an arrangement that can easily be changed.

CONNECTIONS TO HUMAN INTENTION ON HEALING

So, finally, what of the possible effects of human intention on water, such as those of Dr. Emoto? The huge amount of solid data on the amazing reality and importance of the expectation effects (EE) (inaccurately labeled by the mystifying and wholly unnecessary term “placebo”) in *all* human healing transactions, including the highest high-tech procedures, certainly entitles any scientist to hypothesize about the possibility of various modes of human-intention effects on healing.

Dr. Emoto’s work appears to confirm this possibility in a graphically attractive way, as does Stephan Schwartz’s work on water in healer’s hands using I-R spectroscopy. The Qi Gong master Dr. Yan Xin’s classic demonstration of the change of the structure of water as measured in a Raman spectrometer from a distance of hundreds of meters to 7,000 kilometers is part of this database. With the amassing of a wide range of data from different fields, it’s certainly fair to conclude that our understanding of the healing potential of water is, to use the title of a book by the really great physician-healer Lewis Thomas, today’s *Youngest Science*. We know it has a bright future. What we need now is to pursue it—carefully, bearing in mind the power of human intention, and with the goal of fairness.



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CHAPTER 3

WATER: ITS CLINICAL AND SCIENTIFIC DEPTHS

by Cyril W. Smith

SUMMARY

Coming from a background in radar and physics, and while working on electromagnetic effects in enzymes and living systems, I became involved in the diagnosis and therapy of patients hypersensitive to their electromagnetic environment. This led to research on the physics of water, its memory for frequencies, and the use of dowsing as a scientific instrument; the results led to a basis for homeopathy and acupuncture. Frequency was the relevant parameter throughout. Acupuncture meridians have characteristic frequencies naturally present on them. Where there's a connection to the autonomic nervous system (ANS), additional frequencies characteristic of the ANS appear. The presence of these frequencies in the whole body field of a person indicates which systems are under stress. A study of techniques for writing, reading, and erasing frequencies in water gave results of practical value. Logic-gate operations with frequency were shown to be possible in spatial arrangements of water and sensitive enough for nerve impulse trains to control biocomputing. Theoretical work cited predicts domains of phase coherence as a normal property of water. Measurements involving these suggest that the Emoto ice-crystal patterns may start on coherence domains and indicate frequency patterns within.

INTRODUCTION

Since 1973, I've been involved in experimental research on the interactions of electromagnetic fields with biomaterials and living systems. This included my cooperation with the late Professor Herbert Fröhlich, FRS, a theoretical physicist at Liverpool University whose centenary was celebrated recently. One early conclusion from this work was that there were unusual magnetic field effects in water and in living biological systems and that these were only explicable in terms of 20th-century physics, not 19th-century physics. These effects involved highly complex systems that could become interconnected through sharing frequencies that had become synchronized in phase (that is, become coherent). This could happen over distances that might span many molecules; but, as we were dealing with quantum systems, distance might be an irrelevance.

HYPERSENSITIVE PATIENTS

My involvement in the diagnosis and therapy of patients hypersensitive to their electromagnetic environment began in 1982 at the request of Dr. Jean Monro in London. Working with her electrically hypersensitive patients and those of Dr. W. J. Rea in Dallas, Texas, gave me an insight into the extremes of sensitivity and speeds of reaction of hypersensitive patients whose regulatory systems had failed, particularly when they were exposed to electromagnetic fields and frequencies.

Such patients have a long history of ongoing hypersensitivities to many chemicals and/or foods and particulates. They may react within seconds to something in their surroundings to which they happen to be hypersensitive. This includes their electromagnetic environment; and here, frequency is the important factor. Any frequency (from circadian rhythms to light) may be clinically significant.

One important result from this clinical work was finding that the effects on patients of environmental electromagnetic fields, chemicals, or homeopathic potencies could be reproduced with frequency-imprinted water. For example, water in flame-sealed glass ampoules was imprinted with frequencies through the glass with no possibility of any chemical

contamination. Patients reacted to this even if the water was frozen. This showed us that the basis of homeopathy must be frequencies in water.

The frequencies that affect these patients are often those that occur naturally on the acupuncture meridians. These are rather like microwave links running through the body originating as coherence between adjacent cells in the embryo. Enough water remains in a specimen of a tissue even after staining and fixing as a microscope slide for frequency measurements to be made, and these correlate well with the natural frequencies found on the acupuncture meridians (and chakras) regarded by Traditional Chinese Medicine as connecting to these organs. Chemicals (except 100 percent halogen-saturated ones) have a characteristic frequency signature resulting from their interaction with traces of hydrogen-bonded water.

THEORETICAL

Preparata and Del Giudice at the University of Milan did a theoretical investigation of the properties of coherence in condensed matter—which is anything that’s not a gas. Their model for water is the same as for all other coherent condensed-matter systems. Namely, there are two parts: one *incoherent*, comprising water molecules oscillating at random (as in steam, but more densely packed); and the other *coherent*, consisting of domains of *coherence*, within which all the water molecules oscillate synchronously (in phase) with the frequency of a very large electromagnetic field that develops spontaneously within the domain. This resembles what happens in the laser, but it doesn’t need any energy “pumping.” Predictions from their theory are in good agreement with the experimentally determined values for physical constants of liquid water.

The “classical electromagnetic field” is the basis of electronics and radio; it describes oscillations whose phase is well defined (coherent) but for which the number of particles (quanta, photons) carrying the energy is undefined. A “quantum field” has uncertainty in both its phase and the number of particles involved, and this uncertainty is determined by the Heisenberg Relation. The more the uncertainty is taken up by fluctuation in the number of particles, the more perfect the phase coherence becomes.

For any wave, its velocity of propagation equals its frequency multiplied by its wavelength. Within a coherent system such as water, the range of the coherence (coherence length) becomes the constant quantity instead of the velocity. This makes frequency proportional to velocity apparently without restriction, so long as one remains within the coherence length. Such a system can support many velocities (even greater than the velocity of light) with frequencies in proportion; and because these no longer have absolute values, the system has become *fractal*. The same patterns and effects can occur in many different parts of the electromagnetic spectrum. It's this that connects frequencies characteristic of chemical, technical, and biological systems together. If there weren't a duality between the chemical bond and frequencies, spectroscopic analysis would be impossible. This is why a pattern of frequencies can mimic a chemical exposure for hypersensitive patients and trigger their reactions.

IMPRINTING, READING, AND ERASING

Clinically significant information can be imprinted into a vial of water by *succussion*, which is sharply banging it on a surface. This is what creates a homeopathic *potency*. Frequency information from a patient's body can be collected similarly, and this often reveals stress on acupuncture meridians.

IMPRINTING

Imprinting can occur through the glass of a vial containing water by immersing it in frequency-imprinted water. Otherwise, water placed near a source of frequencies (an oscillator and coil, or a chemical or a potency) can be imprinted by a strong magnet or a toroid (ring) of a ferrite material. A sequence of seven voltage pulses will also make an imprint; a mobile phone may do this on dial-up.

READINGD

William Tiller has described work with memory chips imprinted by healers. Although healing can be imprinted, it is also possible to imprint stress. When I visited the laboratory of Jacques Benveniste shortly after the *Nature* inquisition had left, I was able to find by dowsing all the glassware (in a box on the top shelf of the store), the bench, and the incubator that had been used through the stress left behind. It's easy for a person who has the capability of a healer and knows how to do so to affect sensitive living systems such as those Benveniste was using. I told him to trash everything or treat it as if contaminated with radioactivity in order to get his laboratory clean again.

I've shown that the basic arithmetical operations can be performed on frequencies imprinted into water and that the basic reversible logic gates and their operations can be implemented. Nerve impulses should be able to control computing operations in living systems, making biocomputing a possibility.

ERASING

A water imprint is erased by briefly shielding it from the Earth's (geomagnetic) field, such as by placing it inside a steel box. Heating imprinted water alters the imprint, which may become "hidden." It can be recovered by the application of certain frequencies, which include those of the heart acupuncture meridian and chakra. The heart meridian frequency is on the Schumann Band, a geophysical resonance in the upper atmosphere under which life evolved. Another such frequency is the microwave resonance of molecular hydrogen. Medications can be made acceptable to sensitive patients by canceling their chemical signatures.

WATER'S FREQUENCY MEMORY

Frequencies in water and living systems present a very great measurement problem. Clinically, they may be anywhere in the electromagnetic spectrum. These aren't frequencies of "classical" electric or magnetic fields, but rather frequencies of "quantum" fields, which must be converted to the former for measurement with instruments. Information is carried as the frequency of the A-field component, which was originally a mathematical necessity arising from the fact that a magnetic field was found in closed loops. Eventually, it was shown theoretically by Aharonov and Bohm and later experimentally that this component of the magnetic field (called the magnetic vector potential) did actually exist and could produce interference effects.

DOWSING

To measure frequencies in water, I had to develop the dowsing techniques I'd initially devised for the diagnosis of reactions in very hypersensitive patients—persons incompatible with technology, period! This was the only technique able to cover the frequency range and sensitivity required. I later extended it to the detection of resonances in water, allergen dilutions, and homeopathic potencies. I've detected the frequency signature of salt (sodium chloride) to a concentration of about 0.3 ppm by weight in water.

My dowsing measurements agree with instrumentation where this has been possible. Their internal consistency is good. Mind-body interactions make "double-blinding" difficult, if not impossible. The dowsing reaction must involve the heart or pericardium acupuncture meridians; if either is joined to a wire, all dowsing response is lost. A magnetic A-field reverses the dowsing response as it does for the Aharonov-Bohm effect. Since a frequency can be measured in less than the time for a single cycle, its measurement must involve a phase comparison between the left and right arms. (See also Chapter 8.)

FREQUENCY MEASUREMENTS

There are several possibilities for objective frequency measurements. Electrodes immersed in water and connected to the input of a very sensitive amplifier or signal analyzer can detect an imprinted frequency in the kilohertz region if the water is excited by that frequency. A possible physical mechanism for this is that charges entering coherent water from an electrode must do so as charge-pairs; this reduces the number of charges at the water/electrode interface, thereby increasing the electrical resistance. The small “offset” current that flows into an amplifier detects this as a voltage.

Gariaev, in Moscow, has developed a special laser in which two beams are polarized perpendicular to each other. The beams interact with molecular structures, which produce optical rotation, resulting in the emission of radio frequencies. In his experiments with homeopathic potencies, a control solution showed no bio-information, while a D12 potency of platinum gave him peaks at 2.2 kHz and 4.5 kHz. Subsequently, I prepared a D12 potency of platinum and measured by dowsing the three frequencies: 2.301 kHz, 4.455 kHz, and 2.57 MHz. The last was obviously his radio frequency, and the others its modulation. I’ve detected similar resonances imprinted on water using light from an LED.

Elia and co-workers in Naples have carried out an extensive study on aqueous solutions subjected to successive dilutions and succussions. The heat of mixing with acids or bases differs between untreated water, dilute solutions, homeopathic potencies, and frequency-imprinted water. Although his microcalorimetry can confirm a single frequency imprint, it is at present too slow to measure a whole spectrum of frequencies.

IN THE FAR-INFRARED

When working toward a theory for “memory” effects in water, I looked at my measurements of the chemical hexane; this is a more volatile relative of the octane used for gasoline rating. With at least 14 ppm of water present, hexane gave a chemical frequency signature. Since it only has a spectrum in the far-infrared (FIR), this was the only region in which water could interact

with it. Furthermore, I noted that of the very many water lines in this region, just a few [28 μm (357 cm^{-1}), 47 μm (213 cm^{-1}), and 78 μm (128 cm^{-1})] could become coherent enough to use in a water-vapor laser. I concluded that these should be able to provide the necessary coherence for water “memory” and was able to calculate hexane frequency signatures from these spectra.

When the same calculation was applied to pairs of these FIR lines in the absence of any hexane, this gave the measured frequencies of water. When a frequency was imprinted onto water, the FIR frequencies were replaced by two sidebands proportional to the imprinted frequency. Because of coherence, this is a *fractal* effect, and corresponding sidebands appeared in many parts of the electromagnetic spectrum.

A THEORETICAL BASIS FOR POTENTIZATION

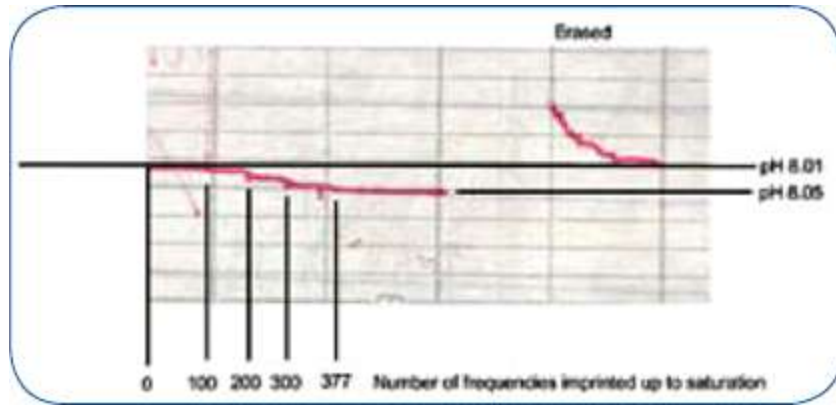
When water was imprinted and then serially diluted, the original frequency disappeared, to be replaced by that frequency multiplied by the dilution ratio; but not all dilution ratios would do this. Some gave no frequencies. This provided a theoretical basis for the potentization of homeopathic remedies, which I demonstrated as follows. Water was imprinted with the complete pattern of frequencies previously determined for thyroxin of potency D15. This was further potentized by conventional serial dilutions and succussions. The frequencies measured for each synthesized potency were exactly the same as those for the potencies prepared from the “mother tincture” of thyroxin. Yet, my synthesized potencies had started from nothing but water. Importantly, there was no discontinuity at potency D24, which is the dilution at which not one molecule of the original substance should remain (Avogadro’s number). This is where the chemists have to give up!

SHIELDING AND ERASURE

As already mentioned, it was during attempts to measure frequency imprints in water by instrumentation and in work with electrically hypersensitive patients and with homeopathic potencies that it was found that a potency or a water imprint would be erased if the geomagnetic field was shielded from it briefly with a steel box. Erasure must occur when the thermal energy is able to break up order due to magnetic energy. The water erasure threshold is about 1 percent of the Earth's magnetic field; the exact numbers imply a domain of phase coherence 53 mm in diameter. This threshold is independent of the imprinted frequency over at least the 13 decades from 10^{-4} Hz to 10^{+9} Hz. One microliter of water (acid or neutral) is needed to take up the imprint of a single frequency; but, if the water is alkaline, more is needed. The concentration of coherent domains in random water can be estimated from the number of imprints possible; the pH (acid/alkali) effect supports the involvement of protons.

In 1983, my laboratory showed that living systems can respond to magnetic resonance (NMR) conditions at geomagnetic field strengths. This high sensitivity allows one to speculate that a frequency might be retained in water if the magnetic resonance precession of the protons can be synchronized to any applied frequency and that they can generate an internal magnetic field that exactly satisfies the proton NMR conditions locally within their coherence domain. This condition turns out to be independent of the frequency to be remembered. Such a process would be stable unless a domain was thermally broken up by reducing the stabilizing geomagnetic field.

A 53 mm diameter domain contains more than enough protons to generate the magnetic field required to satisfy NMR conditions. The statistical fluctuation in the number of protons involved determines the bandwidth of the frequency imprint. This comes to about one part in a million (1 second at 1 MHz or 12 days at 1 Hz) and is consistent with the time needed for imprinting a frequency onto water by contact.



Change of pH on Frequency Imprinting: This chart recording shows that the pH of a solution of sodium hydroxide at pH 8.01 increased to pH 8.05 at memory saturation, which occurred after 377 separate imprinted frequencies. Erasure returned the pH to the initial value. An increase in pH corresponds to the removal of H⁺ ions and the generation of an equal number of OH⁻ ions. The number of protons involved in this pH change for a single frequency imprint is sufficient to generate a local magnetic field to satisfy proton-NMR conditions independent of the imprinted frequency. Thus, imprinting a frequency into water may create a proton coherence that is sufficient to store that frequency. (Chart speed: 10min/div)

ICE PATTERNS

The ice patterns obtained by Dr. Masaru Emoto are reported to have been taken at magnifications of 100–200, where the microscope's field of view would be about 200–100 μm . They have a size and symmetry consistent with originating from a segment of the surface of a coherence domain about 50 mm diameter, the size I calculate from the water-memory erasure condition. These ice patterns are consistent with being a representation of frequency patterns within a domain. In 1989, we found that water frozen in a static magnetic field showed distinctive ice-crystal patterns directed at right angles to the magnetic field. There were also frequency-dependent effects from alternating magnetic fields. Therefore, ice-crystal patterns nucleated by coherent frequencies within a coherence domain remain at least a possibility.

CONCLUSION

Details relating to the contents of this chapter are to be found in the books I've listed in the Bibliography.

Finally, I'd like to recall the myth of Achilles and the tortoise, in which the choice of the wrong paradigm precluded the possibility of ever finding a solution to the point at which Achilles overtook the tortoise. For water, the appropriate paradigm is quantum physics. Ignore it, and make progress at tortoise speed.



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Newsletter by Simon Best (co-author of *Electromagnetic Man*): www.em-hazard-therapy.com



CHAPTER 4

WATER: NATURAL'S MIRACLE — BEYONDS SCIENTIFIC EXPLANATION

by Dolly Knight and Jonathan Stromberg

A part from the many well-researched properties of water, which make it unique as the life supporter of this planet, there is one ability of water that mainstream science has tried to ignore and deny: the “memory of water” phenomenon. This phenomenon lies beyond the accepted level of scientific inquiry, and little effort has been made by conventional research institutes to understand it. However there are exceptions, and an exciting new understanding of the marvelous properties of water is emerging.

VIBRATIONAL IMPRINTING

Various researchers, such as Professor Jacques Benveniste, Dr. Wolfgang Ludwig, David Schweitzer, and Masaru Emoto, have provided clear proof that water acts as a liquid tape recorder and is able to receive, store, and transmit electromagnetic vibrations. Because water molecules have a positive and negative pole, they behave like little magnets. They attach themselves to their neighboring molecules and form clusters of several hundred molecules. These clusters are very sensitive structures and are impressionable by vibrational influences. This is what gives water the ability to store information.

This is closely linked to homeopathy, where a substance is diluted so many times that eventually there's virtually no molecule of the original substance left, yet it still has an effect. Homeopathy works because of the

cluster ability to store vibrational imprints. Every substance and element has its own individual vibrational pattern, a bit like an energy blueprint. If one carries out the homeopathic process of diluting and succussing, the vibrational pattern of the remedy material becomes locked into the cluster structure of the carrier water. When you take this homeopathically prepared remedy, the cluster structure is transferred to the body, and you react to the vibrational pattern of the original substance from which the remedy was prepared.

This phenomenon was shown to occur under rigid scientific conditions by Jacques Benveniste in France in the late 1980s and was confirmed by researchers at five different universities. It caused quite a stir and subsequently a cover-up by the mainstream scientific community.

If water is this susceptible to vibrational imprinting, does it also take on the imprints of environmental pollutants and chemicals with which it has been in contact, and transfer them to us when we drink it?

Unfortunately, this seems to be the case. In Germany, Wolfgang Ludwig has carried out tests that show that not only does the *physical* pollutant have a damaging effect, but so does the *water* that has been exposed to the pollutant, because the cluster structure has taken on the vibrational imprint of the pollutant.

This has huge ramifications for us. Basically, conventional water and sewage treatment systems are not adequate. They may remove the *physical* pollutants and produce tap water that's chemically clean. However, the cluster structure of the water is completely unaffected by the treatment and will still convey the vibrational pattern of toxins and chemicals to the human body.

IMPLOSION

However, all is not lost, thanks to the intriguing work of the Austrian forester Viktor Schauberger (1885–1958). He had ample opportunity to study the workings of nature in unspoiled Alpine forests. Being an extremely intuitive man, very much in tune with the natural world, he soon developed ideas and theories regarding nature, and particularly water, that

were in conflict with conventional scientific understanding. Early on, he discovered that there was an underlying principle governing all natural processes. He called this “implosion.”

Schauberger became a prolific writer and inventor. His inventions were linked to water supply, natural river regulation, agriculture, propulsion, and energy generation, and were all based on implosion. He’s very important to us in that he pointed out a new way of looking at nature and exciting new possibilities—if nature’s true workings could be really understood and copied in a technological sense.

Implosion is a suctional process that causes matter to move inward, not outward, as in the case of explosion. This inward (centripetal) motion doesn’t, however, follow a straight (radial) path to the center, but a spiraling, whirling path. This is called a *vortex* and is the secret of nature. Bathwater, when emptied, flows through the plug hole in this spiraling vortex fashion. Water will always try to follow the path of least resistance. This is what the vortex is enabling it to do. It’s reducing resistance by curving inward more and more, thereby avoiding the confrontational resistance of straight motion.

The vortex motion, which also causes a drop in temperature and increase in density, is paramount for water to stay healthy and disease free. Natural water courses are naturally spiraling and meandering, and the water in them forms whirls and eddies, which are vortices. In nature there are virtually no straight forms; and whenever possible, vortices, spirals, and curves are produced to reduce resistance. Yet in conventional technology, explosion, combustion, and straight motion are employed, all of which increase resistance and temperature and are fundamentally against nature. Realization of this caused Schauburger to proclaim emphatically: “Our technologists are moving matter incorrectly. Their technologies and interference with nature are detrimental to us and our planet.”

RE-ENERGIZING WATER

After researching Viktor Schauburger for a couple of years, we were convinced that he had something very important to impart to humanity.

Sadly, not a lot of work has been carried out in the last few decades on developing practical applications for his ideas. So we started full-time research in September 1997 and developed an implosion machine. In this machine, water is made to form very powerful vortices. We found that water undergoing this process of implosion was developing a rhythmically pulsating field of energy, which comprised the full spectrum of etheric colors. During this process, it was brought back to its natural vibrant energetic state and regained its life force. This energetic charge turned out to be permanent and didn't diminish after the implosion process was completed.

We further discovered that when filled into particular shapes, this imploded water transferred its energy to samples of ordinary non-energized water until they reached the same level of charge as the imploded water. The imploded water was resonating ordinary water in a similar fashion to the way one tuning fork picks up the vibrations of another, the difference being that on the etheric level, the vortical dynamics and vibrations are perpetual.

After building the implosion machine, we developed a spiraling copper device called the "Vortex Energiser," in which we filled our imploded water. We found that placing this Vortex Energiser onto the domestic water mains resonated the tap water flowing past, thereby charging it up with life force or etheric energy. The benefits of energizing ordinary tap water in this way are varied: The clarity and taste of the water improve—the water is more palatable and less hard; the taste and smell of chlorine are much reduced or even eliminated; lime-scale deposits become soft and are eventually removed; bathing in energized water is a reviving experience, leaving skin supple and soft; fresh food and cut flowers washed with or placed in the water last longer.

Perhaps most important, by reclustered water and at the same time energizing it in this way, we believe that we're superimposing a natural vibrational pattern onto a pattern of man-made contaminants, thereby deleting the memory of the water's abused past.



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THE CENTRE FOR IMPLOSION RESEARCH

The CIR was founded in December 1997 by Dolly Knight, MBBS, GCHM, and Jonathan Stromberg, BSc, MSc, DIC, FGS. We believe everyone has a duty to do whatever they can to improve our ailing planet's environmental condition. Our aim is to develop technologies that are simple and pollution free and work in harmony with nature.

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CHAPTER 5

SNOW, IT HAS SIX EDGES

by Maximilian Glas

It was deep in the winter of 1611 when the mathematician and astronomer Johannes Kepler crossed over a bridge in Frankfurt and fine snowflakes drifted down onto him, “all in the form of the hexagon with feathered rays,” he wrote. “It is always like this when it starts to snow—snowflakes always form hexagonal stars—and there must be a definite reason for it. If it happens by chance, why don’t they form heptagons or pentagons. . . .?”¹

Around 400 years ago, nobody knew how matter was constructed, how crystals grew, or what inner laws the formation of crystals followed. Kepler was the first person in the modern age to seriously think about the subject and to develop a coherent model. It would be another 300 years before the Munich physicist Max von Laue proved this model correct. Fortunately for us, Kepler wrote down his reflections in 1611. He not only handed down a pioneering thought, but one that made it easy to understand why all snow crystals (and respectively ice or water crystals) form symmetries based on the number 6, and this leads us to the fascinating pictures from Masaru Emoto.

Kepler dedicated his Latin script *De nive sexangula* (About the hexagonal snow) to Counsellor Knight Wackher von Wackenfels, a well-known philosopher, as a “New Year’s gift.” He wanted to delight the enthusiastic nihilist with a present that came as close as possible to “nothingness”: just a little star formed out of snow, along with a few thoughts about it. In these thoughts, Kepler pondered on how the little star could have grown and concluded that it would have very slowly condensed out of the steam in the air.

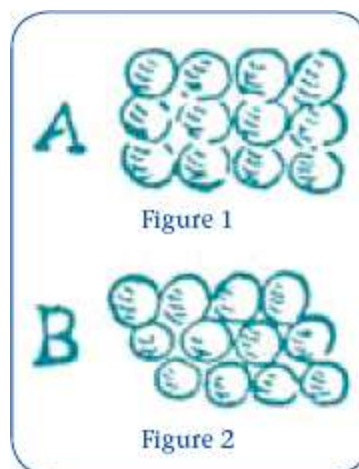
THE MEANING OF FORM

Kepler's thoughts regarding form were: "Only that which forms a boundary in itself has a form, because the boundaries shape the forms."

That is clear, but why a hexagon of all forms? Kepler continued:

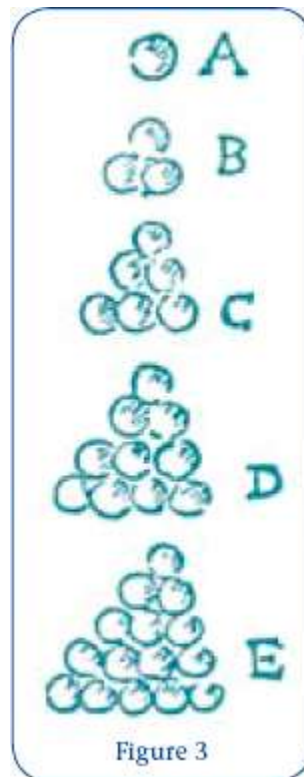
It needed further consideration as to what was at work here. Was the form innate or produced from the outside? Was the hexagonal figure necessitated by the material out of which it was formed, or by its own nature, which was either the prototype of beauty which lies in a hexagon or due to the aim of this figure.²

So, inner or outer necessity—a clear, beautiful train of thought! After this, Kepler developed the concept of the construction of "solid bodies" from minute units, which ideally should possess a spherical form. That means that he had the first vision of what's today called an atom. He also had an understanding of the order of the spheres. He assumed that the order was level, and there were layers over layers, which is what formed the crystal. This is still the current view. He concluded that at least two possibilities existed: that the order of the spheres formed a square (A) or a triangle (B). He even illustrated this:



In a second sketch, he showed the spatial construction: Layer A (with a sphere) is placed on layer B, and this then on C, and so on. Finally, a pyramid is formed by four equilateral triangles—therefore a tetrahedron—which shows threefold symmetry, and that has to be the architectural basis for constructing "snow stars."

Obviously, Kepler didn't know the construction of water molecules at that point and so wasn't able to foresee the necessity of the sixfold (not threefold) symmetry, but in any event it can be derived from the threefold symmetry.

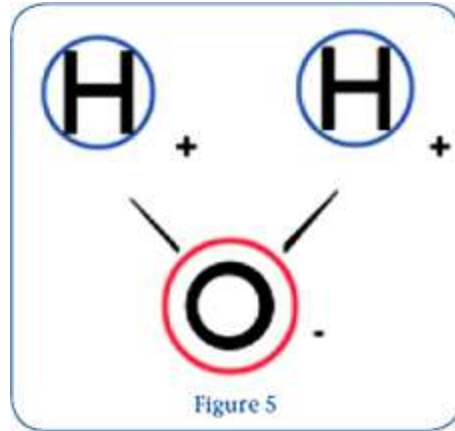


All in all, this was a stroke of genius! Kepler had described the construction of snow crystals in nearly the same way that it would be today. And all this 400 years ago, without the model of an atom, without developed crystallography, and without the help of technical instruments. Crystals are still described today as a three-dimensional spatial grid made up of spherical particles (atoms). And, as mentioned at the beginning, Max von Laue was able to confirm the structure of crystals through x-ray experiments in 1912.



In the case of water, the crystal structure is determined by the shape and form of the H_2O molecule. Contrary to what Kepler expected, the spherical density is less than he showed in his second sketch, but is formed of a looser group of molecules, which are ordered as a tetrahedron and combine to form little rings of six:

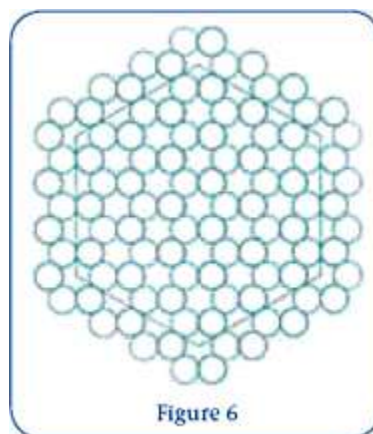
The sketch shows a small section of the crystal structure of ice and puts it in the context of the hexagon. It also explains why ice has a bigger volume than water and consequently is lighter and able to float on water: As ice, there's relatively a lot of space between the individual components; in the fluid state, water is denser. Around two to four million water molecules of this structure are needed to be able to build around 0.039 inches (1 millimeter) of one edge of an ice crystal. The connection of the H_2O molecules in the crystal grid is made through hydrogen bridges, which also play an important role in the formation of clusters.



IT BEGINS WITH A SEED

As easy as it might seem to understand the inner structure of ice crystals, in the living process of growth many different things can occur; and those change and shape the outer form of the finished crystals. Ice crystals can look completely different depending on what happened during the growth process.

At first this starts very simply. As Kepler discovered in 1611 on the bridge in Frankfurt, water begins to condense at some point. That means that steam forms fine droplets, which slowly crystallize and harden in low temperatures according to the “construction plan” already described.



In order for a crystal to be able to form, a “seed” is needed: a tiny unit of the grid on which the water molecules can settle, layer upon layer. Such a

seed can come from pure water, which in low enough temperatures develops spontaneously into a droplet and afterward into a crystal seed with a regular internal construction. But fine floating dust particles in the air can also trigger the formation of an ordered crystal structure.

Once such a seed has been formed, there's nothing to stop it from growing. Layer upon layer of water molecules settle on it in all directions—but not in all directions to the same degree. Depending on pressure and the temperature of the atmosphere, this can be very different. If the process is taking place at great heights and in low temperatures, most of the crystals assume an elongated form, often appearing as very long, fine ice needles, but always with a hexagonal cross section. On the sketch (see Figure 4), this is the top part. The upper end of the crystal is able to develop even more surface area.

More is shown in this sketch. If the conditions aren't very icy, but there's still thick frost, six mainly flat lateral slabs will develop; below, one can see an ice-crystal cup, a form that can be seen in the ice caves of the Alps (sometimes at enormous heights). The last form is a snowflake as we all know it. These are just the simple basic forms—what nature creates out of these is unique.

ENORMOUS FREEDOM OF CREATIVITY

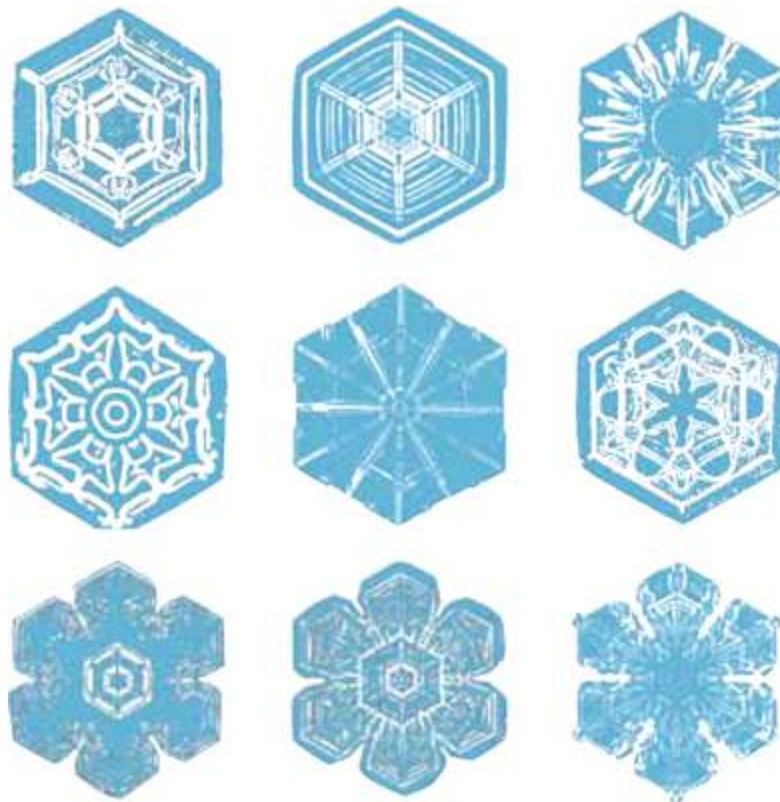
Every single ice crystal is unique. Even with millions of crystals, no two will be identical. A pair might look like identical twins, but they'll never be exactly the same. This is because every single one comes from heaven to Earth in its very own way. On their journey, these crystals pass through different layers of air, each with different pressure, temperature, humidity, and pollution; and the falling snowflakes react to every small change.

Let's consider how a clean crystallized hexagonal ice-slab leaves the clouds and starts its journey down to Earth. If it passes through a warmer layer of air, the edge of the slab will get loose; if it goes through a colder layer, new crystal layers may be taken up. Sometimes this can happen quickly, sometimes slowly; sometimes the growth phases are long,

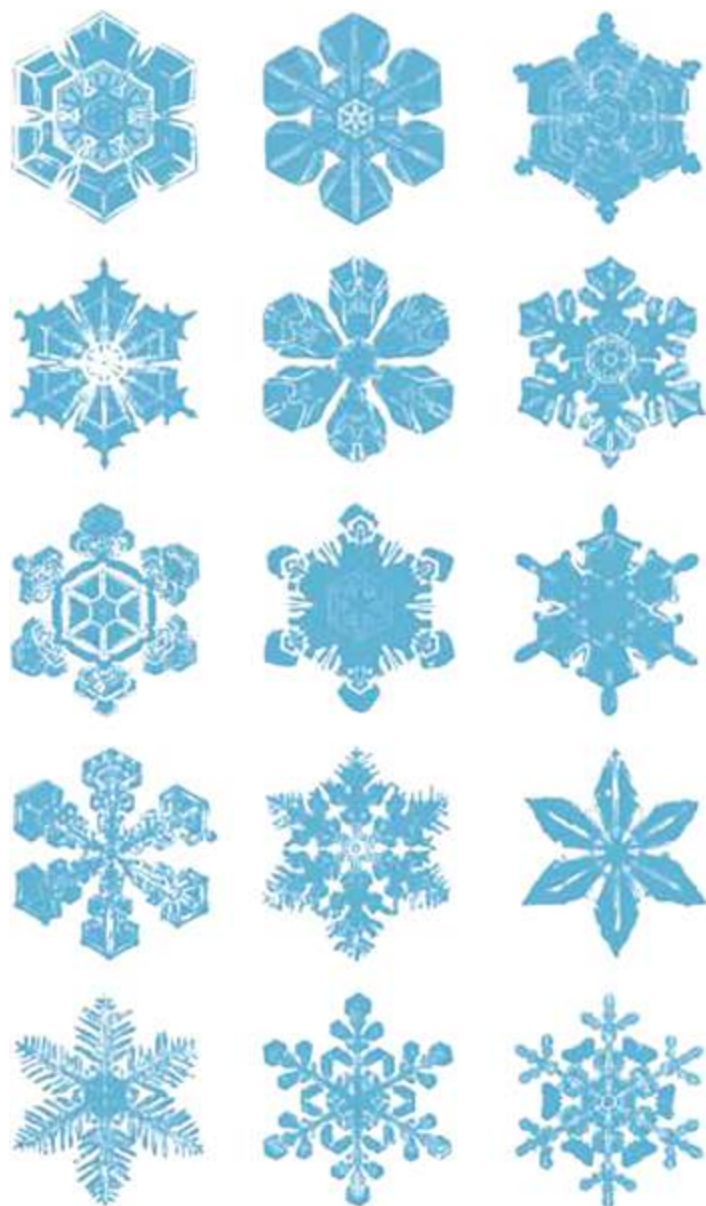
sometimes extremely short; sometimes there's more humidity in the air, sometimes less.

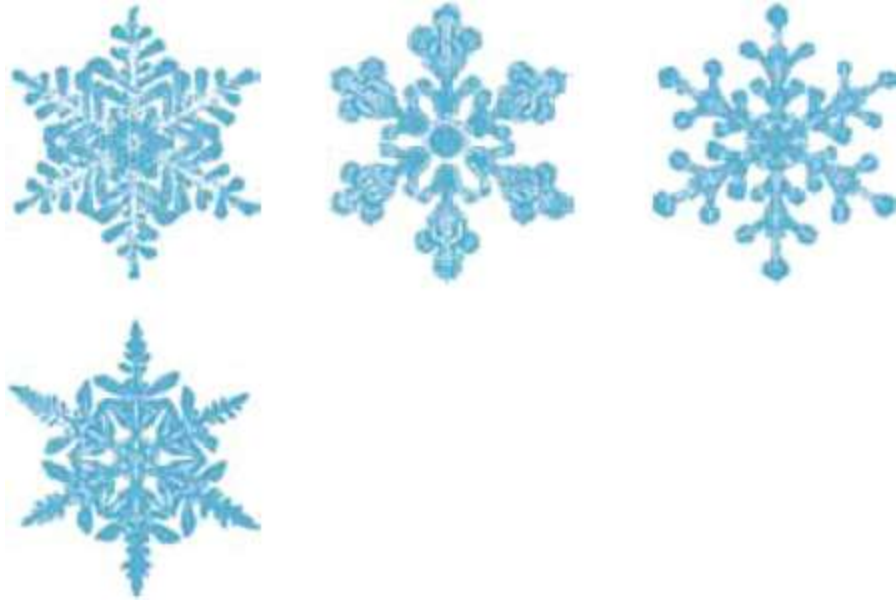
We all know from experience how different these crystals can turn out to be. In the never-ending process of growth and dissolution, the most bizarre shapes can form. Everything is possible. If at one point it gets too warm, the crystals will dissolve completely before reaching Earth, and it will start to rain. Sometimes the droplets will cross layers of ice and become fine hailstones, and so on. There are no limits to nature's imagination.

This variety has always been a source of fascination and several people have tried to "collect" these ice crystals. This is much harder than with other minerals, due to the temperatures involved, although it's just possible with the help of photography. The craziest collection belonged to the American W. A. Bentley. He built himself a special slab-camera and spent winter after winter on a mountain in Vermont, taking pictures of thousands of snow crystals. In 1931 a book of 2,453 of his ice-crystal pictures was published.³ A selection of these follows.



Snow-crystals photographed by W.A. Bentley.





So much for the rather conventional scientific descriptions of the development of ice crystals. These are always related to pressure, temperature, and other outer conditions. Masaru Emoto's research has introduced a new aspect, a mental and spiritual one, as he has shown that the subtle energies and vibrations of thoughts, words, and sounds obviously have an impact on the growth of crystals— quite a radical thought for the more orthodox mineralogist. The path of progress here, as in science generally, has been toward investigating ever-smaller sizes and ever-finer energies. It would be wrong to think that this path isn't being blocked by outdated dogma. But maybe these ice crystals will inspire us, as they did Kepler 400 years ago, to revise our concept of the world.



NOTES

1. Johannes Kepler, *De nive sexangula*, 1611: p. 92.
2. Ibid.
3. W. A. Bentley and W. J. Humphreys, *Snow Crystals*, New York: Dover Publications, 1931, reprinted 1962.

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PART II

HEALTH AND
HEALING PERSPECTIVES



INTRODUCTION

The scientific section of this book described the remarkable properties of water as discovered by scientists in recent years. This portion takes these discoveries and builds on them, showing how we can use water in many ways to maintain our health and fight disease. It will be seen that water does this in two interconnected ways: through its well-known physical properties, and through its more hidden spiritual qualities.

The human body is composed of around 85 percent water, which performs many life-sustaining tasks. For example, it supports complex biochemical reactions, provides structural support for cells, and is the major component in blood and all other body fluids. Also very important, it eliminates dangerous waste products from every part of the organism. These processes all rely on water's physical properties. From my own and other scientists' work with water and water crystals, I'm convinced that there's a profound interaction between our thoughts (and perhaps those of people around us) and the water in our bodies. Positive thoughts affect the molecular structure of bodily water, and thus the health and well-being of the entire organism. This theme is central to all the papers in this section. They advance original and important insights into the value of water for healing, and have all been written by experienced health practitioners who have been pioneers of new ideas and information.

An important paper here is on dowsing—the use of divination to find water. This ancient technique, still in constant use around the world, demonstrates yet more of the astonishing powers of water—in particular, the ability to make itself felt from a distance, and from under many layers of rock.

I hope that you'll make use of the ideas and suggestions in these papers for your own well-being and for that of your friends, family, and communities.





CHAPTER 6

WATER AS A SOURCE OF HEALTH

by Petra Bracht, M.D.

Water is essential to our well-being, but its powerful beneficial effect on our health can all too often go unacknowledged. Because all metabolic processes need fluids, it's of huge importance that the "primeval sea" in which the cells swim is always in sufficient supply. To get a better understanding of the crucial role water plays in our health, it's important to consider the physiological processes behind illness and well-being.

WHAT MAKES PEOPLE ILL?

Most people think that illness comes from outside and out of the blue, almost as if an enemy is there lying in wait for the right opportunity to launch an attack. In the Middle Ages, evil ghosts and demons were blamed. Today these have been replaced by fungi, viruses, and bacteria. Contrary to orthodox medical belief, however, each illness has its origin in our psyche; hence, its nature isn't material. What manifests at the physical level (that is, the symptoms) is the body's effort to fight illness; and it's at this level that we can positively influence the "dis-ease" process, as the physical self has infinite potential to secure the support of its 80 billion cells.

All simple illnesses can be seen as the body's attempt to dispose of "rubbish" (for example, through a cold or skin impurities) or to kill undesired substances through increasing the body temperature. It's only if the body has been abused for many years or if extremely toxic substances have made their way into it that this maintenance mechanism breaks down.

Then we start having problems with our health and illness breaks out, and in time it might become chronic.

Although germs are present all the time in the body, they very rarely trigger noticeable symptoms if there's a healthy immune system. This process is similar to cancer in that in nearly every human body cancer cells arise repeatedly on a daily basis. Yet some people get cancer, while others don't. Why is this? Here too the immune system plays a decisive role. So the question is, how can we strengthen our immune system?

First of all, if our metabolism is functioning properly, it will guarantee optimal support for all our cells. An optimal metabolism also means optimal elimination of waste material and harmful substances. But how can we exert a positive influence on our metabolism? What can we do to ensure it helps maintain us in the best of health?

MEGALOPOLIS, THE CITY OF THE BODY

Can you imagine a crowd of 80 billion people? A megalopolis, a concentration of several big cities into one megacity? Probably not. There are some six billion people alive on our planet today, but nearly 80 billion cells in the body are in communication with each other every single second. A protective wall—the skin—encloses our city, where “people”—cells—of all kinds live together. Food and other materials are mainly brought in from outside, although some food is produced within the protective wall by the body's own chemical factory.

Transport within the city is provided by water. The main part of the incoming material is delivered by a river that runs through the city, then this cargo is unloaded and distributed. The waste material is loaded onto ships farther down the river, which leave the city with the current. A very clever distribution system within the city ensures that everything arrives where it's needed. An equally well-thought-out disposal system carries everything that's no longer needed outside so that there's no accumulation of toxic waste.

So how, in such an organized city, can people still die of starvation, buildings collapse, or stinky wastelands (germ beds) develop and threaten a

whole quarter? The answer is very simple: If you supply this city with inferior building materials or block its main transport routes, you basically turn off its water supply. However, as long as the city is provided with everything that it needs and enough water is available, everything will work smoothly.

Each person is such a perfectly functioning city. We all have the best infrastructure that anyone could ever design. None of the most modern supercomputers can match it, but far too few people are aware that it's only through the continued supply of good-quality water that all these processes run smoothly.

INNER MOVEMENT

Everything, even the smallest process inside us, is based on movement. That's why we function best when in motion. This is true for our immune system, the inner organs, the cardiovascular system, the musculoskeletal system, the nerves, the lymphatic system, the brain, and the emotions. We can influence a whole range of metabolic processes through movement. Let's have a closer look at what happens during these metabolic processes.

The raw materials and tools that the body needs to function properly are carbohydrates, fat, protein, vitamins and enzymes, trace elements, minerals, and fiber. These have to be taken in and transported to the part of the body where a specific process happens. At this "building site," new cells are constructed, as are hormones, enzymes, protein, certain vitamins, and much more. All these are produced in the body's own laboratories. Old cells, meanwhile, die off and are recycled. Waste material is produced, which is discharged with the help of special detoxification organs (kidneys, intestines, skin, and lungs). Now you start to get an idea of how much is going on in your body every second of your life.

The means of transport that makes all this possible is water. Our body has a very complex network of "pipes"—blood vessels—so that every cell can be supplied with the necessary materials. Obviously, the efficiency of the system depends on the condition of the network. Many factors have an

impact on the smooth running of the organization, but there's one that's fundamental: movement. This is the primary secret of life.

Movement is life; stagnation is death! The driving force behind all movement is our muscular system. The muscles ensure that blood, lymph, and all other bodily fluids are transported throughout the body and support the work of the heart. Moving the body is therefore beneficial for the heart. Movement stimulates circulation; and as a result our pipes are "flushed out," all the cells are supplied with oxygen, all the nutrients reach their "place of work," the detoxification organs run at top speed, and all the necessary hormones and enzymes are produced.

When everything is moving along so well, something phenomenal happens: Our body starts to notice that the pipes could actually be bigger and that more pipes would ensure an even better supply, or perhaps that certain areas have not been supplied at all. The body gives immediate instructions to begin the necessary building work. The existing vessels get bigger, new ones are added, and the network is extended. The bones get stronger, and the cartilage and vertebrae get thicker so that they're able to take the additional strain. The organs are refurbished so that they can work more efficiently. The improved supply also explains why the bones of a person who does physical exercise heal more quickly than those of someone who doesn't. Just to give you an idea of the scale of the process, muscles that move have a circulation rate 200 times higher than those that remain at rest. This means that those cells will be 200 times better supplied with building materials and oxygen, and waste will be discharged 200 times faster.

It's hard to imagine, but if all the body's blood vessels were laid end to end, they would be about 60,000 miles in length and would circle the Earth more than twice. These vessels are our body's highways.

We could look around the "building site" of our body for hours and find endless new adjustments being made, all triggered by our movements. These can only take place, however, if there is enough water, in the form of blood, to flush through the 60,000 miles of blood vessels.

Movement in our body is better described as "perpetual motion." Once it has started, the system responds by moving more and more. If it's activated every day, this will trigger a dance of joy in the body. Outer activity will also bring about easier inner movement. If there's no movement, the heart

will simply maintain its most basic rate—sadly, a condition that most people live with today, without even knowing it. The system that’s most affected in this case is the body’s oxygen supply. If you don’t lead an active life, your body is just getting an emergency supply, and your cells are “gasping for breath.” Many important illnesses—such as circulation problems, headaches, impotence, and insomnia—arise through a poor supply of oxygen. And for a proper amount, you need water.

A HUMAN BEGIN IS A WATER BEGIN

Movement, satisfaction, and good food are the main prerequisites for health, which goes hand in hand with beauty. Natural, healthy beauty starts inside the body. If everything is in good order on the inside, it will be on the outside, too. Your skin will be healthy, because there will be no need for waste products to be brought to the surface for elimination. Therefore, the condition of the skin, the outer loveliness, mirrors the inner beauty. If your body contains enough water, for example, your skin will be smooth and elastic and your eyes bright. Your body will be functioning at its optimal level. The water content in babies is often as much as 75 percent, but this will continually decrease with age. Unfortunately, it’s not unusual to find levels of under 50 percent in adults. Even young people show low levels of water.

WATER AS TRANSPORT

Water is the main means of transport not only for all the materials that are required by the cells, but also for all the cells’ waste substances. If the transport network isn’t functioning properly because of a lack of water, waste isn’t taken away, but left behind. In medical terminology, this is a “deposit.” Physicians talk, for example, about the uric acid crystals that trigger a gout attack, and a person is described as “calcified” when part of their brain has become a salt deposit. Deposits may also collect in the blood

vessels over a period of time until one day they trigger a heart attack, stroke, or lung embolism.

HOW AND WHAT SHOULD YOU DRINK?

Many people think that they have done their duty by drinking four pints of water per day. But only a few individuals manage to accomplish this; and those who do drink the recommended amount of water often do so in a way that's very ineffective, because pouring several pints of water into the body, say, twice a day, once in the morning and once in the evening, isn't a very sensible thing to do. Such a large amount can't be used properly and will just pass through the body. It's far more sensible to drink water throughout the day. This then has enough time to trickle through the blood vessels into the spaces between the cells and from there into the cells themselves.

The water we drink should be as soft as possible. Nobody would expect their washing machine to use hard, calcified water. Just as soft water is more effective for washing clothes because it can penetrate more deeply into the fabric, so it's more effective for our body, as it can reach even the most remote corners. Therefore, you should drink still, soft water with only traces of calcium and minerals.

This is contrary to current opinion, which recommends exactly the opposite. Ads for "healing" waters particularly emphasize the high concentration and number of different minerals they contain. The culmination of this is fitness drinks with a high mix of minerals. However, more and more therapists now agree that too much of a good thing can have a negative effect. They share the opinion that minerals that haven't been taken in through the biological bond can't be used to optimal effect, which means they're actually not available to the cells. On the contrary, it's often impossible for the body to dispose of these surpluses, and so they accumulate in the space between the cells. In the longer term, this may result in a system overload and the metabolic processes becoming dangerously restricted.



Above: Fresh spring water that originates at the bottom of a mountain. A shining vibrant crystal has formed, which expresses the original power and beauty of nature.

PURE WATER FOR A LONG LIFE

There's an old Chinese phrase that's often found in ancient texts: "water of long life." This kind of water was collected, with immense effort, from the high mountain region and was only available to the upper classes. It was either rainwater or "dew-water" from melted snow. It was pure, having been cleansed naturally through evaporation or rainfall. Unfortunately, this process can no longer take place—today there are many particles in the atmosphere that pollute rainwater.

According to traditional Chinese wisdom, the health benefits of pure water were far-reaching. Although this belief is easy to understand from a biophysical point of view, it meets with resistance from conventional medicine.

Two arguments are often put forward against the consumption of pure water. The first is osmotic pressure. This is demonstrated by putting animal cells into pure water in a reagent glass. The cells blow up till they finally burst, because fluids with different part concentrations have the tendency to reach the same concentration. So more and more water goes into the cells until the cell wall isn't able to cope with the growing pressure and bursts. The opponents of the pure-water theory assume that the same would actually happen in the human body. This is of course a mistake, as the conditions aren't the same. Water begins its journey in the mouth; and right

from the start, it's no longer pure. Furthermore, the deeper it goes into the body, the more polluted it becomes. This cleansing effect is what gives the result the Chinese describe: a longer life.

The second argument against the consumption of pure water is that it washes precious minerals out of the body, causing a deficiency. Earlier on, however, we saw how water with a strong mineral or calcium content created deposits in between the cells, hindering the metabolism. Flushing these deposits out of the body is exactly why we need to drink pure water. Furthermore, the body measures precisely the levels of minerals it discharges—it doesn't give up those that it needs. If necessary, it will go so far as to take back through the skin minerals that have been dispersed through perspiration. (This was discovered by Japanese scientists who were examining athletes.) This means that the argument against drinking pure water is actually the very reason why it's beneficial for health.

If only it wasn't serious, this might even be funny—in the U.S. and in many Asian countries, pure or distilled water is on sale in supermarkets, and in Thailand it's even marketed with the slogan: "This water is good for your health!" At the same time, in Germany and other European countries, medical students learn that it can be dangerous, perhaps even life-threatening.

In my own family, we've drunk pure water for more than ten years for the good of our health; my husband consumes nearly six pints a day. He's in good health and very fit. By the way, did you know that coffee and tea made out of distilled water taste much better, and that it also makes good beer and baby food?

WHERE CAN I GET PURE WATER?

If you live in a country where you can't buy pure water, then you can make it yourself. To do this, you can either filter or distill water through evaporation. In fact, evaporation is the way nature itself cleanses water. The only difference is that in nature it's cold distillation, and at home it's hot distillation.

In the hot-distillation process, water is heated to the point of evaporation and then spirals its way back down into liquid form. The impurities are left behind in the container in which the water has been heated. This is actually a good test for your tap water. Fill a big cooking pan from your faucet, and let it evaporate. Afterward, have a look at the residue in the bottom of your pan. If you live in a congested area or somewhere with very hard water, this experience should be enough to make you start drinking pure water immediately!

In the steam-distillation process, the order of hydrogen and oxygen molecules in the water is changed, and as a result it can lose its beneficial “information.” To counteract this, it’s a good idea to put the distilled water out in the sun, shake it, stir it, or even play it pleasant music. In this way you load it with positive intent.

The alternative is filtering. There are many ways to do this, but all of them have the same problem as vacuum cleaners: On one hand, the filter must be fine enough so that no dirt can get through, but on the other hand it must be coarse enough so that it doesn’t get blocked by the dirt it picks up. A lot of the filter systems on the market claim to have struck such a balance, but who knows what, if any, minerals are getting through? And water without any minerals at all would be what they call “dead water”—that’s why the filters on our taps don’t remove all the minerals.

What are the criteria for “living” water anyway? Is water from fruit alive? Is fresh spring water alive, because it forms beautiful crystals? We can certainly say that it isn’t the existence of minerals that determines the vitality of water, but the information that’s contained in the water. And this can’t be viewed on the material level alone. We should consider the etheric energy of water here, not just the way impurities and minerals are filtered out of it.

Those who want to purify water thoroughly, however, can do this through the reverse-osmosis procedure. Here water runs through a very fine filter membrane. The pores of this are so small that the purity of the water is as good as when it’s distilled. Reverse-osmosis filters can be connected to the main pipes from under the kitchen sink. Then, to revitalize your distilled water, you can use one of the methods described earlier.



Above: Distilled water that has been shown the movie *Life*. The water seems animated and formed a beautiful crystal.

EATING WATER IS BETTER THAN DRINKING IT

The best possible way for the body to get water is out of fruits and vegetables. In this way, all minerals, trace elements, and vitamins are easily available, as well as all the other plant substances that have benefited humankind for millions of years. Water that's consumed in this manner reaches the blood more slowly and evenly and at the same time that the minerals are offered in the biological bond. Therefore, the body is able to use both water and minerals much more effectively. Thus, the best way to provide your body with water is to eat it.

It's not difficult to do. The water content of most fruit and vegetables is over 90 percent. For melons, oranges, and grapes, it's as high as 98 percent. Therefore, "eat" water whenever you can—that way, "drinking" becomes a real pleasure. A fruit salad or an apple makes a delicious snack and helps you stay healthy as well.

Cooking and frying dehydrate food, so the best way to eat fruits and vegetables is as fresh as possible. Fish and meat also lose water when cooked; and the higher the temperature, the greater the water loss. That's why we should try to cook our food at the lowest temperature possible. This has also the advantage of improving the taste.



Above: Eat fruits that are as fresh as possible.

AND DON'T FORGET—DRINK A LOT!

If for the last decade you've been drinking far too little water, or have drunk it in such a way that your body hasn't been able to use it properly, the consequences will become more and more apparent in the second half of your life. The very sad fact that older people often don't cook for themselves anymore and tend to rely on ready-made meals, which often have minimal water content, also contributes to the water shortage they experience.

So why not turn this around and make a positive change? The older you get, the more water you should drink and the more fresh food you should eat. This will help keep you physically and mentally agile well into old age.

COLONIC IRRIGATION: CLEANSING AND DETOXING WITH WATER

Thousands of years ago, enemas were used to enhance the healing process. Today the same process is used, but with a completely different technique. Colonic hydrotherapy, which was developed for U.S. astronauts, is able to clean the colon thoroughly and hygienically. The flush effect enables the removal of all the old decaying material—fecal matter—which can lead to recurrent poisoning. Through the osmotic process, it's also

possible to reach and remove toxic substances beyond the colon quickly and easily, without any side effects. This process can have dramatic results—in some cases, hay fever and migraines have disappeared completely after just one treatment. Former smokers also experience fewer withdrawal symptoms.

The colon has a huge (approximately 3,230 square foot) interface with the interior of the body. With colonic irrigation, metabolic residues and toxic waste matter can be taken up by the water that has been introduced into the colon, and thus eventually leave the body through the rectum. If your lifestyle needs to be healthier, having this “internal shower” once or twice a year will give you a much-needed opportunity to cleanse yourself of metabolic residues and enable you to experience the healing power of water.



CHAPTER 7

WATER: THE FUSION OF SCIENCE AND SPIRIT

by Dr. Darren R. Weissman

Conscious living, I've learned, begins with understanding the true power of water, as documented through the research of Dr. Masaru Emoto. The power of water exists in its ability to flow effortlessly, no matter what its environment. Water takes on the shape of its container, moves continually in swirling motions, or is effortlessly guided by the banks of a river. As life itself, it's always moving, changing from one state to another, vibrating and resonating at different frequencies. It has the potential to carve a path through a mountain, squeeze through the smallest opening, and, when heated, evaporate into thin air. Water is as mysterious as the infinite universe itself. It holds the secrets of all life. One drop may contain the blueprint for the cure of every disease known to humankind.

The human body is estimated to be between 70 and 90 percent water. Each cell, organ, and system of the body consists of specific percentages of water; and the flow of that water determines whether the body expresses itself in optimal health or in symptoms of imbalance or disease.

The late F. Batmanghelidj, M.D., a renowned physician, researcher, and author of *Your Body's Many Cries for Water*, discovered the profound benefits water has on the physiological functions of the body. He wrote:

From the new perspective of my 22 years of clinical and scientific research into molecular physiology of dehydration . . . I can safely say the 60 million Americans with hypertension, the 110 million with chronic pains, the 15 million with diabetes, the 17 million with asthma, and the 50 million with allergies . . . all waited to get thirsty. Had they realized water [was] a natural antihistamine and a more effective diuretic, these people would have been saved the agony of their health problems.

This article will outline the healing power of water and how the subsequent fusion of science and spirit gave birth to The LifeLine Technique.

DR. EMOTO'S WORK AS A CATALYST

It was the groundbreaking water-crystal research of Dr. Emoto that demonstrated the essence of water's power—its *consciousness*— and the instantaneous impact our thoughts, words, and actions have on its molecular structure. Because every element, cell, organ, and system of the human body is composed of water, we now understand that emotions affect the health of the body in the same way that the water in the crystal research was affected.

Dr. Emoto's work was the catalyst for The LifeLine Technique, which makes it possible for us to *understand* what the body is *saying* when it speaks to us in symptoms. Incorporating aspects of 14 natural healing modalities, The LifeLine Technique is based on the ancient arts of Chinese and Ayurvedic medicines, as well as on years of empiricism, documented research, and biomedical evidence. Through the use of a kinesiological reflex (muscle test), a LifeLine practitioner is able to translate, harmonize, and facilitate the release of emotions trapped within the subconscious mind, thereby enabling the body to heal on a core level. Coupled with healthy lifestyle choices—such as the quantity, quality, and frequency of water, food, rest, and exercise and owning your power—The LifeLine Technique awakens people to the power of living consciously.

My journey to awakening to The LifeLine Technique was the culmination of every experience, teacher, and patient with whom I worked. Each modality I learned and used provided another piece of the puzzle I was constructing in an effort to find the link that would ultimately help my patients heal at the deepest of levels. When it all finally came together, the missing link turned out to be Dr. Emoto. His discovery of the secret life of water forever changed my view of the body's healing potential.

I want to share a portion of my journey with you. During the summer of 1998, my cousin Rob Morgan worked as an intern in my office in

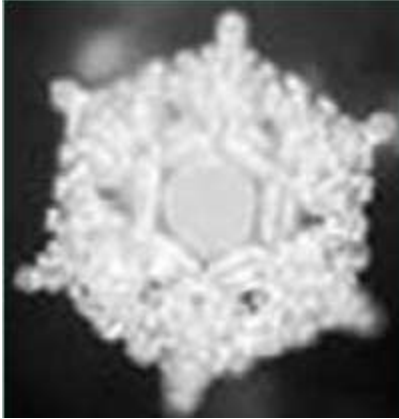
preparation for becoming the first deaf chiropractor ever to graduate from the Palmer College of Chiropractic. After a full day of observing patients, Rob turned to me and held up his hand in what I was to learn meant “I love you” in sign language.



“I love you.”

I was amazed by the warm, powerful, and peaceful feeling I experienced as Rob held up his hand. Intrigued by this sensation, I asked him to hold his arm up as I assessed different reflex points on his body using a muscle test. (A muscle test uses an indicator muscle or involuntary reflex to evaluate the balance or integrity of the nervous system. If the muscle becomes weak when pressed, it’s signaling the presence of an imbalance within the body or that its integrity is somehow being compromised.) I found a weak reflex point when I checked Rob’s body, but when I held my hand in the “I love you” sign mode, the reflex in his arm instantly became stronger. I didn’t realize then the significance of that moment. It would take another three years for all of the pieces of the puzzle to fall into place.

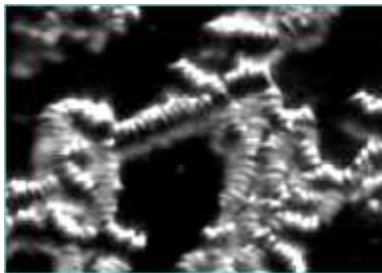
The breakthrough came in the form of an e-mail from a friend containing a picture of one of Dr. Emoto’s water crystals—love and gratitude.



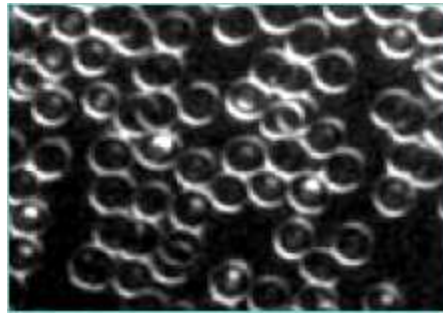
Dr. Emoto's water crystal "Love and gratitude."

When I saw that photograph, it was the first objective representation of what I already knew in my heart to be true—that love and gratitude have the power to heal. That picture became the catalyst for me to link together the experience I had with the “I love you” sign mode and the 12 years of experience I had as a holistic physician trained in chiropractic healing, acupuncture, homeopathy, applied kinesiology (AK), total body modification (TBM), neuro-emotional technique (NET), neuro-linguistic programming (NLP), neuro-modulation technique (NMT), Chinese energetic medicine, natural healing, and aspects of many other forms of energy healing. The result was one unified system that I named “The LifeLine Technique.”

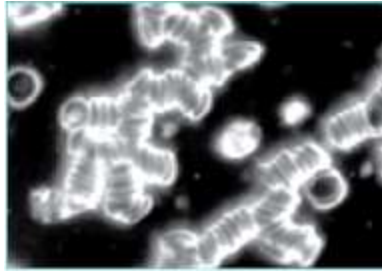
Inspired and empowered by Dr. Emoto's work, I've since conducted experiments utilizing a dark-field microscope and live blood-cell analysis to evaluate and document before and after treatments with The LifeLine Technique. These experiments have conclusively demonstrated an instantaneous change in the molecular structure of blood and a dissipation or total elimination of the patient's original symptoms.



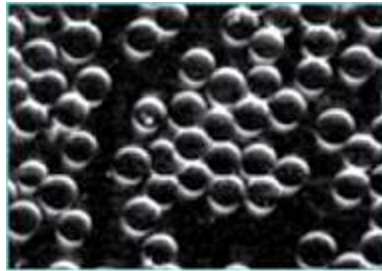
Before: A nine-year-old boy with the symptoms of severe migraine headaches.



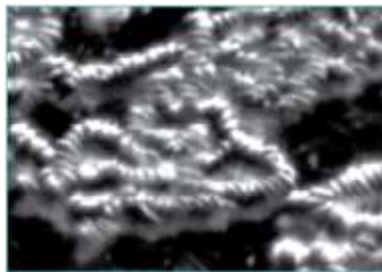
After: Using the power of Infinite Love and Gratitude released his subconscious feelings of anger toward his parents because of their divorce.



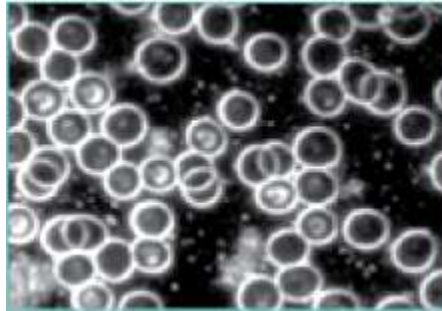
Before: A 32-year-old woman with the symptoms of fibromyalgia.



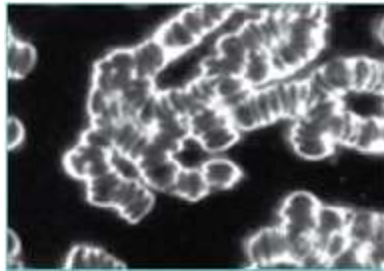
After: Using the power of Infinite Love and Gratitude released the subconscious feelings of grief she had internalized for three years following the death of her mother.



Before: A 40-year-old woman whose attempts to become pregnant had been unsuccessful.



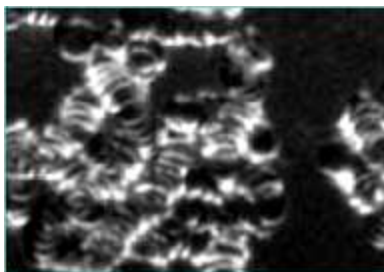
After: Using the power of Infinite Love and Gratitude released the subconscious belief that her age made it impossible for her to get pregnant. She had a baby 11 months later.



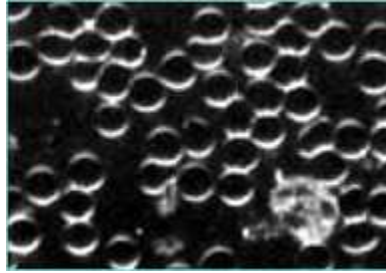
Before: A 42-year-old man with the symptoms of acid reflux.



After: Using the power of Infinite Love and Gratitude released subconscious thoughts of shame related to a family situation.



Before: A 53-year-old woman with symptoms of insomnia.



After: Using the power of Infinite Love and Gratitude released subconscious fears about her future provoked by the reorganization of the company where she worked.

THE TRIUNE BRAIN

While the catalyst for my awakening to The LifeLine Technique was Dr. Emoto's water research, its genesis incorporated the work of three other renowned scientists: Dr. Paul MacLean, Dr. Candace Pert, and Dr. Bruce Lipton, whose research further reinforced the hypotheses put forward by Dr. Emoto.

There's a direct link between the brain research of Paul MacLean, M.D., the former director of the National Institute of Mental Health's Laboratory of Brain Evolution and Behavior in Poolesville, Maryland, and Dr. Emoto's water research. The brain is nearly 90 percent water; therefore, its function is directly impacted and influenced by the makeup of that water.

More than 50 years ago, Dr. MacLean, considered to be one of the world's greatest neuroscientists, hypothesized that the skull held not one brain, but three. He referred to this as "the triune brain theory." He noted in his research that the three brains operated like "three interconnected biological computers." He referred to these three brain centers as the neocortex, the limbic system, and the reptilian brain. MacLean believed that each of these was connected by nerves to the other two, but each seemingly operated as its own system with distinct capacities. He considered the harmonious flow of "the triune brain" to be of primary importance for the optimal functioning and health of an individual.

Let me give you a brief description of the function of the triune brain:

- The **neocortex** is the storehouse of higher cognitive functions such as rational thinking and creative expression. This is the part of the brain that separates human beings from other species. It houses our free will, our ability to choose or take action in any given moment.
- The **limbic system** is a storehouse of short-term memory, emotion, attention, instincts, feeding, fighting, fleeing, and sexual behavior. It will trigger a hypnotic state/reptilian response as a means for survival when an overwhelming experience occurs.
- The **reptilian brain**'s purpose is purely survival. It's rigid, obsessive, compulsive, ritualistic, and paranoid. It maintains and regulates all bodily functions ranging from heart rate and respiration to metabolism, immunity, and hormones. There's no conscious choice when a function of the reptilian brain is occurring.

According to the triune brain theory, unification of the three brains enables the electrical frequency of thoughts, feelings, and beliefs to be integrated into behavior. It had previously been assumed that the neocortex, which was believed to be highest level of the brain, dominated the other, lower levels. However, Dr. MacLean's research demonstrated that the limbic system, which *rules emotions*, had the tendency to hijack the higher mental functions whenever necessary for survival, inhibiting emotions from being processed by the neocortex.

In each and every moment, the body receives its instructions for adaptation and regulation from the reptilian brain. These functions are governed via the law of cause and effect. The reptilian brain doesn't have the capacity to learn, only survive. This process is purely mechanistic, and the body isn't able to differentiate between reality and imagination. When a trauma is triggered that's trapped within the limbic brain, a reptilian reaction causes the body to respond as if it were experiencing the situation for the first time. Dr. Emoto's research helps us appreciate how certain emotions can create a physical breakdown in the molecular structure of the water comprising each of the cells within the body. This makes it difficult for the physical life force to flow efficiently.

The body won't break free of reacting in a survival-like fashion until the trauma is processed consciously. From my work with The LifeLine Technique, I've concluded that the limbic system serves as a stopgap, preventing traumatic or shocking experiences from being processed by the neocortex. Instead, the traumatic experience waits to be released, nudging and reminding the body of the unprocessed emotions by "speaking" with symptoms.

Healing and transformation occur when traumatic experiences and emotions are processed to the neocortex, which occurs during sleep, while the eyes are going through rapid eye movement (REM) cycles. This signal of information to the neocortex facilitates a short-term memory to be processed into long-term memory, enabling a person to learn a lesson from a traumatic experience and consequently to live in the present moment.

The LifeLine Technique uses aspects of eye movement desensitization and reprocessing (EMDR) to break limbic-reptilian holding patterns. Using The LifeLine Technique Flow Chart, which has laserlike accuracy, the process is a fast, safe, and non-content way to reconnect to and process emotions. The beauty of the technique is that a person doesn't need to express openly the painful, scary, or challenging emotions; they need only *think* them. When they do, the cells in their body are impacted in the same way that Dr. Emoto's work has demonstrated that water is influenced by its environment.

PROCESSING EMOTIONS ON A MOLECULAR LEVEL

How the body processes emotions has also been studied on a molecular level by Candace Pert, Ph.D. Dr. Pert, a noted researcher and pharmacologist and the author of the books *Molecules of Emotion* and *Everything You Need to Know to Feel Go(o)d*, has proven that neuropeptides—the specific chemicals triggered by emotions—are thoughts converted into matter. *Webster's New World College Dictionary* defines emotions as "complex reactions with *both mental and physical* manifestations" (emphasis mine). Dr. Pert's research discovered that emotions reside in the body and physically interact with cells and tissues.

Integrating Dr. Emoto's research with Dr. Pert's discovery of neuropeptides demonstrates the connection between our emotions and our health.

My research has shown me that when emotions are expressed—which is to say that the biochemicals that are the substrate of emotion are flowing freely—all systems are united and made whole. When emotions are repressed, denied, or not allowed to be whatever they may be, our network pathways get blocked, stopping the flow of the vital feel-good, unifying chemicals that run both our biology and behavior.

It's interesting to note that emotions compete for the same receptor sites as heroin. Just as heroin is extremely addictive, so the selectivity of emotional receptors helps us appreciate the addictive quality that dramas have in people's lives. We begin to crave particular emotional experiences as a way of feeding subconscious addictions. So our identity is created by the "network pathways" of emotional addictions.

Just as detoxifying a person from heroin too quickly can be life-threatening, so awakening a person to consciousness without the heightened perception, functional tools, and simple strategies to face the pain, fear, and other challenges of life can inhibit them from being open to change.

Using The LifeLine Technique, we're now able to locate specific neuropeptides blocking the network pathways. By targeting specific traumatic events, limiting beliefs, and symptoms within the subconscious mind and body, we're able to recreate the exact environment of trauma. Once targeted, the intention and frequency of Infinite Love and Gratitude is used while the LifeLine practitioner holds their hand in the sign language mode of "I love you." This process harmonizes and releases the network pathways within the mind and body by affecting the molecular structure of water that makes up each of the cells within the body. Once harmonized and released, the pathways are open, the mind is present, and the body's self-healing capacity takes over.

THE ROLE OF BELIEF

Dr. Bruce Lipton, a cellular biologist and the author of the book *The Biology of Belief*, is the next link in the fusion of science and spirit. His

work documents the connection between perception and health. As a result of the research of Drs. Lipton and Emoto, we're now able to recognize and document how the perception of our environment is created by our beliefs. Furthermore, with The LifeLine Technique, we've been able to interpret the exact meaning of symptoms and stress—the language of the subconscious mind—to help us reconnect to what we at one time didn't have the tools or strategies to process. The genetic potential of being able to harmonize limiting beliefs will forever change the way we view genetic processes.

Dr. Lipton set out to discover the brain of a cell. Interestingly, individual cells are like mini-oceans, being composed primarily of water. Dr. Lipton's intention was to find out how perception impacted the function of a cell. He began the process by studying deoxyribonucleic acid, more commonly known as DNA.

DNA was discovered in the early 1950s. This scientific advance was the result of the Nobel Prize-winning work of two scientists, Dr. James Watson and Dr. Francis Crick, based on the initial research done by Dr. Rosalind Franklin. Since that time, scientists have discovered many ways for using the information gleaned from DNA, from genetic fingerprinting to identifying criminals. At the heart of their work has been the belief that DNA is the *brain* of a cell. According to this belief, if people have the genetic makeup for breast cancer, inflammatory bowel disease, or bipolar disorder, they'll eventually develop that disease. As a consequence, some women are having complete bilateral, radical mastectomies without any physical sign of cancer due to a genetic evaluation of their DNA.

The tragedy, as Dr. Lipton's research has documented, is that DNA is *not* the brain of the cell. Dr. Lipton conducted tests in which he removed the nucleus of a cell containing the DNA. He hypothesized that if DNA were the brain of a cell, something very predictable would happen when it was removed—the cell would die instantly, just as a person would die if their brain were removed. Just the opposite occurred: The cell lived. Dr. Lipton then began to remove the individual components of a cell one at a time until he found the specific anatomical part that resulted in instantaneous death. He discovered that the brain of a cell was its protein receptors.

Protein receptors are very thin membranes that function like a cell-phone antenna, sending messages directly to the nucleus. They're not only on the outside of a cell and the nucleus, but also in our senses—that is, the rods

and cones in our eyes and the cilia (hairs) in our nose and ears. All of our sensory receptors are made of protein. And in an antenna-type fashion, protein picks up the vibratory frequencies of sound and light and sends the signals to our brain. Depending upon the message, the brain then sends a signal down the spinal cord to specific areas of the body.

When the protein receptors on the outsides of individual cells receive the information via *neuropeptides*, they send a signal to the nucleus, where the messages are encoded. From that encoding, the protein *creates* the DNA for a specific cell so that it will adapt to its environment. The nucleus, according to Dr. Lipton's research, is in fact the reproductive system of a cell—it is the center of a cell's ability to regenerate.

Dr. Lipton's exhaustive studies also sought to find out how a cell responds to stimuli, in a similar fashion to the way the brain reacts to the senses. He wanted to know how the liver, lungs, or intestines react to what's going on in the external environment. What he discovered, as explained in his book, was the link between beliefs and the state of health: "Cellular biologists now recognize that the environment (external universe and internal physiology), and more importantly our perception of the environment, directly controls the activity of our genes."

When it comes down to it, we'll only perceive what we believe, and our beliefs have a direct impact on the molecular structure of the water that makes up every cell, organ, and system of our body. Dr. Emoto's water-crystal research mirrors how the perception of the "external universe" directly impacts the molecular structure of water, the same water that makes up the "internal physiology" of the body.

The LifeLine Technique creates a conscious awareness of both the "external environment" and the "internal physiology" by harmonizing and releasing limiting beliefs trapped within the subconscious mind. Water's molecular structure is enhanced as our consciousness begins to expand. Not until the subconscious is made conscious are we able to choose or take action based on what we're truly experiencing in any given moment. The ramifications are infinite. Creating inner peace makes it possible to create world peace.

INFINITE LOVE AND GRATITUDE

Using a symptom as the portal, the LifeLine practitioner is able to use the LifeLine Flow Chart to discover the specific subconscious emotional patterns of disconnection and instantly harmonize these imbalances with the frequency of Infinite Love and Gratitude. As with Dr. Emoto's water-crystal research, these profound words have a direct influence on the molecular structure of the body. Defining "Infinite Love and Gratitude" helps us appreciate why.

From time and the cosmos to the cycle of the seasons and life itself, the universe is infinite. It's forever expanding and undefined. Therefore, as a being of the universe, your mind possesses the nature and potential of the infinite. The infinite universe and mind are the great frontier, the endless entity of boundless mystery. Acknowledging your connection to the infinite universe and the infinite mind is fundamental to understanding the unlimited potential that you possess. This view is magnified to infinity by the core truth that you're a spiritual being having a human-being experience. By "be-ing," you experience the infinite essence and wonder of life.

It has been said that there are only two true emotions, love and fear. All other feelings are an extension of these two. However, love takes precedence, for it's only when love is absent that fear is present.

The experience of fear is a gift. True fear happens in a moment of danger and then is immediately released. It's a survival mechanism that's governed by the reptilian brain. The end result of living a life in a constant state of fear is victimization and suffering. Louise L. Hay, the author of many best-selling books, including *You Can Heal Your Life*, is the matriarch of teaching people to love themselves. She has helped millions around the world with this simple yet profound concept. She so eloquently states, "If you change your thoughts, you change your reality." As Dr. Emoto has demonstrated, choosing to love, accept, and forgive unconditionally is universally the most powerful healing energy.

We give thanks to individuals or experiences that we value. However, what about the painful, scary, and challenging people and experiences in our lives? By embracing them with the "attitude of gratitude," we're acknowledging them as having worth. Value gives life meaning, and with

meaning we're able to transcend victimization and suffering. The most powerful people throughout all of history have endured the most difficult situations. A belief structure that every challenge is an opportunity for growth or a vehicle for spiritual awakening empowers a person to move through life in a heroic fashion. We all have the capacity to be heroes—to move through the painful and scary experiences of life with faith, courage, and determination—and to trust that everything happens for a reason, even if we don't understand the meaning in the moment. It all begins with the power of Infinite Love and Gratitude.

For the past five years, I've been teaching seminars internationally to both laypersons and healing-arts professionals. The philosophy of The LifeLine Technique is simple to understand. It combines the best of natural-healing modalities into a unified system that transforms the core emotions trapped within the subconscious mind. Just like the transformation of distilled water into various crystals, the change occurs instantaneously within the mind and body. We continue to document The LifeLine Technique and the power of Infinite Love and Gratitude with live blood-cell analysis and have repeatedly found that both a person's perception of their environment and the function of their internal physiology are transformed.

Let me share an example in which the documentation was provided by the patient's medical doctor, with before and after reports. In the summer and early fall of 2003, a patient I'll refer to as "Alice" began experiencing uterine bleeding and abdominal pains. The lower area of her stomach was also protruding. At first Alice, who was 51 at the time, thought she might be pregnant. Instead, a gynecological exam and subsequent biopsies revealed three ovarian cysts and a fibroid tumor the size of a grapefruit. The masses were all found to be benign.

Alice came to see me shortly after the diagnosis. I knew that with The LifeLine Technique we would be able to determine the *root* cause of why her subconscious mind was using the *symptoms* of a fibroid tumor and ovarian cysts to communicate. But to help facilitate the healing process, Alice had to take responsibility. I discussed with her the importance of following the Five Basics of Optimal Health—the proper quantity, quality, and frequency of water, food, rest, and exercise and owning her power.

As we continued to work together, the abdominal bleeding and pain ceased, and ultrasound and sonogram tests showed that the masses were

shrinking. Despite that, Alice's gynecologist believed that they should be surgically removed.

On the day that Alice was scheduled to have the cysts removed, the operating room was overbooked. After waiting eight-and-a-half hours for the surgical appointment, she chose to leave the hospital. She later told me that she accepted the opinion of her doctor; however, she'd been to a LifeLine seminar and knew in her heart that her body had the power to heal itself.

During a subsequent treatment using The LifeLine Technique, Alice's subconscious mind revealed a limiting belief being held in her root chakra dating back to the age of 12 and associated with the emotions of regret, guilt, and fear. I asked her to pay attention to what *immediately* came to mind when I said those words aloud. This is what she told me:

Immediately, my thoughts went back to the time I was awakened by an argument between my parents. It was the first time I'd ever heard them raise their voices to each other. The next thing I knew, my father was standing above me with a knife raised over my head. But when he looked me in the eye, he stopped. He attacked my sister instead, stabbing her to death in front of me. . . .

I thought my father hadn't hurt me because I'd looked him in the eye; and I believe that if I'd awakened my sister, she, too, might still be alive. I always felt guilty that I survived and my sister didn't. Subconsciously, I felt remorse, guilt, regret, and fear for not having the courage and presence of mind to wake her up.

Reflecting on my experience of the treatment with The LifeLine Technique, I came to accept and appreciate the strength and purpose of lives such as my sister's that were so unfairly and suddenly cut short. As a result of the treatment, I've experienced an inner sense of peace and confidence and now resolve to forgive myself, and commit on a much deeper level to my well-being in all areas of my life and relationships.

Over the next nine months, Alice made conscientious efforts to follow the Five Basics of Optimal Health and continued weekly treatments. In August 2005, tests indicated that her uterus had returned to normal size and that all of the masses were gone.

RECONNECTING TO OUR POWER

The LifeLine Technique consciously reconnects us to the power of our thoughts, feelings, and choices. If you have the belief that everything is an

opportunity, no matter how challenging or difficult, your mind will send that positive charge to the water that makes up the molecular structure of the cells in your body.

It's common to think, *If I can just find the right person/job/other external solution, then everything will be just fine.* However, if we don't change ourselves, we'll continue to repeat the same relationships, financial challenges, and health issues over and over again. Not until we become conscious of the limiting beliefs and the emotions that are trapped within the survival aspects of our subconscious mind will we begin to recognize that other choices exist. These patterns are the language of the subconscious mind that can now be easily understood and transformed with The LifeLine Technique and the power of Infinite Love and Gratitude. The LifeLine Technique demonstrates the healing power of water and quantifies the limitless potential all people possess to heal, find inner peace, and create harmony in their environments.

The LifeLine Law of Transformation and Creation states: Emotions transform energy; energy creates movement; movement is change; and change is the essence of life. It's the *fear* of change that keeps people stuck in patterns of victimization and suffering. The process of healing is a spiritual path, the evolutionary journey to awakening your spirit. Dr. Emoto's research has courageously paved the way for the fusion of science and spirit.



FURTHER INFORMATION

For further information The LifeLine Technique, see:
www.infiniteloveandgratitude.com.



CHAPTER 8

DOWSING FOR WATER

by Sig Lonegren

Today, dowsing is used for many different purposes—health, earth energies, oil, archaeology, and many more. However, by far the most important target for diviners is water. Until recently in Britain, a liter of water cost more than the same amount of gas in the U.S.! Many feel that the major battles of the 21st century won't be over oil, but over an even more basic commodity: water.

Hydrologists explain that all water comes from the sky as rain and then goes through the well-known cycle of falling on the land, going into rivers and flowing into lakes and oceans, where it evaporates up to the skies, only to fall again as rain. This is called “secondary water,” because it's used over and over again. Dowsers find that in addition to this source, there's another one. It's “primary water” that comes from deep in the earth and is the result of the chemical processes going on down there. For example, when you mix an acid and a base (especially under heat and pressure), you get a salt plus water. And where does this primary or “juvenile” water go when under heat and pressure? It moves away, toward the surface, through any crack it can find. It gathers to form enormous underground rivers deep in the bowels of the earth; and when it finds a crack in the ceiling, it goes upward again in what American dowsers call a “dome” and British dowsers call a “blind spring.” When it very occasionally reaches the surface, it's called a “geyser.” But in most cases, its upward journey is halted upon reaching an impermeable layer (such as clay), and so it spreads out laterally as veins. From above, this looks like a spider with an odd number of legs.

Most holy wells come from this primary water. In addition to H₂O, many of them have other elements mixed in as well. At the Chalice Well in

Glastonbury, England, for example, the water is called “chalybeate.” While it runs clear, it’s full of iron. Across the road, the White Spring is full of calcium [see Chapter 17].

Well above the timberline and only a short distance from the top of Mount Katahdin in Maine, where the sun first hits the United States each morning, is a spring of water. Above it is only hard rock. So where does that water come from? It can’t be rainwater percolating down from above. It’s primary water, and it comes from way below the base of that impressive mountain. The message here is that while we’re facing a critical shortage of secondary water around our planet, there are ample supplies of primary or juvenile water that dowsers can find for us.

No dowser hits water 100 percent of the time, but there are water-well dowsers in California who consistently have success year after year between 85 and 95 percent of the time. Not only can they tell their clients exactly where to put the drill bit in, but how deep they’ll have to go and how many gallons a minute they’ll get!

Dowsing is a practice that enhances our intuition and can connect us to sources of information that can’t be found through rational methods. Until relatively recently in our history, diviners were burned at the stake. But one form of divination was judged too important to include in this witch hunt, and that was water dowsing. Despite sometimes being referred to as “water witching,” it was just too valuable a skill to wipe off the face of Europe, as happened with so many other uses of this ancient art.

It’s only within the past half-century that these other applications have been rediscovered. And it’s amazing how many of them are also directly connected to veins and domes of primary water. For example, domes of primary water are found underneath all ancient sacred sites. This was first noted by Reginald Allendar Smith, who worked for the British Museum and in 1925 became the Trustee Representative on the Ancient Monuments Board for England. After he retired in the 1930s, he was one of the first to publish articles in the *British Society of Dowsers Journal* stating that he had dowsed water under all of the ancient sacred sites that were also attracting the attention of ley hunters. (One can commit any heresy after retiring!) According to the theory of ley lines, the water is yin, and the energy leys—six- to eight-foot wide straight beams of energy that cross at power centers directly over the yin veins or domes of water—are yang.

Likewise, information about many archaeological sites can be enhanced by seeing their relationship—or lack thereof—to water. For example, most Bronze Age hut circles in Britain weren't built over primary water.

In terms of health, German dowsers found in the 1920s that certain houses had a high incidence of cancer—*Krebs Häuser* (cancer houses). And under these houses, but not their neighbors', they found crossings of underground veins of water.

It seems that it is the *flow* rather than the water itself that's associated with many forms of degenerative disease. Drinking-water dowsers, who open themselves up to these energies, can frequently be seen wearing copper bracelets to help ease the pain of arthritis. Many alternative-health practitioners find that all their work can be undone if their patient goes home after a treatment and sleeps over underground water crossings. Again, it's the flow that seems to cause the problems. (Primary water, once it reaches the surface of the earth, is usually perfectly fine to drink.)

So underground water plays an important part in many areas of dowsing. It can contribute to contracting disease, and it can enhance the possibility of connection with the numinous at sacred spaces; but it's the ability to find good sources of primary water that will be dowsers' major contribution to the 21st century.



RESOURCE RECOMMENDATIONS

Sig Lonegren, *Spiritual Dowsing*, Bloomington, Indiana: authorHouse, 1986, reprinted 2004. History of earth energies, healing and other uses of dowsing today. A book for the spiritual pilgrim.

Sig Lonegren's Website (lots of information about water and dowsing):
www.geomancy.org

If you want to learn how to dowse, check out:

- The American Society of Dowsers, www.dowsers.org
- The British Society of Dowsers: www.britishdowsers.org

- Dowsing organizations around the world:
www.britishdowsers.org/groups_2a.html



CHAPTER 9

LISTENING TO WATER

by Miranda Alcott

Sharing water with the firefighters, EMTs, police officers, and chaplains at what was left of the World Trade Center after September 11 created some of the most sacred moments of my life.

What brought us all together was a few simple bottles of water available at designated spots on the site. I wondered if anyone standing around the flats of bottled water in exhausted silence was aware of the healing properties of the liquid they were holding. They were replenishing what had been lost due to extreme stress in their already fatigued bodies. They took giant trusting gulps as we stood amid the rubble and body parts. Were they drinking to quench their thirst . . . or to put out their emotional flames?

I'm a crisis responder, intuitive healer, and counselor with a master's degree in spiritual psychology. But most important, I'm a listener. Together with my service hearing/crisis intervention canine, Whisper, in my daily practice I work with people who are confronting some form of crisis in their lives. They may have deep issues—recent or sudden deaths in their families, exposure to mass critical incidents, diagnoses of terminal illness, and life-direction decisions—or the simple yet overwhelming physical toll of everyday stress.

My work allows me to experience many different energetics in places and with those I go to help. Many of the things I observe aren't visible to most people. I'm able to experience, listen, and see energetic fields, colors, frequencies, and vibrations that most others aren't aware of.

I do this by using what's currently referred to as a *holographic paradigm*, which includes *quanta*, or small groupings of energy. These groupings in turn make up atoms that resonate at individual frequencies. At an

infinitesimal level of existence, energetically, we're all a part of the whole; but each atom's frequencies are so unique that every one of us carries a very individual energetic "snowflake." What I experience are the different "signatures" that constitute the fields that permeate and surround each of us and, in fact, all living organisms.

Some of these energetic "nets" of wavelike structures appear as diaphanous forms that make themselves visible to me in a floating manner. They can be created by many events—violent crime, a natural disaster, or simply by the laughter of children. Some result from simple tones of music, which put on a light show the likes of which can only be rivaled by the aurora borealis. (There are more complete examples in my soon-to-be-published book, *An Extraordinary Journey Through an Ordinary World*.) Other energies I see are those that are working 24/7 to keep our bodies running at top efficiency. "Looking" at these energetic forms and fields, in combination with the energetic directives I receive, allows me to access the information from which I work.

My conscious association with water has been going on for quite some time. At two and a half years old, I watched one morning as a pool of water reached up to help a bird rinse its feathers. And early in my life I noticed that although most animals drank lots of water, there were some people who didn't drink much, if any. I didn't understand this, and for a very long time couldn't imagine refueling my body without water's presence. I watched water around these individuals, but didn't see any answers until years later in my private practice, when I noticed that the people who spoke of the mental, physical, emotional, or spiritual abuses in their lives were the same ones who usually wouldn't open the bottle of water I offer at the beginning of each session.

In observing my clients' interactions with the water offered, I saw that there were some who accepted it as a social gesture, some who fondled it in contemplative moments, and some who drank the entire bottle as soon as they could get the top off. When I would ask how they felt about interacting with the water, each of them seemed to hold the belief that drinking, ingesting, or holding it would, at that moment, somehow intensify their own issues. I also noticed that some would begin their de-stressing processes almost as soon as they were offered the water. From then on, I used water as

an active participant when called out into the field for my crisis-response work.

One of my earliest experiences with water out in the field was during an emergency response at our local airport. I saw a woman in physical distress who had fields of faintly colored energy surrounding her body. These colors were rapidly fading in and out. The closer I got to her, the more I felt my blood sugar lower. She was holding a foam cup filled with what I assumed was juice, as the energies rolling off the surface of the cup were of a pale organic orange. As I got closer to her, I noticed that the cup was filled with water. How could water, which normally emits many colors, be emitting only one color? The woman's energetic field was so faint and mottled that I quickly called a nurse over.

Later that afternoon the nurse sought me out to tell me that the woman was a diabetic and had been experiencing a diabetic collapse. The water had been reflecting what she'd needed earlier: orange juice.

WATER AS HEALER

The effects of water's presence in our lives are so obvious that many of us take them for granted, yet we've all noticed how excited children become when they interact with this substance. It also has its own character. Have you ever noticed, when entering an empty room, that if there's a pitcher of water in it, you don't feel alone?

We take water with us everywhere these days. When we're hiking or exercising, we carry bottles of it for regeneration and rejuvenation. We're created in water, bathe in it, cleanse wounds with it, and can die when we don't have enough of it. With roughly two-thirds of our planet covered by water and our bodies containing similar proportions of it, is it any wonder that it's such an amazing conduit for our thoughts, energies, and healing?

Nature provides so many ways for us to live more easily if we can only be more sensitive to what surrounds us, and animals can be such great teachers for us all. Recently, I stood in the high mountains of New Mexico while the lightning-filled charcoal clouds announced a coming storm. As the ions increased, I watched a beautiful coal-black stallion prancing to

discharge the intensity of the electromagnetic energy. He did this by tossing his head, arching his tail, and bucking himself off the ground, breaking the build-up of static electricity. He instinctively knew what he needed to do in order to release the accumulation of the converging energies. When the rain clouds broke, he calmed, and water soothed his body.

I believe that we have a primordial relationship with water as our earliest parent—one of the life forces from which we sprang. It can be so comforting, while also having an uncanny ability to reflect emotions. The reason for this, as I understand it, is that thoughts are energy, which creates vibrations. These can have color and distinct forms, all of which I see. There are also more hues than we perceive with our eyes, including what I call “colorless colors.” When water’s healthy, I experience it as a glowing liquid light that hums. Vibrations give me information, and once I have that, I wait for an energy flow, or “energetic directive,” to see how I’m supposed to help.

As a listener, I naturally pay attention to most beings. In April 2003, my service dog, Whisper, reacted very strongly to the photographs of water crystals that Dr. Emoto was displaying during one of his presentations in Los Angeles. She reacted to both his crystal images and to the vibrations of his tuning fork. Whisper is a healer in her own right, and she was deeply affected by the communication that she saw in Dr. Emoto’s pictures. Her reaction was one of surprise, as she looked at the huge images displayed on the screen. I watched her as she stared at each slide, appearing to communicate with some of the images. At one in particular, she sat upright and was visibly moved. I was deeply touched by the photographs; and it occurred to me then, after so many years of working with water, how patient it is with us all.

Dr. Emoto gave me his card, and when Whisper and I saw him speak once again in Santa Fe several months later, he asked us to participate in his next book. We were thrilled!

The following December, Dr. Emoto came to one of my evening intuitive presentations. I asked anyone wishing to work with me to choose one of the bowls of water located in the back of the room. They were instructed to place their most pressing issue or question, in thought form, into the kindness of the water.



Above: Miranda with her dog, Whisper.

A red-haired woman of about 35 gave me her first name, handed me her bowl of water and stood off to my side, motionless. After a few moments, the vibrational patterns and colors in the water became apparent to me. I watched as its energetic field made clear what she needed to know. The surface of the liquid was acting like a screen, reflecting her inner confusion, deep fear, and physical illness. I could see by looking at the energies surrounding her body that this physical illness was manifesting itself as tension in her musculoskeletal system: bones, muscles, and joints.

As I worked with her nonverbally, I could see that the energy, colors, and vibrations emanating from her body were becoming more vibrant. I then verbally relayed to her what was taking place currently in her life. As I spoke to her about how she could dispel her physical issues, she and the water began to take on more of each other's properties, appearing more and more similar. A woman and a bowl of water, which had started as two distinctive elements, were now experiencing an energetic exchange.

Being hearing impaired, I use a sign language interpreter. With the lights in my eyes I couldn't see the woman's face, so I looked at my interpreter to see if she had any questions or needed to say anything. My interpreter had no signs for me, so I continued.

I saw that the woman's body was wrapped in fields of fearful emotional energies. They were encasing her chest area and causing some restrictive breathing patterns. In checking for any kind of genetic illness, I saw that the

tightness in her chest came from a current emotional situation, which was the cause of her fear.

Happily, she remained receptive for the entire time I worked with her, and I could see the colors and energies surrounding her body shifting. Simultaneously, so were the energies and colors of the bowl of water. Her innate self-altering processes were affecting the water inside her body, which in turn was resonating with the water in the bowl. Even though she was no longer physically holding the bowl, they were inextricably connected. The water revealed that her life would be taking a new direction and that her deep fear of this change was contributing to her physical illness. I let her know that it was imperative that she understand that her illness was very possibly of her own creation. She thanked me and wept as she returned to her seat.

Several weeks later I crossed paths with the woman again. She told me that she'd always been unable to deal with stress and had recently been hired for a new job and was feeling very uncertain if it would end up taking over her life. She said that after I worked with her, the pain in her joints had stopped and the tension in the rest of her body had been released. She told me that ever since that night, she has never looked at water in the same way.

At another one of my evening presentations, a man in his late 40s came and stood next to me in silence and handed me his bowl of water. What I saw in it was that he wanted to know what was wrong with his health. I could see that he was incredibly tense, with ruddy fields of opaque energy, which pointed to his health condition possibly being chronic. When I suggested that spending time floating in water might help him, the look on his face was one of disdain as he returned to his seat.

Several months later, in a local market, his wife introduced herself and told me how grateful she was that they'd come that evening. She said her husband had been going to doctors who'd prescribed several medications and told him that unless he took them, he'd become very sick. The man hadn't listened to them and hadn't taken the drugs. Although he was fairly certain that water couldn't help him in any way, either, his wife told me that after my presentation, he'd gone home and spent considerably more time floating in their pool. A few months later when he went for his next medical appointment, the doctor was pleased to see that his blood pressure had dropped significantly and commended him on finally taking the prescribed

medication. As his wife tells it, her husband just laughed and said, “Actually, all I did was float in water.”

The “floating man” and the union between the red-haired woman and the small bowl of water reminded me of the small bottles of water in the large hands of those men at Ground Zero. But what was the water actually doing for the people at Ground Zero? Watching as they used it to rinse the dust from their masks and the grime from their eyes and tilted their heads back to take a drink, I saw that each of them went into a place that was soothing for them. Whether that was a precious memory of their family, a special vacation, or their kids’ faces, water had become a portal to a rare moment of reprieve from their horrific surroundings. Taking a simple drink had created a sacred moment with a great healer.

EXERCISE TO FACILITATE LISTENING TO WATER

If you’d like to connect with the healing power of water, just sit quietly for a moment and “hear” its sound. In your mind’s eye, see a form of water that you enjoy experiencing: a breezy mountain lake, a reflection of fall leaves in a puddle, a large rushing river, a beautiful city fountain, a salty ocean, a desert monsoon sky, or a high-mountain snow pool. Watch these images in your head. Can you feel the changes inside you as the water in your body “recognizes” the vision of the water that you’re seeing? What are you physically experiencing as these elements resonate with each other? Is the rhythm of your body altering slightly?

In your stillness, what can you hear water telling you? Become quiet and still and allow your entire body to “listen” to its whispers. Whatever it has told you is very powerful guidance. What you do with this wisdom depends on what your commitment to your life is.

Once you’ve received your gift, you’ll continue to hear the flow of water as it gently takes a place in your heart. Don’t be surprised if your dreams also bring you healing messages from water.





CHAPTER 10

THE WATERS OF LIFE

by Carrie Jost

Water is a mystery—a mystery we can feel when we yearn to be by the sea, a river, or a lake when the weather is hot. Its presence balances the heat and reminds us that all life began in water. It speaks to our bodies. Within those bodies are the counterparts of the waters of Earth: the oceans of salty water that bathe every cell; the rivers and streams, which direct the three major fluids to the parts of the body that need them; the lakes and pools of the organs, which hold the reservoirs and inform the senses. Just like Earth, we, too, are 75 percent water.

Water is feminine. It curves and moves in spirals, vortexes, and figure eights. It's also in a state of constant motion. If it becomes still, it stagnates and attracts the energy of decay and disease. The water within our bodies is also in constant motion, moving in the same ways as that of the Earth. Water is both life giving and life sustaining.

Water is able to grow and expand. It's also able to dissolve and expel solid particles. It's important that it has the ability to cleanse and purify itself. A lively mountain stream can expel the dissolved particles from a rotting sheep within 150 yards.

ENERGY IN MOTION

We begin our lives in a sac of water, a warm ocean that's constantly rocking the new life within it. The fetus is at one with this sea, nurtured and supported through the waters of the mother's womb. This is the baby's first experience of receiving information, which is transmitted via the

surrounding waters and the fluids along the umbilical cord. It's apparent to me from my healing work with clients that the mother's feelings are also transmitted through this medium. Trauma and shock will unsettle the fetus, while love, acceptance, and other positive feelings will nurture it.

Over the years, it has become clear that water is affected by the subtlest of vibrations, including emotional states. Blessed water is at the heart of many spiritual traditions and is known to have healing properties. Now we have the findings from Emoto's work to show us visually the direct effect that emotions have on water—they change its structure. Positive thoughts and feelings create the most beautiful of frozen pictures, while negative ones result in distortion and discoloration. This is water receiving and transmitting information at an emotional level.

Emotion, or “e-motion,” can be seen as energy in motion. Water in the body—whether it's the great ocean that bathes every cell; the rivers of blood, lymph, and cerebrospinal fluid; the little streams of the capillaries and minor nerves; or the great lakes of the stomach and the pools of the eyes—can stop functioning optimally if there isn't enough of it or if it becomes too still. [See Chapter 6.] When our emotions are unacknowledged or unexpressed, they, too, can become stuck and suppressed in a part of the body. [See Chapter 7.] They may consolidate into thoughts or belief systems, which then become patterns of thinking and behaving. From my experience, this is likely to occur in the fluids of the body and may result in disease, chronic conditions, and illness. We know from the work begun by Louise L. Hay that many biochemical problems and disease states have an emotional aspect that has often gone unrecognized.



DEHYDRATION

What happens when we become dehydrated? Dr. Fereydoon Batmanghelidj says that in his experience, “It is chronic water shortage in the body that causes most diseases of the human body.” When we lack water, we lose our vital connection with this life-giving substance, and the result is stress in our physical systems. All the fluids of the body become affected, the information transmission is scrambled, and we no longer work efficiently on all levels. Without sufficient water, we’re not allowing the fluid intelligence of life to nurture and sustain us.

For example, when we’re learning new things, the brain uses up a lot of water by connecting to what it already knows, adding the fresh information, and attempting to make conscious what may at first be beneath consciousness. Drinking extra water helps hugely in the learning process. This has been tried in schools and other learning environments with great success.

The nervous system, including the brain, operates in the cerebrospinal fluid. If this part of the body is lacking in water, then the brain and nervous system go into a stressed state. Anxiety, panic, tension, difficulty with learning, and even clumsiness can result. Ironically, the stress itself can cause further dehydration, as the nervous system needs more water to cope with any new situation.

We can apply our understanding of water in a metaphorical way to the fluids of the body. We can easily check if a person is dehydrated by using kinesiological muscle testing. This can tell us the location of the problem, how it’s affecting the system, and the trigger that set it off in the first place. Old traumas, shock, ongoing emotional states, and other difficulties may all trigger imbalances.

A young woman came to see me because she was suffering from anxiety, panic attacks, and asthmatic breathing. I found that she wasn’t dehydrated overall. She knew the value of drinking six or seven glasses of water a day. She knew not to count tea, coffee, and fruit juice as water, since the body treats them as food. Nevertheless, we found that her nervous system was dehydrated. For some reason, her body wasn’t absorbing water in this area. Using kinesiology, I tracked the source of the problem and we found that the trigger was a trauma in her family some years before. She remembered

that her asthma had started then (this condition can be one of the signs of dehydration in the body).

A potent approach to healing is to witness the trigger, accept it, and then find the appropriate energy technique to restore balance, health, and vitality. Here, we used energy techniques to restore the young woman's nervous system to a state of full hydration. She didn't even need to drink any more water than before. After the treatment, her anxiety and panic decreased and her wheeziness disappeared. She was able to move forward in her life, leaving the trauma behind her.



THE WATER ELEMENT

When water spirals, it's making the movement of creation. All growth takes place in a spiral. Watch a fern unfurl, a bean grow out of the ground, or the petals of a rose unfold, and you'll see this spiraling motion in operation.

The DNA in the center of each of our cells is a spiral—a double helix that carries our inheritance. Ancestral influences are passed on through it and also through the water element, according to ancient Chinese tradition. The emerging science of epigenetics is now showing us that we not only inherit physical traits (such as size, eye color, and tendencies toward particular diseases), but also emotional states. These are often held in the

water element and in particular in the kidney meridian, one of the paths of energy that run through the body.

A young man came to see me wanting to be more confident and to take the next step on his path in life. He found it hard to think positively about himself and felt held back by his anxiety about change. We discovered that his DNA and kidney meridian were low in energy. (Kidney energy problems often manifest as anxiety or fear.) Muscle testing showed that he'd inherited an emotional pattern from his father, and that it reached back in his ancestry for 16 generations. The pattern was one of anxiety and fear about change and moving on in life—exactly what he was experiencing. He also recognized this in his father. An additional pattern from his mother, who'd been anxious about giving birth to her son, was also affecting his kidney energy.

By working with the energy of the kidney meridian, we were able to restore balance to the DNA and the water element, and then hydration became optimal in every system in the young man's body. Now free of the pattern of fear and anxiety, he found a spiritual teacher, made changes in his way of life, and began to feel good about himself.

The water element in many ancient traditions is the one that relates to nourishing and nurturing. In the Native American tradition, Father Sun brings his love and passion to Mother Earth, who receives this; and together they give birth to their daughter Water, a Goddess and the Spirit of the plants, who brings life and beauty to the earth. It seems that we in the West have forgotten the ancient stories and the beauty of honoring the balance of nature that we can still see in other cultures.

The first acupuncture point on the kidney meridian on the bottom of the feet is called "Bubbling Spring." It's a major point for energy input. When we walk, this part of the foot acts as a pump and encourages the waters of the body to move. It's natural for them to circulate and, as already mentioned, if they become too still, they turn stagnant. To encourage movement, we can walk, run, or do whatever activity we enjoy. Figure eights will spiral the body's waters into motion and energize them. So by circling the body, we can enhance our flexibility and the flow of our waters. Belly dancers know this!

A woman who was having eye problems, with fuzzy sight and a slight gritty feeling in her eyes, came to a seminar I gave about kinesiological

ways of working with water. I see the eyes as two of the lakes in the body. For a lake to stay healthy, it needs a throughput of water. So we muscle checked and found that figure eights would be a helpful remedy for this woman. She rolled her eyes in a sideways “eight” movement, and then went on to move both her eyes and her neck in this way for a short time. Afterward, her sight became clear, her eyes looked brighter, and the gritty feeling disappeared.

THE MEMORY OF WATER

“I know it in my waters” is an old saying. It may be accurate, when we consider that water has a memory. It recalls what it’s like to be healthy and strives for this state of perfection in its motion. It also remembers subtle energies that have passed through it.

The memory is actually a vibration. This can be very powerful— when information in the form of a vibration is introduced into the body, it can bring about healing to the entire system. Homeopathy works in this way, using the power of water to absorb and retain information that has been shaken into it. Flower essences, pioneered by Dr. Edward Bach, work in a similar manner, using the vibration of flowers in water to trigger self-healing. [See Chapter 20.]

The waters in the body are always ready to receive information from the environment. We continually receive and give out information through our sensory organs and also through our chakra system (the word *chakra* from the Sanskrit for *wheel*). These wheels of energy are vortexes, which are linked to the nervous and hormonal systems. They act as gateways from the subtle realms to the physical and from the body to the environment. In this way, we’re connected to all life.

The common factor here seems to be water. As we bring information into our bodies, our fluids pick up the data and send them to the relevant part of the system. Messages will also be sent out to the world around us. This will give us a particular kind of reception from the people we’re with. Within the body, a similar system is in operation. Here, our waters are affected by the signals we give ourselves. Messages of love, appreciation, or kindness

will affect us in a positive way, while negative feedback will eventually cause problems with our well-being.

Over the years of working in the field of natural therapies, I've become more and more aware of the importance of water. It's an obvious factor in creating and maintaining health and well-being. Increasing research, including that outlined above, has pointed out that the way we treat water, in the world and within our bodies, is significant both for our own health and that of the planet.

We're all looking for vitality, happiness, and good health; and we have an ally: water. Once we acknowledge this and recognize its nurturing and healing powers, we can begin to feel it working for and with us. Water ties us all to each other and to every other life form on Earth. We could begin by feeling connected to each part of ourselves.

WATER TIPS

- Drink six to ten day—more if you're learning, and more if you're stressed.
- If drinking a minimum of six glasses a day, take some salt to balance the water.
- Start the day with one or two glasses of water to flush the system and bring new life to your day.
- Drink deeply to energize and feed the water element in your body.
- Sip slowly to detox and cleanse.
- Hold the water in your mouth for a few seconds to encourage absorption.
- Dechlorinate tap water by letting it stand in a jug— the chlorine will evaporate.

- Energize water by stirring it, blessing it, or using a water-energizing device.
- Move your internal water pump: Run, walk, move your ankles, and do any other foot or leg movement that you enjoy.
- Get a foot massage.
- Circle the body—move in figure eights with your eyes, head, hips, and shoulders.
- Heal scars by moving your hand in a figure eight over them.
- Talk kindly to yourself (and your inner waters) with appreciation, respect, and acceptance.
- Speak to others in the same way.



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FURTHER INFORMATION

See: www.creativekinesiology.org





PART III

SPIRITUAL AND
MYTHOLOGICAL
PERSPECTIVES



INTRODUCTION

Water has been revered over thousands of years for its powerful spiritual qualities. In the following chapters, we'll see how this respect is a common theme in many of the world's religions, and how water is used both for sacramental purposes and in stories for teaching the faith.

Animism is the oldest spiritual path, dating back to the earliest times, and José Luis Stevens's paper gives a glimpse into an era when the spirits of local rivers, lakes, and seas were universally revered. Their help and guidance were essential to early humans' very survival in a dangerous world.

Starhawk continues in a similar vein, with her deep understanding of paganism and its rituals.

Other authors explore how water is central in many major religious traditions, including Hinduism, Christianity, and Judaism. All have the common theme of the powerful cleansing and purifying properties that water possesses and its centrality in the processes of redemption and forgiveness, as well as initiation into faith.

The spirit of place, especially important for understanding spirituality and water, is also a concept that several of these papers have in common. In many cultures, ancient and modern, the powers of water are believed to be especially strong in certain locations—such as the sacred river Ganges in India, one drop of which is said to cleanse the soul of all karma. In the same vein, Doreen Virtue describes the goddesses and presiding female saints of Lourdes and other holy places, Richard Beaumont writes about the Roman spa of Bath in England, and William Bloom explores the Chalice Well of Glastonbury.

Maril Crabtree's essay ends this section (and the book) practically and inspiringly, with a range of ideas and rituals for readers to try themselves, from simply drinking a glass of water or taking a shower with awareness and appreciation, to techniques for healing illness.

What's most astonishing about this collection of essays is the remarkable unity that so many diverse traditions display in their perception of water over countless ages. Surely this alone would be enough to provoke scientific inquiry into the nature of water. In fact, science itself has recently added its own vast body of discoveries about water and its centrality to the life of this planet.

It should now become clear that the scientific and the spiritual qualities are simply two sides of the same coin. So, for example, just as water can store memories and be influenced by thoughts and feelings, so it's also able to use this absorptive property to remove and cleanse negative emotions and their effects from people and leave them prepared to move on in their lives. This is an aspect widely used in religion; the indigenous cultures of South America use waterfalls to this end, while the Hindus of India bathe in their sacred rivers, especially the Ganges.

We can hope that in time, all modern societies will come to honor water and its spirit as much as ancient traditions have done through the ages. That's certainly my desire and intention.



CHAPTER 11

WATER IN CHRISTIANITY

by Alan Walker

The Bible begins and ends with images of water. At the beginning of creation, “darkness was upon the face of the deep, and the spirit of God moved upon the face of the waters” (Genesis 1:2). At the end of time there will be a new heaven and new Earth. There will be no more sea, but “a pure river of water of life, clear as a crystal” (Revelation 22:1) will flow from God and quench the thirst of all who drink from it (Revelation 22:17).

In the mythological worldview of the Old Testament, water stands for the primeval chaos that God must overcome to begin His work of creation. The sky (or “heaven”) is a “dome” in the midst of the waters, separating the ones above from those below (Genesis 1:6–8). Then the waters below are gathered together in one place so that dry land might appear, and so the sea and the earth are created (Genesis 1:9–10).

We hear echoes elsewhere in the Hebrew scriptures of a primordial battle between God and sea monsters: “You divided the sea by your might; you broke the heads of the dragons of the waters. You crushed the head of Leviathan” (Psalm 74:13–14).

God’s work of creation, therefore, hasn’t destroyed the primeval chaos, but pushed it back. The sea is set limits, and the waters are ordered to stick to them (Proverbs 8:29); but they still pose a threat. Humans are aware that their lives are, as it were, suspended over the brink. Not surprisingly, the biblical writers looked forward to a time when this threat would be removed — when “God will punish Leviathan the fleeing serpent, Leviathan the twisting serpent, and he will slay the dragon that is in the sea” (Isaiah 27:1) — and saw a dry ocean as a sign of the final establishment of God’s rule on Earth.

In the meantime, God keeps the waters under control so that those “who went down to the sea in ships, doing business on the mighty waters . . . saw the deeds of the Lord, his wondrous works in the deep” (Psalm 107:23–4).

When God despairs of the wickedness of humankind and resolves to undo His creation, He does so by unleashing the waters in a flood, allowing only Noah and his family to survive (Genesis 6–7). Later, when the Israelites are escaping from Egypt, God separates the waters of the Red Sea to allow them to cross and releases them to destroy the Egyptians (Exodus 14–15).

Of course, for the most part, water appears in the ordinary sense of the word in the Old Testament as an essential element for drinking and washing, particularly so for a people living in or on the edge of a desert. Paradise was portrayed as an oasis, and water was also used to depict the blessings that came from God: “Let justice roll down like waters, and righteousness like an ever-flowing stream” (Amos 5:24).

In the New Testament, Jesus begins his ministry in the wilderness of Judea by being baptized by John in the river Jordan (Matthew 3). *Baptism* originally simply meant to “dip” or “immerse” in water. In the 1st century, the Jews had a ceremony of “proselyte baptism,” which was an initiation ritual for converts to Judaism. John says his baptism is “for repentance” (Matthew 3:11), and he understands it as preparation for an imminent fresh intervention by God in the world.

Christians believe that moment arrived with the Incarnation—the entry of the Son, the second person of the Trinity, into the world as a man. By sharing our human nature, God makes it possible for us to “participate in the divine nature” (2 Peter 1:4). By dying and rising again, Jesus Christ conquers death and offers a share in his risen life to all who identify with him through faith and are baptized.

Christian baptism, therefore, has a much broader and more profound meaning than that of John. It’s not simply a ceremony marking entry into the Christian community in the way that circumcision marks a boy’s membership to the Jewish people, and it’s far more than a “naming” ceremony.

Baptism is a mystical participation in the death and resurrection of Christ. The candidate goes under the water, “drowning” to his or her old life, and is then dramatically drawn out into a new kind of existence.

Christians believe that the church isn't simply an association of like-minded people, but is the very "body of Christ," which, in another mode, burst out of the tomb at Easter. In the early church, baptisms were principally conducted at Easter to reinforce this connection.

In the baptismal liturgy, the water is blessed with words that call attention to the place of water in the history of salvation:

Father, we give you thanks and praise for your gift of water in creation; for your Spirit, sweeping over the waters, bringing light and life.

You delivered Noah from the waters of destruction; you divided the waters of the sea, and by the hand of Moses you led your people from slavery into the Promised Land.

In water your son Jesus received the baptism of John. . . . In it we are buried with Christ in his death. By it we share in his resurrection.

May your holy and life-giving Spirit move upon these waters. Restore through them the beauty of your creation. . . . Drown sin in the waters of judgement.

Now sanctify this water that . . . they may be cleansed from sin and born again. . . . (*Common Worship: Christian Initiation*, 2006)

The meaning of baptism as a "drowning," clear when performed as an immersion, has been obscured by the practice of baptism by "affusion" (pouring) or "aspersion" (sprinkling) and by the use of bowl-like fonts. Similarly, this has also encouraged a misplaced emphasis on the aspect of "cleansing" in baptism, which is confusing (even distressing) when the candidate is an infant.

Christians understand baptism to be a washing away of "original sin," the condition of being alienated from God, which is characteristic of all humanity and mythologically inherited from their first parents, Adam and Eve. This is possible precisely because the human Christ has paid the penalty for sin in his death on the cross and made possible again the fellowship humanity enjoyed with God in the Garden of Eden.

Baptism is described in Christian theology as a *sacrament*, that is to say, "an outward and visible sign of an inward and spiritual grace" (*Book of Common Prayer*). It's an "effective" sign, one that actually brings about what it signifies, by which God works invisibly within us.

Sacraments are not magical. They're not at the disposal of men and women who happen to know the words or how to perform the actions. They work because part of humanity is being restored to its proper relationship with God, and so to its intended dignity and status. They belong to a redeemed space within the "fallen" world.

In the language of the gospels, this space was called the “kingdom” of God and was actualized when Christ lived on Earth and “went about among us.” The miracles that he performed may be interpreted as signs of the kingdom “overflowing” into mundane reality. Interestingly, the first of these was the transformation of water into wine at the wedding feast in Cana (John 2:1–11).

Wine itself is, of course, pregnant with meaning in Christianity. At the Last Supper, Jesus identifies wine with his own blood and instructs his disciples to share wine in memory of him until they’re reunited in heaven (Matthew 26:26–29). The next day, Good Friday, they see blood and water flowing from his side when it’s pierced by a Roman soldier’s spear to confirm that he has truly died on the cross (John 19:34).

To this day, when Christians meet to remember Jesus, a little water is mingled with the wine that is to “become” his blood. As the priest does this, he whispers one of the “secret” prayers: “By the mystery of this water and wine, may we share the divinity of Christ as he humbled himself to share our humanity.” The wine represents the divinity, the water the humanity. In the Eucharist—the mystic supper—Christians have a foretaste of the divine life that’s promised to them and prefigured in the turning of water into wine at the marriage feast.

We’re to understand the occasion when Jesus “walks on water” (Matthew 14:22–33) in a similar way. The miracle is not a display of power in which Jesus bypasses the laws of nature, nor is it a “natural” act that the eyewitnesses failed to understand (such as that Jesus was actually walking on submerged ice). What the disciples are witnessing is a manifestation of the world as it’s meant to be and was before the Fall, a world where the forces of nature and humanity are in harmony with one another. Jesus even encourages Peter to follow him onto the sea as a foretaste of the restored creation.

There are other occasions in the gospels in which water plays a central role and illuminates important aspects of Christian teaching. At Jacob’s Well, Jesus asks a Samaritan woman who’s drawing water if she could give him a drink. When she expresses surprise for “religious” reasons (Jews normally had no dealings with Samaritans), Jesus tells her that if she’d known who he was, she would have asked *him* for a drink and would have received in return “living water”: “Everyone who drinks of this [well] water

will be thirsty again, but those who drink of the water that I will give them will never be thirsty” (John 4:13–14).

He isn’t simply using a metaphor in which water represents faith. Jesus is pointing to a time when the elements, along with the whole of creation, will be restored. Christianity doesn’t reject the material world or consider it as in opposition to the spiritual. Everything God made is “good” (Genesis 1:31); although everything, too, has been affected by humanity’s disobedience.

At the Last Supper, Jesus “poured water into a basin and began to wash the disciples’ feet” (John 13:5). He tells them, “Unless I wash you, you have no share in me” (John 13:8), thus making a connection with baptism. The next day, his life will be poured out like water on their behalf. Then he instructs them to “wash one another’s feet” (John 13:14) because “sharing” in him isn’t an individual but a social experience. Salvation in Christian terms isn’t an escape from the world, but a call to the service of others. A ceremony of the washing of feet is performed each year in Christian churches at the beginning of the Maundy Thursday liturgy. In England, it was for centuries the custom of the monarch to wash the feet of some poor people on that occasion and to give them a small gift of money. Today the Queen still gives gifts of “Maundy money.”

In the early centuries of the church beyond the New Testament period, water came to play an important role in worship and devotion. The theological rationale for “holy water” was that as Jesus had been sinless and in no need of “washing,” his presence in the Jordan had the effect of sanctifying the water. The water of the Jordan is today considered by many Christians to have a sacred character, and bottles of it are sought after. Members of the English royal family have been baptized in Jordan water since the time of the Crusades.

There’s evidence that water was blessed in Egypt in the 3rd century for use in exorcisms and in curing illness, and since the 4th century it has been the custom in the Eastern churches to bless water on the feast of the Epiphany in memory of Jesus’ baptism by John. This water is made available to members of the church to bless their homes and possessions and to drink in time of illness or special need. On one of the following days, a visit is made to bless the sea or a nearby river or lake as a sign of the redemption of all creation through Christ. Sometimes a wooden cross is

placed in the water. A blessing of the Thames from Southwark Bridge has been revived in recent years by Anglicans in London.

In the West, holy water is first recorded as being used in the 6th century for the dedication of a church. This water was mixed with wine, salt, and ashes.

Today, holy water is often found in a stoup at the entrance to churches for the faithful to dip a finger in before making the sign of the cross. It's used to sprinkle the congregation at the beginning of the principal Sunday service or on other occasions as a reminder of their baptism. During the year, the harvest gifts or the Christmas tree, for example, are sprinkled to "set them apart" from ordinary use; and any appropriate object or place may be blessed in the same way.

In Christianity, neither places nor the natural elements are endowed with any intrinsic supernatural or spiritual power, but because of the Christian belief in the inherent goodness of creation, any natural source of water has the potential to be considered holy "by association."

One of the best-known examples is Lourdes in France, where the Virgin Mary appeared to Bernadette Soubirous in 1858 and instructed her to uncover a spring, which would have healing properties [see Chapter 16]. Another is the Holy Well at Walsingham in England, where a spring of water gushed up at the site of the Virgin Mary's appearance to Richeldis de Faverches, the lady of the manor, in 1061. Today pilgrims receive the water there in three ways: as a drink (for the health of the body), with the sign of the cross (for the soul), and in the cupped hands (for the spirit).

Nevertheless, because God is not only a transcendent reality beyond the world He has made but also an immanent reality active within it, many Christians would accept that a variety of times, places, and materials have the potentiality of revealing the mystery of God. However, they'd always affirm that in any encounter, it's God Who takes the initiative. He's never at our disposal; He's always a God of surprises.





CHAPTER 12

MIKVAH: GATEWAY TO PURITY

by Rivkah Slonim

In the beginning, there was only water. A miraculous compound, it's the vivifying force of all life as we know it. But it is more. For these very same attributes—water as source and sustaining energy—are mirrored in the spiritual. Water has the power to purify, restore, and replenish life to our essential spiritual selves.

Jewish tradition relates that after being banished from Eden, Adam sat in a river that flowed from the garden as part of his attempt to return to his original perfection. To this day, water in a *mikvah* pool is used as a means of purification.

The world's natural bodies of water—its oceans, wells, and spring-fed lakes—are mikvahs in their most primal form. They contain waters of Divine source and thus, Jewish tradition teaches, the power to purify. Created even before the world took shape, these bodies of water offer a quintessential route to consecration. However, they may be inaccessible or dangerous, and there may be additional problems of inclement weather and lack of privacy. Jewish life therefore necessitates the construction of mikvah pools, and indeed this has been done by Jews of every age and circumstance.

To the uninitiated, a modern-day mikvah looks very much like a miniature swimming pool. Its ordinary appearance, however, belies the complex web of laws that surround its construction and its primary place in Jewish life and law. The mikvah offers the individual, the community, and the nation of Israel the remarkable gift of purity and holiness. No other religious structure or rite can affect the Jew in this way and on such an essential level.

The mikvah's extraordinary power has held sway since the dawn of time. Before the revelation at Sinai, all Jews were commanded to immerse themselves in preparation for coming face to face with God. In the desert, the famed well of Miriam served as a mikvah, and Aaron and his sons' induction into the priesthood was marked by immersion in it. In Temple times, the priests and any other Jew who wished to enter the House of God had to first immerse themselves in a mikvah. On Yom Kippur, the Jewish day of atonement and most sacred of all days, the high priest was allowed entrance into the Holy of Holies, the innermost chamber of the Temple, which no other mortal could enter. This was the zenith of a day that involved an ascending order of services, each of which was preceded by immersion in the mikvah.

The primary uses of the mikvah today date back to the dawn of Jewish history and cover many elements of Jewish life. The most important and general usage is for purification by the menstruating woman within a framework known as *taharat hamishpachah*, family purity. Briefly, from the onset of a woman's menses until after immersion in a mikvah, which takes place seven days after the cessation of her menses, the woman and husband are prohibited from expressing their love for each other in a physical manner.

The observance of family purity and immersion in the mikvah within that framework is a biblical injunction of the highest order. While most see the synagogue as the central institution in Jewish life, Jewish law states that constructing a mikvah takes precedence over building a house of worship. Jewish married life, and therefore the birth of future generations in accordance with Jewish law, is possible only where there is access to a mikvah. It's clearly no exaggeration to state that the mikvah is the touchstone of Jewish life and the portal to a Jewish future.

In primitive societies, menstruating women were a source of consternation and fear. Peace could be made with menstruation only by ascribing it to evil and demonic spirits and by the adaptation of a social structure that facilitated its avoidance. Viewed against this backdrop, the Jewish rhythm in marriage is perceived by many as a throwback to archaic taboos, a system rooted in antiquated attitudes and a ubiquitous form of misogyny. In truth, family purity is a celebration of life and our most

precious human relationships. It can be understood most fully within the larger concept of ritual purity and impurity.

Judaism teaches that the source of all *taharah*, “purity,” is life itself. Conversely, death is the harbinger of *tumah*, “impurity.” All types of ritual impurity—and the Bible describes many—are rooted in the absence of life or some measure—even a whisper—of death.

When stripped to its essence, a woman’s menses signals the death of potential life. Each month, a woman’s body prepares for the possibility of conception. The uterine lining is built up rich and replete, ready to serve as a cradle for life in anticipation of a fertilized ovum. Menstruation is the shedding of the lining, the end of this possibility. The presence of potential life within fills a woman’s body with holiness and purity. With the departure of this potential, impurity sets in, conferring upon the woman a state of impurity or, more specifically, *niddut*. Impurity is neither evil nor dangerous, and it isn’t something tangible. It’s a spiritual state of being, the absence of purity, much as darkness is the absence of light. Only immersion in the mikvah, following the requisite preparation, can change it.

The concept of purity and impurity as mandated by the Bible and applied within Jewish life is unique. It’s often difficult for the contemporary mind to relate to the notion and view it as relevant. In ancient times, however, *tumah* and *taharah* were central and determining factors. The status of a Jew, whether ritually pure or impure, was at the very core of Jewish living. It dictated and regulated a person’s involvement in all areas of ritual. Most notably, *tumah* made entrance into the Holy Temple impossible.

There were numerous types of impurities that affected Jews, regarding both their life and Temple service, and a commensurate number of purification processes; but mikvah immersion was the culmination of the purification rite in every case. Even for the ritually pure, ascending to a higher level of spiritual involvement or holiness necessitated immersion in a mikvah. As such, the institution of mikvah took center stage in Jewish life.

In this post-Temple period, the power and interplay of ritual status has all but vanished, relegating this dynamic to obscurity. There is, however, one arena in which purity and impurity continue to be pivotal. In this connection only does there continue to be a biblical mandate for mikvah immersion—and that’s regarding human sexuality. Lovemaking signals the possibility

and potential for new life, the formation of a new body, and the descent from heaven of a new soul. In their fusing, man and woman become part of something larger; in their transcendence of the self, they draw on, and even touch, the Divine. They enter into a partnership with God; they come closest to taking on the Godly attribute of creator. In fact, the sacredness of the intimate union remains unmitigated even when the possibility of conception doesn't exist. In the metaphysical sense, the act and its potential remain linked.

Human sexuality is a primary force in the lives of a married couple; it's the unique language and expression of the love they share. A strong relationship between husband and wife is not only the backbone of their own family unit, but is integral to the world at large. The blessings of trust, stability, continuity, and, ultimately, community all flow from the commitment they have to each other and to a joint future. In reaffirming their commitment in their intimacy, the couple adds to the vibrancy and health of their society and to the fruition of the Divine plan: a world perfected by humans. As such, they're engaged in the most sacred of pursuits.

In this light, it becomes clear why marital relations are often referred to as the holy temple of human endeavor. And entrance to the holy always was, and continues to be, contingent on ritual purity. Immersion in the mikvah is the gateway to the holy ground of conjugality.

There are other important usages of the mikvah as well. Mikvah is an integral part of conversion to Judaism. New pots, dishes, and utensils must be immersed in a mikvah before they may be used. The mikvah concept is also the focal point of the purification rite of a Jew before being laid to eternal rest and the soul ascending on high. Finally, Jewish men also use the mikvah on various occasions for the purpose of heightened purification. With the exception of conversion, however, these uses are all customary.

Immersion in a mikvah effects a change in status; more correctly, an elevation in status. Utensils that could heretofore not be used can, after immersion, be utilized in the holy act of eating as a Jew. A woman who from the onset of her menses was in a state of *niddut*, abstaining from sexual relations with her husband, may be reunited with him after immersion in the ultimate holiness of married intimacy. Men or women in Temple times, who were precluded from services because of ritual

defilement, could, after immersion, enter the House of God. The case of the convert is most dramatic. The individual who descends into the mikvah as a Gentile emerges from beneath its waters as a Jew.

So the mikvah personifies both the womb and the grave, the portals to life and the afterlife. In both, the person is stripped of all power and prowess. In both there's a mode of total reliance, complete abdication of control.

Immersion in the mikvah can be understood as a symbolic act of self-abnegation, the conscious suspension of the self as an autonomous force. The person immersing signals a desire to achieve oneness with the Source of all life, God. Immersion indicates the abandonment of one form of existence to embrace one infinitely higher. It's thus described not only in terms of purification, revitalization, and rejuvenation, but also—perhaps primarily—as rebirth.



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CHAPTER 13

WATERS OF THE WORLD

by Starhawk

One morning I was meditating beside a beautiful lake in Vermont, listening for whatever messages the water might have for me. “All water is connected,” the lake said. “All water is in constant communication with all other water. The waters of the world are one—one consciousness, holding the world in liquid embrace. What you do to any part of the waters affects them all.”

I am a Pagan, someone who practices the ancient Earth-based religions that have roots in pre-Christian traditions of Europe and the Middle East. For Pagans, water is one of the four sacred elements—earth, air, fire, and water—with the fifth, the spirit, honored as the center of the sacred circle. These things are revered because they’re the basis of life. We begin every ritual by honoring and invoking them, and end every ceremony by thanking them and bidding them good-bye, reminding ourselves again and again of our deep dependence on the natural world.

To say that water is sacred has both spiritual and practical implications. If we honor water spiritually, we must also treat it with respect in very ordinary ways. The land I live on, in the coastal mountains of western Sonoma County, California, is a place of water extremes. In the winter, we can get 80 to 100 inches of rain, which often comes in torrents. Hillsides wash away, and nearby rivers flood. We learn to respect water’s power to carve, to change, to undermine, and to rage—and we know that every structure we build, every road we lay, and every bridge and crossing we construct must be designed to respect and channel water’s flow, or we risk immense damage to the land.

The salmon and steelhead trout, keystone species of these hills, depend on clean gravel in running streams and deep summer pools in order to reproduce. The health of the hills and forests, in turn, depends on the salmon, who, as they migrate back from the sea and swim upriver to their birth streams to spawn and die, return nutrients that have washed downstream to the soil and the trees. But a century and a half of logging, gravel mining, and road building has silted much of the gravel and dried up the summer pools. To hold water sacred, we must cherish the salmon and work to repair the damage.

Water also teaches us to be *humble*—a word that shares a root with “humus” and means “close to the earth.” For our greatest allies in cleansing and healing water are the most humble things on Earth—bacteria, fungi, beneficial microbes, and plants. Gray-water systems provide habitat for these creatures, who obligingly eat pathogens. Sewage can be treated in constructed wetlands or “living machines” that mimic nature’s own ways of cleansing water, sending it through a sequence of living communities of bacteria, algae, plants, and fish.¹

Conserving water and creating systems to heal and clean it are practical prayers. We’ve also created rituals that honor water’s powers of cleansing and connecting. For many years, Reclaiming, my extended spiritual community, has practiced a simple ritual we call “Waters of the World.” We collect water—from sacred springs and from our household taps, from significant places and from the sites of significant events—and combine it when we come together in ritual, often keeping a bowl of it on the altar so that it becomes infused with our energy. Then, when we separate, we each take a small amount. Some of us carry it with us wherever we go, using it to make offerings to the earth and to give back to the spirits of any place where we collect more water.

This ritual began more than two decades ago as a response to fear and despair. It was in 1980, shortly after Ronald Reagan was elected President of the United States, when our circle met for the winter solstice. We held an all-night vigil and spoke about our deep fear that the new regime would undermine hard-won environmental protections and might even lead us into nuclear war. We decided to hold a larger ritual on February Eve, the feast of

Brigid, who is the ancient Celtic goddess of the holy well and sacred flame and presides over smithcraft, poetry, and healing.





We began with a simple cleansing ritual. We divided the gathering of about 100 people into small groups and gave each a bowl of salt water. We asked the groups to pass the bowls counterclockwise—the direction of banishing and releasing— giving each person a chance to speak about the places in their lives where they felt powerless and to imagine the feelings as a muddy stream flowing into the bowls. Then we sang, chanted, and poured our spiritual energy into the bowls to transform the energy locked up in hopelessness and despair. Salt—a crystal—helps bind and focus energy.

When we could see the bowls glowing with light and feel the energy shifting, we passed the bowls clockwise, letting each person dip their

fingers into the water to take back some of the transformed energy and speak about where in their lives they felt power, love, and hope.

This water-cleansing ritual is one I've often used in personal meditation when my thoughts and emotions were churning with anger or stress. I've used it in groups, placing a bowl of salt water in the center of a group in conflict and asking people to speak their frustrations and bitterness into the bowl, then raising power to cleanse and transform the energy so that it can be taken back. In all these rituals we focus on honoring the energy locked up in anger or grief or resentment, seeing it not as something negative to be gotten rid of, but as something potentially strong, powerful, and positive that has gotten stuck and stagnant and needs to be released to flow more freely.

That first despair ritual led us into action to stop the building of an unsafe nuclear power plant and protest the development and testing of nuclear weapons. Brigid's feast became a time for us to do rituals to strengthen our commitment to act in the world to protect what was sacred to us: the elements that sustain life; the human and plant and animal communities that depend on them; and those real but intangible qualities—freedom, justice, compassion, and love—that infuse life with spirit.

One year, we decided to create Brigid's well—a big punch bowl filled with waters from special places. My friend Luisah Teish is a Yoruba Priestess of Oshun, the river *orisha*, or “spirit power.” When I was traveling once, I asked Teish what I could bring back for her, and she said, “Water.” So I began collecting water from special places, and that gave us the idea to create the well. We added water from many places that were important to us, from sacred springs and wells and from our homes, and saved some back at the end of the ritual. Now, more than two decades later, our Waters of the World contain water from every continent and ocean, even from Antarctica, from sacred rivers and Brigid's well and from the many political actions we've done to save and preserve water. They're a living embodiment of the message I heard from the lake—that all water is one.

In recent years, the issue of protecting water has become a central one for me and many of my friends. In today's world, water is seen as a commodity to be bought, sold, privatized, and hoarded for profit. More than a billion people lack access to safe drinking water.

“Tell me about your home. . . . Who owns the water?”
“Nobody owns it. You can’t own water, where I come from.”
“Somebody’s got to own it. . . . Somebody always does.”
“We believe there are Four Sacred Things that can’t be owned . . .
water is one of them . . . because they belong to everybody.
Because everybody’s life depends on them.”
“But that would make them the best kind of thing to own. . . .”²

That scrap of dialogue from my 1993 novel, *The Fifth Sacred Thing*, expresses the heart of the conflict. It’s estimated that the resource wars of the 21st century will center on water. If we hold water sacred, if we want to preserve it as a source of peace, fertility, and life—not a ground for conflict—we must be active in establishing and protecting access to it as a human right.

With a loose group of spiritually based activists that we call the Pagan Cluster, I’ve many times taken part in demonstrations and protests to protect water rights. We dress in blue and carry puppets or rivers of cloth suspended on sticks to represent a Living River. In April 2001, we took part in demonstrations against the Free Trade Area of the Americas, an international trade agreement that would have privatized water across three continents. We danced and chanted through a haze of tear gas, bringing the free spirit of water to the gates of power, along with the Cochabamba Declaration, written by the people of that Bolivian city who in January of 2000 took back their water supply from privatization by rebelling, filling the streets, and shutting down the city for two weeks until the government relented. Their eloquent and poetic statement became, for us, a sacred document:

THE COCHABAMBA DECLARATION

For the right to life, for the respect of nature and the uses and traditions of our ancestors and our peoples, for all time the following shall be declared as inviolable rights with regard to the uses of water given us by the earth:

1. Water belongs to the earth and all species and is sacred to life, therefore the world's water must be conserved, reclaimed and protected for all future generations and its natural patterns respected.
2. Water is a fundamental human right and a public trust to be guarded by all levels of government, therefore it should not be commodified, privatized or traded for commercial purposes. These rights must be enshrined at all levels of government. In particular, an international treaty must ensure these principles are noncontrovertible.
3. Water is best protected by local communities and citizens who must be respected as equal partners with governments in the protection and regulation of water.

Peoples of the earth are the only vehicle to promote earth democracy and save water.³

All water is one. Whenever we're working to protect, heal, and respect water in practical ways and advocating the rights of every human being to clean water, or honoring water through ritual and ceremony and connecting with its deep spiritual healing and cleansing powers, we're acknowledging and celebrating the deep unifying life force that sustains us. Our practical and political efforts give our prayers strength and integrity; our prayers and rituals sustain our spirits for the hard work of service, healing, and action.



NOTES

1. See John Todd's work on living machines: www.oceanarks.org
2. Starhawk, *The Fifth Sacred Thing*, NY: Bantam, 1993: pp.71–2.
3. The Cochabamba Declaration can be found at:
www.starhawk.org/activism/cochabamba-dec.html and
www.nadir.org/nadir/initiativ/agp/free/imf/bolivia/cochabamba.htm

For an account of the uprising, see “Bolivia’s War over Water” by Jim Schultz, at www.democracyctr.org/waterwar

FURTHER INFORMATION

Starhawk’s Web site: www.tarhawk.org

To receive her periodic writings and schedule, e-mail **Starhawk-subscribe@lists.riseup.net**

For more information on Starhawk’s Earth Activist Trainings, see: www.earthactivisttraining.org



CHAPTER 14

THE SPIRIT OF WATER IN THE WORLD OF SHAMANISM

by José Luis Stevens, Ph.D.

INTRODUCTION

In the course of my life, I've been most fortunate to study and work closely with elders and men and women of knowledge from several shamanically oriented tribal cultures. I've witnessed extraordinary healings and methods of communicating with the elements that radically challenged my university-bred beliefs about the nature of reality and gave me insight into the possibilities that I'd been trained to screen out by my traditional Western education. In particular, I've observed what a unique and central place the element of water has in the teachings and beliefs of these extraordinary peoples.

In this article, I'll focus on three tribes with a shamanic base from diverse locations in the world, yet ones that well represent the universal shamanic understandings about the nature of water and its properties. First, I'll present a simple introduction to shamanism and then a description of the Shipibo culture from the Peruvian Amazon and the centrality of water in their world. Next, I'll look at the Huichol tribe from rugged central Mexico and examine some of their most profound insights into the nature of the spirit of water. Finally, I'll compare this with how the Tuvan people from Mongolia understand and relate to water in their traditional shamanic culture.

A BRIEF EXPLANATION OF ANIMISM AND SHAMANISM

Animism is the world's most ancient set of spiritual beliefs regarding the nature of reality and is now seeing an upswing of interest in every continent. Its premise is that everything in the universe is alive and highly conscious and has a uniquely intelligent soul.

Animism is based on the belief that the world consists of overlapping energy fields and that underlying the visible world is the spirit world, the origin of all power, energy, and vitality. Consequently, animists believe that invisible forces or spirits can affect physical elements such as water, fire, air, earth, plants, animals, and people. Animistic cultures believe in showing the utmost respect to the spirits in everything—whether they be clouds, rocks, winds, springs, or birds of prey—as all are participants in the greater community of life.

While animism refers to the beliefs of the members of a tribe or community at large, shamanism is a specialty developed within that society by certain individuals. It requires acquired skills, knowledge, and natural talents. However, it's not a religion because it has no structured hierarchy or set of dogmas; rather, it's a set of special techniques for manipulating energy and power.

Shamans specialize in diagnosing and healing illness and suffering, divining and prophesying, journeying to other worlds through trance states to seek knowledge to gain control over spirits, and gathering and storing power through techniques and practices associated with nature. They're known to make special use of trance to manipulate and control the weather, speak with the spirits of plants and animals, and conduct strenuous ceremonies for fertility, healing, and sorcery. Without the ancient practice of shamanism, it's unlikely that humans would have survived prehistoric times, as it includes many practical techniques designed to solve everyday problems and to aid survival in the world's harshest environments.

The word *shaman* comes from the language of the Tungus people in Siberia and was initially used by anthropologists to describe the unique practices and experiences of shamans in that culture. Today the term has grown in popular usage to include similar customs in cultures all over the world.

The practice of shamanism is remarkably similar from continent to continent, even though in many cases there has been little or no contact between the shamans of the Amazon, the Andes, the steppes of Asia, Africa, Australia, Europe, Polynesia, and all of North America. Shamans from all over the planet say that this similarity is a result of their cross-cultural use of deep trance to access the *axis mundi*, the universal tree of life, an invisible highway leading to all locations in the world.

Common to all shamanic cultures and peoples is the central importance of the spirit of water, for without it there would be no plants and animals, and it's from these that shamans learn some of their most cherished secrets. It's through their alliance with these totems that they gather much of their power to create, manipulate, and thus control reality.

THE RELATIONSHIP OF THE SHIPIBO TO WATER

The Conibo-Shipibo are a combined tribe of approximately 30,000 people living in the Peruvian Amazon around the Ucayali river system, one of the two main sources of the Amazon. Theirs is truly a world of water; and from it they derive their primary food staples, the fish and many of the plants they rely on for survival. Their lifestyle and beliefs are typical of many of the varied tribes in the Amazon region. However, they're considered the ones with the greatest knowledge of shamanic practices, and therefore many shamans of other tribes study with them to learn their potent sorceric skills, as well as their powerful *icaros*, sacred songs for healing and controlling the elements. For the last 15 years, my wife, Lena, and I have been traveling to their jungle homeland to study and train with the Shipibo elders Doña Juana, Don Carlos, and Don Niko; and from them and their families we've gained some understanding of the importance of water in their cosmology and how they interact with it in ceremony and healing.

According to them, the Shipibo (for short), a shamanically based culture, believe that Roni, the giant anaconda, created the world using the pattern on its back to manifest the patterns in all the forms of reality, including the human body, the land, the sky, the waters, and all the plants and animals. Roni makes its home in the rivers of the Amazon, the lifeblood and

transportation system for all jungle tribes in this region of the world. The Shipibo are most grateful to Roni for providing this grand-patterned landscape, and thus they focus on discerning the energetic designs in everything around them through the traditional use of *ayahuasca*, a mixture of plants that when cooked and taken in ceremony produces powerful insights and visions regarding the vibrating subatomic structures of the elements, the plants, and the animals. For thousands of years, through their ancestral use of *ayahuasca*, they've seen and learned the intricate patterns and the songs woven into every aspect of life. This gives them the power to communicate with, learn from, and command the powers of everything around them—including the powerful spirit of water.

I've seen how they reproduce these beautiful patterns on textiles, on the walls of their buildings, and even on their skin in the form of vegetable-dyed tattoos for protection, healing, and gaining knowledge. Among the countless specific designs they reproduce are the patterns for the sun, the earth, the plants, and of course the spirit of the water. In healing practices, they specifically use the patterns of the water to purify and cleanse the body of unwanted foreign intrusions.

According to Don Carlos, the Shipibo believe that each object has its original pattern and that these patterns can in turn carry others within them. The pattern for water is especially capable of carrying other designs in a way that's similar to a boat transporting people or cargo. He tells me that since the human body consists mostly of water, it's a strong vehicle for carrying other patterns, sometimes positive ones and at times negative. The negative patterns, resulting from other people's fearful or angry thoughts and from plants and animals that have been disrespected, can throw the physical or emotional body out of balance and thus create illness, depression, or other disharmonious states. These alien patterns can be extracted and replaced with the positive songs representing the designs of beneficial plants, animals, and elements.



Song for the power of water



Song of the water spirits for protection

The patterns for water and its infinite variations are also used to promote prosperity and abundance for individuals who are having trouble manifesting what they want in their life. This pattern may be tattooed on their skin, using temporary plant dyes, or placed around their shoulders in

the form of an embroidered shawl. It might even be worn as an article of clothing, such as a skirt; and it could be painted on the side of their boat.

Variations of the pattern for water may involve the design for a good catch while fishing; for learning from the powerful spirits of the river dolphins; for protection from Roni the water anaconda; and the motifs for springs, waterfalls, pools, rain, clouds, and rainbows.

For the Shipibo, as with most shamanic cultures, water is considered a great power, a *poderio*, a force that embodies spirits that may be helpful or harmful. Reproducing its patterns and the designs, then, is a way of showing respect for them and harnessing the power inherent within them. For example, by wearing the design for the spirit of the river, someone might then navigate safely upon it and fish from it with success. In other words, the Shipibo have learned to become that with which they wish to be in harmony.

According to Don Niko, mermaids and dolphins are particularly powerful water spirits that can be asked for help in a variety of situations. He says that the ancient shamans used to dive into the river and commune with these spirits, learning songs from them and gathering the wisdom they chose to share. He says that today this is mostly a lost art and that therefore these water spirits create problems because people no longer show them honor or respect.

Nevertheless, during ayahuasca ceremonies, it's not unusual for the participants to experience the spirit of the river coursing through the veins and organs of the body, washing, cleaning, purifying, and protecting. The result is a roaring sensation or a rushing sound of water in the ears that may last for hours.

During one such ceremony in the jungle, my visions enabled me to meet the loving spirit of a specific river in the Amazon. It told me that we had met very long ago and that it had been my totem many times before. This spirit told me its name and explained that it had been with me all my life and had taught me many things while protecting me from dangers. I suddenly recalled the many years I had been a river rafter safely navigating the rapids in the Grand Canyon and in many difficult rivers in California, Colorado, Idaho, and Alaska. I recalled a song that I'd spontaneously begun to sing about the river being my friend during a rafting trip down the Salmon River in Idaho many years prior. This brought tears to my eyes, and

I realized that this river spirit was indeed my old friend and that I owed it respect for its protection and assistance. The river spirit told me that I could call upon it anytime by experiencing it coursing through my body, and it would help me in any way it could as long as I told it what I wanted.

On another occasion I went for a walk in the jungle with a friend. We found a big pool with a waterfall pouring into it, and we both stood underneath the falls—I briefly, but he for a long while. Later that day, he wasn't feeling too well. That night in ceremony I overheard the *ayahuasquero* (shaman conducting the ceremony) explain to my friend that he'd stood under a waterfall for too long and had taken on too much of its spirit, and that was why he was feeling sick. The shaman explained that the spirit was benevolent but that my friend had simply absorbed an excess of it in his body. He performed an extraction, sucking out the excess of the pattern for that water spirit, and my friend's health was restored. I was truly amazed that the shaman had been able to detect exactly what had happened, given that we hadn't told him about the incident.

During healing ceremonies, I've witnessed Doña Juana and many of her fellow Shipibo healers filling small basins with a little bit of water, which they then cast extractions into, often by spitting or vomiting foreign objects into the bowls. They then visually study the extractions floating in the water in order to diagnose the problem. Afterward, they toss the water away. They see the water as a great cleanser and purifier, and never is a healing ceremony conducted without its benevolent presence.

On numerous occasions I've seen the Shipibo healers sing icaros (those sacred songs derived from the patterns of nature) into a glass or bottle of plain water, and the patient is then instructed to drink a little of the water all day long or over a period of days. Again, the understanding is that water is a medium in which prayers and songs can be held and then carried into the patient's original healthy pattern. The water itself has its own structured design, but may also carry additional patterns sung into it, designs that are beneficial to the recipient.

For the Shipibo, all forms of water are powers to learn from and work with. Doña Juana is an elder Shipibo woman with great knowledge of the icaros passed down to her through generations of ancestors. She tells me that her greatest ally is the spirit of rain, which she can call forth with her icaros to purify and cleanse the land. I've heard her sing an icaro for rain

and bring in a thunderstorm within a half hour. Such practices aren't by any means exclusive to the Shipibo people, of course, but are to be found all over the Amazon and, for that matter, anywhere shamans use their skills. Having water as an ally in its varied forms is part and parcel of shamanic practice everywhere.

THE HUICHOLS'S RELATIONSHIP TO WATER

Let's now shift our focus the Shipibo people and move it north to Central Mexico to become acquainted with the powerful Huichol people and their understanding of the power of water. The Huichols live in the states of Jalisco and Nayarit, in a harsh mountain range stretching from the interior of Mexico to the Pacific Ocean. Numbering about 20,000, they are one of two tribes in Mexico who've managed to preserve their original culture from destruction at the hands of the Spanish invasion. They have strong shamanic roots with a rich tradition of collecting peyote, which they ingest during multiple day and night ceremonies and rituals.

The Huichols, like all shamanic cultures, honor the spirits of nature and call upon them during healing and fertility ceremonies. Fundamental to their cosmology is the Pacific Ocean, one of their primary *poderios*, the great powers they work with. They call the spirit of the sea *Tatei Haramara*—*Tatei* for “our Mother Goddess,” and *Haramara* for “sea.” During their annual pilgrimages to the Pacific Ocean, they deliver sacred objects (*objetos sagradas*), often arrows embedded with prayers that they then cast into the sea or bury nearby. Upon returning to their villages, they carry seawater with them in bottles for sprinkling on their fields and for use in ceremony.

For ten years, Lena and I studied intensively with a Huichol *maracame* (shaman) named Guadalupe Candelario, until his death in 1999. Over the course of that time, we participated in numerous ceremonies and learned a great deal about the importance of water in the Huichol culture. Guadalupe explained to us that the Huichols, being mostly dry farmers, rely on the sea for the clouds and weather systems that bring rain to water their crops of maize and squash in the arid mountain ranges they call home. According to

him, Huichols believe that salamanders are helping spirits who act as midwives to the four Rain Mother Goddesses, especially the one of the east, *Tatei Nariwami*. The salamanders' job is to assist nature by directing the clouds to release their rain in specific places over the land. In their exquisite yarn paintings and beadwork, the Huichols typically depict the rain goddesses as a powerful coiled serpent or as heavy storm clouds out of which millions of tiny snakes descend, symbolizing the life-giving rain.



Yarn painting with snakes

The Huichols often depict serpents as middlemen between humans and the spirit world and use them to represent a deep intuitive knowledge of nature, especially water. Turtles are emissaries of *Tatei Nariwami* as well. Their job is to cause the waters to flow, purifying and replenishing ponds, springs, and small bodies of water.

Springs containing *Kuutsala*, beneficial healing waters, are especially sacred to the Huichols, and are important pilgrimage stops for extensive ceremonies. From these springs they obtain the waters they later use in ceremony to purify, cleanse, and revitalize. One of their most sacred

springs, *Tatei Matinieri* (“Where our mother is”) lies en route to the sacred peyote fields of central Mexico, a destination all Huichols strive to reach during their lifetime.



Huichol yarn painting depicting water or rain

Guadalupe, like all indigenous peoples, considered water to be the sacred source of life. Without it, he said, nothing on this Earth would be able to survive. He often sang to the spirit of water to thank it for its many gifts; invoke its life-giving waters; and invite its ability to transform, cleanse, and heal.

During ceremonies, I often witnessed Guadalupe placing a small jar of seawater on the altar to bring the spirit of the sea into the ceremony and make her available to all participants. According to him, during the course of an all-night ceremony, the open bowl of water absorbs the songs and prayers chanted by the *maracames*, the shamans presiding over the ceremony. In the morning, Guadalupe would dip a deer-tail wand into the seawater and drip it onto the crowns of our heads and our foreheads, cheeks, wrists, and throats. This, he told me, was meant to both purify us and to embed the prayers and songs of the ceremony into us. In the breezy, freezing dawn light after a sleepless night of smoke, wind, and chanting, the

water drops would feel amazingly refreshing. They were like ice trickling down the face and hands as the sun began to bathe the desert in its golden glow.

As with the Shipibo, the Huichols use water as a medium to transport prayers and healing songs into the body of the patient. I've seen Guadalupe pass eagle and hawk feathers over a *hayurame*, an open bottle of water, then sing into it and instruct the patient to drink it as a *remedio* (remedy) throughout the day or over a period of days. He told us that water is friendly to people and supports the transfer of prayers (intentions) and healing energies from other allies, such as the eagle, sun, moon, or stars. Interestingly, other Huichols can tell the difference between plain, unconsecrated water and water into which prayers have been introduced. They can actually see little lights and energy particles dancing in the treated water, whereas the average person can see no difference whatsoever. Most amazing, the Huichols can pick out the prayer water every time.

For Huichols, water isn't a separate or a dead thing, nor is anything in nature isolated. All *poderios* work together, overlapping their energy fields to produce a balanced world where humans, plants, animals, and elements can be in harmony. For example, the Huichols believe that human beings were created by Spirit to be like flowers with blossoms (the crown of the head) open to the sun, supported by a strong vertical stalk (the spinal column). This beautiful flower is, of course, kept alive by an ample supply of water, as all plants are. For this reason, Huichols dress like colorful flowers, the men wearing wide-brimmed hats like gorgeous blossoms in full bloom. They're fond of pouring water onto the crown of the head in ceremony—not to get rid of original sin, as Christians do in baptism, but to introduce life-giving energy to that sacred opening in the head.

TUVAN SHAMANIC UNDERSTANDINGS OF WATER

Now we shift our focus all the way around the world to Mongolia in the northern Asian steppes, where many groups—including Tuvans, Buryat, Hamnigan, Darkhad, Tsaatan, Hotgoit, Urianhai, and the Halh—practice the ancient tradition of shamanism. In particular, our focus will be on the

Tuvans, a society of approximately 235,000 people, perhaps most famous for their traditional art of throat singing. Although as of this time I haven't had the opportunity to visit Mongolia personally, I've been able to learn from those who have training in the Tuvan form of shamanism. Their beliefs are remarkably similar to the traditions I have more direct experience with and have already described.

Tuvan shamanism has its origins in the Stone and Bronze Ages, when survival was difficult and specialized tools and practices were needed to cope with a dangerous and hazardous environment. The fact that the Tuvans' shamanic practice has survived to this day is testament to its practicality, effectiveness, and resilience even in the face of attempted eradication at the hands of the Communists and organized religions. (The Buddhist religion, however, didn't attempt to eliminate it, but rather accommodated it in its practices and beliefs. Buddhism continues to be practiced alongside shamanism to this day.)

Early shamans from this region crossed the Bering Strait during the ice ages and began their migrations into North, Central, and South America. Thus, it's understandable that shamanic insights about the power of water are so similar in such diverse regions of the world.

Tuvans believe that every lake or river has its own spirit keeper or guardian who protects that place and is in charge of the animals and plants living there. They believe that if drawn into alliance through proper respect, these guardian spirits have the ability to protect people living nearby or those who happen to be traveling through the area. The Tuvans believe that guardian spirits of the waters are able to understand the languages of humans and that by speaking or singing directly to them, one can obtain their protection and goodwill.

Like most shamanic peoples, they understand that guardian spirits must be complimented and honored if they're to become good human allies. They erect a small hut (*ovaa*) made of stones and branches on the riverbank near fords in order to house their offerings to the guardian spirits there. (This is similar to the Huichols' temples that contain sacred objects at pilgrimage sites.) Inside, they place sacred stones, crafts, textiles, and blessed objects as forms of sacrifice. This is often carried out prior to attempting to cross the river in order to ensure the safe passage of all the travelers.

The subjects of the Tuvans' songs are usually the elements of nature: the wind in the grasses, ripples on a body of water, rain-laden clouds, and so on. On one occasion, I witnessed traveling throat singers, singing to reproduce the spirit of rain clouds on the distant horizon. They told me that the idea was to make a connection with that element and communicate with it via deep-throated sounds. Thus, like the Shipibo and the Huichols, the Tuvans connect with the spirits of water through their singing practice. By bonding deeply and forming resonance with the water, they honor it and receive its gifts.

The Tuvans hold springs to be especially sacred and consider the trees and plants that grow there to be guarded by the spirit keeper of the spring. Particularly unusual trees growing in these places—ones with double trunks, gnarled survivors of harsh weather, and those clearly struck by lightning—are called “shaman trees” and are given special honor. Under them, the Tuvans perform their ceremonies honoring the springs and asking for their protection and healing gifts. Around such springs, especially medicinal ones, hunting is forbidden in order to keep from offending the guardian of that place, whose protection is extended to the animals there.

Like shamans in many parts of the world, Mongolian shamans practice the shamanic journey, inducing trance states with the use of skin drums. They train for these experiences by stimulating the imagination until it becomes a powerful and useful tool to travel with. Often the trance journey begins at the sacred spring, the entrance point for the three worlds of the spirit realm. As the drumming begins, the shaman imagines himself entering the water of the spring, meeting with the guardian spirit there and communicating his intention or destination. The guardian of the waters then accompanies the shaman on an extensive and sometimes perilous path through underground waterways to a distant landscape where knowledge may be found or power garnered in order to perform healing or a task.

Through the use of this technique, the shaman may meet other powerful spirits, do battle with them, retrieve lost souls, or see into the future. The return journey is typically back through the waterways and out of the spring again. Other shamans may use cave entrances or shaman trees as points of entry into the spirit realm, but entering water is a particularly effective method.

Guided by a woman trained in Tuvan shamanism, I was able to journey via a spring and the underground waterways to discover the answer to an important question about my health. The guardian of the waters I encountered was a beautiful, tall woman who directed me to the shore of a river, where I was led to a small cave and given guidance about my condition. After offering thanks, I returned to the shore, plunged into the river, and went back through the rapidly flowing channels of underground water to the spring where I began the journey. As a result, my health was restored. Tuvan shamans align themselves with, and draw their power from, particular spirits and become specialists in those elements. Some are more connected with mountains while others are focused on the spirit of water, either in the form of small springs or large bodies such as broad rivers and big lakes. Interestingly, given my own experience, the spirit of water among the Tuvans is typically feminine, and therefore appears to the shamans who work with her as a tall woman with long arms. Sometimes the spirit also appears in the form of a large snake, similar to Roni, the anaconda spirit of the Shipibo.

One of the jobs of the Tuvan shaman is to see that bodies of water are protected from pollution by people. Casting waste or garbage into water is seen as disrespectful and may arouse the ire of the water guardian of that place. For the Tuvans, as with the Shipibo, the spirits of water can be helpful and protective or may be dangerous if not handled properly. Healing often has to do with maladies and illnesses that have come from being careless around sacred bodies of water. On the other hand, the guardian spirit of water can be called upon to free someone of illness, depression, or bad luck. Tuvan shamans understand that these cures may not last forever, so repeat ceremonies may be needed every year or two to continue benefiting from the help of the spirit. In this way, the water spirits are continually honored, and the tradition is perpetuated. Likewise, the shamans understand that their work with spirit through ceremony is a necessary and ongoing practice in order to keep the world in balance.



In this short article, I've touched on the deepest understandings of three different cultures regarding the properties of water. Although remote from

one another geographically, all three cultures have remarkably similar beliefs about the nature of water. The Shipibo, the Huichols, and the Tuvans all:

- See water as the giver of life
- Hold water to be sacred
- View water as alive and guided by spirits
- Understand water to be a vehicle or medium of transport for other energies
- Sing to water to make a deep connection and resonance with her
- Use water to heal, purify, and cleanse in ceremony
- Form an alliance with water for assistance and power
- Make offerings of sacred objects to honor water
- Recognize that disrespect toward water can cause negative consequences
- Acknowledge that water has a deep structure that reflects the patterns in nature

If we were to expand our study to include thousands of other shamanically based tribes in the world, we would discover similar if not identical beliefs.



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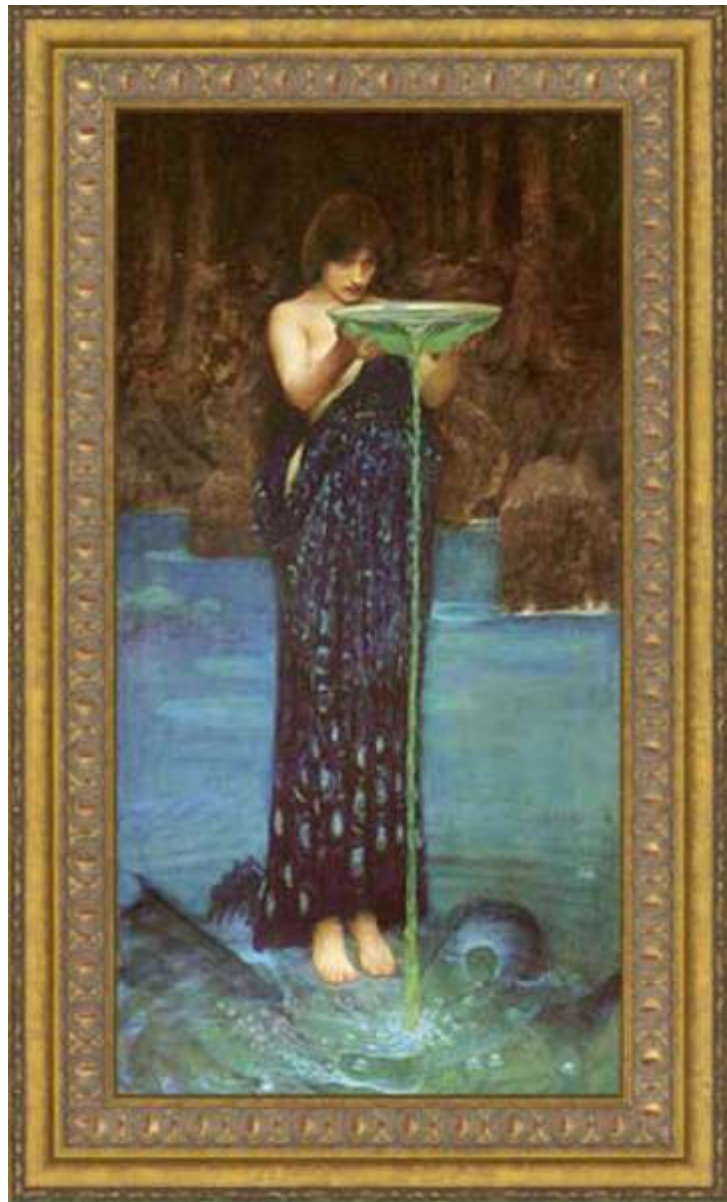
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CHAPTER 15

WATER LORE AND RITUAL IN WORLD MYTHOLOGY

by Terri Windling

Water comes up from the ground, water comes down from the sky. Water comes into our bodies, water comes out of our bodies. All life is communicated through water. Nature talks to itself through the medium of water. We are born in water. We are of water.”¹

— TOM BLUE WOLF

From my Devon village in the west of England, it’s a short distance through winding green lanes to the once-independent kingdom of Cornwall—a land of mysterious standing stones, crumbling Celtic ruins, and ancient stories. On a bright, clear day near the summer solstice, a friend and I made a sacred pilgrimage to the Cornish countryside. We went seeking an ancient magic that lies beneath the surface of the rolling hills: water magic, pooled in half-forgotten holy wells and springs . . . found in myths and legends not only in the British Isles, but all around the world.

A mile or so past the village of Callington, we parked at the edge of a farmyard and followed an overgrown footpath to Dupath Well. Like many of the holy wells of Cornwall, the spring that runs through Dupath Well is believed to have been a sacred site to Celtic peoples in the distant past, its older use now overlaid with a gloss of Christian legend. At one time, this spring may have been surrounded by a grove of oak, rowan, and thorn—trees sacred to the druids and practitioners of other animist religions.

In 1510, a group of Christian monks claimed the Dupath site for their own use, enclosing the spring in a small well house made out of rough-hewn granite. This was the common fate of many pagan sacred sites in the

British Isles. Unable to dissuade the local people from visiting their holy places, Christian missionaries simply took them over—building churches where standing stones once stood; erecting baptisteries over sacred springs; and cutting down groves of oak, rowan, and thorn in a new god’s name. One can still find numerous holy wells buried all over the British countryside, many of them now named for saints and associated with their miraculous lives. But scratch the surface of these legends and older stories emerge like a palimpsest—stories of fairy creatures, the knights of Arthur, and the old gods of the land.

Inside the tiny chapel-like building erected over Dupath Well, the holy water pools in a shallow trough carved from a single granite slab. The air feels thick, heavy with shadows, with silence, with the ghosts of men and women drawn to this spot over hundreds of years. The stones are worn where these people once knelt and prayed to the Virgin Mary, or to the Goddess of the Sacred Springs. At the bottom of the trough lie a few copper coins—the modern custom of making wishes being not so very different from the pagan practice of throwing pins into a well to ask for blessings. I watch as my companion places an offering of wildflowers by the water—an equally ancient practice recalling a time when it was the land itself our ancestors worshiped, prayed to, and thanked for the gift of life.



ANCIENT WATER MYTHS AND RITUALS

Today, with clean water piped directly into our homes and largely taken for granted, it takes a leap of imagination to consider the greater importance of water to those who fetched it daily from the riverside or village well. Deeply dependent on the local water source for their crops and animals, our ancestors had a natural reverence for those places where good, pure water emerged like magic from the depths of the earth. As a result, water has played a role in myth, folklore, and sacred rites in cultures all around the globe, particularly in arid lands where the gift of water is most precious.

CREATION MYTHS

According to a Blackfoot creation myth, in the beginning there was a great womb containing all of the animals, including Old Man. One day the womb burst, and all creation was underwater. Old Man and the animals emerged floating on a large raft. Old Man suggested that Beaver dive down and try to bring up some mud. Beaver was gone a very long time, but still he couldn't reach the bottom of the water. Loon tried, Otter tried, but the water was just too deep for them. Finally little Muskrat tried. He was gone so long that he was nearly dead when they pulled him onto the raft again, yet he clutched a precious bit of mud in one of his little claws. From this mud, Old Man formed the land that emerged from that great ocean of water, and then he created all of the peoples, trees, and plant life upon it.



“Hylas and Water Nymphs” by John William Waterhouse

We find variations of this “diver motif” myth not only throughout North America but also in cultures around the world, including Buriat cosmology, Finnish folktales, and the Hindu *Paranas*.

WATER GOODDESSES AND NATURAL SPIRITS

Many cultures associate water with women—with the Great Goddess, or several goddesses, or a variety of female nature spirits. The !Kung of Botswana, for example, attribute the mythic origin of water to women and therefore grant all women special power over water in all its forms. All-mother, in an Aboriginal myth from northern Australia, arrived from the sea in the form of a rainbow serpent with children (the Ancestors) inside her. She made water for the Ancestors by urinating on the land, creating lakes, rivers, and water holes to quench their thirst.

The “living water” (running water) of springs and natural fountains is particularly associated in ancient mythological systems with women, fertility, and childbirth. Greek wells and fountains were sacred to various goddesses and had miraculous powers, such as the fountain at Kanathos, in which Hera regained her virginity each year. Greek springs were said to be the haunts of water nymphs, elemental spirits shaped like lovely young

girls. (The original meaning of the Greek word for *spring* was “nubile maiden.”)

In Teutonic myth, the wild wood-wife (a kind of forest fairy) who loves the hero Wolddietrich is transformed into a human girl when she’s baptized in a sacred fountain.

The Norse god Odin seeks wisdom and cunning from the fountain of the nature spirit Mimir. He sacrifices one of his eyes in exchange for a few precious sips of the water.

In Celtic legend, the salmon of knowledge swims in a sacred spring or pool under the shade of a hazel tree; the falling hazelnuts contain all the wisdom of the world and are swallowed by the fish.

RITUAL WASHING

Ritual washing in water or immersion in a pool has been part of various religious systems since the dawn of time. The priests of ancient Egypt washed themselves in water twice each day and twice each night. In Siberia, ritual washing of the body—accompanied by certain chants and prayers—was a part of shamanic practice. In Hinduism, *ghats* are traditional sites for public ritual bathing, an act by which one achieves both physical and spiritual purification [see Chapter 19]. In a strict Jewish household, hands must be washed before saying prayers and before any meal, including bread. In Islam, mosques provide water for the faithful to wash before each of the five daily prayers. In the Christian tradition, baptism is described by Saint Paul as “a ritual death and rebirth which simulates the death and resurrection of Christ.” [See Chapter 11.]

FLOOD MYTHOLOGY

In numerous stories, Earth itself is reborn after catastrophic floods. In Greek legend, Zeus sends a flood in which all perish except Deucalion and his wife, who manage to survive by floating in a chest for nine days and nights. Landing on Mount Parnassus, they wisely make a prompt sacrifice

to Zeus. The god instructs the obedient couple to throw handfuls of stones over their heads. These turn into a new, better race of men and women, who repopulate the planet.

In Welsh myth, the lake of Llŷon overflows and drowns the British Isles. One couple escapes in a mastless boat filled with animals like Noah's Ark and lands on dry land at last in Prydain, or modern Wales.

In Persian tales, the world is filled with wicked creatures ruled by the demon Ahriman. An angel, Tistar, comes to Earth three times as a man, a horse, and a bull. Each time he brings ten days and nights of heavy rain, flooding the globe. After several pitched battles with Ahriman, Tistar prevails and the demons are driven from the world; but their poison, flushed from the land, causes the oceans to turn to salt.

In Norse myth, the blood of the ice giant Ymir, who's slain by Odin, causes a massive flood, wiping out most of the ice-giant race. Ymir's body becomes the earth, and his salty blood forms the oceans upon it, creating the world that humankind has inhabited ever since.

India, Africa, Russia, and Tibet—all have ancient tales of monumental floods, after which the blessed (or just plain lucky) members of the human race start anew.

REGENERATION THROUGH WATER

The idea of regeneration through water is echoed in tales around the world about fountains and springs with miraculous powers. The native peoples of Puerto Rico, Cuba, and Hispaniola all told tales of a magical Fountain of Youth located somewhere in the lands to the north. So pervasive were these stories that in the 16th century, the Spanish conquistador Ponce de León actually set out to find it once and for all, equipping three ships at his own expense. He found Florida instead.

One Native American story recounts how the Fountain of Youth is created by two hawks in the netherworld between Heaven and Earth. But this fountain brings grief, as those who drink of it outlive their children and friends, and eventually it's destroyed.

In Japanese legends, the white and yellow leaves of the wild chrysanthemum confer blessings from Kiku- Jido, the chrysanthemum boy who dwells by the Fountain of Youth. These leaves are ceremonially dipped in *sake* to assure good health and long life.



“A mermaid” by John William Waterhouse

In the Alexander romances, Alexander sets off to find the fabled Fountain of Life in the Land of Darkness beyond the setting sun. The prophet Khizr is his guide, but the two take separate forks in the road and it’s Khizr, not his master, who finds the fountain, drinks the water, and obtains knowledge of god. Khizr is still venerated in modern India in both Hindu and Muslim traditions. In Muslim practice, he’s honored by lighting lamps and setting them on little boats afloat on rivers and ponds.

To the Celtic people of the British Isles, certain waters were deemed to have healing properties and thus were under divine protection. The famous hot spring at Bath (Aquae Sulis) was dedicated to the goddess Sulis, who was linked from Roman times with one of the Romans’ own goddesses to become Sulis Minerva. The Romans built a temple on the site, and a magnificent public bathhouse that still stands today [see Chapter 18].

Chalice Well in Glastonbury is reputed to be among the oldest of the continually used holy wells in Europe; archaeological evidence suggests it

has been a sacred site for at least 2,000 years [see Chapter 17].

WATER RITES

The standing stones and circles of Britain are generally found near wells or running water, attesting to the importance of water in pagan religious rites. With the spread of Christianity, a concerted effort was made to stamp out the older animist religions, which attributed divinity to nature. In the 5th century, a canon issued by the Second Council of Arles stated unconditionally that if, in the territory of a bishop, “infidels” lit torches or venerated trees, fountains, or stones, and the bishop neglected to abolish this usage, he was guilty of sacrilege.

Despite the destruction of ancient holy sites, pagan beliefs proved harder to eradicate. By the 7th century, Pope Gregory decided on a new approach and instructed Saint Augustine to convert sacred sites to Christian use. Pagan wells became holy wells, and churches were built upon them or beside them—yet the old ways must have persisted, for in the 10th, 11th, and 12th centuries, a stream of edicts was issued denouncing the worship of “the sun or the moon, fire or flood, wells or stones or any kind of forest tree.”

Over time, however, pagan and Christian practices slowly blended together. Wells named after Christian saints were celebrated with festivals and rites on old pagan holy days in ways that wouldn’t have been unfamiliar to “heathen” people. On the Isle of Man, for instance, holy wells are still frequented on August 1, a festival called *Lugnasad* (a day once sacred to the Celtic god Lugh). August 1 is *Lammas* in the Christian calendar, but the older name for the holiday was still in use on the Isle of Man until the 19th century. In Scotland, the well at Loch Maree is dedicated to Saint Malrubha; but its annual rites, involving the sacrifice of a bull, an offering of milk poured on the ground, and coins driven into the bark of a tree, are clearly more pagan in nature.



SACRED WELLS

The custom of “well dressing” is another Christian rite with pagan origins. During these ceremonies (still practiced in Derbyshire and other parts of England), village wells are decorated with pictures made of flowers, leaves, seeds, feathers, and other natural objects. In centuries past, the wells were “dressed” to thank the patron spirit of the well and request good water for the year to come; now the ceremonies generally take place on Ascension Day, and the pictures created to dress the wells are biblical in nature.

As Christian tales were attached to the springs and wells, they became as colorful as any to be found in pagan folklore. Wells were said to have sprung up where saints were beheaded or had fought off dragons, or where the Virgin Mary appeared and left small footprints pressed into the stone. Wells dedicated to Saint Anne were called “granny wells” (because, as the mother of the Virgin Mary, she was the grandmother of Christ), and particular powers concerning fertility and childbirth were attributed to them.

Up until the 19th century, the holy wells of Britain and Europe were still considered to have miraculous properties and were frequently visited by those seeking cures for disease, physical deformity, or mental illness. Other wells were famous for offering prophetic information—generally determined through the movements of the water, leaves floating upon the

surface, or fish (or eels) swimming in the depths. At some wells, the water was drunk from circular cups carved out of animal bone, an echo of the cups carved out of human skulls by the ancient Celts. Pins (usually bent), coins, or bits of metal were common offerings. Rags tied to trees around the holy well were another tradition dating back to pagan times. The cloth was symbolic of ill health or misfortune left behind as one departed.

Some wells, known as “cursing wells,” were rather less beneficent. Curses were made by dropping special cursing stones into the well, or the victim’s name written on a piece of paper or a wax effigy. At the famous cursing well of Ffynnon Elian, in Wales, one could arrange for a curse by paying the well’s guardian a fee to perform an elaborate cursing ritual. A curse could also be removed at this same place for a somewhat larger fee.

In the mid-19th century, Thomas Quiller Couch became interested in the history of sacred wells in Britain; he spent much of his life wandering the wilds of his native Cornwall, seeking them out. Extensive notes on this project were discovered among his papers after his death; and in 1884 *The Ancient and Holy Wells of Cornwall* was published by his daughters, the Misses M. and L. Quiller Couch.

More recently, folklorist and photographer Paul Broadhurst revisited the sites documented by Quiller Couch; and in 1988 he published *Secret Shrines: In Search of the Old Holy Wells of Cornwall*, an informative guide to the many sacred wells still to be found in the Cornish countryside.² In addition to holy sites dedicated to Celtic goddesses and Christian saints, Broadhurst discovered crumbling old wells half-buried in ivy, bracken, and briars inhabited by spirits somewhat less exalted: the piskies (fairies) of Cornish folklore. Wells under the protection of the piskies are not to be trifled with, for they’ll take their revenge on any who dare to disturb their homes. A farmer once decided to move the stone basin at Saint Nun’s Well (also known as Piskey’s Well), with the intention of using it as a water trough for his pigs. He chained it to two oxen and pulled it the top of a steep hill, whereupon it broke free of the chains, rolled downhill, made a sharp turn right, and settled back into its place. One of the oxen died on the spot, and the farmer was struck lame. This rather enchanted-looking well can still be found in the beautiful part of Cornwall between Liskeard and Looe.

WATER FAIRIES

All running water, not just spring water, can prove to be the haunt of fairies, for crossing over (or through) running water is one of the ways to enter their realm. Here in Devon and Cornwall, one still finds country folk who avoid running water by dusk or dark, for the spirits who inhabit water can be troublesome, even deadly. The water spirit of the River Dart, for instance, is believed to demand sacrificial drownings, leading to the well-known local rhyme: “Dart, Dart, cruel Dart, every year she claims a heart.”

The water wraith of Scotland—thin, ragged, and invariably dressed in green—haunts riversides by night to lead travelers to a watery death. In the border country between Scotland and England, the Washer by the Ford wails as she washes the grave clothes of those who are about to die. This frightening apparition is similar to the dreaded *Bean-Sidhe* (Banshee) of Irish legends. The *Bean-nighe* is a similar creature found in both Highland and Irish lore, a dangerous little fairy with ragged green clothes and webbed red feet. (Yet if one can get between the *Bean-nighe* and her water source, she’s obliged to grant three wishes and refrain from doing harm.)

Jenny Greenteeth specializes in dragging children down in stagnant pools. The Welsh water leaper (*Llamhigyn Y Dwr*) is a toadlike creature who delights in tangling fishing lines and devouring any sheep who fall into the river. The *fideal* is a fairy who haunts lonely pools and hides herself in the grasses by the water; the *glai stig*, half woman and half goat, tends to lurk in the dark of caves behind waterfalls. The *loireag* of the Hebrides is a gentler breed of water fairy, although as a connoisseur of music even she can prove dangerous to those who dare to sing out of tune.

In Ireland, a fairy woman known as the Lady of the Lake bestows blessings and good weather to those who seek her favor; in some towns she’s still celebrated (or propitiated) at midsummer festivals. Her name recalls the Welsh Lady of the Lake who gave King Arthur his sword and now guards his body as he sleeps in Avalon.

Brittany, on the west coast of France, also claims to be the home of the Lady of the Lake. The Château de Comper, where she’s said to have lived and raised Sir Lancelot, still stands near the old Forest of Paimpont (called *Broceliande* in Arthurian lore), a magnificent manor house of golden stone, crumbling romantically at the edges. Nearby is a lake whose origin is

attributed to Morgan Le Fay, located in the mysterious Val sans Retour (Valley of No Return).

Chalice Well in Glastonbury is one of several sites where the Holy Grail is reputed to be hidden. At the foot of ancient Glastonbury Tor is a lovely garden where one can drink the red-tinged water of the well—colored, according to legend, by the blood of Christ carried in the Grail [see Chapters 8 and 17].

Although the well's association with Arthur may be, as some Arthurian scholars suggest, a legend of recent vintage, archaeological excavations in the 1960s established the site's antiquity—and the place manages to retain a tranquil, mystical atmosphere despite its transformation from sacred site to tourist attraction. One often finds small offerings in the circle around the well's heavy lid: flowers, feathers, stones, small bits of cloth tied to a nearby tree . . . remnants of ancient pagan practice carried down through the centuries.

THE ROLE OF WATER TODAY

In modern times, we generally view such practices as quaintly (or foolishly) superstitious; we dismiss our early ancestors as ignorant savages who worshipped natural phenomena because they lacked the rationality of science. Yet a look at the animist religions that still thrive in many cultures around the globe indicates that this may be a simplistic view of nature-based religions [see Chapter 14]. Rather than focusing on the hocus-pocus of the supernatural (as they're often portrayed), such religions are rooted in the natural world, celebrating and regulating the relationships between humankind, other species, and the land that sustains us all.

In America, animism runs through the indigenous religions of the land. Various springs, wells, and pools are sacred to Native American tribal groups; and in such holy places one finds offerings similar to those by Chalice Well: feathers, flowers, stones, sage, tobacco, small carved animal forms, scraps of red cloth tied to trees, and other tokens of prayer. The Native American sweat-lodge ceremony uses water sprinkled over red-hot rocks to create the steam that's called the "breath of life." The lodge itself is

the womb of Mother Earth, in which one is washed clean, purified, and spiritually reborn. In Native American church ceremonies, a pail of “Morning Water” is traditionally carried and prayed over by a woman before being sent sunwise around the circle to be shared by all. Water is sacred through its absence in the four-day Sundance ceremony, or the ritual of Crying for a Vision. After four days without water (or food), the first drop on the tongue is a potent reminder to be thankful for this precious gift from Mother Earth.

Tom Blue Wolf of the Eastern Lower Muscogee Creek Nation speaks of the central importance of water, particularly at a time when water tables worldwide are diminishing at alarming rates:

Once upon a time, the Chattahoochee River was known to the people here as the source of life. Every morning we would go to the water and fill ourselves with gratitude, and thank the Creator for giving us this source of life. We would honor it throughout the day. At that time, water was known as the Long Man. It came from a place that has no beginning, and went to a place that had no end. But now, for the first time in the history of our people, we can see the end of water.³

Mythologist Michael Meade takes note of the ancient symbolism of water, and its vital role in our lives today:

Of the elements—which some people count as four, and others count as five—water is the element for reconciliation. Water is the element of flow. When water goes missing, flow goes missing. The ancient Irish used to say that there were two suns in the world. One you see rise in the morning. The other is very deep in the Earth, and it’s called the black sun or inner sun. It’s a hot fire in there; no one knows how hot. The Earth is roughly 70 percent water because of that hidden sun inside. When the water goes down, the Earth heats up too much—part of the global warming that’s happening everywhere. It happens inside people also, because people are like the Earth. People are 70 percent water, like the Earth, and people have a hidden sun—or else we wouldn’t be 96° when it’s 40° outside. Everyone in the world is burning, and the water in the body keeps that burning from becoming a fever. What happens literally also happens emotionally and spiritually, so when people forget how to carry water and how to use water to reconcile, you get an increasing amount of heated conflict, as we’re seeing around the world today. . . . In many cultures it’s the elders who carry the water, because elders are the peace-bringers. When a culture can’t remember or imagine peace on its streets or how to negotiate peace, it means its elders have forgotten what to do, how to carry water.⁴

The following evocative words come from a film about Chief Seattle, depicting the forced transfer of Suquamish lands to the U.S. government in 1855:

The shining water that moves in the streams and rivers is not just water, but the blood of our ancestors. If we sell you our land, you must remember that it is sacred. Each ghostly reflection in the clear water of the lakes tells of events and memories in the life of my people. The water's murmur is the voice of my father's father. The rivers are our brothers. They quench our thirst. They carry our canoes and feed our children. So you must give to the rivers the kindness you would give any brother . . . This we know: the Earth does not belong to man, man belongs to the Earth.⁵

I'm reminded here, at Dupath Well, that I, too, have distant ancestors who didn't consider themselves greater than the land on which they lived; didn't take good, pure water for granted; and who knew humans belonged to the earth.

An old English folklorist told me once that nature spirits would live in a well, a spring, a lake, or a grove of trees only as long as they were remembered and addressed respectfully. If the spirits were neglected, they'd leave the place; the land would feel soulless and dead henceforth. Remembering this, I dropped a pin into the brown water of Dupath Well. The well house stands near a farmyard. I could hear the traffic of the roads nearby, and yet somehow the spot still seemed timeless, magical—and very much alive. I cupped my hands, drank from the well, and whispered, “Thank you,” as I left. I couldn't even tell you now who exactly I was addressing—a nature spirit, a well fairy, a Celtic goddess, or the earth itself. And yet, in that ancient place, I swear that someone was listening.



NOTES

¹. Tom Blue Wolf and Michael Meade, “The Big Story: The Return of Sophia” lecture, the second Mythic Journeys conference, Atlanta, Georgia, June 2006; www.mythicjourneys.org.

². Paul Broadhurst, *Secret Shrines: In Search of the Old Holy Wells of Cornwall*, Mythos Publishers, 1988.

³. Tom Blue Wolf, *op. cit.*

⁴. Michael Meade, *ibid.*

5. The speech has been erroneously attributed to Chief Seattle himself. More information on the subject can be found at www.kyphilom.com/www/seattle.html.

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CHAPTER 16

LOURDES AND OTHER HEALING WELLS AND SPRINGS ASSOCIATED WITH GODDESSES AND FEMALE SAINTS

by Doreen Virtue, Ph.D.

Of the four earthly elements, water and earth have long been considered feminine, while air and fire are regarded as masculine elements. Women, as childbearers, are associated with the life-giving flow of rivers, streams, springs, and wells. Cross-culturally, water is a symbol of fertility and prosperity. So it's logical that our ancestors built water-based shrines in honor of divine feminine goddesses and female saints.

Archaeologists have discovered water wells with spiritual and religious themes dating back to the late Bronze Age, which are reputed to have healing properties. The root word for *well* is *wella*, *wielle*, or *waella*, which in Old English means "natural spring" or "moving water." So a healing well could be a thermal spring, or the head of a river or stream. Rivers named for healing goddesses are abundant throughout Europe, including the Danube, which was named for the Celtic Mother Goddess Danu; and the Seine, named for the Gallo-Roman healing goddess Sequana.

Healing wells and springs are found worldwide, but are particularly abundant in Europe. Ireland reportedly has more than 3,000 healing wells. Many of these are dedicated to Brigit, a healing goddess who was later adopted and canonized by the Catholic church.

The most famous healing spring is undoubtedly Lourdes in southern France, dedicated to Mother Mary. Scientists have verified 66 healings at Lourdes, and an estimated 50 unverified healings per month are reported.

Another famous healing spring is in Bath, England. This 10,000-year-old shrine was originally erected in honor of the Roman goddess Minerva, and later became dedicated to the Celtic water goddess Sulis [see Chapter 18].

Many healing wells were created during pre-Christian eras. They were dedicated to Hindu, Roman, Celtic, Egyptian, Mayan, and other goddesses (and occasional gods) to appease and appeal for favors, healings, divination, and protection. During the Crusades, many European wells were rededicated to saints. Roman and Celtic wells dedicated to the goddess Coventina were converted into “wishing wells.” The previous Roman practice of throwing sacrificial animals into the well to win Coventina’s favor was replaced with tossing in coins or floating votive candles to elicit good luck.



Specific wells and their associated goddesses and saints gained reputations as having healing specialties. Many of these locations were attributed with miraculous abilities to heal eyesight, which some believe had to do with the vitamin and mineral content of spring water. Others were reputed to restore fertility, heal toothaches, skin diseases, and other illnesses and injuries.

I've personally visited several healing wells dedicated to goddesses and saints. Each time, I've noticed intense feelings of positive energy near these waters. Going to the well (known as a "grotto") at Lourdes was a particularly powerful experience for me. Standing near the water felt as intense as being in a room filled with magnets drawing impurities out of my body, mind, and emotions. I witnessed people wheeled on gurneys and saw their beaming smiles as their nurses bathed them in the sacred waters. I brought home some Lourdes water and gave bottles to friends, one of whom reported the immediate healing of an injury after she'd splashed the water on it.

Studies on the properties, effects, and electrical fields of Lourdes and other healing wells have been conducted by scientists. Dr. Enzo Ciccolo, a biologist at the University of Milan, collected water from wells where Mother Mary apparitions had been sighted, including Lourdes, Medjugorje in Croatia, Fatima in Portugal, and Montichiari and San Damiano in Italy.

Dr. Ciccolo placed small quantities of these Marian waters (named for Mother Mary) into normal tap water. The tap water's pH, conductivity, and redox potential were immediately modified by the addition of the Marian water. Researcher A. Ansaloni also found that tap water's pH level reduced with the addition of one part Lourdes water to 400,000 parts tap water. In addition, Ansaloni discovered that Lourdes water slowed the decay of chlorine in water, no matter how small of a sample of Lourdes water was added to the chlorinated water.

Dr. Ciccolo noted that after people bathed in Lourdes water, it became cloudy, as if the bather had detoxified into it. A study of the residue in the water revealed that the pathogens were neutralized:

A photoelectronic spectroscopy revealed that all frequencies of light were present in that sample of water, a phenomenon which usually never occurs in water. In fact, it was precisely this perfect, extraordinary and powerful set of frequencies which prevented the pathogenic germs from reacting and becoming harmful.¹

Other scientists have measured Lourdes water using a Bovis scale, which detects life-force energy. Using the earth's energy as a baseline, a substance with fewer than 6,500 Bovis energy units is considered to have a negative or life-detracting charge. Between 6,500 and 8,000 units is thought to be

neutral; and 8,000 and above is positive or life affirming. Lourdes water has been measured at 500,000 Bovis energy units.

Interestingly, the particles of negative substances spin clockwise, while positively charged particles spin counter-clockwise. Goddess traditions teach that feminine energy spins to the left or counterclockwise.

Dr. Ciccolo also experimented with water from Medjugorje, Croatia, another healing shrine devoted to Mother Mary, adding small quantities of its water to solutions of sodium chloride, albumin, and cupric chloride and comparing these mixtures to control samples. The Medjugorje samples crystallized into more finely divided filamentary patterns than the control solutions. Dr. Ciccolo noted that the crystallized patterns resembled those that had been observed in samples treated by healers' bioenergy and by magnetic fields.

In other words, water from healing wells associated with Mother Mary is structurally different from other water. Marian water stores the heartfelt prayers and the loving energy associated with Mother Mary and the angels. The studies show that this energy is transferable to ordinary water.

The ancient practice of seeking health through water while invoking the loving help of a goddess or saint remains a popular practice. Between five and six million people visit Lourdes annually. Thousands drink from or swim in the River Ganga, which Hindus regard as the embodiment of Ganga Ma, Saravati, Lakshmi, and other healing goddesses [see Chapter 19]. The ancient Hindu *Vedas* prescribe running water as the means of carrying away physical pollution to attain health.

The universality of visiting healing wells associated with goddesses and saints shows that it's more than a religious practice. The magnetic appeal of healing wells seems to be deeply ingrained. Perhaps it's a human instinct to seek our Divine Mother when we need comfort and healing.



NOTES

1. Enzo Ciccolo, "Domenica del Corriere," Cooperative Nuova, Milan, Feb. 18, 1988.

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CHAPTER 17

CHALICE WELL, GLASTONBURY

by William Bloom, Ph.D.

The English landscape is known for its rolling and soft beauty and for its unexpected and spectacular vistas. You may turn a corner or reach a peak and suddenly, unfolding far into the distance, is a long and intriguing view. One of the greatest of these vistas can be found when you travel south from Bristol and Bath in the west of England. As you pass over the top of the Mendip Hills, before you stretches the large plain of the Mid-Somerset Levels. This is a flat landscape some 15 miles across, which at several points in its history has been covered in water—and may be again. At the center of this flatland is an island whose most prominent feature is a dramatic 500-foot hill with a tower upon its summit. This is Glastonbury.

Also known as the Isle of Avalon, it's one of the most sacred landscapes in Europe. It's the burial place of King Arthur and Queen Guinevere, and the Holy Grail is said to be hidden here. It was a major center of Druidic and pre-Christian spirituality. In the shape of the isle can be found the form of a great goddess, while a vast zodiac can be seen in the landscape surrounding it, carved into the contours of the land. It's the site of the earliest of Christian churches founded, so the legend goes, by Jesus' uncle, Joseph of Arimathea. This small church evolved to become the greatest abbey in all Christendom. The Isle of Avalon, also called the Isle of Glass, was also said to be the capital city of the fairie realm, a great claim for a country known as Angel-Land or England.

The island of Glastonbury is made up of several hills. Three of them are well known: Wearyall Hill, Chalice Hill, and the Tor. Each of these has a very different shape and atmosphere. Wearyall is long and slim, like a fish, and is known as a place that's good for peace and reflection. Chalice Hill is

soft and round, shaped like a breast or pregnant womb, and holds an atmosphere of healing. The Tor is masculine and dramatic, accentuated by its tower; and its energy is powerful and dynamic. People often comment on how these three hills and their characters reflect the trinity found in many spiritual traditions.

The small town of Glastonbury itself sprawls on the island overlit by these hills, its inhabitants divided into those who honor the spirituality of the landscape—I'm one of them, and lucky enough to live on the side of Wearyall Hill—and those who live there as if it were any other small country town.

One of Glastonbury's most intriguing features is to be found in the valley between Chalice Hill and the Tor, down which runs a small road. Near the bottom of this road, on the right side toward Chalice Hill, there's a lovingly tended public garden, the main feature of which is the Chalice Well, previously known as Blood Spring. On the other side of the road, in a nondescript building, is the White Spring.

The waters for each of these two springs have unique sources, and their chemical content is completely different. I've lived in Glastonbury for 30 years and am fascinated by the polarity and paradox of these two wells. Their contrast is so great that many people who visit Chalice Well Gardens—for nurture, inspiration, and meditation—may not even know that the White Spring exists at all.

The water of Chalice Well, Blood Spring, is good for the health. It has an iron content similar to that of human blood, and the flow runs strong and consistently even in periods of drought. As the water surfaces out of the earth, the way in which it's contained and then channeled has been lovingly constructed by human intervention over many centuries. The actual source of the water, the well itself, is capped by a large lid, on which is the ancient symbol of two interlinking circles, the *vesica piscis*. The water then runs through a lion's head, down through some shallow baths for healing, through a Steiner-inspired flow form and into a large pool, again in the shape of the *vesica piscis*. The surrounding gardens are tended by men and women sensitive to the elements of nature, the Green Man, Pan, and the Goddess, as well as to the fairies, nature spirits, and landscape energies.



Chalice Well

The White Spring, however, has a certain chaos surrounding it; and the human involvement often seems harsh, in my opinion. This may, of course, be totally appropriate—a perfect balance.

Many people have a simple relationship with Chalice Well. They just love it and are grateful for its peace. They quench their thirst and enjoy the atmosphere of the flowing water and the garden's nature spirits. My relationship with the well is more complex. The whole landscape of Glastonbury is filled with symbolism and meaning. For many of its citizens, it's like living inside a pack of tarot cards, each aspect of its landscape filled with metaphor and significance. What then is the role of Chalice Well? How intriguing that it flows with blood between the polarities of Chalice Hill and the Tor. Is this the blood of Christ from the hidden grail? From the Goddess?

The water comes from a deep, powerful, consistent source. Sometimes I imagine this to be the heart of a great dragon miles below in the earth. But why does the creature release some of its blood here? What's the connection? It's interesting to sit in the garden and contemplate the origins of the flow, deep in the earth. Water is alive—not just in its molecular and subatomic structure, but also in the forms it takes. Rivers, lakes, seas, oceans, wells, and springs are all beings in their own right. Who is this

being who surfaces at Chalice Well? Of course, this type of question is well asked of any body of water, but first the enquirer must pause and form a relationship with the water.

I often wonder what Blood Spring looked like before any human being had begun to organize it. Its geology isn't rocky or hard. I imagine there was mud and bubbling. It would have spread into the surrounding grassland, and then perhaps channeled away in several directions—uncontrolled, free, and natural.

To the human eye, concerned with a civilized aesthetic sensibility, the messiness of mud and an endless oozing and spreading may seem unattractive compared to the form of a well-tended garden. But it's good for people to play with mud and experience the primal sensations of life. There's no tended garden in a mother's womb, but the environment is luscious and perfect. So sometimes a primal part of me feels a haunted loss when I encounter the neatness and containment of the well and its gardens. But I also recognize the practical need for easier access to the water. I understand why Blood Spring transformed into Chalice Well; and in general, I appreciate the beauty of gardens created by humanity in rapport with nature.

There is, however, another issue for me. It has to do with spirits. I wonder, when the Blood Spring waters were first contained and channeled, whether people offered prayers and ceremonies to ask permission of the spirits of the water and of the land. I wonder whether the great creature who's the whole form and being of this powerful source was ever courted. At every successive stage of the well's construction down the centuries, did the builders have the sensitivity and courtesy to continue these ceremonies and communications of permission and gratitude?

When I first encountered Chalice Well many years ago, ceremonies weren't happening; and the first Warden of the Well, whom I knew, wasn't a happy man. The atmosphere of the gardens was strained. Over recent decades, however, the culture of the custodianship has transformed into one that's attuned to and respectful of the nature spirits, the earth energies, and the life of the water itself. Instinctively and lovingly, ceremonies and communications are happening today; and the governing community of the well is generally, I gather, harmonious. There has been a healing here of the relationship between humans and the spirits of this water. To me, the spirits

of this water seem happy now. There's still perhaps some healing needed in the bigger picture and in the relationship with White Spring, but I feel confident that this will come, too.

All this is a lesson, one that's echoing through this entire book: We need to reawaken our care for and relationship with nature and the elements. Without us, the elements flow, explode, emerge, cycle, recycle, die, and are reborn. This is the dance of life. With water, it's all so visible and touchable—the movement, the play, and the power. We love water, but meaningful love is always love in action.



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CHAPTER 18

THE DREAMING POOL OF BATH

by Richard Beaumont

Looking earthward, the densely wooded valley couldn't have concealed the ancient river snaking through it. Closer inspection of the serpentine bend would have revealed to prehistoric people a truly awesome sight: clouds of steam billowing out from England's only three hot springs. Mingled with the steam would have been the pungent smell of minerals. The ground soft and boggy, the night sky illuminated by stars playing hide-and-seek through the steam, the sounds of woodland creatures screeching and scratching near and far—it would have been like a dream, an entrance to another world, an underworld, a magical place of initiation. . . .

A MAGICAL HISTORY

In almost two decades of researching mind, body, and spirit subjects, I've encountered many interesting and wonderful people, places, and techniques for self-discovery. One of the strangest encounters followed my interview with Margaret Marion Stewart of the Springs' Foundation.

Margaret was a guide to the Bath springs: Cross Bath Spring, the Hetling Spring, and the King's Spring. She gave guided tours of the Cross Bath. R. J. Stewart, author of *Waters of the Gap*,¹ had told her about the origins of the springs. His research had shown them to be a pre-druidic sacred place, oracular mystery school, and underworld initiation center.

According to Celtic legend, in the 9th century B.C., a chieftain called Bladud was expelled from court because his leprosy made him so ill that he

was unable to rule. He became a swineherd instead. One day he followed a scabby pig to the springs and watched as it wallowed in the hot mud and emerged with its pink complexion restored. He plunged in himself and was cured. (The pig is the cult animal of Ceridwen, the goddess of the cauldron of inspiration and immortality.) Bladud is believed to have set up the first academy at the Bath springs around 800 B.C.; and the arts, astronomy, mathematics, astrology, prophecy, divination, and necromancy were taught there.

Margaret told of a legendary place referred to by the Greeks that was beyond Hyperborea, beyond the north wind. It was a triangular island that had two crops a year and hot springs gushing at the center. She felt sure that these were the Bath springs. Reinforcing the Greek connection, there are stories that druids from Bath taught Pythagoras.

The area around the springs would have been sacred, with the public possibly only accessing it at festival times connected with the eightfold calendar. The pre-Roman Celtic culture would have been matriarchal and matrilineal; the sun would have been regarded as feminine, the hot springs as waters from the womb of the Goddess. A volunteer for the Springs' Foundation said, "I really believe it's sacred." She also revealed that since being involved with the spring, "I've felt completely protected. When I have difficulties in my life, I go to the spring, and things work out." This Goddess spirituality is undoubtedly of considerable importance to some in Bath.

During an excavation of the springs in the late 1970s, pre-Roman artifacts were discovered—coins and offerings going back 7,000 years. There were also the remains of the walls the Romans had built around the springs. They paid homage to the local deity by calling the site *Aquae Sulis* (Waters of Sulis) in honor of the Celtic goddess Sulis (*sulis* means "an opening," "an orifice," "an eye," or "a gap"). They built a temple there, incorporating the ancient Celtic site, and dedicated it to Sulis Minerva. (Minerva is the nearest equivalent Roman goddess to Sulis, a goddess of wisdom, healing, and war.)

West of the larger King's Spring, linked to it by a sacred grove, lies the Cross Bath. Margaret's sense of its function was that it was an inner sanctuary. An earlier excavation had revealed part of an altar stone dedicated to Aesculapius, the Greco-Roman god of healing, who presided

over *aesculapia*, dream healing temples, where people had a ritual bath and then slept nearby. (Evidence of sheltering cubicles has been discovered under what's now a modern shopping center.) They would have discussed their dreams with the resident therapists of the Romano-Celtic period—a sort of early form of psychoanalysis.

From medieval times to the 18th century, the Cross Bath was known as *Balneum Crucis* (Bath of the Cross). It was part of a pilgrimage route between the Glastonbury and Malmesbury abbeys. The pilgrims would carry a life-sized replica of the cross and stop at certain points on the journey. One of the stopping places was the nearby Saint John's Hospital, built by the Knights Templar in 1174. At the time, it was a hospitality place, but such spots eventually became known as hospitals because so many travelers were sick. At the Cross Bath, the pilgrims would have a ritual bath in the healing waters before going on refreshed.

It's also reported that many queens visited the Cross Bath over the years, including Queen Mary; and the town itself became known as Royal Bath in the early 17th century when James I's queen, Anne of Denmark, visited, bathed, and soon conceived. An 18th-century author of a guide to the baths suggested that the waters might well act as a miraculous cure for infertility.

Bath became a fashionable resort of Georgian England under Beau Nash, the legendary master of ceremonies; and in 1822 a doctor with a lucrative practice treating wealthy neurotics in the town said the water was a sovereign cure for “rheumatic, gouty, and paralytic afflictions, in all those disorders originating from indigestion and acidity of the stomach, bilious and glandular obstructions, hypochondriac and hysterical afflictions.” By that time, many townsfolk were making a living off the waters, providing cures ranging from cups of steaming water to hot water enemas, selling souvenirs, housing invalids, or carrying them in “Bath chairs” through the streets.

In the 1970s, that all stopped. In 1976, the National Health Service stated that plunging patients into the miraculous water was no more effective than turning on a hot tap, and in 1978 tragedy struck. The water at the King's Spring was found to be polluted, and a girl died of a meningitis-related illness. Bathing ended overnight, and visitors to the Roman baths museum were warned against touching the water.

DREAMS OF INTERVENTION

In 1979, Margaret Stewart started a campaign to reopen the Cross Bath for bathing. The effort gained considerable momentum . . . and then the dreams began.

In one dream, Margaret found herself inside the Cross Bath surrounded by many nonhuman “inner plane” beings. Her sense of privilege at being there amidst so many magnificent creatures turned to dismay and embarrassment as the largest of these beings told her that she was to stop her campaigning and that the baths were meant to be closed at that time. She contacted all the protesters and ended the process the next day.

On reflection, she believed that the baths needed to be closed for a period of inner purification. In the time since bathing had been prohibited, there'd been a change in the springs' temperature. The three springs are all from the same aquifer in oolitic limestone (nonsulfurous, nonvolcanic). The Cross Bath Spring is the deepest at 1.8 miles and used to be the coolest, at 103°F; the Hetling Spring was the hottest at 120°F; the King's Spring was 115°F. Today all the springs have a similar temperature around 111°F.

A recent mineralogical analysis of the hot springs has shown that all the thermal water contains sodium, calcium, chloride, and sulfate ions in high concentrations. Although there are some small variations, allowing for changes in analytical methods, the composition has remained constant over the past century.

When a borehole was put into the King's Spring (the source of the largest volume of water) to get amoeba-free water, Margaret formed the Springs' Foundation to stop plans to cap the Cross Bath Spring and take water from the King's Spring borehole and pump it into the Cross Bath. As each of the springs comes up from different fissures, they each have slightly different mineral constituents; and Margaret wanted to retain the integrity of the Cross Bath water. As a result of her action, another borehole was made into the Cross Bath Spring's source to provide amoeba-free water to the Cross Bath.

The Springs' Foundation has since seen modern-day pilgrims from all over the world find their way to the Cross Bath and feel blessed.

I'd come to Bath to report on a story about Margaret's fears that the springs might be tapped off and replaced by ordinary heated water from the

main water supply. As I listened to her talk about the importance of protecting the site, I remember letting my right hand play in the hot water. It felt thick and strangely “pregnant” with life. It made my fingers tingle.

Four hours later, Margaret was still talking—about the strange dreams that had brought her to be a protector of the site, about unusual winds that had thrown the planners’ only redesigns into the water, and about the sudden illnesses that had afflicted the key proponents of the unwanted refurbishment. Having failed to bring the “interview” to a polite end, I took the only option available: I abruptly informed her that I was leaving and, with her voice still echoing behind me, walked away. What I’d imagined would be a pleasant hour-long interview had turned into a four-hour experience of extraordinary mania.

By now I was feeling very strange, and the world around me was echoing this, becoming somehow dreamlike and viscously fluid in a most disconcerting way. As I walked to my car, the night seemed darker than it should have been against the lights of the city.

Upon returning home, I felt an uncharacteristic need to go directly to sleep. What I didn’t realize at the time was that I, too, had been affected by the water and was about to experience its power—whether I wanted to or not.

THE GREEN MAN

As soon as I lay down, my entire body seemed leaden; and I fell into a deep, deep state. I could smell waterweeds and see many light-bodied nature spirits wafting around me, almost as if they were preparing the ground for something. A sense of timelessness pervaded the room. As the “dream” began to take a dark turn, I found myself unable to move. Earthy, troll-like characters gathered around me in a circle, their solid frames immovable and glistening with a pale bluish-green light. All these beings were strangely, intimately, familiar to me. They seemed almost like cousins or family: I “knew” which tribe they belonged to, and I “knew” each one of them and they were dear to me; yet I hadn’t seen them for longer than I could remember.

Then, with slow methodical progress, a being of immense size and power—ancient beyond my comprehension—came toward us. Imagine a grizzly bear 100 times bigger than any bear you’ve ever seen, but with an almost human articulation to him. He had to bend down to see me; I was so small in comparison to him. His face seemed as far away as the clouds, but his presence permeated everything. I could feel his breath on my face, and he snorted like a horse. He, too, was familiar, but I’d never before had his attention focused on me alone. It was overpowering. He turned his head from side to side as if trying to understand what I was doing there.

When he spoke, everything around us moved; and the wind of his words flew over my head. It was almost deafening, and yet somehow silent at the same time. It pervaded my whole body. I was “told,” wordlessly, but in no uncertain terms, that I had a job to do; and there was no backing out of it. I felt his eyes see right through to my essence. He seemed immortal, immensely wise, and as compassionate as one would be to a creature far lower on the evolutionary chain who’d gotten lost. I also can’t forget a feeling of deep sadness emanating from him. I’ve never felt so “merely” human, so puny, so completely out of my depth.

I woke with a start, soaked with sweat. I felt tiny and insignificant beside such an ancient power. The entire room seemed different and unfamiliar to me. There was no comfort, no assurance that I’d simply had a dream. My reality seemed entirely insubstantial in comparison to what I’d just experienced. I knew with absolute certainty that there was nowhere on Earth where he couldn’t find me. It was daylight; I’d “slept” for ten hours, but it felt like 15 minutes.

I got out of bed and the sense of urgency was so great that I called Margaret even before getting dressed. At first it was hard to speak—my voice seemed disconnected from my body, as if I were an actor using a foreign accent—but I now felt a connection to her, knowing that we’d both encountered the same beings. And I had compassion for her, as she was connecting with them on a regular basis. It was no wonder that she’d become so fixated on being a guardian of the waters. She’d seen hundreds of people receive healing from the springs, and knew intimately the powers behind that wonder.

I told her that I was going to run the story and was just calling to check a few details. In the long conversation that ensued, she added yet more

information about the complexities of water analyses, microbiological filtering systems, and town-council plans for redevelopment of the springs. I knew I had to pull it all together—premonitions, mythology, history, excavations, water analysis, the lot. I didn't dare cross the ancient being I'd just met.

The result of my labor is in print for all to see.² I felt driven throughout the writing of the piece and never lost the strange sense of being in the flow of the fates. As soon as I'd finished the article, I walked toward my kitchen through an enclosed passageway, hearing something calling me. There, for the first and last time in the three years I lived on those premises, I met a huge frog. Its loud croaking filled the sealed corridor, and a tingle went down my spine. The force of nature had sent a messenger. The spell had been completed; the job was done.

THE MYSTERY OF WATER

In our current study of water, especially with Dr. Emoto's discovery of the effect of thought and prayer upon water crystals, there are two paradigms at work, and they don't necessarily mix. On the one hand, there's science, with its reliance on neutral, objective evidence and logical conclusions. But there's also the mystical experience of those in touch with natural forces, which defies logical definitions, as its interpretations are both universally applicable and yet subjectively personal.

We know that water holds memory. It's also the requisite for all life on this planet. Dr. Emoto's work has demonstrated the effect of our consciousness on water, but what if water isn't simply the receptively inert medium his studies demonstrate? If it can indeed become altered by the consciousness directed at it, isn't it also possible that it could contain and project a more evolved consciousness? Certainly I believe that we should include in our studies of water an investigation into the shamanistic practices upheld even today in the more remote areas of the world, where water blessings still hold their power and human understanding isn't regarded as the pinnacle of awareness.

In our scientific attempts to define and understand matter, we may well have become blind to a direct, more potent way of perceiving the world around us. Can we truly claim to have a fully comprehensive understanding of life without incorporating the experiences of the countless mystics who point to a paradigm beyond intellectual understanding?

THE CURRENT DAY

My meeting with Margaret Stewart took place in 1998. Much has happened since that time. The council's plan for the redevelopment of the springs met with years of bitter wrangling. Petitions were signed for and against it. There was strong local opposition, which led to the threat of legal action against the local authority and the developers, but the case was settled out of court. An uneasy truce was established, giving residents priority access and reduced prices to the restored Georgian Cross Bath. Construction work on the project began and Thermae Bath Spa finally opened in August 2006.³ Margaret eventually came around to the idea of the refurbishment of the Cross Bath on the basis that "the Goddess is getting a facelift."



Roman baths in Bath, England

The development, which eventually cost \$43 million (£23 million), around 50 percent more than its original budget, is certainly impressive. The new spa, the only one in Britain where visitors are able to bathe in

naturally heated mineral water, is a combination of new-build and refurbishment. A 1920s swimming pool was demolished to make way for the central cubic structure, composed of glass and the city's signature yellow stone, and designed by architects Nicholas Grimshaw and Partners.

At the top of the complex is the open-air pool. Below that is a floor with steam rooms containing fluted pillars around a central device where spa goers can walk into a mist of scented steam lit by state-of-the-art fiber optics. There are also treatment rooms, a gym for yoga and Pilates, and a big thermal pool at the bottom.

Healing claims for the waters persist. The Thermae Development Company, Dutch operators of the spa complex, state:

Sufferers [of all ailments], from sports injuries to rheumatic pains, sinus-related ailments to skin problems, will find healing properties in the spa waters. Bath's reopened spa, taking water from a very pure source, will be a relaxed, sociable environment contributing to the well-being of all users—a much-needed resource in today's very busy and very stressful world.

All the bathing facilities in the spa complex use natural spring water cooled to 91.5°F. Sand filtration, enhanced UV, and minimal chlorine dosing for residual disinfection are the only treatment requirements.

Whether you choose to align to the sacredness of this ancient place or not, the fact remains that it's once again active in the 21st century, a time when we need all the magic we can get.



NOTES

1. R. J. Stewart, *Waters of the Gap: Mythology of Aquae Sulis*, Bath: Bath City Council, 1981.

2. The article appeared in the Summer 1998 edition of *Kindred Spirit* magazine, issue 43.

3. Margaret seems to have succeeded in making the city council aware of the need for guardianship, as its Website now states that it's the guardian of the baths.

FURTHER INFORMATION

For more information on Thermae Bath Spa, go to: www.bathspa.co.uk
or telephone (44) 1225 477051.

Kindred Spirit magazine: www.kindredspirit.co.uk



CHAPTER 19

MOTHER GANGES INDIA'S SACRED RIVER

by Elizabeth Puttick, P.h.D.

Verily, Ganga is the path to heaven of those that have bathed in her current.

— FROM THE *MAHABHARATA*

The story of the Ganges, from her source to the sea, from old times to new, is the story of India's civilization. . . .

— JAWAHARLAL NEHRU

SACRED WATER IN HINDUISM

Hinduism is the world's oldest religion, rooted in a reverence for nature and the interconnectedness of life that's largely missing in Western culture. In an animistic society, nature is alive with spirit—literally animated. Every rock, tree, and stream has its own spirit, which humans can perceive and communicate with. Oblations may be offered in return for blessings. Over time, in a development that Westerners call *polytheism*, the most important spirits became personified as gods and goddesses, with greater powers requiring more elaborate propitiation rituals. Water has been an object of worship from time immemorial, and among the most worshipped deities are Indra (king of heaven and god of rain), Varuna (god of water) and the river goddesses.

Over the last few millennia, Hinduism has evolved through many different stages and manifestations, becoming more urbanized and

“sophisticated,” but nature gods and goddesses are still worshipped in the villages. Even in urban society, they remain vital spiritual and artistic forces.

For the purity-conscious Hindu social system, in which pollution is inevitably accumulated on a daily basis, water plays a central role in both domestic and public rituals. Water is a purifier, life giver, and destroyer of evil; it cleanses, washing away impurities and pollutants. In most Hindu families, it's considered auspicious to keep a vial of *Ganga jal* (sacred water from the Ganges) in the house. This is used to purify the body, household objects, and rooms. Bathing or sprinkling oneself with water is the customary way to rid oneself of impurities when entering the house, before eating, and on many other occasions.

Water is also important in rites of passage. Newborn babies are sprinkled with water in a ritual similar to Christian baptism [see Chapter 11]. Brides take a ceremonial bath similar to the Jewish *mikvah* [see Chapter 12], while the groom has his feet washed by his prospective brother-in-law. The last rite of life is to place drops of sacred water (preferably *Ganga jal*) in the dying person's mouth.

Water is also essential to temple ritual. Every temple has its own sacred wells and tanks, and both priests and worshippers bathe before entering the sanctum. Statues of the gods are immersed in water before installation; and daily libations of water, or flowers and leaves soaked in holy water, are offered to gods, *rishis* (saints), and ancestors. Water may also be sipped during prayers and invocations.

To Hindus, all water is sacred, but rivers are particularly venerated on account of the purifying quality of running water. Water absorbs pollution; but moving, flowing, or falling water has a great cleansing power that carries impurities away. This power can be utilized by sprinkling water over your head or taking a dip in a running stream—rituals that remove most kinds of daily contamination. The current of a river changes constantly, but in the body of the river dwells a spirit who controls the flow of the water. River spirits are propitiated and deified as goddesses.

GANGA MA: SACRED RIVER AND GODDESS



Map of the Ganges from source to sea

There are seven sacred rivers in India, of which the holiest is the River Ganges (Ganga). Its source is high up in the Himalayas—India’s holiest mountains—in a glacial cave. For over 1,500 miles, it flows through the plains and cities of northeastern India, joining the sacred river Jumna (Yamuna) at Allahabad before eventually merging into the Bay of Bengal. Mythologically at least, the Ganges courses way beyond its earthly boundaries to the realm of *moksha*—spiritual liberation.



Satellite image of Ganges delta

The Ganges has been held sacred for millennia and is repeatedly invoked in sacred Hindu texts, including the Vedas, Ramayana, and Mahabharata. In

an ancient society that depended on the seasonal monsoons for its agricultural needs, the perennial nature of the Ganga was literally a godsend. Personified as *Ganga Ma*—Mother Ganges—the river is revered as a powerful goddess who embodies the cardinal virtue of purity, cleansing the sins of the faithful and aiding the dead on their path toward heaven:

Ganga is Righteousness in liquefied form. She is energy also running in a liquid form over the earth. . . . The very mother of the heavens, she has sprung from the highest mountain for running over the plains and conferring the most precious benefits on all creatures of the earth. She is the highest cause of all things; she is perfectly stainless. She is as subtle as Brahma.¹



Ganga devi on lotus

There are many versions of the Ganges creation myth, but in most stories she transforms herself into a river and flows out of the big toe of the god Vishnu; or perhaps she manifests herself the hair (or ear) of the great god Shiva (“Salutations to Lord Shiva who holds Ganga in His matted hair”), or even the mouth of the silver cow Gomukhi. Ganga’s heavenly origin and descent to Earth makes her an effective intermediary between the two worlds of humans and gods. Images of Ganga on a crocodile and Yamuna on a tortoise flanked the doorways of early temples. Entering the temple, devotees were symbolically cleansed by the purifying waters of these two rivers.



The Goddess Ganga seated on a crocodile

BATHING IN THE GANGES

In cities along the river, daily dips are an important ritual among the faithful. Many cities are considered sacred and have become pilgrimage sites for people from all over the world: Gangotri, at the river's source; Sagar Island, where it flows into the sea; Varanasi (formerly Benares), the holiest city of all, one of the world's major pilgrimage centers and the most auspicious place to die; and Allahabad, where the Ganga and Jamuna meet, the site of the most important festival in the Hindu religious calendar, *Kumbh Mela*, where millions of pilgrims from all over the globe gather for the bathing ritual.

Many Hindus believe that water from the Ganga can heal sickness of body and soul and cleanse the soul of all past karma. *Ganga jal* is often used to anoint the forehead of someone who's ill, and is drunk with one's last breath to take the soul to heaven. Even a single drop of Ganges water, carried by the wind over a great distance, is believed to cleanse a lifetime's sins. "By seeing, touching, and drinking the waters of Ganga, or even by applauding Ganga, hundreds and thousands of sinful men became cleansed of all their sins" (from the Mahabharata).



Ganges ghat

Bathing, immersion in the river itself, is even more purifying. Hindus may travel great distances to scatter the ashes of their relations in the waters of the Ganga, with the aim of helping them attain a better rebirth, and ultimately freedom altogether from samsara (the cycle of death and rebirth).

Even more desirable is to be cremated in Varanasi, the most sacred city on the Ganges: It's been said that "Death, which elsewhere is polluting, is here holy and auspicious." People travel from all over India and even internationally to spend their last days in Varanasi. The river is lined with ghats (stone platforms with steps leading to the water), where the funerals are held, and the pyres burn nonstop.

POLUTION AND PURITY

There's a paradox at the heart of Hinduism, which reveres nature but isn't a "nature-loving" culture in the Western sense. Gardens and parks are often left untended, even in wealthy suburbs, and animals may be neglected or mistreated. Yet while mangy curs wander the streets looking for scraps, cows still have right of way and hold up the traffic with impunity. Plants may wither, unwatered under the burning sun, while flower garlands adorn honored guests and idols. The implications of this contrast between belief

and practice have ironic and tragic consequences in the ritual use and abuse of India's sacred rivers.

As a mother, Ganga is tangible, accessible, and all-accepting: No one is denied her blessing. However, though her devotees revere her, they don't always treat her with the love and respect she deserves in return for her many blessings.

While the spiritual purity of the Ganges has remained unchallenged for millennia, her physical purity has deteriorated to the point where she has become one of the most polluted rivers on Earth. Many of the world's rivers are contaminated through human exploitation, but the Ganges has suffered particularly—partly as a consequence of what could be called “spiritual exploitation.” Thousands of sick people with open wounds and festering ulcers bathe in the river daily to get healed, and these numbers swell into the millions during festivals, which also puts tremendous strain on the antiquated sewage system.

Dying in Varanasi takes the impurity out of death, but at the cost of putting pollution into the river. Some 40,000 cremations are performed there each year, and many more take place on other sites along the river. Most funerals are carried out on wood pyres that don't reduce the body to ashes; but the remains are thrown into the water regardless, to be fought over by dogs and vultures. The thousands more who can't afford cremation have their bodies simply thrown into the Ganges. It's an all-too-common sight to see partially burnt corpses floating down the river, along with the carcasses of thousands of dead sacred cows and assorted household rubbish.

Sacred ritual is only one source of pollution. The Sacred Land Film Project has produced a report on the Ganges, based on extensive scientific research, which identifies the main source of contamination as organic waste—sewage, trash, food, and human and animal remains. Around a billion liters of untreated raw sewage are dumped in the Ganges each day, along with massive amounts of agricultural chemicals (including DDT), industrial pollutants, and toxic chemical waste from the booming industries along the river. The level of pollution is now 10,000 percent higher than the government standard for safe river bathing (let alone drinking). One result of this situation is an increase in waterborne diseases, including cholera, hepatitis, typhoid, and amebic dysentery. An estimated 80 percent of all

health problems and one-third of deaths in India are attributable to waterborne illnesses.

Wildlife is also under threat, particularly the river dolphins. They were one of the world's first protected species, given special status under the reign of Emperor Ashoka in the 3rd century B.C. They're now a critically endangered species, although protected once again by the Indian government (and internationally under the CITES convention). Their numbers have shrunk by 75 percent over the last 15 years, and they have become extinct in the main tributaries, mainly because of pollution and habitat degradation. However, at least in one stretch of the river, numbers are rising, owing to the efforts of the "Dolphin Man," Dr. Sandeep Behera from World Wildlife Fund India.

There have been various projects to clean up the Ganges and other rivers, led by the Indian government's Ganga Action Plan, launched in 1985 by Rajiv Gandhi, grandson of Jawaharlal Nehru. Its relative failure has been blamed on mismanagement, corruption, and technological mistakes, but also on lack of support from religious authorities. This may well be partly because the Brahmin priests are so invested in the idea of the Ganga's purity and afraid that admission of its pollution will undermine the central role of water in ritual, as well as their own authority. There are many temples along the river, conducting a brisk trade in ceremonies, including funerals, and sometimes also the sale of bottled Ganga jal. The more traditional Hindu priests still believe that blessing Ganga jal purifies it, although they're now a very small minority in view of the scale of the problem.

One famous environmental campaigner is Dr. Veer Bhadra Mishra, a Hindu priest who's also a civil engineer. He approaches pollution from both a scientific and a spiritual perspective, and has proposed an alternative sewage-treatment plan for Varanasi that's compatible with the climate and conditions of India. His "Clean Ganga" campaign is currently trying to persuade India's central government to adopt the plan, so far without success.

Dr. Mishra describes the importance of protecting this sacred river: "There is a saying that the Ganges grants us salvation. This culture will end if the people stop going to the river, and if the culture dies the tradition dies, and the faith dies." Mishra feels it important to find new language for the

river that respects the Hindu worldview and veneration of the Ganges. To tell a Hindu that Ganga—goddess and mother—is “polluted” or “dirty” is an insult, suggesting that she’s no longer sacred. Instead, it needs to be made clear that human action, not the holy river herself, is responsible: “We are allowing our mother to be defiled.” This approach has stimulated grassroots involvement in the clean-up effort and is transforming the work for environmental preservation into a model for cultural and religious preservation as well.



A MIDDLE WAY: INTEGRATING SCIENCE AND SPIRITUALITY

It’s unknown how many people have been healed by bathing in the Ganges. Clearly, it’s hazardous, and drinking the water is even riskier, although most bottled Ganga jal is either strictly processed and filtered or issued with a warning not to drink it. My Indian guru used to mock the “credulous fools” who drank the water direct from the river, but many pilgrims—including some Westerners who might be expected to be smarter—gulp it down enthusiastically. As a result, they often contract hepatitis, typhoid, or cholera. There’s a belief that Indians are less likely to get sick than Westerners on account of their faith, but the virological explanation is that they do become ill but manifest fewer symptoms because their bodies have suppressed the reaction.

On the other hand, there are stories of “miraculous” cures. It’s hard for the rational, skeptical Western mind to believe that the power of the mind can overcome the effects of such an enormous range and volume of pollutants, although we know that the placebo effect has great potency. However, there have been some very persuasive experiments demonstrating

the power of prayer and intention in healing, and it seems likely that the collective faith of so many millions of pilgrims could have a transformative therapeutic effect—both on the water and on the human body.

It would be interesting to conduct experiments on Ganges water in the footsteps of Dr. Emoto to determine how far blessing and thanking the water could alter its condition, both at sacred sites along the river and on bottled Ganga jal sold for ritual purposes. One exciting, radical implication of Dr. Emoto's findings is a democratization of the process of working with energy and bestowing blessings. His results indicate that any person with a pure heart and clear intention can trigger a transformative effect on water crystals, thus undermining the need for priestly ritual and intervention. If human consciousness can truly affect the structure of water—as the evidence clearly demonstrates—then we all have the power to heal, whether we're ordained or not.

I think it's important to find a middle way between the extremes of hard-nosed scientific materialism and ungrounded, gullible spirituality. Having lived in India for years, I've witnessed and experienced the literal ill effects of unclean water, which is a major risk to personal and public health. In my opinion, environmental campaigners like Veer Bhadra Mishra and Vandana Shiva and charities such as WaterAid, which save the lives and improve the health of millions of poor people, do more good—physically, environmentally, and spiritually—than businesses (including temples) peddling “holy water” at the “very small price” of \$35 a bottle to wealthy pilgrims and tourists. I can't accept that a drop of Ganga jal cancels all your karmic debts. Attaining merit surely requires a more muscular effort—a more engaged spirituality.

I'd like to give the last word to Dr. Veer Bhadra Mishra, who has done so much to publicize the crisis, provide practical solutions, and integrate the opposing philosophies—and has been recognized on the United Nations Environmental Program's Global 500 Roll of Honor, as well as honored as a *Time* magazine “Hero of the Planet.” For Mishra, the Ganga represents the meeting point where two worlds combine. He describes the world of scientific thought as being one bank of the river, and the deeply spiritual world, one alive with a limitless pantheon (“I would say there are as many gods and goddesses as people who live in India”) as the other bank. And, he says, they're both equally important:

We have to clean all the rivers, and only then our hearts will be happy. . . . It cannot be clean just by technology, just by setting up the right kind of infrastructure, there has to be an intermixing of culture, faith, science and technology. We have that kind of living relationship with the river. You [Western societies] have the best technology. So both the societies need to interact with each other to take care of these rivers.



NOTES

1. Quotations on the sanctity the Ganges are taken from the Anusasana Parva, Section XXVI of the *Mahabharata*, translated by Sri Kisari Mohan Ganguli (Indypublish.com, 2004).

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WEBSITES

Friends of the Ganges, a San Francisco-based organization that helps Sankat Mochan in its clean-up efforts: www.crabgrass.org/ganges

Sacred Land Film Project:
www.sacredland.org/world_sites_pages/Ganges.html

Vandana Shiva interview:
www.pbs.org/now/transcript/transcript_shiva.html

Veer Bhadra Mishra interview:
www.coveringreligion.org/2006/04/22/wade_in_the_water_veer_bhadra.html





CHAPTER 20

WATER, THE MOON, AND THE SOUND OF THE PLANETS

by Sayama

There's a strong interaction between water and the moon, which is very apparent in the phenomenon of tides. The gravitational pull of the moon exercises a similar effect on the human body, since as much as 70 percent of it is water.

This knowledge was gathered by ancient cultures and kept by some indigenous tribes, and has recently been rediscovered and scientifically supported by our modern high-tech civilization. We live in very interesting times, where the gap between intuitive perception on the one hand and rational realization on the other is starting to close.

In nearly all cultures, the moon embodies the feminine principle and is related to the emotional world and the human spirit. Because of this, it can be seen as a symbol of intuition and emotional perception. The sun, on the other hand, embodies its opposite, the masculine principle, and is the symbol of reason, intellect, and rational scientific realization. From these two complementary opposites, holistic perception comes into being. It takes place in the human heart, and it's nurtured and carried by love.

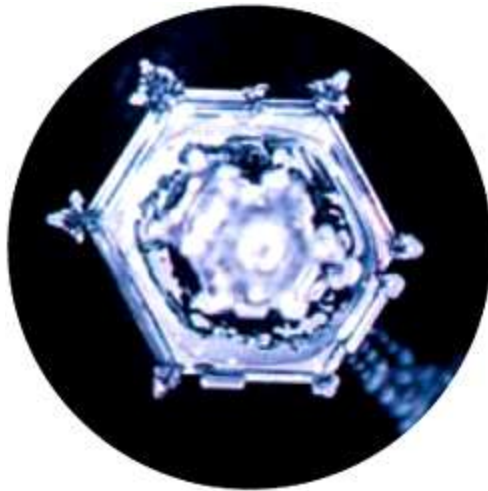
ALL IN EVERYTHING

We live in a universe in which all is mirrored in everything, and all is contained in everything. A single cell of the human body contains all the information about the whole of the body; and in turn the human body

contains all the information about our planet, our solar system and, most likely, the entire universe. This holistic philosophy of life was already described more than 2,000 years ago in the words of the Chinese sage Lao-tzu: “One can know the whole world without having ever stepped out of one’s door.”

Another very beautiful metaphor about water can be found in the I Ching (The Book of Changes), in which water represents one of the eight primal energies. It’s described as always flowing and filling out all places and hollows. It’s not afraid of any current or waterfall and yet it always stays faithful to its original flowing character. In the Chinese tradition of the five elements—water, wood, fire, earth, and metal—each element is related to a specific organ, sense organ, and mental and emotional qualities, as well as colors and healing sounds.

The element of water corresponds in this case to the color blue; the kidney and bladder; and the ear, with its sense of hearing.



Water responding to the color blue.

HEALINGS SOUNDS

At this point it’s worth mentioning Masaru Emoto’s water crystals and the vital role that water plays in our body. As the water crystals showed

different reactions according to their exposure to sound, so our body, too, reacts directly to sound.

Music and sound therapy, which has become more and more popular in the past few years, uses this power purposefully and with positive results. Often the music comes from the traditional instruments of indigenous people or ancient cultures. Personally, I find that the most fascinating musical instruments in this context are the Tibetan sound bowls that originate in the Himalayas. These bowls are traditionally made of seven different metals, each vibrating at a different frequency.¹ Long ago, these metals were each assigned to a corresponding celestial body in the solar system:

- Gold: sun
- Silver: moon
- Mercury: Mercury
- Copper: Venus
- Iron: Mars
- Tin: Jupiter
- Lead: Saturn

Before being worked according to a formula that has been kept as secret as a precious recipe, each metal is placed for three days under the light of a full moon in order to absorb its energy.

The origin of the Tibetan sound bowls is lost in the mists of time, but they could date as far back as 7,000 years. It's believed that the Buddha used sound bowls some 2,600 years ago to accompany his meditation practice. Nowadays, they're still being played in Himalayan monasteries and in many parts of Asia to calm and clear the mind and focus thoughts and feelings during meditation, and also as an accompaniment during

religious ceremonies. In the Western culture of the 20th and 21st centuries, they've found a place not just in music and sound therapy, but also in healing practices such as sound massage, sound journeys, and sound baths.

Playing the Tibetan sound bowls is quite easy. They produce a multilayered sound that's rich in overtones. Out of the interaction of many sound bowls, a range of attractive "soundscapes" comes into being, which harmonizes mind, body, and soul and opens up the heart. Experience has also shown that the bowls can balance the brain hemispheres and cleanse and revitalize the body's energy at the cellular level.

VIBRATIONS OF LIFE

Meditation practice supported by the sound bowls will enhance body-mind-spirit harmony in unison with the core principles of the universe.² How can we make the most of this wonderful realization and use it for health, well-being, and creative self-development?

The most beautiful and creative way would be to get a sound bowl and play it yourself, place it on your body, or feel its harmonious vibration in your aura. You can also experience the feel-good factor through a sound massage or a sound bath administered by somebody else. For most people, the easiest method is to make use of a CD.³ That way you can have a sound massage or a sound bath any time you wish in familiar and comfortable surroundings just by lying between the speakers of a stereo system. In all of these methods, the body, mind, and spirit react immediately in harmony with the sounds; and the high percentage of water in our body starts to form beautiful crystalline structures.

I've also experimented with another method, which I use regularly because it has a very positive effect on me. I place a glass bottle of good spring water directly into a sound bowl (I recommend that you place a piece of cloth underneath the bottle so that no discord arises between the metal and glass), and I let the water absorb the vibrations for a few minutes. I choose a specific planetary sound according to whether I wish to go on a journey of self-discovery or initiate a healing process. Afterward, the water tastes softer and full of energy and, above all, absorbs the strength of the

planet. I've experienced lovely results with these "planet essences." Their effect is similar to the Bach flower remedies—they're gentle yet powerful transformational tools and can be combined with other essences.

If you don't have a sound bowl at home, you can place the bottle of water between a stereo's speakers and let it absorb the vibrations. The CD *Chakra Sounds* features all 13 sounds of the solar planets and gives clear instruction as to how to manufacture your own planet essences.

Let's conclude by looking at water as an "information warehouse." When we drink water, we don't just take in fluids, but also the vibrations of life and nature, because water stores information throughout its infinite cycle. Spring water that's healthy contains "memories" of the leaves and blossoms on which it fell as rain, of the minerals and stones that it trickled through. It contains the vibration of the wind, the sea, the sun, and potentially the whole Earth's ecosystem. It reminds us of our origin and our evolution from a one-cell organism to a full-fledged human being.

Unfortunately, this is no longer true of tap water in most big cities. Because of various chemical treatments and the pressure inside the faucets, the water seems to lose its strength and information. Also, in recent times, more and more cell-phone transmitters have been erected on top of water towers and tanks. These have completely destroyed water's crystal structure, and the fluid has taken on artificial frequencies that are totally lacking in creativity. Luckily, however, thoughts and words such as *love* and *gratitude* have the power to neutralize those vibrations and "resuscitate" water's original attributes [see Chapter 7].

I've experimented with different methods: For example, sometimes I play nature sounds to tap water (rain, birds, the sound of rippling streams, and so forth) and then put the water in a jug with crystals (such as amethyst or rose quartz). Then I place the jug on a picture of a natural landscape—be it mountains, sea, or forest—to restore to this "sad" water its original information and vitality. The CD *Sacred Healing Waters* is ideal for this purpose, because water's journey from rain to spring to river to sea is set to music played on sound bowls, gongs, and bamboo flutes, which are mainly tuned to the sounds of the moon, the sun, Earth, and Venus.



NOTES

1. There are a number of different types of Tibetan bowls. When you play them, you can hear a variety of tones and overtones. All the notes can bring out similar vibrations in the body. You can place them around a person's body or on different chakras. This is like receiving a sound massage. As well as the seven different metals, there are also bowls made from quartz crystal. You can get a lot from recordings of these bowls, but nothing is like hearing them live. The different sounds affect different parts of your body—the sound “AA” impacts your heart, for example, while the sound “EE” vibrates in your head, around your pineal gland.

2. For those who wish to go more deeply into this topic, I recommend the CD *Chakra Sounds* and the book *Chakren im Wassermanzeitalter (Chakras in the Age of Aquarius)*.

3. The Sayama CDs *Sacred Healing Waters* and *Sacred Healing Touch* (both available from www.realmusic.com) are recommended here because they've been produced mainly with sound bowls, gongs (tuned into planetary sounds), and nature sounds in excellent 24 bit, 96 kHz sound quality and therefore do justice to the sensitivity of the human ear. The majority of people who were muscle-tested (via kinesiology) for these CDs showed positive results.



CHAPTER 21

RITUALS FOR CELEBRATING THE SACRED GIFT OF WATER

by Maril Crabtree

The sacred energies of water are a source of healing, guidance, inspiration, illumination, and spiritual wisdom for our life journeys—sometimes in marvelous and mystical ways. Water can be used to celebrate everything from the mundane to the extraordinary, alone or with a group, on holidays or any day.

To use the sacred energies of water in rituals and ceremonies, remember that everything in the energy realm begins with intention. Take a moment to align your intention with the cosmic consciousness—that space within and without where everything is interconnected. From that space, call in the sacred energies of water to assist you in accomplishing what you intend.

In my work as a hands-on energy healer and spiritual coach, the energy of intention plays an important role. Water becomes my ally; after every healing session I join my client in drinking water that carries its pure vibration to enhance the goals of the healing.

When you become aware of water's gifts, you can bring your intention to the water you use in your everyday life and create rituals for those uses. Most of us bathe or shower on a frequent basis. Why not pause just before turning on the shower or climbing into the bath and give thanks for this gift that cleanses, refreshes, and renews not only the body but also the mind and spirit? Take another moment to silently create whatever intention you wish — an intention for serenity as you go through your day, for example. You'll then be ready to receive the benefits of water at a much deeper level as you immerse yourself in it.

Receiving the benefits of water can, in and of itself, be your intention as you go through your day. Whether you drink from a water fountain or your own bottle, be mindful as you sip. In your mind's eye, see the fluid hydrating and replenishing all the cells in your body. You can also carry an atomizer of water with you. When you feel stressed or upset, take a moment to spray the air just above your head and lift your face to receive the droplets of water. In doing so, you'll be giving a self-administered blessing to your body and spirit—and those around you will also be thankful!

We'll explore other examples below, but don't be afraid to create your own rituals to meet your desires and needs.

WATER FOR HEALING AND CLEANSING

Soft candlelight and music surrounded four women seated in comfortable chairs, their eyes closed, their bare feet in tubs of warm water, looks of bliss on their faces. Four other women sat, one in front of each partner, rhythmically cleansing, massaging, and applying lotions to the feet.

The women were participating in the ancient ritual of foot washing. They took their time with it. Each washer focused fully on the woman in front of her, giving her feet loving attention in complete silence.

"It was heavenly," one woman said afterward. "I was surprised that I enjoyed giving the foot washing as much as receiving it. After a while, my hands seemed to merge completely with the foot I was working on—I simply disappeared into it."

Others agreed. Before the ritual, we'd invoked the healing presence of water; and afterward we all felt relaxed, refreshed, and transformed in a way that connected us with more than hands and feet. Use this ceremony with your partner, your best friend, or a small group to enhance well-being for everyone.

One friend discovered that she had lung cancer and used water's healing gifts to help herself. Each day, after taking time to focus her intention, she drank water from a glass with the words *healed, whole, and grateful* taped to it. As she drank, she visualized the water going to the cancer cells and

transforming them, then floating them out of her body. “The water tastes different,” she said. “It becomes my ally in healing.”

A woman with breast cancer used two water rituals. First, whenever she could, she went to the ocean and lay back in the water, arms open to signify that she embraced all the healing the universe had to offer. She visualized the sea flushing the cancer cells out of her body. Although natural water may feel better, you can do this ritual in a swimming pool, an indoor exercise pool, or even in your own bathtub. The important thing, again, is to align your intention and then create a strong vision of water flushing away those damaged cells.

This woman’s second ritual involved other people. Inspired by Dr. Emoto’s research, and knowing that the body is at least 70 percent water, she invited her friends to come and write positive affirmations on her camisoles and T-shirts. She also invited them to bring their own favorite pieces of clothing and write whatever messages of self-love they wished. In a rainbow of colors written with waterproof pens, the words *dance*, *celebrate life*, *sexy*, *love*, and *gratitude* graced her camisoles and T-shirts at the end of the evening. “Now, whenever I get dressed,” she said, “I feel the healing power of those words lying next to my skin.”

The healing benefits of water can bring a true sense of community by connecting and uniting those with a common purpose. In the midst of our women’s circle sat a large crystal bowl filled with water. This water, our leader said, represented the tears of our sisters everywhere, and the loss of life and dignity women experience all over the world through being treated as less than equal.

One by one, each woman sat next to the bowl, speaking words of solidarity and support to their unknown, unseen sisters. As we spoke, many of us added our own tears to those in the bowl. At the end of the ceremony, we carried our sacred water outside and poured it into a nearby stream, adding it to the waters that nourish the earth.

WATER TO CELEBRATE LIFE PASAGES

When Mark and Melissa fell in love, they felt like soul mates. They were so grateful for having found each other that they decided to marry at Thanksgiving and asked me to plan their wedding. A simple water ritual at the heart of the ceremony provided everyone with the opportunity to give the couple a special blessing. A large pitcher of water stood next to an empty bowl. One by one, friends spoke words of blessing, pouring water from the pitcher into the bowl as they did so.

At the end of the ritual, the bowl was filled with clear, sparkling water containing all the blessings. The couple poured some of the water into two goblets and, looking into each other's eyes, drank it, while I spoke of how these mingled blessings would strengthen their love. They took the rest of the water home with them, bottled some of it to freeze and drink on their first anniversary, and poured the remainder into the garden they'd planted together.

You can adapt this ceremony for births, bar mitzvahs, birthdays, graduations, memorial services, and other life transitions. Use it to create blessings and prayers for harmony, world peace, or for any other intention a group wishes to express.

CONNECTING WITH THE WHOLENES OF WATER

Listen to the sounds of water: the whoosh of ocean tides, the tinkle of fountains, and the steady musical drip of gentle rain. Feel the liquid against your skin: smooth and silky or pounding and prickly, enveloping you in a womb of buoyancy. See how water sparkles in sunlight, how a rushing creek foams and curls against the stones, how a deep lake looks still and bottomless. Smell the ocean-salt tang, the brine of old rivers, and the fresh scent of waterfalls.

To celebrate water is to take pleasure in and honor its sounds and smells and textures and faces. Sift through your water memories: What stands out? Do you remember the first time you went into the ocean, bobbing joyfully and merging more and more with each wave? Perhaps someone gave you a dipperful of cold well water on a summer day. Did you revel in taking a long shower after walking several hours on a dusty trail? Have you watched

a breathtaking waterfall as it cascaded down a cliff? What messages did you receive from your experiences with water? As you relive those memories with gratitude and appreciation, in the quiet of your room or in your own heart space, you're celebrating the sacred gift of water.

Anytime you want to experience the energy of that blessing, close your eyes. Picture that shimmering lake or those crashing ocean waves. Let their sounds and textures come alive for you. Soon you'll be floating in harmony with the universe.

Let sacred water be your guide and teacher to help you flow through life with the ease of a river, with the strength of a waterfall, and with the abundance of an ocean.





ABOUT THE AUTHOR

Masaru Emoto was born in Yokohama, Japan, in July 1943. He's a graduate of the Yokohama Municipal University's Department of Humanities and Sciences with a focus on international relations. In 1986, he established the IHM Corporation in Tokyo. In October of 1992, he received certification from the Open International University as a doctor of alternative medicine. Subsequently, he was introduced to the concept of micro-cluster water in the U.S., and Magnetic Resonance Analysis technology. The quest thus began to discover the mystery of water.

He undertook extensive research of water around the planet, not so much as a scientist, but more from the perspective of an original thinker. At length he realized that it was in the frozen crystal form that water showed us its true nature. He continues with this experimentation and has written a variety of well-received books in Japanese as well as the seminal *The Message from Water* (Volumes I, II, and III), published bilingually. He also wrote *The Hidden Messages in Water*, *The Healing Power of Water*, and *The True Power of Water*.





ABOUT THE CONTRIBUTORS

MIRANDA ALCOTT

Miranda Alcott is a crisis responder, intuitive healer, and counselor who works with her service hearing/crisis intervention canine, Whisper. She has a master's degree in spiritual psychology and uses her awareness of energetic fields, colors, frequencies, and vibrations to help those who are confronting crisis in their lives.

RICHARD BEAUMONT

Richard Beaumont cofounded *Kindred Spirit* magazine in 1987 and has been its editor-in-chief for almost two decades. His investigations into the mind, body, and spirit have led him on countless investigations and resulted in him writing more than 100 articles. Recently he was on a live television broadcast of BBC4's *The World* program discussing the film *What the Bleep Do We Know!?*, which contains key references to Dr. Emoto's work. He has interviewed Dr. Emoto and filed several articles on the mysteries of water in the magazine. He's currently the director of the national organization for the dissemination of information on the Human Design System, which studies the genetic imprints behind incarnation. See www.humandesign.info.

WILLIAM BLOOM, PH.D.

William Bloom is one of the U.K.'s most experienced teachers, healers, and authors in the field of holistic development. His background includes a doctorate from the LSE, 2 years of spiritual retreat living amongst the Saharan Berbers in the High Atlas Mountains, 30 years on the faculty of the

Findhorn Foundation, and being cofounder and director for 10 years of the Saint James's Church Alternatives program in London. He's a meditation master; and his books include the seminal *The Endorphin Effect* (Piatkus Books, 2001), *Working with Angels* (Piatkus Books, 1999), *Psychic Protection* (Piatkus Books, 1996) and most recently *Soulution: The Holistic Manifesto* (Hay House, 2004). He's currently heading up several projects to ground holistic spirituality into mainstream U.K. society. He lives in Glastonbury with his family.

PETRA BRACHT, M.D.

Petra Bracht is a physician who also works with natural remedies. She writes for a variety of medical journals and has published a book. She spent eight years lecturing on health and diet at the Johann-Wolfgang-Goethe University in Frankfurt and is currently a visiting lecturer. She appears regularly as a health expert on a variety of German television programs.

MARIL CRABTREE

Maril Crabtree is a writer, editor, energy healer, and spiritual coach. She's the editor of four anthologies of personal essays, meditations, and rituals on the impact of the four elements, including *Sacred Waters: Stories of Healing, Cleansing and Renewal* (Adams Media, 2005). You may contact her through her Website: www.sacredfeathers.com.

MAXIMILIAN GLAS

Maximilian Glas fell in love with stones at the age of ten and has been loyal to this love ever since. He studied mineralogy and became cofounder and editor-in-chief of the mineral journal *Lapis*. He has written numerous articles on the subject and organizes mineralogical exhibitions.

CARRIE JOST

Carrie Jost has been working with kinesiology since 1987. She has trained in many of the kinesiological approaches, psychotherapy, a variety of bodywork methods, and shamanic healing. She's currently head of the School of Creative Kinesiology in the UK, working with individuals and running training courses for practitioners who use kinesiology to help people find their way forward in life by dealing with the issues that get in the way. She brings her love of this work to everything she does.

DOLLY KNIGHT AND JONATHAN STROMBERG

Dolly Knight holds degrees in medicine and homeopathy and has cared for and helped many people and animals since the age of three. Jonathan Stromberg holds a bachelor of science in environmental geology and a master of science in engineering geology and is a fellow of the Geological Society. Together, they founded the Centre for Implosion Research in the UK in 1997. Both are members of the Scientific and Medical Network.

SIG LONEGREN

Sig Lonegren was taught to dowse over 45 years ago by his mother. He has a master's degree in the study of sacred space, is a past trustee of the American Society of Dowsters, and presently serves as vice president of the British Society of Dowsters and as a trustee at Chalice Well in Glastonbury. He's the author of three books on dowsing.

ELIZABETH PUTTICK, PH.D.

Elizabeth Puttick is a sociologist of religion and Indologist. She's the author of *Women in New Religion* (Macmillan/St. Martin's Press, 1997), numerous scholarly papers, and contributions to various books and

encyclopedias on world religions, including the *Encyclopedia of Hinduism* (RoutledgeCurzon, 2007). Her spiritual path took her to India, where she traveled extensively and lived in an ashram for five years. Nowadays, she runs a literary agency in London (www.puttick.com).

RUSTUM ROY

Throughout his 60-year career, Rustum Roy has interwoven both world-class science and the reformation of theology and the practice of religion. He's at once a distinguished research scientist and a social activist, a societal reformer, and a champion of whole-person healing (or CAM). He currently holds professorships at Penn State, Arizona State, and the University of Arizona covering those fields. His work has been recognized by his election to five separate National Academies of Engineering/Science: the U.S., Sweden, India, Japan, and Russia. He has had the Order of the Rising Sun with Gold Rays conferred on him by the Emperor of Japan.

One of the key founders of the first major interdisciplinary field in the Western world's academia—materials research—he played the same role for the field of science, technology, and society. He has also been involved—usually as the only scientist—with cutting-edge reform of the Christian church. He has given the prestigious Hibbert Lectures in London and served on the Pope's Nova Spes Committee on Science and Religion, a field on which he has written and lectured for 50 years.

SAYAMA

“Sayama” Richard Hiebinger was born in 1964. He worked for several years in the field of music therapy with mentally handicapped children and for the last 15 years has been involved with sound therapy and holistic practices (Tai Chi, Qi Gong, meditation, energy work, and aromatherapy) to harmonize mind, body, and spirit with the aim of developing the human creative potential. He founded the record label Sayama-music in 1991 and has published numerous CDs, including *Sacred Healing Waters* and *Sacred*

Healing Touch (both available from www.realmusic.com). His work is characterized by sensitive arrangements from different cultures of the world and by being in tune with the sounds of the planets as developed by H. Cousto. He regularly gives concerts and leads seminars.

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CYRIL W. SMITH

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STARHAWK

Starhawk is the author of ten books on Goddess religion, Earth-based spirituality, and activism, including *The Spiral Dance*; *The Fifth Sacred Thing*; and her latest, *The Earth Path* (HarperSanFrancisco). She teaches permaculture design with a focus on Earth-based spirituality, organizing, and activism in her Earth Activist Trainings. A committed activist for global justice and the environment, she travels globally, teaching, lecturing, and training.

JOSÉ LUIS STEVENS, PH.D.

José Luis Stevens is the president and cofounder (with Lena Stevens) of Power Path Seminars, an international school and consulting firm dedicated to the study and application of shamanism and indigenous wisdom to business and everyday life. He's based in Santa Fe, New Mexico.

José completed a ten-year apprenticeship with a Huichol *maracame* (shaman) in the sierras of central Mexico. In addition, he's studying intensively with Shipibo shamans in the Peruvian Amazon and with Pacos in the Andes in Peru.

He's a licensed psychotherapist, life coach, and teacher with more than 35 years of experience, and is the author of ten books and numerous articles, including *The Power Path* (New World Library, 2002), *Secrets of Shamanism* (Avon Books, 1988), and *Praying with Power* (Watkins, 2005).

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William A. Tiller, professor emeritus, Stanford University's department of material science and engineering and fellow to the American Academy for the Advancement of Science, is the discoverer of a second, unique level of physical reality—a new energy manifesting in nature. In his conventional science field, he has published more than 250 scientific papers, three books, and several patents. In parallel, for the past 30 years, he has been pursuing

serious experimental and theoretical study of the field of psychoenergetics, which he thinks will become a very important part of “tomorrow’s” physics. In this new area, he has published, to date, an additional 100 scientific papers and three seminal books: *Science and Human Transformation: Subtle Energies, Intentionality and Consciousness*; *Conscious Acts of Creation: The Emergence of a New Physics*; and *Some Science Adventures with Real Magic*. He currently directs the William A. Tiller Foundation for New Science in Arizona (www.tiller.org) and was a featured scientist in the movie *What the Bleep Do We Know!?*

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Doreen teaches classes related to her books and frequently gives audience angel readings. For information on her products, workshops, message-board community, or to receive her free monthly e-newsletter, please visit: www.angeltherapy.com.

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“With his simple but far-reaching message, Masaru Emoto has made an important contribution to global efforts for peace and harmony.”

**—Anthony Robbins, author of
*Awaken the Giant Within and Unlimited Power***

From its arrival on earth to the vast areas it traverses before emptying into the sea, water holds all the knowledge and experience it has acquired. As phenomenal as it may seem, water carries its whole history, just as we carry ours. It carries secrets, too.

In *The Secret Life of Water*, bestselling author Masaru Emoto guides us along water's remarkable journey through our planet and continues his work to reveal water's secret life to humankind. He shows how we can apply its wisdom to our own lives, and how, by learning to respect and appreciate water, we can better confront the challenges that face the twenty-first century—and rejuvenate the planet.

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—Marcus Laux, N.D., editor of *Naturally Well Today*



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Dr. Masaru Emoto is an internationally renowned Japanese researcher, lecturer, and bestselling author. He is a graduate of the Yokohama Municipal University's Department of Humanities and Sciences with a focus on international relations, and he received certification as a Doctor of Alternative Medicine from the Open International University.



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Masaru Emoto

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The universe, silence, a world stretching into all eternity

They came here from far away—hundreds and thousands of clumps of ice—moving through outer space. After a long journey through the expanse between planets and stars, the grand journey is about to come to an end.

The earth, emerald-green, shining brightly

As the ice approaches earth, it enters the atmosphere and begins to break up, gradually becoming smaller, spreading out, and then finally falling to the ground.

Clouds, ornaments in the sky, art evolving moment by moment

When the ice granules fall to a certain point, they become a fine curtain of mist and spread out in the sky, creating a white carpet above the earth. A cloud is born.

Rain, ice granules falling down on plants, gently providing moisture

Rain falls, bringing nourishment to the earth—forests, fields, flowers. The water sinks into the ground only to emerge ages later as springwater.

River, splashing, sparkling, flowing magnificently

At first a muddy stream, the water eventually becomes a river flowing through the meadows—waterways, carrying life within.

Sandy beach, blue sky, sparkling ocean reflecting the sun, white waves

Aeons ago, this is where it all began. The ocean gave birth to life and life emerged on land, creating a new day—the birth of bustling culture.

Morning mist, droplets flowing down the veins of green leaves

Water, in its most pure and beautiful form, rises up in the cool air of the forest morning, creating a mist.

Beside the water well, nice and cool, the laughing of children

The children share a watermelon. Plants take their moisture from the ground, providing us with sweet fruit. Water from the well is cold and delicious.

Industry, chimneys, black smoke, discarded plastic bottles

Somewhere along the way, we have forgotten how to show our appreciation for water. Water from the ground is polluted, and water from our taps no longer tastes good, so we resort to water in plastic bottles.

A new century, a new war, hope and despair

Perhaps the pollution of water is nothing more than the pollution of the human soul. Modern society has gone as far as we can go. What is to come of us now?

Ice crystals, shining diamonds, a new hope, the beginning of a new adventure

CONTENTS



[Introduction](#)

[CHAPTER ONE](#)



[Tune in to the Hado of Happiness](#)

[CHAPTER TWO](#)



[Water's Healing Melody](#)

[CHAPTER THREE](#)



[Cycles of Water, Cycles of Life](#)

[CHAPTER FOUR](#)



[The Wonder of Hado: Explaining the Inexplicable](#)

[CHAPTER FIVE](#)



[Our World and Our Water Are Changed by Prayer](#)

[Epilogue](#)

INTRODUCTION

Starting with my first collection of water-crystal photographs, *Messages from Water* [*Mizu kara no dengen*] (Vibration Kyoikusha, 1999), I have come to realize that these water books have a strange and wonderful power. They have wings of their own and go beyond my own familiar boundaries to distant lands, where they have an enormous impact. They force people to experience a different way of seeing things, and I am often invited to speak to the people who have been touched by these books.

I sometimes feel like I'm being guided by the spirit of water. I feel like I can see and even talk to this spirit, which I see as water droplets shining brightly in the air. The droplets join together to form clouds, disappearing just as fast, all for my entertainment.

Even though I now feel like I am being guided by the spirit of water, my first conscious interaction with water was not at all pleasant. In Yokohama, Japan, where I grew up, my family lived on a plateau near the ocean. It was only a short walk down a slope to the water's edge. When the tide went out, the shallow shore was left uncovered for miles, making it a great place to hunt for various types of clams. But at high tide, the scene was completely different.

I must have been six or seven when the sea swallowed me up one day. I had gone out swimming with the boy next door, who was two years older than I.

We had gone out farther than we should have, and I suddenly began bobbing up and down, gasping for air. It was the first time I had experienced anything like it. I was only ten meters from land, but my feet didn't touch the bottom. I panicked and started waving my arms and kicking my feet. But the more I panicked, the more I sunk, and soon I started to swallow water. I thought that was going to be the end of me, but a small boat approached and pulled me out of the water.

When I went home and told my mother what had happened, she gave me some advice based on her own ability to swim and her understanding of water. “You can float if you just give in,” she said. She told me that if I let the water lift me instead of trying to resist it, it would pick me up and carry me.

These words have stuck with me over the years. Since that time, I have tried to let myself go with the flow as I gently move in the direction that I wish my life to take me.

Now whenever I go swimming in the ocean or a pool, I like to just lie on my back and let myself be carried in the arms of water. And it’s times like that more than any other that I feel the presence of the spirit of water in the form of shining droplets.

I feel quite confident in saying that the reason I came up with the idea of freezing water and taking photographs of the crystals was that I desired to go with the flow of life. The spirit of water came to my aid, guiding me to live the life that I now live. The spirit has led me and guided me over the years, teaching me the many things I need to know, culminating in the publication of my book *The Hidden Messages in Water*.

Shortly after its publication, readers began sending me letters of appreciation. Their kind words have helped to create a wonderful flow for me to give myself up to. Most of the letters expressed appreciation and also amazement in seeing the truth of nature revealed through water crystals.

One woman wrote, “Of all the books that I have read in my life, this is the most wonderful. Thank you so much for this book—it’s as if it were surrounded by light. I will treasure it for the rest of my life.”

Another message read, “To see truth revealed in such a visible way is truly surprising, amazing, and convincing. This book made me realize that the effects brought about by ancient teachings, prayer, and religion are not simply superstitions and random ideas, but effects based on the truths of the universe.”

Another wrote, “My seventy-six-year-old father told me, ‘Of all the books people have recommended to me, this is the only one I’m glad I read.’ Thank you for this book that has changed my perspective on life.”

In fact, if we were to take the energy from all these messages and make a crystal, I am certain that it would be a beautiful one.

This is the work of the water crystals. I find that those who are attracted by the beauty of crystals become connected and then they resonate with each other. Like when a single leaf falls onto the surface of water, a quiet and soft but certain wave is spreading out as a result of water’s secret life being revealed to mankind.

The response has been the same all over the world. I have met with people from Germany, Switzerland, Austria, Holland, England, France, Italy, America, Canada, Costa Rica, Uruguay, Ecuador, Brazil, Australia, South Korea, the Philippines, and Taiwan, where I have given lectures. In June 2002, I was invited by the Greek Orthodox Church to join a luxury-cruise seminar tour on the Adriatic Sea along with religious leaders and scientists from around the world. Symposiums were held in Greece, Albania, Montenegro, Slovenia, Croatia, Italy, and other ports of call. Called the International Symposium on Religion, Science, and the Environment, the event was being held for the fourth time. I had been invited just three months before the symposium by one of the organizers of the symposium, a Greek woman whose daughter had showed her the collection of crystal photographs. The emotions of the many people who saw the crystal photographs reached behind the individual and resulted in a flow of wonderment from one person to another that has now become a flowing river.

There’s another way to express the response to the water-crystal books. It’s as if the water crystals have brought moisture back to the dried-up souls of those who live in the harsh conditions of modern society. They have replenished the brilliance of life to individuals and society. More than anything else, the photographs have succeeded in starting an enormous movement that is taking place among people around the world.

The act of living is the act of flowing. If a dam is built in a river to stop its flow, the river will die. Likewise, if the flow of blood gets dammed up somewhere in our bodies, it will mean the end of life.

The same is true for cities and countries. I was recently blessed with the opportunity to lecture to a large audience in Berlin. As you know, Berlin is a city that was once divided in two by a wall. I told the audience that just as water should remain free to flow, in no way should a city or a country be divided. The splitting of Berlin in 1961 resulted in a great hardship, loss of homes, and loss of dreams.

Then, twenty-eight years later, the wall was torn down and, like water allowed to flow freely, millions of people began to come and go of their own free will. The people emulated the flow of water, a principle of nature. And the reason is that people are mostly water.

About 70 percent of our bodies are water. This is the case for adults of all races, and it is why people should not be divided by political strategies and ideologies. Just like water, people must always be allowed to flow freely.

When I finished speaking to the audience, I noticed that a change had come over the hall. It was like a feeling spread over all of us. A wave of people stood up and started clapping. Their souls had been touched by my message, and the result was a wave of emotion that encompassed the hall, creating an ever-larger wave that would expand to others.

The desire for peace and prayers of love cannot be contained within borders. Differences in skin color or language are easily overcome when hearts resonate together, creating a new flowing wave.

A small adventure beginning with a tiny little water crystal has spread to people all over the world, creating a growing movement. The water crystals have resonated with something pure and holy deep within the souls of the people who see the photographs. Hearts have been opened, and love, gratitude, and a hope for peace have spilled out, opening the way for a new adventure.



Through this book and through these crystal photographs, I hope to convey the power of prayer.

When water is exposed to certain expressions—“You’re cute,” “You’re beautiful,” “Love and gratitude”—a beautiful crystal results when the water is frozen. What does this really mean for us? The thoughts in our hearts have an impact on all life and in the creation of our world tomorrow.

A wondrous power resides within the human soul. We hear all the time that our actions are a result of our thoughts, and this principle is truly demonstrated in how water forms crystals according to what influences it has been exposed to.

But the power to affect action with thought is a double-edged sword. If people desire to see the destruction of the world, then that is what will result.

A lot has happened in our world since people have become aware of the water crystals. Gigantic buildings—symbols of civilization and prosperity—have collapsed before our eyes. New wars have erupted. We have seen sadness give birth to anger, and anger create more sadness, creating a cycle that encompasses the world around us. Some people cry, some look down in despair, and some look up in prayer. We must use the power within us to keep our thoughts focused on the good around us and not on the forces of destruction.

We are at a point in human history when we most need to rediscover some important truths that we have somehow forgotten. In fact, this might be our last chance. And this is the lesson that I feel water crystals are trying to teach us.

My research into crystals began with the desire to get even one tiny step closer to understanding the universe, but that has now led to the evolution of a broad field of study for me.

I have seen the effect that bright smiles of people throughout the world and expressions of emotion can have on the formation of beautiful crystals. But you may ask, can world peace occur from mere water crystals? It is my

desire to take the first step in that direction and then one more and then another and on and on toward that end.

As I continue my conversation with water, the crystals continue to teach me many lessons: the importance of living in tune with the rhythm of life and the flow of nature, leaving the earth beautiful for future generations; love; and prayer. All of these various messages have been included in this book. I could be no happier than to find that it has had a positive influence on all those who have picked it up.

Finally, I would like to express my appreciation to Beyond Words Publishing, my English-language publisher of *The Hidden Messages in Water* and *The True Power of Water*, and all others who have helped in various ways, and also my staff at IHM who endured many hours in a refrigerated room taking pictures of crystals.

CHAPTER ONE



Tune in to the Hado of Happiness

What comes to mind when you think about happiness?

Do you think about love coming true for you? Perhaps the moment of birth of a son or a daughter? A job well done? Or a time you remember lying in the green grass and gazing up at the blue sky? The answer is different for everyone. We all have our own image of what happiness is. But all of us want to live a life filled with happiness.

I know of only one way to do this, and that is to align yourself with the hado of happiness. As I described in my book *The True Power of Water*, hado is the subtle energy that exists in all things.

All that exists in the universe vibrates at a unique frequency. So if you emit a hado of happiness, then you can be sure that the universe will respond with happiness. What do you need to do to align yourself with the hado of happiness?

Part of the problem is that it's hard to know what happiness really is. Perhaps there was a time when you thought you were happy, but then you realized that it was only an illusion. Or maybe you believed that a blissful relationship was finally within your reach only to compare what you had with someone else and see your dream castle crumble in the sand and be washed away.

On a trip to Germany, my daughter, who now lives in the Netherlands, told me about one of her friends who had lived in East Germany before the Berlin Wall came down. The construction of the Berlin Wall was a time of great sadness for the people of Germany, but my daughter's friend said that despite the city being divided, life on the east side of the wall went on basically as normal. In fact, a sense of contentment came from knowing that

no one had to worry about what others were thinking because everyone was poor.

But when the wall finally came down and the people in the eastern part of the city were now suddenly able to obtain everything that the western part of the city had to offer, problems began. The more new, shiny things they saw, the more they wanted. But the easterners were basically still poor, so the result was a lot of unsatisfied needs. Some even longed for the days before the wall came down when people were poor and prices low.

It seemed as if the country had first been torn apart and then put back together all without regard for the will of the people. Of course the fall of the Berlin Wall is one of the most jubilant moments of modern history, but we have to admit that even this wonderful turning point had its repercussions.

When we start to compare our happiness with that of others, we soon start resonating with the hado of unhappiness. As long as we search for happiness from the outside, then it's unlikely that true happiness can ever be found.

Return to Bliss

The search for happiness is ultimately and simply a search for self. You can go searching for it in distant lands, but you'll only find it in the palm of your hand.

Think back far enough in your life and you'll probably remember a time when you felt innocent bliss. Your life had meaning and you were so busy living that time was forgotten. Then adulthood set in and you put those things away and locked the door. Perhaps you have even forgotten where you put the key.

But those happy feelings are not gone for good. With a little effort, you can open the door and take out those things that you thought were forever a part of your past. When you are true to your self and search for what you really want to be and do, your life will once again begin to flow.

In your job, in your play, and in your love, you need to return to the starting point to find the bliss. When you do this, you will soon realize that your life has changed. You'll first feel a renewed sense of health and well-being. This is because the bliss within you will purify the water that flows through your body. If we were to take a picture of such water, the resulting crystal would most certainly astound us.

One treatment suggested for people with cancer is “life-purpose treatment.” By finding a purpose in life—giving speeches, climbing a mountain, laughing—the immune system is revitalized and the cancer often goes into remission. It's now common knowledge in the medical community that your mind has an enormous impact on your body. Filling your body with the hado of bliss is the very best secret for living a healthy life.

This state of bliss is also the key to expanding what we can do. We all know that if you enjoy something, then you usually excel at it. Yukio Funai, a famous business consultant in Japan who has provided advice to some three thousand companies, advocates an effective method for strengthening the abilities of companies and individuals. He calls this method the “strength-development method,” and it simply involves focusing on the strengths of the company or the individual and working to expand those strengths. Weaknesses are not even considered. The result is that the strengths become stronger and the weaknesses take care of themselves.

For example, if you run a store, it's easy to focus all your attention on how to move the products that aren't selling well. But most stores will have a product that's a strong seller. For a boutique, it may be a particular style of dress; if they can focus their attention on that dress, then sales of that product and other products as well will increase. For a business to succeed, it needs to focus on what is selling well, what's most effective, and what they do best.

We see this concept reflected in the hydroponics method of growing vegetables, which makes it possible to harvest ten thousand tomatoes from a single tomato plant. How, might you ask, is such a thing possible? The answer is surprisingly simple: create a good environment for growing tomatoes.

Plants, of course, grow in soil, but with hydroponics farming, the roots grow in water infused with the nutrition that a plant requires. And because the plant doesn't need to use up energy to push its way through the soil, the roots can grow at will and easily find all the necessary nutrition. In this way, the tomato plant is able to take advantage of all its hidden potential. I remember visiting an experimental farm operated by agronomist Shigeo Nozawa, the inventor of the hydroponics method, a few years before he died and seeing the tomato plant he had grown. To put it lightly, I couldn't believe my eyes.

The same thing applies to us as humans. When you find what you do best and realize that this is where you need to focus your attention, then you will be well on your way to returning to bliss. It won't be long before you sense that your life is undergoing a change. If you know someone, perhaps a child, who is focused on a sport or a certain aspect of study, then you need to provide nourishment in the form of encouragement and compliments. This will help the person become even more focused and more determined.

A good illustration of what can result from the right words can be seen in the formation of water crystals. When water is exposed to the words "You have to do it," the result is never a well-formed crystal. This also goes for words like "You fool," and the worst, "It's no good." Perhaps it's time to take these words out of your vocabulary. Fill it instead with words like "Thank you," "Let's do it," "I love you," "Beautiful," and "Well done." Make these warm and beautiful words the ones you use the most.

The words that make beautiful crystals from the water that flows through your body are the words that fill you with a gentle feeling of peace. And that is when you will be able to expand on your abilities and go about each day with passion and bliss.

In my previous book, I explained how we put cooked rice in three glass jars, and to one of the jars we said "Fool!" To another we said "Thank you." And we simply ignored the rice in the third bottle. The rice that was told "Thank you" fermented and had quite a nice fragrance. The rice that was told "Fool!" darkened and rotted. The rice that was ignored turned black and emitted a highly repugnant smell.

However, that's not the end of the story. I took these same jars of rice to an elementary school, and the students said "Thank you" to the rice in all three containers. It wasn't long before the rice in all three containers fermented and started to emit a pleasant smell—even the rice that had spoiled.

This indicates that even that which is dying and decaying can be brought back to life by caring attention, kind words, and positive thoughts.

Shinichiro Terayama, a former director of the Japan Holistic Medical Society, is a testament to this. Terayama spent his career as an impassioned businessman, and before that he had kidney cancer. He started making it a habit to wake up early and go to the rooftop of his condominium to greet the rising sun. As he watched the morning sun each day, he began to realize that life is a gift, and the words "Thank you" started coming out of his mouth. Without turning his eyes from his cancer, he instead spoke words of appreciation to the cells, and the result was that they began to recover. The cancer receded until he was declared cured.

The ability of the spoken word to give life is much more powerful than we can imagine. A ten-year-old girl conducted an experiment similar to the rice experiment but instead used sunflower seeds. On the seed envelope, the flowerpots, and the watering can, she wrote the words "Thank you" for one and "Fool" for the other, and then she spoke these words to the respective seeds as she took care of them each day.

The plant exposed to "Thank you" grew tall with full, lush leaves. In sharp contrast, the plant exposed to "Fool" had a deformed stem and wrinkled leaves. When we looked at the plants through a microscope, we saw that the leaves of the plant exposed to "Thank you" were dense, while the other plant had leaves that appeared weak and frail.

This may well indicate the presence of consciousness in plants, accounting for this striking difference in the two plants raised by the young girl. I learned about this experiment when the mother of the young girl wrote me a letter, which she ended with a question: *What would happen if this same thing applied to raising children?*



One way to look at words is to consider them the switch for turning on or off the vibration of everything in the universe. Or perhaps words can be thought of as a remote control that has the power to reach anywhere.

Humans are the only animals capable of using words, and this allows us to align our wavelength with anything and everything that exists in the universe. And it's instantaneous. Our words and our thoughts can go anywhere and to everyone in the instant they come forth.

Experiences of unexplainable coincidences are too common to be ignored. Perhaps you have dreamed about someone and later found out that they had died. Perhaps you've thought about someone from your past and then you get a call from that person. It's happened to all of us. And the cause of this phenomenon can be found in the vibration of thoughts.

I once conducted the following experiment. I filled a jar with plain water from the tap at my office in Tokyo, and then I put it on my desk. Since the water came from the city water-works system and contained chlorine, attempts to make crystals from the water failed.

I then asked for the help of five hundred people located throughout Japan. At the same time on the appointed day, they all sent positive thoughts to purify the water on my desk and then sent the message "Thank you" to the water.

As expected, the water changed and was able to form beautiful crystals. The chlorinated water from the tap had changed to pure water.

How could this have happened? I think you know the answer. The thoughts and words of five hundred people reached the water without regard for the borders of time and space.

And in the same way, the vibration of your thoughts at this very moment is having a certain effect on the world. If you understand this, then you can also understand that you already hold in your hands all the keys you need to change your life.

There Is Value in Unhappiness

We can learn another thing about happiness from the perspective of hado: Life is not all happiness. As long as there is life, there will be sadness. All our high hopes can be easily deflated, but another way to look at this is to realize that unhappiness is the path on the way to happiness.

We exposed water to the words “happiness” and “unhappiness.” As expected, the water exposed to “happiness” formed beautiful round crystals that would make a precious ring. But what about crystals formed from water exposed to “unhappiness”? We expected to find deformed and broken crystals, but the crystals were rather beautiful hexagonal crystals that looked like they had been cut in half. It looked as if the water was trying its best to form crystals. It would seem, then, that unhappiness is not really the opposite of happiness. Unhappiness, in fact, is the process required for the creation of happiness.

Happiness and unhappiness are like two ends of the same rope, and sometimes you hold one end of the rope and everything goes your way, and other times you have the other end of the rope and nothing goes your way.

Such is life. We all want to be happy every day and never have to experience sadness. How unnatural that would be! Like the waves that rise and fall, if water never falls, then it could never rise or flow ahead.

For every happiness in life, there is another side. When you’re in love, every day is filled with anticipation and joy, but accommodating another person in your life may require that you sacrifice your free time, your money, and your space. And you can almost be sure that after a fight, you’ll find yourself thinking that you’d be better off alone. The elation felt when you buy the car of your dreams seldom lasts as long as the car. Each new scratch in the paint and each time you fork out money to maintain the car will chip away at your initial happiness.

You can never own only one side of a coin. If you want to find happiness, then you have to be ready to accept what comes with it. Such is the fate of all those who live in this world.

But we can still have hope and look forward to the future. In fact, do you think you would be able to have hope if everything went exactly as you

wanted it to? Your ability to be happy no matter what and no matter when depends entirely on what's going on in your heart.

A Thankful Heart Is the Way to Happiness

Why do people go through life looking for happiness? Dogs and cats look for food and comfort, but they certainly don't go to all the trouble that people do in their continual search for happiness. I suppose the reason is that we are the only ones who can align ourselves with the hado of happiness.

Many years ago, I had a discussion with Dr. Ravi Batra, a well-known international economist, and he said something that has stuck with me:

Why do you think people continually search for happiness? The reason is because we people have a link to unlimited existence. But many of us make a serious mistake. We set up conditions for happiness based on riches and fame, momentary pleasures, and things that are limited and always changing.

There are those who are rich beyond most of our imaginations, and yet they continue to want more as they strive in vain to find happiness. The reason it's in vain is because they are looking to find unlimited happiness in limited money and riches.

Unless we can become one with the unlimited existence, we will never find true happiness. This requires that we raise our consciousness.

All that can be seen with the human eye is of this limited world. Sooner or later, the material trappings will end, and as long as that is how we define happiness, our hearts will always feel hollow.

Of course I understand that casting aside all desire is not possible or even advisable. In fact, desire is not what's preventing us from finding happiness. An appropriate amount of desire is needed to make people strive for something better, and it's what made it possible for human society to rise to its current level. The problem arises when we become slaves to our desires. Our modern society operates on the ability to stir up desire in the masses.

It's no easy task to find happiness in a society established on insatiable desire. So what is it that we need to do to escape never-ending desire and find happiness? The answer is to have a thankful heart.

More than ever, we live in a time when love and appreciation is truly needed. And I think the right ratio for appreciation and love is 2:1—the exact ratio of hydrogen to oxygen in the H₂O molecule!

We have seen where words of appreciation and love result in crystals of indescribable beauty. There are no conditions needed for appreciation. We can be thankful for life and for our freedom to move about.

When you align your soul with the hado of appreciation and love, a small drop of happiness will seep into your heart and spread throughout your body. This will link you to the vibration of happiness, and happiness will become a part of your daily life. And this is the secret for finding happiness right now wherever you are.

The Invisible World of Hado

Water crystals are just one aspect or face of the universe. Water changes its appearance at will as it attempts to speak to us concerning the formation of the cosmos. It is in itself a temporary world formed within a severe environment.

We can peer into this temporary world when we photograph crystals. To take the photographs, we collect water and place drops in fifty petri dishes. We then freeze them at minus 25 degrees centigrade and let them cool for two and a half hours, during which time they form tiny round clumps of ice. We then peer at the ice at five degrees below zero at a magnification of 200 times. The crystals appear for only two minutes under the microscope. During that time, the tiny water crystals form hexagonal patterns and then melt just as quickly as they appear.

In just a few precious moments, the door to a new dimension is opened, giving us a glimpse into a fantasy world. People who see photographs of these crystals are fascinated by their wondrous beauty. Like the

kaleidoscope that we remember looking into as a child, we are suddenly carried away into another world, if only for a brief moment.

This world we enter is the invisible world of vibration, or hado. Three key words are helpful to understand hado. The first is *frequency*. The entire universe is vibrating at a particular and unique frequency. Frequency can be modeled as waves, a fact easily supported by quantum mechanics. All matter is frequency as well as particles. What this means is that rather than considering something a living organism or a mineral, something we can touch or something we can see, everything is vibrating, and vibrating at a unique and individual frequency. But that is still not all, for the words we speak, the words we write, paintings, and photographs all emit their own frequencies as well.

You may have heard of blind people who are able to “see” colors. When they hold something in their hands, they are able to *feel* the color. They know if something is a warm color or a cool color, a strong color or a pale color. Similar to how we feel the temperature and texture of an object, these people are able to feel the color through their skin. They are receptive to the unique frequency emitted by different colors.

The same applies to written words. People with psychic powers reportedly can read a word by touching it while their eyes are closed, and some say they can read letters still sealed in an envelope. If you consider the concept of hado, you might consider that there is the possibility of this being more than a parlor trick.

But why would the formation of crystals be affected by a word written on a piece of paper and placed around a beaker of water for a few hours, or a photograph placed under a beaker for twenty-four hours? The answer, I believe, is that water is capable of feeling hado from the source and memorizing it.

The second word helpful in understanding hado is *resonance*. Resonance is made possible when there is a sender of hado information and a receiver of the information. Say you make a call to someone you want to talk to. Unless that person picks up the receiver, there will be no conversation. Without a receiver, information cannot be sent. A Japanese expression *aun*

no kokyu, or “in-breath and out-breath,” means a state where subtle synchronization occurs when we do things together. This also refers to a relationship between a sender and a receiver.

When there is a match in vibrations, resonance occurs. We can observe the phenomenon of resonance in various aspects of daily life. For example, if you have feelings of hatred toward someone, there is a good chance that this person feels the same way about you. Likewise, if you have positive feelings toward someone, that person will sense those feelings even if you don't express them in words. What we feel in our hearts has a strange way of being relayed to other people.

The third word helpful for understanding hado is *similarity*. The macro world we know is a symbol, an expansion of the micro world. The nine rotating planets in our solar system are the macro version of the electrons circulating around the atomic nucleus, and what is going on within the human body is a miniaturization of what is going on in the grandeur of nature.

We can also say that this is an aspect of the fractal theory. When you look at a tree, you can see that the tips of the branches divide and spread out much in the same way that the first branches of the tree divide and spread out. In other words, because the tree is formed in the same way as the branches, the tree forms a single silhouette, which is sometimes called a fractal structure. The fractal structure can be seen in various aspects of nature: in the ocean coast, in the churning of a river, and in the formation of clouds.

This is also the case with water crystals. Why do water crystals form hexagonal shapes? When the molecules of water join together, the hexagonal shape is the most stable. Of course, such hexagonal structures are too small to see, but when these small structures join together, they form a larger hexagonal shape. In other words, the placement of molecules too small to see and the formation of crystals that we can see through our microscopes are in compliance with the fractal structure.

So by observing the micro world, we can increase our understanding of the macro world; likewise, by observing macro phenomenon, we can learn more about the micro world.

These three key words— *frequency*, *resonance*, and *similarity* —will give you a better understanding of hado. Another important aspect of hado is flow. The Buddha, knowing that flow is a fundamental principle of the universe, said that all things are in flux and nothing is permanent. Water is a good example of this. Water is always flowing with life, purifying what it encounters as it travels. It carries with it the nourishment necessary for sustaining life while also carrying away impurities, giving life to all.

All life flows with the flow of water. Even your life is in constant flow with water. In fact, even the cycle of birth and death complies with this single principle. Circulation is indeed the law of nature.

But there is one form of life that insists on breaking this law of nature: humankind. The desire for more, pride, and the insistence of one ideology over another all serve to block the flow. This is the cause of many of the problems that we find ourselves facing in these troubled times. War that begets greed, tragedy that begets loathing, pollution that begets apathy. These are distortions or blockages of the natural ways of nature.

Many of the problems that we have not even started to solve require careful resolve and bold action. And what will be necessary for us to arrive at solutions? The answer is circulation. This is the key that we need to open the floodgates to a new day for the human race—finding happiness, spreading love, restoring peace, and protecting this jewel called Earth. It all begins with circulation, and it is water that will show us the way. I invite you to begin the journey:

Let's listen carefully. Let's listen to the voice of water.

And steep ourselves in the fantasy world created by water crystals.

Someday we will return to water and become a part of the natural flow.

Filled with amazement, your heart and your step will be lightened.

Such a feeling will show you the most beautiful sight you've ever seen.

There's no need to resist the flow.

No need to be afraid of moving forward.

And the reason is that you are water.

CHAPTER TWO

Water's Healing Melody

If you find yourself feeling down, overwhelmed by the daily grind, or offended by an unkind word or act, then I suggest you try something: simply look at water. Walk to the edge of a nearby pond or a stream and cast your eyes on the gentle waves reflecting the sun. If it's raining, find a puddle and watch the raindrops make rings that appear and disappear. Or while you are washing dishes at the sink, gaze at the geometric creations made as the light from the window mingles with water cascading downward.

I recommend this because you will discover that water takes you to another world where you will feel the water within being washed clean; you will be able to return to who you really are. You have just forgotten for a while that you are water. As you let the water flow gently through your mind and your body, it will heal you at your core.

The flow of water has much to teach us. In fact, the act of living is the act of flowing. It's almost as if the water within your body has a desire to flow. In the same way, your soul must also flow. When your soul is allowed to flow, you feel a burden lifted from your weary body, for the soul and the body are simply two sides of the same coin.

If you have been offended, forgive the offender. And if you feel oppressed for your own offenses against others, forgive yourself. Forgiveness opens up the path for you to naturally and freely flow toward your future.

The universe holds something potentially wonderful for you at each passing moment of life. Open yourself to the good things flowing toward you and you will be able to reach out and welcome a wonderful future into your bosom. If you can't get over a broken heart no matter how hard you try, the last thing you can do is go back and change the past. But there always

remains the possibility that the flow of life will take you to a place more wonderful than you could have hoped for. Every second of life is a new crossroads with new possibilities. If you can realize this, you can free yourself from your burdens, you will see how trivial your problems are, and you will no longer need to be tied to the past.

Water teaches us how to live, how to forgive, how to believe. If you open your ears to the possibilities in life, you may just be able to hear the sound of the pure water that flows through your body even now. It is the sound of your life—a melody of healing.

Water Is Part of the Rhythm of Life

The water flowing within us is part of the water flowing through nature and part of the rhythm of life being played out throughout the universe.

In Europe and other parts of the world, it has long been said that the moon rules over water. The ocean's tides are directly affected by the movements of the moon. Perhaps low and high tides are the most visible response to the moon, but wherever life is to be found, there is certain to be a link to the movement of the moon. The clam feels the gravitational pull from the moon and opens its shell at high tide. The breeding cycle of the sea urchin is exactly in line with the lunar cycle. And seagulls come to shore to lay their eggs almost always on the evening of a full moon, for reasons other than the increased light.

We could hardly expect that human bodies, consisting of 70 percent water, would be the exception. More babies are born when there is a full moon, as any midwife will tell you. The female reproductive cycle is in time with the moon's. Many people with sharpened sensitivities say they are energized on nights when the moon is full. Full-moon energy is linked to insanity and stories of werewolves. Even the word *lunatic* comes from the root *lunar*.

It makes perfect sense that most of the ancient cultures of the world have relied on the lunar calendar to measure time. The lunar calendar, which is closely aligned with the cycle of life, was an important tool for planting and harvesting crops. When our rhythm is in line with the movement of the

moon, we can more easily align to the flowing of the water within us. This is nothing less than living life to the beat of the drum played by the rhythm of nature. It is also a piece of wisdom mostly lost on modern man.

Similar to the lunar calendar is the thirteen-month calendar used by the Mayans, which is somewhat different from the lunar calendar. I learned about Dr. Jose Arguelles and his wife, Lloydine, who have made it their cause to print copies of this calendar and spread its use throughout the world. They believe that if the calendar is used on a global scale, then people will start to live within the rhythm of nature, thus opening paths that lead to solutions for many of the problems faced by modern society.

According to this calendar, the new year starts on July 26. When the 365 days of the year are divided by 28, the days in each month, you get 13 months. And one extra day. On the Mayan calendar, this extra day of the year was called “the day out of time.” All work was laid aside, prayers were offered, and prosperity was celebrated with laughter and dance.

While changing to a lunar-based calendar may not be practical or desirable for everyone, we can attune to the moon and the rhythm of life in our own ways. The human body is a tiny universe of its own. Being in tune with this grand universe within allows us to fully experience the energy flowing from the cosmos. When we return to living as one with the universe, we will rediscover the simplicity and spontaneity we were intended for and that was intended for us.

The number of people in the world searching for inner healing is vast, and it may include you. Perhaps the reason is because the environment we have created for ourselves has evolved too fast, and now we find ourselves in a world of pain and fatigue of our own creation. How do we save ourselves from it? Listen to the melody flowing from the world around you. When you can feel this rhythm flowing within the water that makes up your being, then you will become one with the water crystals. This is the life that so many of us are searching for. It’s the healing experience that we know deep in our souls is waiting for us. Everyone is searching for healing.

Music as a Healing Force

Alan Roubik is an American pianist who has based his musical career on the principle that music has the ability to heal. In addition to being a performer, Alan is a music producer for television commercials and films, and he also has his own recording company. His piano music has no rival in clarity: many who listen to it say that they feel like their bodies become transparent.

Alan had an experience when he was a young boy which convinced him that music has the power to heal, and since that time, he has based his career on writing music for healing. He started playing the organ at age three as a child prodigy, and from the age of nine, he focused on the piano and on writing and performing. But in his teen years his life took a sudden change. He injured the ulnar nerve in his right arm during physical-education class at school, making it painful and nearly impossible to move his fingers.

For several months, he was unable to play the piano. The muscles in his fingers began to weaken. It seemed as if the road to his future had suddenly come to an insurmountable impasse, and the realization that he would likely lose the music which he loved so much sent him into a deep depression. He tried thinking about other futures, but he always found himself sitting in front of the piano.

And then one day, perhaps in utter desperation, he put his hands on the keyboard and let whatever was in his heart come out. Alan says that what he felt at that moment was something like happiness in his fingers. He could feel the life energy flowing through his hands and the resonance between the sound of the piano and the movement of his fingers.

Alan's hands began to recover almost immediately, and it wasn't long before he was able to play as good as before—or even better.

I first met Alan in 1995 through an introduction by the scientist who had invented the Magnetic Resonance Analyzer (MRA), a hado measuring instrument that is capable of measuring minute vibrations. With the cooperation of this scientist, we asked Alan to compose music that would express the healing powers of hado. We wanted to have healing music that would be capable of boosting the body's immune system.

When the score was completed and recorded, we exposed water to it, and as might have been expected, crystals formed from the water were exceedingly beautiful and delicate—typical of healing characteristics.

When we showed photographs of the crystals to Alan, he said that he was surprised to see that all the crystals formed were identical to the images he had in his mind when he was composing the music.

Alan is one of many artists who is highly aware that music is a form of healing. But we also know that the classical music from the past, famous jazz pieces, and folk music from the corners of the world also have the ability to heal in their own individual ways.

I exposed water to classical music from various composers and then took photographs of the resulting crystals. Then we took hado measurements of the photographs with the MRA. The results revealed the hado—emotional and physical—affected by the music. Some of these results I shared in *The True Power of Water*. Here are two additional findings:

Wagner’s “Ride of the Valkyries”

Emotional hado: Self-pity

Physical hado: Alleviation of indirect pain

Debussy’s “Prelude to ‘The Afternoon of a Faun’”

Emotional hado: Environmental stress

Physical hado: Alleviation and prevention of back problems

What this all means is that good music has the ability to guide us on the path of healing. It seems that this is especially the case with classical music, which has stood the test of time. When water is exposed to this music, my research has found that the water becomes energetic, and beautiful crystals are formed.

Music is also a representation of the time and environment in which the music was composed. If you look back on different periods in history,

you'll find that different periods are characterized by certain music. This is because the types and degrees of stress that society experiences change with the times and require healing. This results in the creation of music that harmonizes with the frequency prevalent in society.

Consider the jazz that came out of New York beginning in the 1940s. Toru Yazawa, a member of a popular band in Japan known as Alice, once shared with me a brief history of jazz.

Jazz got its start with the blues sung and played by African-Americans. When this music was combined with the brass bands of New Orleans, the result was the vivid and liberal genre known as New Orleans jazz. The jazz of this period was mostly simple three-chord melodies, which is why it sounds simple and blissful.

Over time, the center of jazz moved to New York, and in the years after the end of World War II, a new form of jazz called modern jazz started to emerge. Modern jazz consists of complicated chords. Sounds that would normally create a roar were combined, and then other sounds are piled on top of each other, resulting in the uniquely gloomy, avant-garde feel of modern jazz.

During that time, New York City, as well as the whole United States, was experiencing uneasiness and anxiety over the emergence of the Soviet Union and other threatening enemies, creating the atmosphere that led to the Korean and Vietnam wars. Those who lived in New York, a melting pot of different people, in that particular time were experiencing a type of stress never felt before. Perhaps, simpler music (three-chord) was needed for healing simpler human relations, while more complex music was needed for healing more complex human relations. Simply put, music, in addition to being art and providing entertainment, is more than anything a form of healing.

Healing with Hado

As I mentioned in my book *The True Power of Water*, I am keenly interested in the field of hado medicine. Hado medicine focuses on the

underlying cause of the symptoms of illness, in contrast to the medical practices which require that we take pills or undergo surgery to deal with symptoms of disease. Hado medicine deals with the unique vibration of the illness itself. I can say with certainty that the day will come when hado medicine is widely accepted. Most people today go to the drugstore to find solutions for their ailments, but perhaps one day instead of getting a prescription of medicine, you will get a prescription of music to heal what's ailing you. Such a day may not be as far away as you think.

All symptoms of illnesses vibrate at a unique frequency. By knowing the frequency, it is possible to overlap the exact opposite wavelength on top of the symptom's wavelength; thus, the frequency of the illness is dissipated and the symptoms are alleviated. This is already in practice to some degree with treatment for Parkinson's disease and other neurological illnesses.

Hado medicine not only deals with the specific body part where symptoms are located; it also helps to alleviate the real cause behind the sickness, which is often negative emotions. For example, if a person is experiencing liver problems, then we will also almost always find that the person has anger issues. The wavelength generated by anger is the same as the wavelength generated by the molecules of the cells that make up the liver, so the wavelengths of anger and the liver are in tune with each other. In the same way, the emotion of sadness is in tune with the blood, and so sad people tend to be easily plagued by leukemia and hemorrhage-type strokes. Continued irritability damages the nervous system, often leading to pain, sensitivity, and stiff muscles in the lower neck and shoulders.

An important aspect of hado medicine is that the human body is considered to be a universe of its own. Our bodies consist of some 60 trillion cells, each carrying out its specialized responsibility while simultaneously harmonizing with other cells in a wonderful way to make us who we are. The organs, nerves, and cells of the body have their own unique frequency. The body is like a grand orchestra consisting of the harmonization of various sounds. When something goes wrong somewhere in our body, there is discord with one of the sounds. And when even one sound is out of pitch, the entire composition is not as it should be.

A dentist named Kazumasa Muratsu has seen significant results with patients he has treated based on the perspective that teeth are nothing less than organs of the body. In one instance, one of his patients was unable to clench her hands for many years, but when Dr. Muratsu removed the metal fillings on her upper teeth and adjusted her bite, she regained full use of her hands. She also found that she no longer suffered from chronic pain in her lower back and her right leg.

This indicates that teeth have an effect on the entire body, and complications with teeth can influence the rest of the body in totally unpredictable ways. Dr. Muratsu, in fact, says that the teeth are one part of the core control center of the body.

But modern medicine sees the human body as a machine consisting of various independent parts, and the healing they provide deals only with taking care of the particular defect of the particular part that's gotten out of order. But if one symptom is attended to and followed by something failing elsewhere in the body, then true healing has not really taken place. Hado medicine is all about dealing with the health of the entire body, which is why the word *healing* and not "curing" is more appropriate.

Other Forms of Hado Medicine

We can see that hado medicine holds tremendous promise, but I don't want to give you the impression that this technology is anything new. The principles were well known by the ancient cultures and incorporated into their daily lives. In fact, there have been many cases where the wisdom of the distant past has been reexamined to discover that the applications are still valid in our day.

The use of flower essences is one ancient method of healing that has paved the way for hado medicine. The energy and vibration of flowers is transferred to water, and by drinking this water, the patient receives both physical and mental healing benefits. You might postulate that during the transferring process, it is the actual components of the flower that are dissolved in the water, but actually it is only the vibration that gets

transferred. Therefore, a chemical analysis of flower essence will detect only water.

The science of flower essence was established by a British bacteriologist named Dr. Edward Bach. He developed essences known as Bach Flower Remedies, which can now be found throughout the world. In fact, flower essence therapy has expanded to incorporate the characteristics of individual countries. A popular form of flower essence in Japan is called Findhorn flower essence. In northern Scotland, near Loch Ness Lake, there is a community called Findhorn where people from all over the world have come together to live and participate in events and workshops related to living as one with nature and finding one's true way through life.

Marion Leigh introduced flower essence therapy at Findhorn. She is a woman whose smile has the brilliance of flowers. I interviewed Marion when she came to Japan several years ago. She told me,

Our bodies serve as a tool for accomplishing spiritual missions. In order to carry out our mission, we need to release the warped feelings and emotions—fear and grief, sadness, suspicion, impatience, weaknesses, and apathy—that form a block between the spirit and the body.

Such emotions become the cause of many of the symptoms that we experience. Our modern medicine is for the most part unable to deal with the roots of our illnesses, but this is an area where flower essence has proven to be effective.

According to Veda philosophy from India, there are seven places on the human body called chakra points that serve as the portals for unseen energy to enter the body. It is said that flower essence makes use of these chakras to heal certain ailments and parts of the body, depending on the characteristics of the flower. The gorse flower prevalent around the area of Findhorn has a vibration of joy and passion and can be used to effectively deal with a lack of energy, depression, and the weakening of the immune system. Scottish primrose is a symbol of peace and is used to calm and harmonize during times of fear or panic. The cherry blossom can be made into an essence that has the ability to return you to your inner path. It can effectively be used to help you overcome negative patterns of thinking and

feelings of inferiority that weigh you down, while helping you to regain feelings of love and compassion.

To make your own flower essence, go outside on a bright and sunny morning and collect flowers. Cut each flower at the stem, being careful not to touch the flower itself with your hand. Then put the flowers in a container filled with fresh and pure water and set it in the sun. In about four hours, the essence of the flower will be transferred to the water. You can add a little brandy to make the water last longer. Store the water in glass bottles, and as you use it, dilute it even more with water. As needed, put a few drops on your tongue. Your body and soul will feel the effect without the typical side effects of modern medicine.

I decided to see what would happen if I diluted such essence and made crystals. The crystals that resulted were all very beautiful, not unlike the flowers themselves.



Vibration is something you can't see with the naked eye, which is why it is difficult to verify the positive effects of hado healing using modern analysis and medical examinations. However, we shouldn't be too quick to say that there can be no benefits without scientific verification. Many recognized home remedies do in fact make use of the principle of vibration. Homeopathy, as a form of vibration-based medicine, has the ability to heal the body by using vibrational water.

Homeopathy is a medicine in which "like cures like." To treat an illness, the poison that causes the symptom is diluted with water by 10 to the power of 10, and sometimes even by 10 to the power of 600 or more. The poison, diluted to almost an incomprehensible level, is then given to the patient.

Lacquer, for example, often causes a rash when it comes in contact with skin, but when a homeopathic remedy is made using lacquer, it can be used to treat rashes and skin injuries. Freshly cut onions cause tears and a runny nose, but a homeopathic remedy made with onions is good for treating colds, hay fever, and some allergies that have symptoms of teary eyes and a runny nose. This is referred to as "the law of similars."

Homeopathy got its start when a German doctor named Samuel Hahnemann noticed that the essence of the bark of the cinchona calisaya, which is used to treat malaria, brings on symptoms of malaria when extracted and taken orally. Hahnemann developed his theory of homeopathy and announced it in the early part of the nineteenth century; thereafter homeopathy gradually spread throughout Europe and the United States. This was a completely new type of medicine, and it was widely prescribed because of the noticeable benefits.

By the middle of the nineteenth century, more than four hundred homeopathy clinics existed; even physicians to the royal family in England started practicing homeopathy in 1830. In America, homeopathy was so popular by around 1900 that one in five physicians specialized in it. But then medical associations began to form with the intention of getting rid of homeopathy practices. Such organizations, hand in hand with pharmaceutical companies, brought enormous pressure to bear, and soon homeopathy was forgotten.

This is just one more example of how the most beneficial things often receive the most negative pressure. But while homeopathy was once cast aside, it is again starting to regain its former reputation. Homeopathy is now taught in thirty or more medical schools in England, and state-operated hospitals now specialize in it. In France, homeopathic remedies can be purchased at the neighborhood drugstore; about 10 percent of German doctors are homeopathic physicians. In recent years, a homeopathy medical association has been established in Japan, and more and more people are becoming aware of the benefits of this practice.

Healing Comes in Unexpected Forms

Two hundred years ago homeopathy was recognized as an effective form of medicine, and many people over the years can testify to its effectiveness. But it goes mostly unrecognized by modern medicine. I know of one well-known scientific journal that has featured article after article supporting the benefits of homeopathy, but the articles, often published with a note of derision from the editor, have gone mostly ignored.

Many in the scientific community would say, “We know that a lot of people use it, but there is no scientific proof for the benefits of homeopathy.” If homeopathy had no benefits, don’t you think it would have been forgotten a long time ago?

I will be the first to admit that saying that water has the ability to read and memorize information turns scientific common sense on its head. But such unscientific phenomenon are more common than we may think.

Dr. Teruo Higa, a professor at Ryukyu University in Okinawa, has been striving to spread the use of a form of organic bacteria he developed called Effective Microorganism (EM). EM is a liquid formed from bacteria. It has been shown to be perfectly safe—even beneficial—for people and the environment. When EM is applied to soil, the result is a bountiful crop without the use of chemicals or synthetic fertilizers. When used to treat polluted water, the water becomes drinkable. It can even be used to treat the dioxin resulting from the burning of refuse.

While Dr. Higa was doing research on EM, he had a strange experience. He poured the EM liquid in a ceramic container, poured it out, and then cleaned the container, but the properties of EM persisted. He washed the container repeatedly, but he couldn’t get rid of the EM properties. He tried to sterilize the container with high heat, but even that failed to eliminate the EM properties.

This gave Dr. Higa an idea. He transferred the EM into a new ceramic container. At 700 degrees centigrade, a temperature that certainly would allow no life form to survive, the bacteria survived and became baked into the ceramic. This goes against scientific common sense, but EM ceramic has proven to work and now has various uses in the home (such as water treatment and building materials), in the environment, and in agriculture.

We can say that this is another indication of hado science. All matter has its own hado, and water relays this information. The molecules of water carry messages like the magnet of a computer disk. Hado can be either beneficial for life or harmful for life. But even if the vibration is good for life, if water—the mediator—is impure, the hado will not be relayed correctly.

Dr. Higa asserts that in nature there exists both a flow of revival and a flow of destruction. For example, if a piece of fruit is left sitting, it will soon rot and emit a foul smell. This is the flow in the direction of destruction. But fermentation is the flow of revival. Fermentation is a process that creates sauerkraut, yogurt, bean-paste soup, soy sauce, cheese, liquor, and many other foods. Both fermenting and rotting are the work of microorganisms, but they are not the same.

EM is a collection of microorganisms that do the work of revival. When EM is added to the soil, it enhances the power of existing microorganisms; the result is high-quality vegetables without chemicals or synthetic fertilizer. EM is completely safe for humans, and it doesn't deplete the soil.

In contrast, consider chemicals and synthetic fertilizers. Chemicals do eliminate harmful insects, and synthetic fertilizers do ensure bigger crops. But their use kills even the good insects along with all the microorganisms that would normally enrich the soil. Chemicals provide instant gratification, but the long-term and lasting result is destruction of the soil. In fact, much of the farm soil now in use is, according to most definitions, lifeless. We alone have the power and responsibility for restoring the cycle of nature.



Many aspects of our modern society appear to be in destruction mode. For the pursuit of momentary pleasure and convenience, the cyclical laws of nature have been ignored and replaced by the convenience of use-once-and-throw-away.

And we are beginning to hear the groaning from our tortured planet. We are at a point when we must realize that if we want to continue to call this planet our home, we need to change—not the planet, but ourselves.

We have to stop being agents of destruction and start becoming agents of revival. The slogan “From a destructive-type human being to a revival-type human being” may be added to our list of slogans by which we will live from now on.

One of the most beautiful sights you'll find in Japan is a group of tiny islands not far from Hiroshima. Starting in 1998, the people who lived on

the islands got together and decided they had to do something about the polluted water that surrounded them. Batches of EM were made and distributed to each home by volunteers with instructions to put it in their drains. The results were immediate and unmistakable. The clumps of sludge along the shore disappeared and schools of fish began to return. There are now octopuses and abundant clams, something that had existed only in the memories of the oldest inhabitants. The area is known for its seaweed crop, and when EM was added to the water used to wash off the harvested seaweed inland, sludge in the ditches and waterways was soon gone, and even the seaweed quality improved.

A nearby village called Akitsucho heard about the success, and they also distributed EM for free to the villagers, and again the effects were immediate. The waterways became clean, frogs returned, and clams started appearing in the once-barren bay.

The waters near Akitsucho produce some of the best oysters in Japan. When the town's residents put clods of dirt containing EM into the oyster beds, the quality of the ocean water improved, resulting in bigger and better crops than in recent memory. The use of EM spread quickly along the coast, culminating with the formation of the Seto Inland Sea Environment Conservation Council in 2002.

The people along the coast have taken the first important step to restore the revival and circulating type of society. Healing isn't only about the recovery of our own physical health. We need to think about the healing of the land, the rivers, the oceans, and the planet in its entirety.

But what does healing the planet really mean? The answer is a return to the circle of life—the circulation of resources, of water, and of life. That is our responsibility as occupants of this delicate and crystal-like planet.

CHAPTER THREE

Cycles of Water, Cycles of Life

According to a theory first proposed by Luis Frank at Ohio State University, and confirmed by NASA and the University of Hawaii, water arrived on this earth after traveling through space. In every minute of the day, about twelve comets, some as heavy as 100 tons, fall to earth. These comets are made up mostly of ice. When the ice reaches the atmosphere, it forms clouds and eventually falls to earth in the form of rain to fill the ocean. And since we are mostly water, in a sense we all come from outer space.

You've probably gone outside on a clear night to lie on your back and look up at the stars. Did you ever experience a feeling like nostalgia, maybe memories of long ago? When you gaze at the heavens, your soul is taken back in time millions and billions of years. Do you ever get the feeling that you yourself are somehow floating up there in the cosmos, like a planet of one? It makes a lot of sense that we would be so eternally and universally enchanted by the heavens.

From the time when Yuri Gagarin, the Russian cosmonaut, first broke the earthly shackles in 1961, and Neil Armstrong made one giant leap for mankind, the possibility that you and I might someday make the journey ourselves has steadily become more of a reality.

Scientists currently have their sights set on Mars. NASA is already working on concrete plans to send a manned spaceship to Mars, paving the way for people like you and me to become aliens on a distant planet.

But traveling to Mars presents several challenges, and here again, the solution may well be found in water. Among the risks of space travel is the weakening of muscle and bone due to the lack of gravity, not to mention the mental stress of spending long periods in isolation. Cosmic radiation is another problem. Space is filled with radiation from distant universes as

well as from the solar flares of the sun, which can be especially harmful. Safe space travel requires close observation of the sun and a way to escape the intense radiation as needed. Such a place would need thick and sturdy walls.

One way that NASA is addressing this obstacle is by working on building a room in a spaceship with walls made of columns of water. The water could be used for consumption and for preparing water-based foods—and for protection. When a solar flare occurs, the water in the columns would act as a shield for the voyagers until the danger passes.

Because the weight of a spaceship must be kept to a minimum, only a limited amount of water can be carried. The average person uses about 180 liters of water a day; on a space vessel, this amount can be reduced to 3 liters. But even that small amount would add up quickly for a crew on a long journey. This is where recycling of water becomes an important issue. Systems are now being developed to effectively recycle the water used for drinking and bathing and even to recycle sweat and urine.

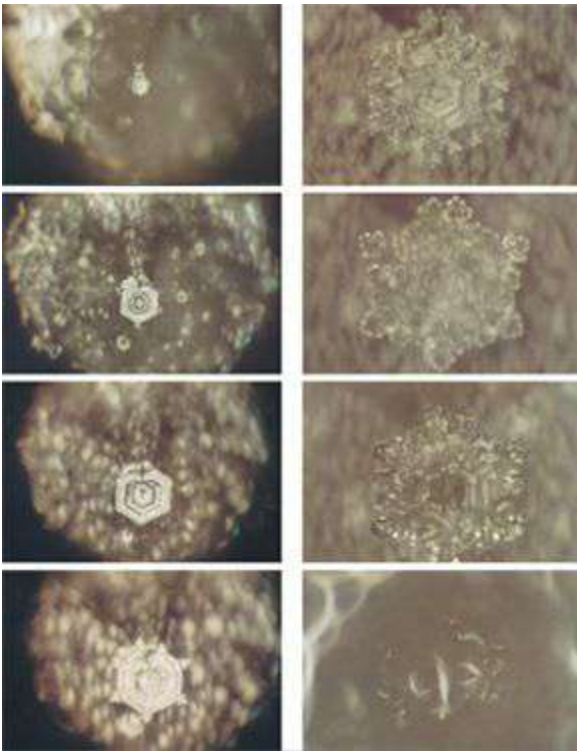
When the NASA probe *Odyssey* touched down on Mars in May 2001, they discovered that large volumes of water existed in the form of ice just beneath the planet's surface, meaning that water existed on the surface of the planet at some period in the distant past. If this frozen water can be used, then it opens up the possibility that this planet can be made green like our own so that people can someday inhabit it. Work is now moving ahead to make this a possibility.

In 1996, NASA conducted an experiment on Devon Island in Canada to simulate life on Mars. The experiment studied biological scenarios, living conditions, and telecommunications. The temperature on Devon Island is low and the land is barren, not unlike the environment of Mars. Scientists were studying the feasibility of space colonization, but there are other implications of the experiment. Our planet is deteriorating at a rapid rate, and no one has a definitive solution for global warming, overpopulation, starvation, pollution, and water shortages. It makes one wonder how long our own planet will remain friendly and inhabitable. Will we someday be faced with the realization that the only way we will survive as a species is by moving to a distant planet such as Mars? It is no small problem.

Understanding water's remarkable journey to and through our planet may bring us closer to the answers we are searching for.

The two-minute life span of a water crystal is revealed through photographs.

The drama of life is played out in just two minutes, between the time the crystal forms and when it disappears.



A small white granule forms on the tip of the frozen water droplet. In a brief moment, a crystal jewel appears under the microscope and then melts away.

Words are reflected in the water.

We showed words to water in a glass beaker.



Happiness

A crystal of almost perfect shape is formed, like an exquisitely cut diamond. Perhaps this tells us that balance is an important condition for happiness.



Unhappiness

This faint and weak crystal is out of balance and appears as if it is only partially formed. Unhappiness is not the opposite of happiness—it's what we experience on the way to happiness.



Hang in there.



Just the way you are.

“Hang in there” results in a rather tight and shrunken crystal. But “Just the way you are” results in a unique shape that seems to be stretching out, just as these words let an individual expand.



You're beautiful.

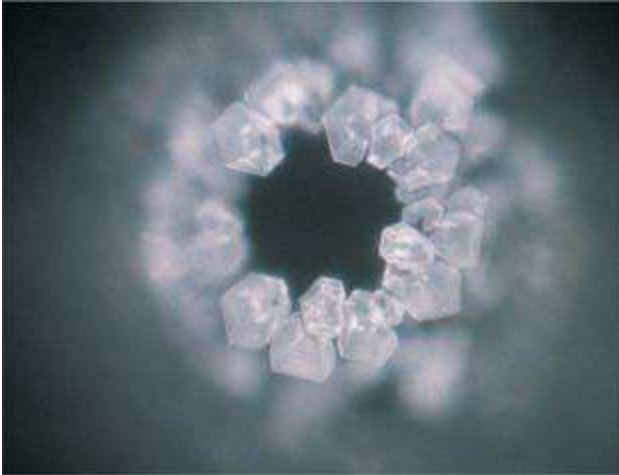


Try to be beautiful.

“You’re beautiful” results in a beautiful, natural crystal. “Try to be beautiful” is slightly deformed. This indicates that praise yields better results than pressure.

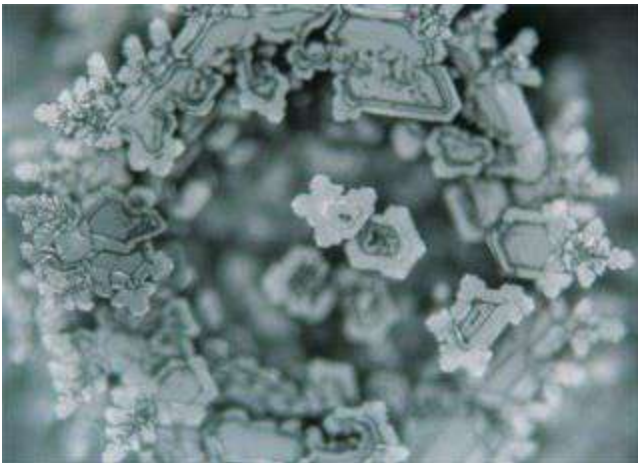


Like



Hate

The word “Like” seems to take on the shape of a joyous heart, and “Hate” results in a hollow image, almost appearing to suffocate.

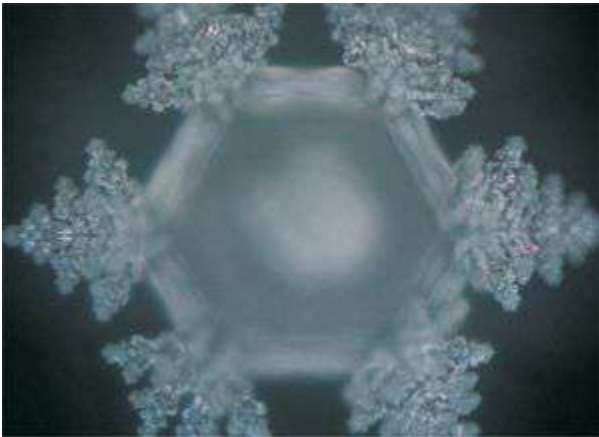


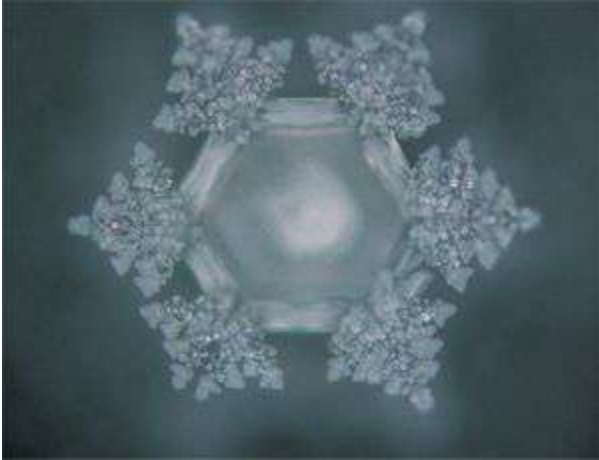
Power



Helplessness

“Power” created a crystal that was unique but jumbled; not every problem can be solved with power. “Helplessness” results in a hollow-looking crystal robbed of its power.



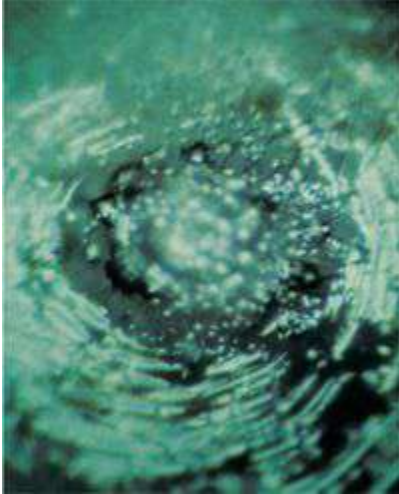


Innocence

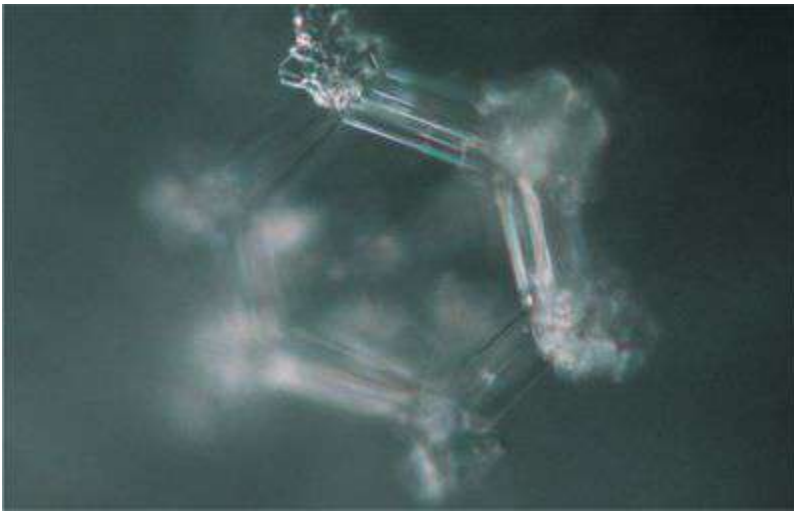
Doing things with innocence perhaps gives you the greatest power to accomplish them. The crystal became too large to fit inside the frame, and so we decreased the magnification to take this picture.



Thank you

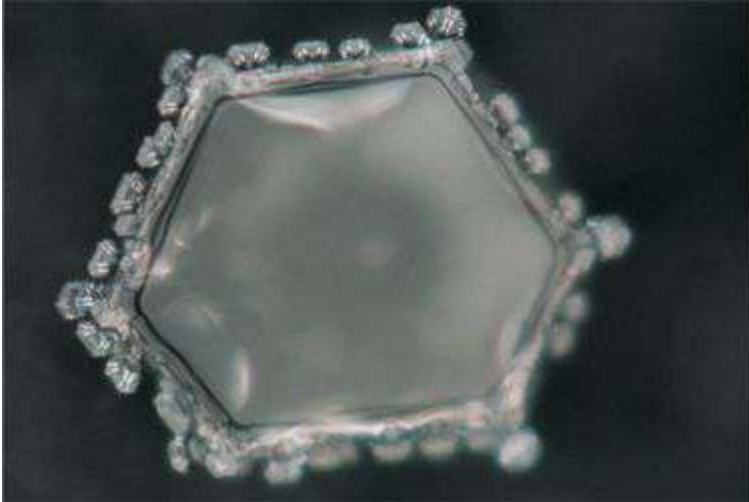


You idiot!



Thank you and You idiot!

When the two words in the top two photographs from my previous book were combined, the result was a thin half-formed crystal. This might indicate that the power of “Thank you” is stronger than “You idiot!”



“Thank you” in Malaysian



“Thank you” in Tagalog



“Thank you” in Portuguese

As in my previous book, we looked at the results of “Thank you” in various languages. The crystal for Malaysian was especially unique. “Thank you” in various languages has different nuances, resulting in highly distinctive crystals.



War



Peace

The crystal resulting from “War” was taken two months before September 11, 2001. The crystal looks almost as if a jet plane crashed into it. The word “Peace” creates a crystal resembling people coming together in harmony.



New York City, September 11, 2001

The events of September 11, 2001, shocked the world. The water formed a crystal like a terrible nightmare.



Coexistence



Competition

The word “Coexistence” resulted in a crystal formed by two crystals, and the word “Competition” created a surprisingly beautiful crystal. This may indicate that wholesome competition is a positive thing.



Peace of mind

“Peace of mind” created an expansive crystal. Perhaps this is what people in these hectic times need more than anything else. This is a photograph you might want to put in your pocket and carry around with you.



The god of happiness and wealth



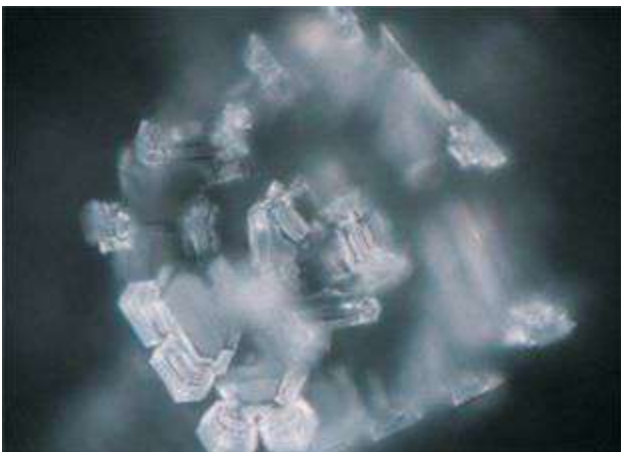
The god of poverty

In Japan, the Shinto religion observes hundreds of deities; these are two of them. The top crystal is full and round, while the bottom one is pointed. I interpret the message to mean that if you live your life harshly like the pointed tip in the bottom picture, happiness and wealth may not come.



Marital love

This crystal may represent the relationship dynamic at work when one partner is caring and the other needful. Of course, it's best when each partner takes turns caring for the other.



Goods and capital



Oil

These are some of the forces that move the modern economy. They are not bad in and of themselves, but when balance is lost, chaos results.

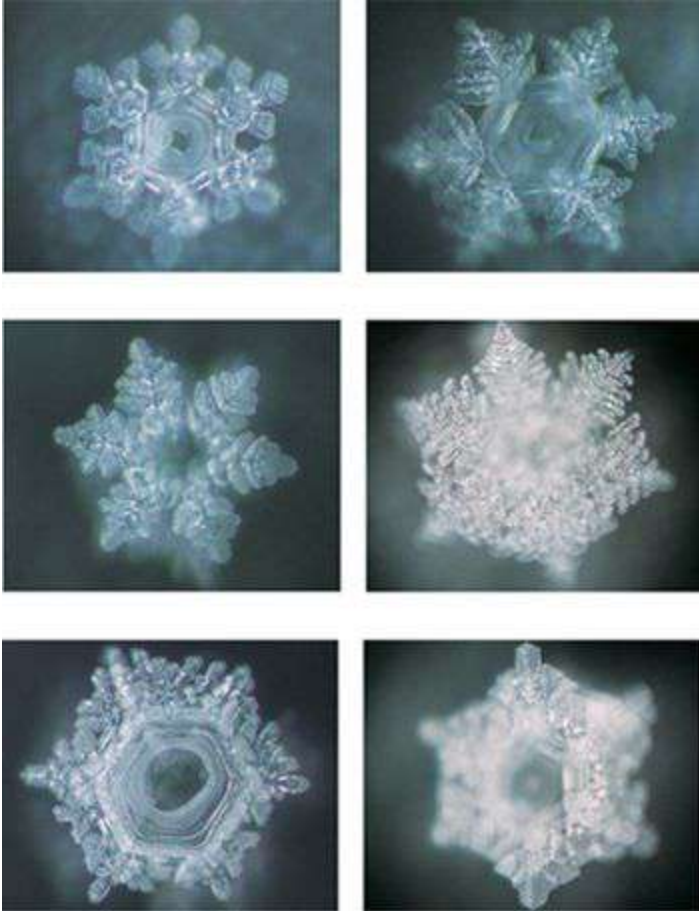


Hemp

As I discuss in [chapter 5](#), hemp has great potential and can be used to make various products, like food and clothing, with its good vibration.

Healing melodies that touch the heart

This music has the power to heal, as seen in the formation of beautiful crystals.



Alan Roubik's "Keys to My Heart" (1-6)

Alan is doing research into the healing effects of music, and crystals formed while being exposed to his music are all beautiful. This attests to his music's healing influence.



Mendelssohn's "Wedding March"

This crystal results from the joyful wedding march. The crystal brings to mind a flower in full bloom, resembling a beautiful bride.



Wagner's "Ride of the Valkyries"



Sarasate's "Zigeunerweisen"

These are two composers from the second half of the nineteenth century. Although the motifs are different, both crystals shine with a brilliant healing effect.



Albinoni's Adagio



Schubert's "Ave Maria"

The first crystal is the reflection of a mournful melody, while the second one, reflecting "Ave Maria," is a balanced crystal that appears to be overflowing with love.



"Edelweiss," from *The Sound of Music*

Edelweiss in German means "noble white," and so appears the crystal. We can imagine a glass mirror within the crisp white crystal.



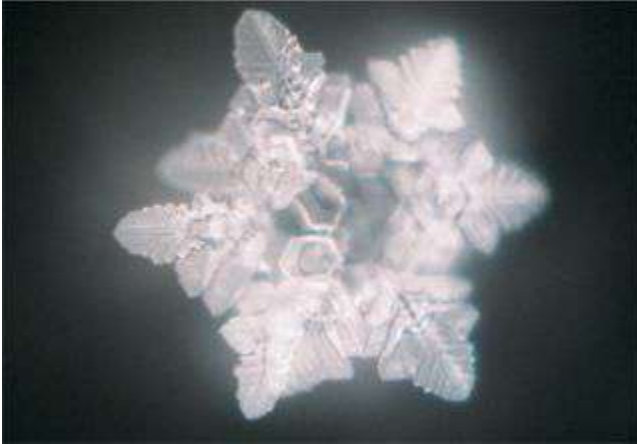
“Amazing Grace”

This famous prayerful gospel hymn from America created a striking crystal full of grandeur and reverence.

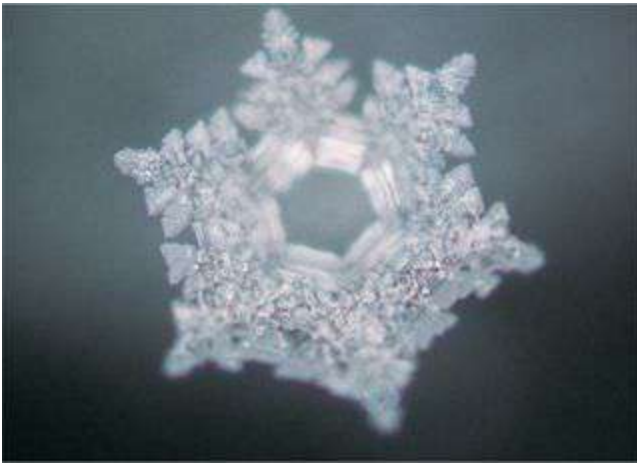


A Celtic folk song

We played a song sung by Enya, who is an Irish singer of Celtic spirit. The resulting crystal was pure, innocent, and white, just like her voice.



“Rokudan,” traditional Japanese melody played on the koto



“Hyojo Etenraku,” ancient Japanese court music

These two pieces of traditional Japanese instrumental music we played to water yielded beautiful and orderly crystals, indicating overlapping tones of koto (above) and orderliness of the court music (below).



“Crane and Turtle,” traditional Japanese kouta song



“The Green of Pine,” traditional Japanese nagauta song

These pieces are traditional Japanese vocal music. It was interesting to see a turtle-like shape as the title indicates (above). “The Green of Pine” is a song about a beautiful prostitute.

The power of prayer can change the world.

Crystals produced before and after prayers were offered for the water and the world are dramatically different, as can be seen from these examples.



Water prayed for by five hundred people

At the same time, five hundred people from all over Japan said a prayer of love for the water. It was normal tap water, which does not usually form crystals due to the chlorine, but the water formed beautiful crystals. Feelings of love have an instantaneous effect, no matter the distance or the source of the water.

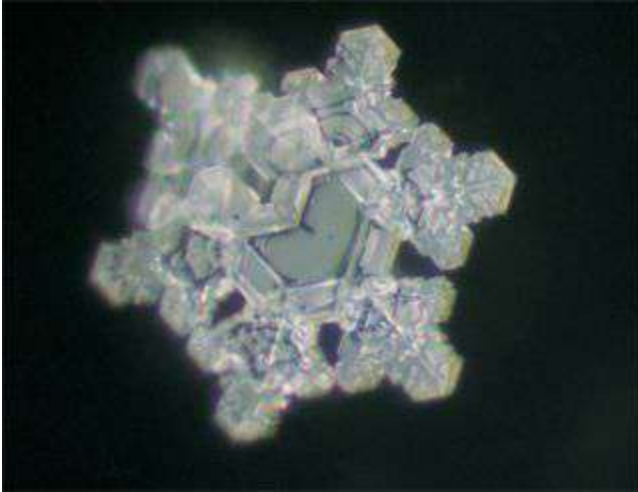


A Sanskrit prayer

This crystal resulted from a prayer to Shiva. The pattern, as balanced and orderly as a mandala, is divine indeed.



Before prayer, Lake of Lucerne

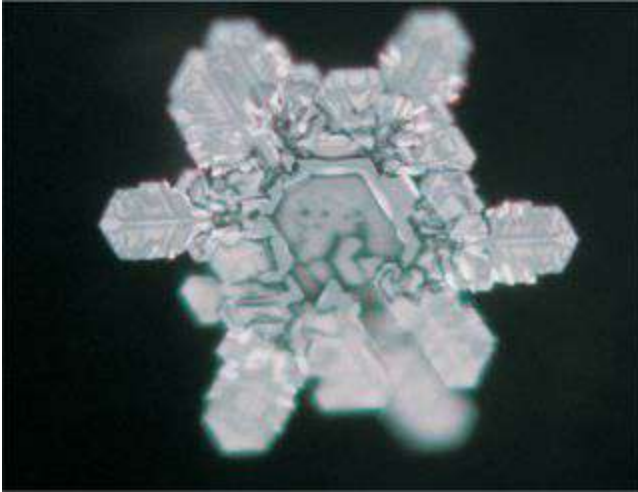


After prayer, Lake of Lucerne

We offered a Swiss Lutheran prayer at Lake of Lucerne. The crystal formed after the prayer resulted in a marked difference.

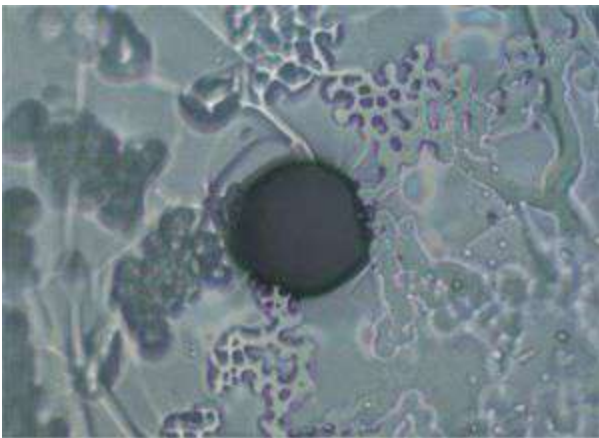


Before prayer, Lake Zurich in Switzerland



After prayer, Lake Zurich in Switzerland

At Lake Zurich in Switzerland, the crystal formed before the prayer was deformed, but the one formed after was gorgeous.

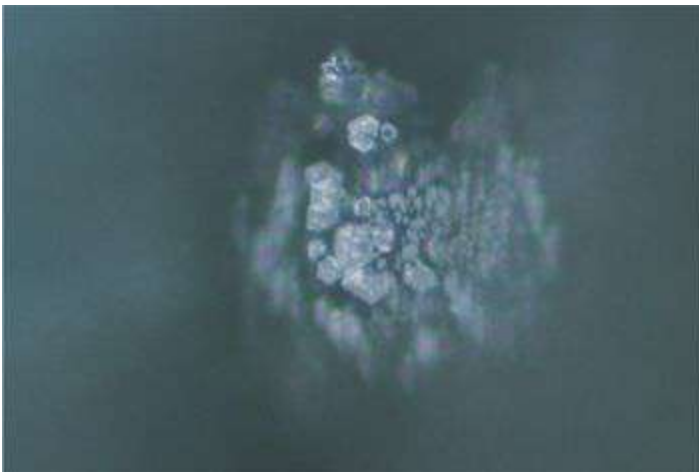


Before prayer, Bahamas

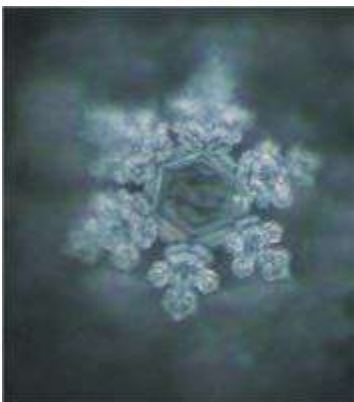


After prayer, Bahamas

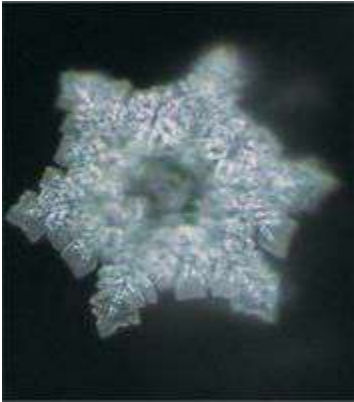
We clasped our hands around a cup of water on the table and spoke to the water with feelings of prayer, resulting in a completely different crystal.



Before prayer, Uchi Lake, Oklahoma



During prayer, Uchi Lake, Oklahoma



After prayer, Uchi Lake, Oklahoma

We gathered people who lived near Uchi Lake in Oklahoma and had them offer a prayer for the water. It's easy to see how the crystal changed from the prayer.

Water's Adventures on Planet Earth

Imagine you have just returned from a trip into space. You step off your vessel onto our green planet and find yourself standing in a deep green forest. Rays of light filter through the trees towering above you. Fallen leaves soften the ground, and deep-green moss envelops the trunk of a fallen tree. Ferns cover the ground all around you. The sounds of life permeate the air—the flapping of wings, the calling of birds, and the wind whistling through the trees and shaking the leaves. As you take a deep breath of cool air and let the scents of pristine nature fill your body, you have a deep realization that this is your planet and your birthright. And that is why you must love it and why you do.

You now see water trickling out between rocks, forming a pool of water. You cup your hands together and drink. You feel the energy of the earth filling your soul, and you know it's because of all that water has experienced in its secret life.

Where did this water, arising from the bosom of the earth, come from? Think for a moment about the earth as water has experienced it. Arriving

from the cosmos in the form of clumps of ice, water fell from the sky upon mountains and forests to give moisture to the trees. That first droplet of dew on a leaf is water in its infancy. From there it begins a journey of unforeseen adventures on our planet. After water falls in the form of rain, what happens next?

A good portion of rainwater—one-third of all that falls—seeps into the ground where it's absorbed by plants, again to be evaporated into the atmosphere. In evergreen forests, as much as ten tons of water will evaporate from a square hectare (approximately 2 1/2 acres) in the first few moments after a downpour.

The water will then rise into the air as mist that drifts among the trees, or it will rise even higher to form clouds. Water in the form of mist will sometimes take another path. When the temperature drops below the freezing point, the mist touches down on the leaves and flowers and forms a thin white layer of ice on the plants and the ground.

It's hard to find anything more beautiful than dew on flower petals and leaves. Clear, crystal-like dew is loved by the plants. A single drop of dew falls off the tip of a sprouting leaf on a branch and make its descent, through the forest canopy, and lands on the back of a frog. Thus, in the forest morning, water spreads itself about in multiple forms to shower love on the frog and the new sprout—and to be loved in return. Just as a mother instinctively loves her newborn, water in infancy is loved by all of nature.

After falling as rain or forming as dew onto the ground, what is water's next destination? Some water will be taken in by the roots of plants and then evaporate again into the atmosphere, but much more will seep slowly into the ground and begin an incredibly long leg of the total journey. Its main path will be the infinite number of secret tunnels under our feet.

The ground is filled with spaces of air, such as the tiny tunnels created by creatures out of our sight: earthworms, centipedes, spiders, beetles, bugs, mites, countless microorganisms, along with moles, rabbits, and other animals. All these creatures serve to soften the soil by opening spaces in the ground in every direction. Spaces between rocks and sand, and openings

left by melted ice, rotted roots, dehydrated soil, and cracked stones, all serve as possible pathways for water on its incredible journey.

Water moves through layers of sand and clay and bedrock. Its journey downward is unwearied and profound. Depending on the hardness of the ground, it's not uncommon for water to move as little as 30 centimeters in a year's time.

Deep within the earth, when water finally reaches hard clay or bedrock, the droplets of water come together and flow into streams, sometimes becoming rivers or lakes such as those that exist above the ground and have names we know.

From the time when water left on this journey through the ground early in its infancy, it has gained experience and knowledge and has formed a personality depending on its path in life, much as a person's personality is formed by his or her journey. Water that has experienced coal, for example, has knowledge of calcium and magnesium, which is why we call it hard water. And water that has experienced granite is mostly left unchanged by minerals and is known as soft water.

Eventually, water learns all it can from the ground and is ready for the next stage in life. Out of darkness, it moves upward, toward the light above ground, and then after untold adventures and experiences, water emerges into the light.

From the ground's crevices rises water, cold and pure. From a tiny spring, water merges with other water fallen fresh from the sky and water permeating the soil to form a small stream that makes its way downward until, eventually, a river is born.

The river builds momentum and eats away at layers of soil and ground as the flow slowly widens and deepens, like a bright-eyed child emerging from infancy. The river becomes strong enough to carve away at a mountain or even to create a canyon. But the carving away of hard rocks and ground is not accomplished by water alone; most of this work is accomplished by the gravel and sand caught up in the flow of the water. These small particles carried along by water carve away at the surrounding land and bring in even

larger rocks and stones, building enough strength to eventually carve away even the largest of stones.

The river begins to develop characteristics that give the river its reputation. While one river becomes dark brown from the earth it carries with it, another one flows clear and pure, and still another roars downward, smashing against rock and stone.

In its downward journey, water witnesses a great deal. It might witness salmon migrating upstream. Deer, bears, squirrels, and other creatures gather on its banks to quench their thirst. And trees brought down by a storm might even alter its flow.

The river eventually comes to gentler reaches, and now it flows gently as it winds along like an enormous snake crawling boldly across a plain. Never satisfied with its current course, the river will continue to change, at one point widening and letting sediment accumulating into a sand-bank, and then later narrowing to grind its way past stone.

If we could see the passage of ages in seconds, we would see just how much rivers turn and twist over time. Most rivers plot their courses so slowly that it defies human measurement, but there are some that shift relatively quickly. The Mississippi River, for example, has been known to shift by more than 20 meters in a single year.

After a river has shifted, the sand and soil it carries often accumulates and forms natural banks. Then a flood will come and wash away the bank, pushing the sediment onto the flat land. These floodplains become fertile land that gives birth to civilizations.

The Egyptian empire arose along the fertile floodplain of the Nile. So while floods are considered natural disasters, they also provide land with nourishment that civilizations require to establish themselves and grow.

When water encounters human beings, it has even more to witness. An old man crossing a bridge, a young girl on her bicycle, a couple sitting and watching the river flow. Ever slowly and ever gently, the river watches children playing in the park on its banks and a father and son playing catch.

The river, now in its twilight years, becomes ever more gentle as it inches toward the sea. Then the moment comes when it finally touches the sea, and the flowing of water finally comes to an end.

All the sediment carried by the water is then dropped into the estuary of the river. The result is the formation of a delta. The Ganges, the Mississippi, and the Amazon rivers have all formed great broom-like deltas at the points where they enter the ocean. What must have started as a small sand-bank eventually grew into a great expanse of land, creating a new and spacious coastline. These fertile deltas form some of the greatest agricultural regions in the world—the final gift that water has to offer humankind before, at the end of its life, it gives itself up to the ocean.

But this is not really the end of life for water, for the ocean is also teeming with life, and together with all the creatures of the sea, water is even now just beginning. In the process of eternal rebirth, water is there to give us a full account of all its wisdom and experience. In a cycle that we would count as eternity, water travels the path from above the earth to the tips of mountains and to the depths of the ocean, carrying life within its bosom and linking everything together in perfect balance.



As water makes its journey through life, it becomes a witness to all of life on earth, becoming itself the flow of life.

For the second collection of water-crystal photographs in this book, we took photographs of water collected at various points along water's cycle, from the source to the bottom reaches of rivers. We also exposed water to various photographs of nature and plants to see how the water would reveal itself through crystals. Within the crystals can be seen the reflection of life.

Let Water Flow

Much of human history has been set along the banks of rivers. The great cultural hearths of civilization have all developed along the banks of rivers—the Nile, the Tigris and Euphrates, the Indus, and the Yellow River. And wherever explorers have traveled, they searched for water along their way.

From the days of the horse-drawn carriage to the automobile, rivers have observed the workings of our race. Today people continue to walk along the banks of rivers, talking with friends, looking at the flowing water, and speaking their hopes and dreams.

But now, armed with technology and knowledge, we work to change the very flow of water under the belief that the result will yield great benefits for humankind. And we have succeeded. Or so it would seem.

In 1971, construction on the Nile River of the Aswan High Dam, 3.6 kilometers across and 110 meters high, was completed. Its construction had required the relocation of the enormous and ancient Temple of Abu Simbel, along with 100,000 people who lived in the area. The completion was met with cheers of joy. Mankind had finally conquered the Nile, putting an end to a long history of flooding while also producing enough electricity for a quarter of Egypt's population.

But gradually it became clear what the river really had provided. After being dammed, the Nile was no longer capable of nourishing the once-fertile farmland at the delta. Irrigation systems were implemented, and for the first time chemical fertilizers were used. Irrigation raised the salt density and deteriorated the quality of the topsoil. Puddles and pools of water formed on the delta, becoming a breeding ground for harmful insects and causing great harm to nearby residents. The delta plain itself has even started to sink. Scientists soon noticed that the fish population in the dam was becoming infected with mercury as the water from the mountain valleys drained into the dam. Plant life buried by the dam became the perfect breeding ground for bacteria; as this bacteria absorbed the mercury in the ground, it became a highly toxic bacteria containing methylmercury. The density in the ecosystem steadily rose until it entered the bodies of fish in alarming amounts.

The annual flooding of the Nile may have made life along its shores difficult for humans, but it was an integral part of the life cycle for many other creatures. The dam squelched the vast ecosystem that nature had taken hundreds of thousands of years to form.

Similar effects are seen in other parts of the world when rivers are dammed. In Canada, high levels of mercury have been found in hair samples of the Cree Indians living around the James Bay and Peace River since the lake where they fished was dammed up to make a reservoir for generating electricity. This same phenomenon can be seen in other parts of Canada as well.

These are examples of what can happen when we choose to block or change the flow of water.



The time has come for us to put on the brakes and think. Always keep in mind water's pure, natural journey, and you will see how we as humans fit into this delicate cycle of life. We are part of the flow, and we need to respect it. We have seen how water shows its love by showering its gifts onto flowers, trees, birds, insects, and all the small creatures of nature as it flows along its path. In return, water is loved by all of nature.

It's time that we return to the cycle. When you have learned to love nature from the bottom of your heart, then you too will be ready to be loved by nature.

The earth knows how to answer our most earnest prayers. When you pray, the earth responds. Then love spreads to all life and to water.

CHAPTER FOUR

The Wonder of Hado: Explaining the Inexplicable

“Long ago at the top of a distant mountain lived an old shaman . . .” So began a tale told to me by an old aborigine with a white scraggly mustache and a face darkened by time. He’s in his late eighties, but no one, not even himself or his family, knows his exact age. Wisdom and knowledge accumulated over the decades is as deep as the wrinkles in his face.

I was on my first lecture trip to Australia in August 2002 when I was introduced to Eric, the aborigine elder. We met at a restaurant, and I presented him with a collection of my photographs of water crystals. He looked at it slowly and intently, and then he began to tell me an ancient tale passed down for generations.

This evil shaman lived at the top of Mount Ridge in the northern region now known as New South Wales. A river runs down the mountain, and the shaman lived near the upper reaches of the river.

One day she looked down on the river valley and saw all the happy people who lived along the banks of the river. The sight of all this happiness filled her heart with resentment, and she copied her thoughts into the water. She filled the river with spite and the desire that only she would be happy.

She also blocked up the river so only a trickle of water reached the people. The riverbed where pure water once freely ran became filled with filth. The people who lived along the banks of the river soon became sick, and thievery, bickering, and fighting became rampant because of the evil thoughts copied into the water by the shaman.

Years of pain and sorrow passed. Then one day a young shaman in the valley went for a walk with his dog. The dog chased after a kangaroo it saw, and the shaman waited for a long time for his dog to return. When the dog

finally returned, he was dripping wet with pure water, not the foul water from the river.

Wanting to know where the pure water came from, the young shaman followed his dog up the mountain to the doorstep of the evil shaman's house. Nearby, the young shaman saw where the pure water of the river had been blocked.

The young shaman turned the evil shaman into water, and in a moment she was washed down by the river. They say that the rugged fissures at the far reaches of the river were caused by the evil shaman clawing at the edges, trying to save herself from being washed out to sea.

Just in time, she grabbed hold of a big rock. The young shaman spoke to her and said, 'I will save your life if you change your ways. Stay where you are now and promise to work for the good of people.'

The evil shaman promised to do so, and she became a large tree growing on top of the rock. The people along the riverbank were finally able to go back to living happy and peaceful lives. The old shaman, in the form of a tree, stood along the river to warn the people to stay away from the dangerous ledges.

Listening to Eric's story, I was surprised to hear the phrase "copied into the water." I then realized that this was in complete accordance with the principle of hado. I would never have imagined that this phrase would be found within a story handed down from generation to generation for thousands of years. But I should have realized that the more years one has lived, the more likely one is to know that such things are possible.

It was quite unexpected that I would hear such a story about water in such a distant corner of the world. Like the myths and fables of other countries and cultures, those of the aborigines in Australia are rich in truths about the universe and the ways in which life should be lived.

From the fable told by the elder, we learn that water must always flow. When the flow is stopped, then the river will die. We also learn that

jealousy and greed have the power to destroy that which is good—an appropriate message for the times we live in.

Yet another lesson is that water has the ability to read emotions and to spread the hado of such emotions to the rest of the world. In other words, the messages that water carries throughout the world depends on each one of us, for better or worse.

For our ancestors, fantasy, science, and theology were all one and the same. And the way to pass on the truths of the world to future generations was through stories. Such stories were based on an understanding of the invisible laws that govern the visible world.

The advanced medical practitioners were the shamans who prayed for and healed the afflicted. Such is the role of water crystals. In fact, my journey toward water-crystal research was born out a desire to heal.

I was first introduced to the strange and wonderful world of hado more than fifteen years ago. I had just set up my company, IHM (originally International Health Medical, now International Hado Membership), and was importing a low-frequency medical device used to alleviate pain from the United States. My contact in the States was a biochemist named Dr. Lee H. Lorenzen. I learned that Dr. Lorenzen's wife had been quite ill. He had done all he could think of to restore her health, but nothing seemed to work. He finally decided to consider water.

He formed a team of scientists specializing in electronics and physics with the goal of developing the best water possible. They started their research with the proposition that water had the ability to transfer information. I heard from Dr. Lorenzen that they had actually found this water. Then one day I had the opportunity to see for myself what the water could do.

Under the bright blue skies of California, I was playing golf with Dr. Lorenzen and two of the researchers working with him when my left ankle started to ache from an old rugby injury. The other three noticed that I was limping and were concerned.

When we finally got back to the clubhouse, one of the men handed me a small plastic container with water in it. They instructed me to apply the water to the area around my ankle. I knew on one level that water couldn't remove pain, but I also knew that it couldn't hurt either, so I applied the water to my swollen ankle.

To my amazement, my foot no longer hurt when I walked on it, nor even when I stretched it out. I couldn't help but become interested in this strange water.

In Japan at that time, there was widespread interest in various types of water that claimed to be good for the health, so I signed a contract to introduce this technology to Japan, and I invited Dr. Lorenzen and the two researchers to seminars in three of the largest cities in the country.

At all three locations, perhaps because there was no charge to get in, the halls were overflowing with people. But I soon learned that the explanation of water's healing abilities was far too difficult for most people to grasp. I myself could hardly understand what the scientists were describing. Some people got up and left partway through; many others nodded off in their chairs. It was pretty much a disaster.

Afterward, I reflected on what went wrong. I realized that water is essential to human life in so many ways, and yet we really don't understand much about it. Around that time when I was still thinking about what to do next, I heard something that made sense to me: "Science is based on first forming a hypothesis and then using instruments and technology to prove the hypothesis."

Then it hit me. All sorts of instruments and technology can be used to analyze chemicals and other materials, so why isn't there anything that can be used to analyze water? I wasted no time in calling Dr. Lorenzen to ask him to look for a device of some type that we could use to analyze water. This led to my encounter with the MRA device that analyzes and transfers hado.

Since bringing this device to Japan in 1987, I have had the pleasure of working with as many as 15,000 people who have come to me with

concerns about their health. I have written more than ten books about hado and the many miraculous cases I witnessed.

Over the years, scores of people have tried to imitate this hado machine and have made similar devices to analyze hado, creating a type of hado fad in Japan. Vast numbers of people have become interested in learning about the unseen world of hado. This movement has the energy to take us into a new age and open the door to a new stage of our evolution.

Understanding hado gives us a better understanding of how our world works, and it also gives us hope for the future. I sometimes even think that knowing the possibilities of hado is like possessing a golden lamp that can make the impossible possible. Then at other times, I feel that the more I understand hado, the more there is to understand about what's going on around us.

Photographing Crystals Is a Subjective Science

To gain the understanding and support of as many people as possible, I have approached my research as scientifically as possible. But we can't forget that not everything can be understood by research or science. The photographs of water crystals present to us a majestic fantasy world, but this is a fantasy world that has much to teach us, for sometimes fantasy is the best way to get a clear picture of reality.

When water is frozen, the same crystal will never appear twice, just as there are no two snowflakes that are exactly alike. When I show slides of crystals at lectures, I am often asked, "If no two crystals are alike, how do you choose one particular crystal photograph?"

It's a good question. Of course it would be impossible to show you all the hundreds of photographs we take of all the crystals, but then again, I don't see why this should cause grave concern. It would be like looking at an encyclopedia of animals and questioning how the picture of one particular dog could possibly represent all the different dogs of that species. When I choose a photograph for a collection, I make a choice based on the

photograph of the crystal that most accurately represents the crystals made under a certain set of circumstances.

In *The True Power of Water*, I briefly described how we photograph water crystals. I'd like to add more details to that explanation. If we are testing the effects on water of words, photographs, or music, we begin with distilled water and then expose the water to whatever influence we are testing for the appropriate amount of time. If we are testing water from a source such as a lake, we do not expose it to any outside influence, such as words or music. We simply use the water as is.

To photograph water crystals, we put 0.5 cc of water into about fifty petri dishes using a syringe. Then we freeze the petri dishes to minus 25 degrees centigrade and take photographs through a microscope. Of course, the result is never fifty similar crystals in the fifty petri dishes.

When we have the photographs, we divide them into eight categories: beautiful, rather beautiful, hexagonal pattern, radial pattern, lattice pattern, indefinite pattern, collapsed pattern, and no crystal formation.

This classification helps to give us a general idea of the type of crystals formed. Let's take, for example, the crystals made from water collected from the Honmyo River shown on pages 185–186. When we took water from the river before it runs into the Isahaya Bay in the Ariake Sea, we found that the crystals were broken and no complete hexagonal crystals formed. The results were as follows:

Beautiful: 0
Rather beautiful: 0
Hexagonal pattern: 0
Radial pattern: 2
Lattice pattern: 6
Indefinite pattern: 29
Collapsed pattern: 2
No crystal formation: 11

This shows us that no crystal formations appeared in eleven of the petri dishes, and when crystals did form they were broken. There was a not a

single crystal that could be considered beautiful. Based on this, we then chose a crystal that we felt best represents the array of samples—an indefinite pattern, in this case.

Let's next look at the example of crystals formed from water collected near the source of the Honmyo River. The results were as follows:

Beautiful: 2
Rather beautiful: 4
Hexagonal pattern: 0
Radial pattern: 4
Lattice pattern: 8
Indefinite pattern: 29
Collapsed pattern: 3
No crystal formation: 0

In this case, we chose a beautiful crystal to represent the sample. Of course, there were only two beautiful crystals in the sample of fifty. But when such crystals appear from a sample, there are also usually many crystals that are classified as rather beautiful, hexagonal pattern, radial pattern, and lattice pattern. This indicates that there are many formations that are in the process or have the potential to make beautiful crystals.

Considering that crystals easily form from this particular sample of water, we can justifiably choose a beautiful crystal to represent the sample. I admit that the selection process is not strictly in accordance with the scientific method, but simply put, we choose the crystal that best represents the entire sample instead of simply one from the most common category.

And the whim of the person doing the selecting certainly comes into play. When making the selection for a collection of crystal photographs, it is best if one person chooses all the photographs for consistency, which is why all the photographs in this book were selected by me.

In fact, the crystals in the photographs that we take are affected by such factors as the environment, the timing, and even the personality and thoughts of the photographer. This is not unlike the uncertainty principle of quantum mechanics. The uncertainty principle was first put forth by a

Germany physicist named Werner Heisenberg, and it is said to have completed the science of quantum mechanics. The theory says that each time you look at electrons, they move in a different way. In other terms, the very act of observing results in a differing movement of the electrons, making observation impossible.

The reason for this is that human observation requires light, and when electrons are exposed to light electrons, the electrons are disrupted, making their direction impossible to predict. This means that we know very little about what is going on in the world around us. When this theory was first presented to the scientific community, it apparently came as quite a shock.

The same principle applies to water. It changes its form completely depending on the person doing the observing. Water's reaction will differ depending on whether the heart of the observer is filled with appreciation or with anger, and this difference is reflected in the formation of the crystals.

Another factor that makes the observation of crystals even more difficult is that the form changes moment by moment for the two-minute life of the crystal. The crystal will look quite a bit different depending on when the shutter is pushed. Uncertainty truly is a factor in everything in our world.

The sun rises in the morning and sets in the evening. That is one thing we can count on. But if you consider the long history of the universe, this phenomenon is something that has continued for only a short time, and it's something that won't go on forever. After some five billion years, the sun will gradually expand and eventually consume the earth. And that too is just a part of the process that the sun which lights our world today is going through. What's a mere five billion years of earth time when talking about the forever time of the universe?

The methods employed to photograph water crystals might not pass everyone's definition of being scientific, and there is a degree of uncertainty involved. In fact, there is much about the world of hado that is murky and that cannot be explained by the black-and-white standards of statistical analysis.

But when you think about it, all any scientist can do anyway is lift up one small corner of the veil that covers the truth of this world and then try to express it with words that the general population can stretch their minds around.

Everything Emits Hado

Another question that I'm frequently asked is, "How could exposing water to a picture or words possibly result in crystals that are so different from each other?" Even I must admit that this is a difficult question to answer.

I first got the idea of exposing water to words and photographs before I even thought about taking photographs of water crystals. I was experimenting with the hado machine I mentioned previously. When people suffering from health problems came to my office for consultation, I would test and analyze their hado and recommend water as one treatment. The water would be infused with hado to counteract their illness. If they were too ill to leave their bed, I would print out the person's name and then test the hado from the name. Or I would test the hado of their photograph. The scores of instances where the ill person healed convinced me that even photographs have their own hado. (To read more about these cases, please refer to *The True Power of Water*.)

You might refer to this hado as something like a desire. There are people, but not many, who are able to detect the hado emitted by photographs and thus are able to sense if a missing person is dead or alive from a photograph in the newspaper. Even people who would never admit to believing in such special powers may experience having a premonition and then later learn that their premonition was valid. An acquaintance of mine said he remembered reading about a mountain climber who had reached the top of Mount Everest. When he looked at the picture of the climber, he sensed that the climber was no longer alive. Not long after, he heard on the news that that the climber was lost and presumed dead. It's hard to deny that somewhere buried deeply within the human consciousness, there is a hidden power—perhaps intuition—to sense what has happened despite the barriers of time and distance.

This same thing can also be said of words. There's an ancient belief in Japan that each individual word has its own spirit, which makes it possible for messages to be transferred and information relayed.

When water is exposed to words such as "Thank you" and "You idiot!" we can see that the water accurately captures the characteristics of these words. But when words are spoken to water, the meaning of the words changes significantly with the speaker's intonation and inflection. The words "You idiot!" can have completely different meanings depending on whether they're said with deep-felt hatred or in jest. But with words written on paper, the way the word is said is not a factor, and the pure energy of the word is able to reveal itself in the formation of the crystal.

No matter how often or how deeply you consider it, it remains remarkable—almost unbelievable—that the messages of water are able to pass through the barriers of time and space.

The fact that a photograph contains information indicates that consciousness is involved. When you see a photograph of a landscape and think it's beautiful, or a picture of a friend that brings back old memories, the photograph is appealing to your consciousness. In the same way, an ID photo serves as ID because of the awareness that the picture represents the actual person.

A psychology professor at Yale University conducted an experiment a while back. He chose several words from Hebrew, and then he simply made up an equal number of words. Next he mixed all the words together, showed them to subjects who didn't know Hebrew, and had them guess the meanings of the words. The subjects, of course, did not know that half of the words were fake. The result was that there were significantly more right guesses for the Hebrew words than for the made-up words.

This experiment serves as support for the theories of Dr. Rupert Sheldrake, a scientist who believes that the words which people have used for ages form "morphic fields" for perception of the meaning of such words. So someone who has never seen a word can guess its meaning with an unexpected degree of accuracy. The morphic field is not anything you can

see with the eyes, and it's not an energy that can be measured. It might best be described as another world invisible to the eye.

With the formation of a morphic field, there's an increased likelihood that something which happens twice will happen again. This same process can be seen in the unfolding of history. The words that have already been spoken somewhere in the world are somehow easier to learn.

To illustrate this idea, let's look at an example. On a visit to Germany a while back, I heard an amazing story. A doctor had collected blood samples from several patients and stored them. The doctor said he was able to identify what the patient was ailing from by just looking at his or her blood sample.

The samples were sealed and stored to keep them from being contaminated or altered. But two years later, when the physician reexamined the patients and the previous samples, he noticed that the components of the blood had changed, and not just randomly. The two-year-old blood was now changed to the same components as the recently reexamined blood. In other words, if a patient was sick two years previously and then healthy after, the two-year-old blood changed to be that of a healthy person, and vice versa. The doctor then went on to conduct two thousand more experiments and to publish the results.

I met another doctor, a man in his eighties, in Germany who had conducted a similar experiment. He had used a pendulum to conduct diagnoses by taking a drop of blood from the patient's finger and soaking it into a piece of paper. He said that he could use the same bloodstain throughout the treatment of the patient, because it continued to change in appearance according to the patient's condition. In other words, a bloodstain from two years ago could be used to diagnose the current condition of the patient.

The scientific explanation for this? I do not know.

How can we interpret the principles of hado? Think about the three terms we discussed in the first chapter of this book concerning hado.

First, hado is vibration. All human beings are in a state of vibration, and the condition of an individual can be understood by examining the vibration of a blood sample from that person.

Second, hado is resonance. Blood taken from a person two years ago remains in resonance with the person's hado today, changing to match the current status of the blood flowing through the veins now.

And third, hado is similarity. For all hado, there is a miniature and a macro version, and these versions resonate with each other. In the experiments done in Germany, my interpretation is that the blood sample is a miniature version of the sample's body, changing in unison with the body from whence it came.

About seven decades ago, a scientist named Harold Saxton Burr laid much of the basic foundation for the science of hado. Burr was a renowned professor of anatomy at Yale University. In his attempt to understand the mysteries of life, he gave us the term *L-field* or *life field*. Since all the cells within our bodies are replaced over a period of six months, why do we keep being reborn as the same person over and over?

Like a mold used to make Jell-O, an invisible force enables this to happen, he believed, and he called it the "life field." He believed that since the life field is an electrical field in nature, it could be measured, and he even developed his own measuring device using a voltage indicator and an electrode. He discovered that the measurements he took varied with the way the subject was feeling. He got higher voltage readings from subjects who were feeling blissful, and lower voltage readings from those feeling depressed.

It seems that his device was a forerunner for the MRA device that I use to analyze hado. By entering various code numbers into the device, it's possible to identify the part of the body that matches the code. When a certain part of your body is suffering, emotional hado is inevitably involved. By using the codes, such emotional hado can also be measured and classified.

In his book *Blueprint for Immortality: The Electric Patterns of Life*, Dr. Burr wrote that someday it will be possible to pinpoint even the emotions of people using millivolts.

Anyone who has worked very much with vibration has noticed at least one thing: the soul is affected by anything, and it *affects* everything. Both your body and the things that go on around you—and even the world that you live in—is created by your soul. It's something that I have observed over and over. There is so much power within you.

Perhaps we do live in a world of uncontrollable and unpredictable chaos. We really don't know what's going to happen from one moment to the next.

But this chaos is also of your own creation. Chaos is brimming over with myriad amounts of energy. After all, before heaven and earth, before there was a universe moving in order, there was just one thing: chaos.

So if you feel lost, disappointed, hesitant, or weak, return to yourself, to who you are, here and now.

And when you get there, you will discover yourself, like a lotus flower in full bloom, even in a muddy pond, beautiful and strong.

CHAPTER FIVE

Our World and Our Water Are Changed by Prayer

When I was a child, I had a recurring nightmare. The ground shook beneath my feet, and a volcano spewed out red-hot lava. The ocean turned into a huge wave that enveloped everything, knocking over houses and buildings like blocks, and all the people ran about screaming as the earth moaned.

There was a time when it seemed like I had this dream every night. I'm no longer bothered by the dream. In fact, it stopped when I published my first book of water crystals. But I suspect I have seen the dream thousands of times over the years. Sometimes it scared me so much that I jumped out of bed wide awake and ready to run for my life. To this day, I still don't know the meaning of the dream or why I saw it over and over. I know it was just a dream, but that scene of hell still lurks in my memory as if it were real.

The turn of the century seemed to be a time of particular uncertainty and instability. One of the outcomes was a greater interest in spiritual matters. Yes, we survived July 1999, the month when Nostradamus said the world would be destroyed, and 2000 came and went without all our computers turning against us. While many people can recall a feeling that something dreadful was about to happen, many others believed that we stood at the brink of a period in human history when all the knowledge and wisdom of the ages just might culminate to create a golden age. And those who didn't have such a feeling at least hoped for such a future. But the hopefulness wasn't to last long.

September 11, 2001, came and nothing was the same. The flames of war ignited in the Middle East, Afghanistan, Iraq, and Israel. The first page of our new hope-filled century was stained with blood. Then came the devastating Indian Ocean tsunami in December 2004 and Hurricane Katrina in 2005. And I recalled the nightmare of my childhood.

There have always been people who believe the end of the human race, the destruction of the world, and global catastrophe are imminent. I don't believe such a bleak future is waiting for us, and I've always tried to take a stand against such negative predictions. The reason for my optimism is that I feel that the words engraved in our hearts might just have an effect on the direction in which the world is moving.

But I must admit that it sometimes does seem that the world is taking the steps which will lead straight to the destruction of the human race. No matter how positive you try to be, it's hard to ignore the fact that we are faced by an avalanche of problems of our own creation.

With the global population expected to explode by 1.5 times in the next fifty years and four times in the next one hundred years, with rapid industrialization, with the condition of the environment deteriorating at a rapid pace, our survival is uncertain. Some reports say that a temperature increase of between 4 and 6 degrees centigrade within one hundred years will increase the ocean level by 80 to 150 centimeters and flood much of the land we currently inhabit.

And there's no guarantee that the change will be gradual. Large islands in the South Seas are already now slipping into the ocean. The rising of the oceans combined with a tsunami similar to the one we just witnessed could wipe out many of the great cities and entire civilizations in some parts of the world. Instable weather patterns are another concern. Unusual downpours and droughts are wreaking havoc with the world's food supply.

I sometimes wonder if the recurring dream I saw a child wasn't more than just a child's dream. What could we possibly do to change this course even slightly? One solution is to change the way we live and the structures and systems that form society.

Environmental Concerns

In [chapter 3](#), I discussed the destructive repercussions of blocking the flow of water. We see the same results when we interfere with the delicate circle of life that forms ecosystems.

One of the first warning bells was the book *Silent Spring* by Rachel Carson, who revealed that pesticides such as DDT pollute the water and push entire species of birds and fish to the brink of extinction. *Silent Spring* told the story of how the insecticide dieldrin was sprayed in and around Sheldon, Illinois, in order to eradicate the Japanese beetle in that area and stop its northern progression. The chemicals seeped into the ground, killing or driving out all the beetles and other insects. After eating the insects or bathing in the polluted water, the death of robins, pheasants, and starlings came next, followed by the deaths of squirrels, rabbits, and then 90 percent of farm cats. Even sheep could not escape the fatal effects of the chemicals.

Carson also revealed the impact of the chemicals on the salmon and trout in rivers, and the rising cancer rate in humans. But all this didn't stop the state and federal governments from spraying stronger and stronger insecticides for years to come.

As expected, her work earned protests from the agricultural industry. They made fun of the book and labeled her a hysterical woman. But when Carson appeared in the press to defend herself, her logic and her dignity made an even deeper impression on the viewers. Eventually this led to the government being forced to admit that she was right. Carson's good judgment and courage reaches beyond her time and has just as much to teach us today. Her book should be required reading for anyone living in these times.

Carson sounded an early warning about the potential risks of pollution, but she also warned us about the chain effect that results when a link of the circle of life is broken. We have already seen where the removal of bugs or weeds by chemical means can lead to the extinction of a vast area of other forms of life, including the microorganisms that live in the soil. And when the soil has died, then the perpetual use of chemicals becomes necessary to continue farming.

Once the natural circle of life is broken, putting it back together is next to impossible. Some forty years have passed since Rachel Carson first warned us about the effects of pesticides. Have we seen any improvement in the situation? In advanced countries, at least, the use of DDT, dieldrin, and other chemicals that Carson warned us about have been banned and for the

most part discontinued. But deplorably, these chemicals are still sold to other countries that haven't banned them yet.

In our pursuit for profit and convenience, we have closed our eyes to the cycle of life that has formed over the aeons. So much of what we do threatens to end this cycle and create a new cycle of waste and destruction.

Ever-Increasing Materialism

Do you ever get the feeling that society in general and you in specific are moving at a faster pace than ten or twenty years ago? It's not likely that the hands of our clocks have sped up, but our perception of time certainly has.

Imagine that the world is an enormous spinning top. We'll call it the "top of materialistic culture." As culture develops and we acquire more and more, the top gets bigger and bigger. This is how life goes in our materialistic state. Each year, sales have to increase, incomes have to rise, and economies have to expand. We're made to think that staying the same or slowing down will lead to recession, depression, and failure. Goals achieved lead to the setting of higher goals and requirements to work ever harder and faster. Ever loyal, we have labored diligently to expand the size of the spinning top.

And we at the edge of this top must travel an increasingly wider distance to make one rotation. While a small top might complete a rotation in one second, a top twice as large—or a thousand times larger—would take much longer to go around once. While a small top may rotate a few centimeters per second, a larger top may travel a few meters.

The speed of the hands on your clock are going at the same speed, but the rate at which change takes place is speeding up, and perhaps someday this spinning top will go so fast that we'll no longer be able to hang on. How can we slow down this spinning top?

I know of only one way, and that is to cast aside our fast-paced, materialistic lifestyles. In other words, our continued sojourn on this planet will require that we pack lighter. It's just that simple.

You may believe that you can get more accomplished in less time if you live your life in over-drive, but for most people it ends up meaning working harder and harder in a job they like less and less.

As society expands and infrastructures become more complicated, the role of the individual is increasingly delegated to a miniscule piece of a vast machine; feeling powerless to make a difference, people resign themselves to doing what they are told to do and nothing more. But the greatest steps forward can often be made by becoming smaller instead of bigger, by going slower instead of faster.

Within an organization, workers are able to expand their abilities only to the limits of the box within which they function. In many large companies with compartmentalized divisions, the scope of most people is limited to the task at hand. With only a small role to perform within a large box, the importance and value of each role is minimal, as is the employee's perspective and need to develop his or her abilities. But when the size of the box that people function within is reduced, the role of the people within the box becomes more important and valuable, and knowing this, most people will strive to expand their skills and abilities. They get to know their co-workers, communication improves, and motivation increases. Ideas that were formerly obscured by the complexities of the big organization would emerge and innovations would revolutionize the organization. Young employees in the company would see hope and be motivated by their unlimited potential to move up in the company. The concept that smaller is better applies not only to companies. These same results could be seen in governments and all other organizations in society.

A Changing Sentiment

More and more people are beginning to understand that bigger and faster is not necessarily better. It is becoming clearer that continually piling unreasonable greed and demand on top of each other leads to destruction rather than success. It's not unusual to see financial institutions, construction companies, and retailers fighting for their survival. We might even say that the destruction of the World Trade Center was symbolic of a broader change taking place in our society. Of course the terrorist attacks

were a heinous crime, but one reason the twin towers in New York were targeted by the terrorists was because they were a symbol of the global economy and one of the most enormous building complexes ever built. I believe that its collapse has played a role in moving us humans toward the theory of E. F. Schumacher, who advocates “Small is beautiful” in his new economics with humans in its center.

Many people today are coming together to form communities beyond the typical definitions of neighborhood and village. In Europe, the United States, Australia, and other parts of the world, communities are forming with the aim of living peacefully with the environment. These communities take various forms, but they all have the basic goal of separating themselves from consumer-based lifestyles and becoming self-sufficient. Another aspect of this trend is the slow-food movement and the rising voice against the drive for standardization promoted by globalism.

In recent years, we’ve also heard talk of new regional currencies and the drive to implement systems that return to focusing on the exchange of goods and labor of equal value instead of the continual expansion of speculation that is going on now. This is another way that we are returning to the fundamentals of the concept of community.

A Natural, Renewable Alternative to Oil

One thing that these new old concepts of community have in common is concern for the environment. For a long time, oil has been a source of major concern and conflict for the world. Most world economies are powered by oil, as are many of the wars going on in the world. And that’s to be expected. Energy is at the foundation of all cultures. We owe our comfortable lifestyles to our ability to procure sufficient amounts of it. We can keep the neon lights on all night. There’s always a store open nearby to feed our hunger and our desire of the moment.

But what will happen to us when the last drop of oil is used up? The lights will go out and our appliances will be useless. But it won’t matter because we won’t be able to transport food to our tables. The foundation supporting us is frail indeed.

If it's not cramping our style today, then we tend to think it's a problem for someone else. But now in times of abundance is when we should be laying the foundation for the survival of future generations. We need to be looking for something to replace oil and the oil-based products that we so rely on.

One possible alternative that has caught my attention is hemp. Nature provides for us in many wonderful ways, so we should look to nature first for solutions to our challenges. The hemp plant can provide many of the things that humankind requires in order to survive on this planet.

From its stalk, paper, cloth, and even plastic can be produced. Four times more paper can be made from an acre of hemp than from an acre of trees. The cloth made from hemp is much more gentle on the skin than chemical-soaked cotton, not to mention that hemp is three to four times more efficient than cotton as a crop.

From the seed and stalk of the hemp, diesel fuel, methanol, and ethanol can be obtained without the by-products of sulfur that causes acid rain and air pollution. Ford Motors has even made a car with a plastic body made from hemp that runs on hemp fuel.

Hemp can also become an ideal source of human nourishment. The fruit of the hemp plant provides the same amount of protein found in soybeans, and it is easy to digest. It also contains essential amino and fatty acids.

The hemp seeds can also be used to make a healthy oil. *Huo Ma Ren* is the Chinese name for it, and it is widely used as herbal medicine. Its medical uses are numerous. Possible derivative products include an antibiotic, antidepressant agent, pain reliever, and headache medicine. It's also reported to have shown dramatic results in the treatment of cancer, AIDS, rheumatism, and skin rashes. Hemp can also be used to make shampoos and cosmetics because of its moisturizing characteristics.

Another feature that makes hemp attractive is its rapid growth rate. In 110 days, the plant will reach a height of two or three meters, making it possible to harvest several crops in a single season. In Japan, it's said that ninjas would use hemp to improve their jumping skills. When the plant first

started to grow, they could easily jump over the top of it, but as it grew taller day by day, it required more and more effort and skill to clear.

As the hemp plant grows, it converts carbon dioxide into oxygen at a faster rate than almost any other plant. The amount of carbon dioxide taken in by hemp is pound for pound three to four times more efficient than deciduous leaves.

From a hado perspective, hemp is good for the environment because it has positive hado. In fact, hemp's high rate of vibration is what enables it to grow so quickly. It is a gift of nature that could come to our rescue just when we need it.

Hemp is woven into the fabric of America's history. It's said that without hemp to make ropes and sails, Columbus would have never been able to make the trip across the ocean. Even the Declaration of Independence is written on hemp paper. You could even find hemp growing on George Washington's farm.

Unfortunately, there are misconceptions about hemp because of its relation to marijuana, or cannabis, which is illegal in many parts of the world. Despite this, there has been a grassroots reawakening in recent years to the potential uses of hemp. In July 2001, the Hemp Car, a biodiesel car running on fuel from the seed of the hemp plant, left Washington D.C. and started on a trip across America to promote the benefits of hemp as a resource. The efforts to attract attention to this amazing new source of fuel were going well until the news was buried by the events of September 11.

In Japan as well, a hemp car also crossed the country in 2002. A man named Yasunao Nakayama has made it his life's calling to promote the use of hemp. He says that he sees hemp as essential for the survival of the human race.

As a teenager, Nakayama-san came close to drowning and had a near-death experience. The young man found himself surrounded by light in another world where people were going about their lives. He saw a plant with beautiful leaves and recognized a wonderful sense of healing coming from

the plant. When he came to, the experience made him think in a deep way about the purpose of life.

Several years had passed when Nakayama-san encountered the plant that he had seen in his out-of-body experience. There was no doubt in his mind that this was the plant which would help him understand the mysteries of life and the universe. The plant of course was hemp, and since that time, Nakayama-san has made the study of hemp his life's work.

Japan's version of the hemp car left a small city in the northern tip of Japan with its destination the Heitate Shinto shrine in Kumamoto prefecture. In place of gas in the diesel engine, hemp oil was used. This biodiesel fuel emits no sulfur dioxide and only one-third the amount of toxic smog emitted by petroleum fuel.

During his journey, Nakayama-san visited many places related to hemp, including the hemp road of Japan that served as the network tying together an ancient self-sustaining society. In ancient days in Japan, many trade routes linked the country. Along with routes for salt, sugar, silk, and other products, there were also routes for transporting hemp. If you drive the hemp road you can see the traces that ancient Japan had an abundant self-sustaining society, which was based on a solar worship.

The Shinto Religion and Hemp

On its long journey through Japan, the hemp car made stops at the many Shinto shrines in Japan where hemp is considered to have special significance. Their ultimate destination, the Heitate Shrine, is considered the oldest shrine in Japan; even its name comes from the ancient Japanese word for hemp.

From ancient times, hemp played an important role in Shinto beliefs and practices. It was considered to have many powers, including the power to purify and cast out evil spirits. I suspect that one reason the ancients revered cannabis so much was its rapid rate of growth, indicating a high vibration rate. This enabled it to drive out evil, impurity, and other forms of low vibration.

Hemp's many uses in the temples include the braided ropes around sacred trees and the bell rope used to wake the gods at the entrance of the shrine. At the Ise Temple, the most sacred of all Shinto shrines, ancient cannabis is preserved along with the sacred mirror, serving as emblems of the body of Amaterasu, the founding Goddess of Japan. A sacred Amaterasu talisman is referred to as the shrine cannabis, and each year ceremonies take place according to the sacred "cannabis calendar."

The ancient Shinto religion of Japan can be described as a religion of vibration. It has no founder, no teachings, no sacred writings, and no ceremonies or practices with the aim of causing an awakening or rebirth. Shintoism is mostly about raising the vibration rate to drive out negative forces, thus creating holy spaces. It is said that the sites for ancient temples were chosen in areas of pristine nature that emitted a high energy level.

Shinto does not claim one founder or one god. Mountains, rivers, oceans, animals, trees, and flowers are all gods, and along with people, all elements of a single, unified universe. The soul of Shintoism is harmony. In nature, nothing is inferior and nothing is superior. All things are given a role and responsibility, and one part of the universe serves all other parts by best being who and what it is.

Perhaps the bountiful and beautiful nature of Japan had something to do with the emergence of such a concept. With the beauty, colors, sounds, and scents of four distinct seasons, the Japanese have become sensitive to the nature around them, making it possible to see multiple gods within nature and leading to the formation of a culture that promotes the richness and sacredness of vibration.

When Prayer Touches Water

The Shinto prayers referred to as *norito* are for the purpose of creating vibration, which will link us to the sacred. I have previously written that the hado from a certain type of voice can have the effect of prayer in healing. I have had many experiences with praying over water with the locals in places such as Lake Biwa (the largest lake in Japan); in Lucerne, Switzerland; on the shores of Lake Zurich; in the Bahamas; and in other

parts of the world. In every case, there was a striking difference in the crystals made from water collected before the prayer and after the prayer, and the subsequent crystals were always beautiful and glorious.

Words spoken from a heart filled with prayer takes on the form of hado, and this leads to a new world being eternally created. Your world becomes different when things are created in a whole new way. The Shinto prayer is not a prayer to the One and Only but a prayer to myriad holy beings. What could we mean by myriad holy beings? From the perspective of hado, it is possible to form an idea.

Consider the fact that there are some sounds that can be perceived by the human ear and others that cannot. The highest sound that humans can hear is about 20 kilohertz, but there are certainly sounds that exist in a higher range than that, and we refer to this sound level as ultrasound. The same concept can be applied to light. The light spectrum visible to the human eye has an electromagnetic wave of between 380 and 780 nanometers, and anything outside of this range cannot be seen. But electromagnetic waves above 780 nanometers do exist.

This principle applies to all our senses—or perhaps we should say that what we can feel with our senses is only a small part of our world. The blind bat uses ultrasound that the human ear cannot hear to avoid hitting cave walls. A dog can distinguish between scents that are beyond our detection. Many animals have almost supernatural abilities.

Considering these facts, it would not be too much of a stretch of the mind to say that there are types of consciousness and life forms that are beyond our limited ability to sense. Perhaps it would not be so strange to believe in the existence of higher-frequency consciousness without a physical body like ours. If there is such a being, I suspect that it may exist in a parallel universe with our own world.

When a vibration is doubled, it is possible to create a new set of sounds one octave higher. And with each case of doubling, the octave goes higher and higher until we reach a set of sounds too high for the human ear to hear.

In the same way, rocks, grass, animals, and people all vibrate at their own rate and in octaves we are in tune with, and so it shouldn't be too difficult to surmise the existence of an equivalent frequency in octaves that are off our own scale of sensitivities. Within this line of theory, perhaps we can then come up with a description of the gods of all of creation. Perhaps we can form a link between ourselves and a higher being. The method I speak of is, of course, prayer.

Our Common Consciousness

No one I personally know has seen the face of a deity, although I realize there are people who say they have had this experience. All we can do is gather evidence and consider it. By considering it based on the principles of hado, I believe considerable progress is possible in this realm.

If you examine any culture—ancient or modern—you'll find that everyone has somehow arrived at a concept of deity. Genetic engineers, physicists, and other scientists who have reached to the edges of their fields become enraptured by the magnificence and order of nature and thus become convinced of some unseen hand at work in the creation. My own path to this understanding was shown to me by water crystals. Water has shown me in a very real way how prayer can change the world.

No one particular religion has been able to secure the exclusive rights for the power of prayer. No matter who we are, we all have the ability to take advantage of this amazing and wonderful power. Once you realize this, you will then be filled with the desire to help others realize this as well. More and more people are resonating with this understanding, and this could result in a more wonderful future for humankind.

In my presentations, I mention that I have another interpretation of Einstein's theory of relativity represented by the formula $E=mc^2$: c represents consciousness; m represents mass (the number of people); and when the number of people with an awakened consciousness founded in the desire to make the world a better place increases, the result is an exponential increase in E , or energy.

Earlier in this book, I talked about Professor Hideo Higa, who developed the unique micro-organism EM. He explained to me that within the world of microorganisms, 10 percent of microorganisms are harmful. But there are also only 10 percent of beneficial microorganisms. He refers to the remaining 80 percent as wait-and-see microorganisms. They watch until either the good or the bad microorganisms emerge as the victors, and then they join the stronger of the two.

I find that there is a correlation to what goes on in human society. Within our society, there are people, about 10 percent, who have the ability and feel the call to make this world a better place. But many of these people have not yet become aware of their destiny. I am quite sure that as more and more of these people awaken and begin to employ their consciousness in prayer and action, the vast majority of the population—about 80 percent—will then also join their numbers.

The Water within Us

We are well into the twenty-first century, and blood continues to be shed. Especially painful to watch is the conflict between Palestine and Israel. How much life will have to be destroyed by ethnic fighting and holy war? Without an end to this horrendous conflict, it is hard to imagine a peaceful future for any of us. But it appears as if the hatred and loathing has over centuries slowly entered the very DNA of the two sides.

I was once thinking about this when I suddenly realized the close relationship between DNA and water. DNA is structured by two chains in a spiral formed by a hydrogen bond. The consciousness of our ancestors is passed from one generation to the next through blood—the *water* that circulates throughout our bodies. And the water that flows through the bodies of the Jews and Palestinians comes mostly from the Jordan River. The Jordan River flows southward from northern Palestine and connects the Sea of Galilee with the Dead Sea, forming the eastern border of Palestine. Along its way, it provides much of the water necessary for sustaining life in the region.

The power of prayer has the ability to reach far distances of space and time. Through the photographs of water crystals, I have strived to help people from around the world understand the power and wonder of prayer, and I have encouraged people everywhere to pray for peace in the world. I decided that I would ask people to join together on a particular day to send hado of love and peace to the Sea of Galilee, which flows into the Jordan River. The people who drink its water would receive this hado, and their bodies would be filled with beautiful energy. Can you just imagine the possibilities for peace?

Before I set the date, I discovered something quite surprising. Another name for the Sea of Galilee is Lake Kinneret, and *kinneret*, in Hebrew, is the word for *harp* —the shape of the Sea of Galilee. And it also happens that Lake Biwa is named after the *biwa*, a traditional harp-like instrument in Japan. Could the similarity be more than a coincidence?

I decided to set the day for the special prayer for July 25, 2003. As I mentioned in [chapter 2](#), this day is very important on the thirteen-month calendar used by the Mayans. It is called “the day out of time,” the one extra day on the Mayan calendar.

Even in this modern age, perhaps we have the spirit of this day buried within us. I intend to work toward making this an international day of prayer for expressing love and appreciation for water.

A year prior to the date I set for sending hado to the Sea of Galilee, I established what I call the Project of Love and Thanks to Water. This was a project aimed at unifying the souls of people from around the world and raising consciousness on July 25, 2003.

My first efforts focused on expanding the circle of people willing to participate in the prayer. I asked everyone I knew to do the following: On the 25th of each month, either at 7:25 in the morning or 7:25 in the evening, face a body of water and express your love and appreciation. You could do this anywhere, such as your kitchen or your bedroom. A glass of water would suffice. Gently say to the water, “I love you” and “Thank you.” As you do this, imagine the power of love and appreciation flowing through you into all of the water of the world.

All water, even the glass of water, is connected to all the rest of the water in the rest of the world. The hado of love and appreciation that you release will become streams of brilliant gold and silver light in the flowing water and reach out to the entire world, ultimately covering it in light. The result will be a testimony of the healing and harmonizing of our planet.

Water carries within it your thoughts and your prayers. And as you yourself are water, no matter where you are, your prayers will be carried to the rest of the world.

So, pray. Pray for the victims of meaningless wars and landmines, for orphaned children, for the sick and the bedridden. There is much you can do from now on, and even a lot you can do at this very moment.

I recall that horrible recurring dream I saw as a small child. It wasn't warning me about my fate to witness the gloom and doom of the human race. It was teaching me what I must do in life. But it wasn't a lesson for me alone. It was for you and for everyone else who reads this book: Fill your soul with love and gratitude. Pray for the world. Share the message of love. And let us flow as long as we live.

EPILOGUE



We are now approaching the end of this journey of water together. What discoveries did you make along the way? Water has a secret life. It shows us how to find happiness. It reveals the meaning of the love of nature. It shows us the path that humankind must take to find the answers we seek.

Water Is Life

James Lovelock, a professor of biophysics, put forth the Gaia Theory, the concept that the world is all one life form, an active self-regulating system. The environment on the earth is kept at a certain level so as to make life possible. The volume of oxygen in the atmosphere is always about 20 percent no matter where you go. Plant life produces oxygen through photosynthesis, and animals breathe out carbon dioxide. The atmosphere works to maintain the temperature within a set range. So even though the seasons may change, we manage to keep our body temperature fairly constant. They say that 3.5 million years have passed since the birth of life, and while the sun may be gradually heating up, the temperature on earth has been maintained within a range to make life possible. The world operates in perfect balance

Indeed, this planet is like one life form. And what is it that gives life to this living planet? Water, of course. Water makes it possible for plants to grow, to produce oxygen, and to maintain life. But we all realize that this balance of life is now becoming ever more perilous. We are even playing with the balance of the atmosphere.

Water Is Beauty

Water's long journey began when it arrived on this planet in the form of lumps of ice from the far reaches of the universe. From there arose all the diverse forms of nature and life that now cover the surface of this planet.

And from that point, human civilization arose, and the life of each individual was born.

From water emanates all beauty: the colorful grandeur of nature, the green meadows, the silk strings of rain, the clouds that filter golden sunshine, the rainbow-filled skies, and the expansive sea, blue in gradation the deeper you go. Rays from the sun dance on the surface, reflecting off ocean plants and coral below. Fish of every color swim in schools that expand and contract again as if by magic. It is art, a grand performance, at its finest.

And then there's the crystals of water. Like pearls of the highest grade, finely carved by nature—almost like grand chandeliers.

The work of nature is far beyond the aspirations of the greatest artists. And the amazing thing is that it's no accident. It's all the result of a distinct intention, a hidden master plan. Its creation requires a level of intent and determination that we are incapable of understanding, much less mimicking.

So then, we must ask, who? Kazuo Murakami, professor emeritus at Tsukuba University in Japan, has used the term “something great.” It is an existence that has put its signature on each one of the some sixty trillion cells of our bodies, each containing enough genetic information to fill thousands of books thousands of pages long. It is this “something great” that has brought order to the universe and that keeps it moving in order.

It was through such a consciousness that water was brought to this earth. It was brought to this earth for the creation of beauty.

Water Is a Mirror

Water reflects the human soul. If you say “Thank you” to water, it will be reflected in the formation of beautiful crystals overflowing with gratitude in return. If the hearts of those who live on the planet are contaminated, then the earth as well will become that way.

Very little pure water—only 3 percent of our total water—remains on the earth, and the amount suitable for human use is declining at alarming rates.

Of all the water on the earth, the amount that falls from the skies and runs into the oceans is incredibly small. Almost all the water on earth is saltwater in the oceans, while most of the drinkable water is frozen in glaciers at the top of the tallest mountains. Compared to all the water that runs into the oceans, the amount available for our use is a tiny fraction, about 1/10,000th of all the water on the earth.

The outlook of the human race could be perceived as becoming more and more gloomy. The population is rising at a rapid rate, and even the groundwater, the source of last resort, is now becoming polluted. The pollution of water is the pollution of our very soul, and unless we change our consciousness, we will never be able to restore water to its pristine form.

Water Is Prayer

Water comes to earth as the answer to our prayers, and that process continues even now. What prayer, you ask? The prayer that life will be born, breathe, and take root. The prayer that nature will prosper, expand, and cradle what the native people call the “circle of life.” The prayer that intelligence will emerge and civilizations will form to protect the earth and spread love and gratitude.

Why do you think it is that when water is shown the words “love and gratitude” such spectacular crystals form? The answer is that words are a form of prayer. When something is in line with the principles of nature and it interacts with water, the result is the formation of beautiful crystals. This is because nature itself is the result of prayer. Prayer is also the true nature of human beings. All races of people over time have had the element of prayer. Even in these present days when science reigns supreme, we still pray. What heart doesn't pray when a sick child clutches to life or when a loved one is far away?

Water is given to answer our prayer for life, for evolution, and so human beings can look toward water and offer their prayers. Human beings are essentially crystals formed upon this earth. And that is why we have the

responsibility to protect the earth by protecting our water. And the first step we can take is to return prayer to our lives. I offer you a poem about water:

You are water and the wisdom of water you know.

So just allow yourself to flow,

And then the wonder grows ...

Your soul will reach beyond the seas,

With harmony on prayers of peace ...

Never stopping, never halting, bravely water flows ...

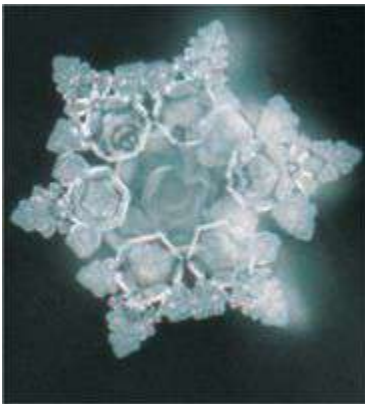
Brightly and boldly into the cosmos, for water knows.

Springwater and dam water

We journeyed down the Kumano River to collect water samples along the cycle of water. At the southernmost tip of Honshu Island in Japan, the Kii Peninsula and Kumano Mountains protrude out into the ocean. From this land where nature gods are said to live in Japanese lore, we collected water and from it produced crystals.



Dew on a low, striped bamboo on a mountain trail

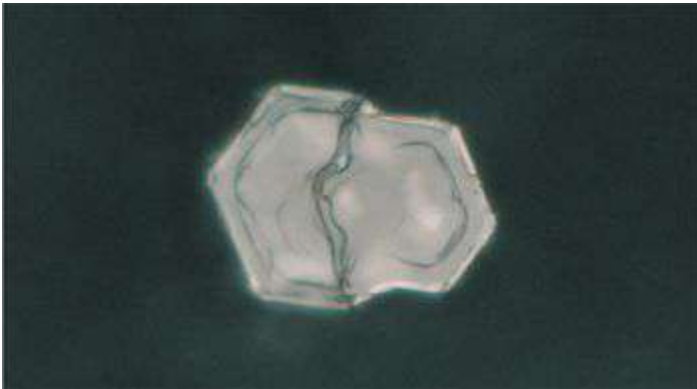


Springwater at the foot of a mountain



Water flowing into a river

We began our journey from an altitude of 1,800 meters and collected water from a low, striped bamboo leaf. Such droplets eventually spring from the ground and form streams that lead to rivers.



Dam water



A stream merging with a river

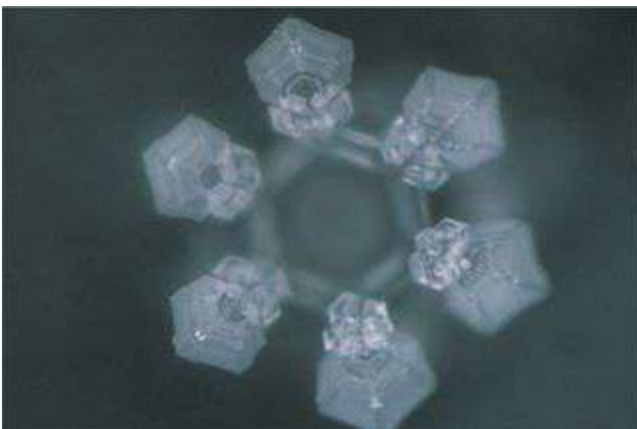


One kilometer downstream from the dam

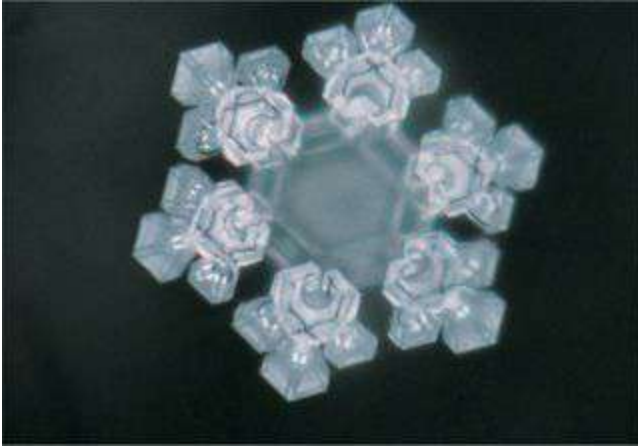
The crystals formed from the dam water lack any momentum. However, a kilometer away from the dam, beautiful crystals are once again possible. The stream eventually merges with the main river.

A flowing river and blocked-off water

At the edge of the Ariake Sea where the Honmyo River empties into Isahaya Bay, a land-reclamation project is taking place, despite protests from local citizens. We collected river water from the source to the reclamation area.



At the source of the river



Upper reaches of the river

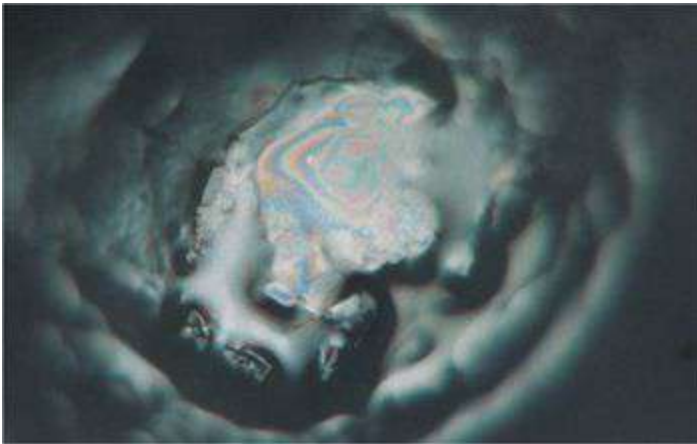
At the source, the water creates an almost transparent crystal, and water from the upper reaches of the river revealed a breathtaking crystal.



Water flowing through the city



Water right before it reaches the bay



Pond in a planned land-reclamation area

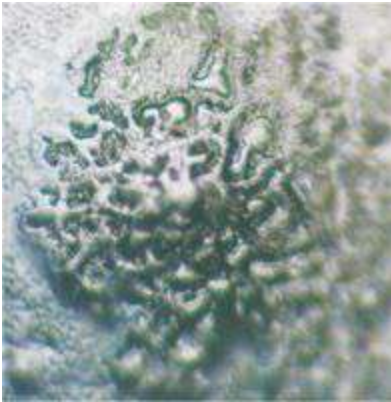
As the water moves along, it becomes polluted until crystal formation becomes difficult or even impossible. At the land-reclamation site where the water has been diverted, the puddle water resulted in a tragic-looking crystal. When water is prevented from flowing, it dies.

Three faces shown by the river

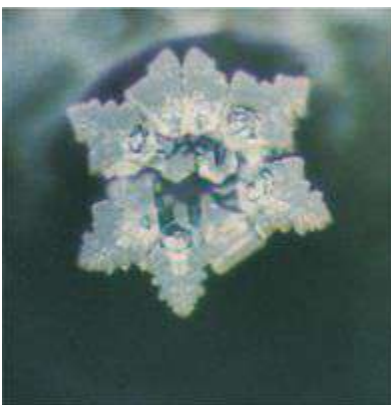
The Fuji River flows through a plain at the foot of Mt. Fuji. We made crystals at the upper reaches, midstream, and lower reaches of the river.



Upstream (Metori Yusui springwater)



Midstream

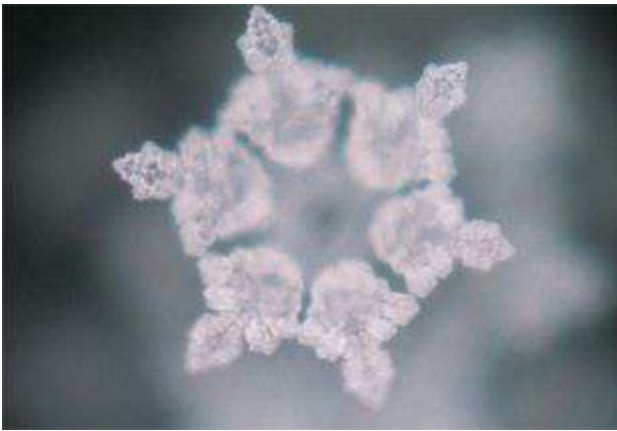


Downstream

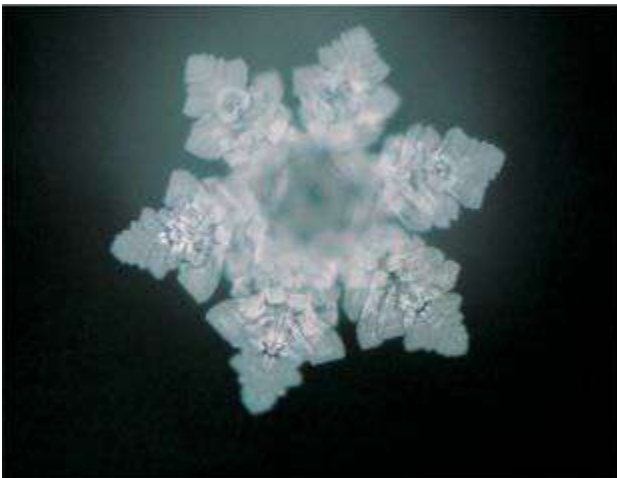
The springwater from the upper reaches creates a crystal that looks like a beautiful pearl. In the midstream, where the water runs through a rural area, a deformed crystal is formed. At the lower reaches of the river, the water becomes cleaner.

Japanese water collected at several locations

The difference in crystals formed from city water and water from springs, waterfalls, lakes, and rivers is profound.



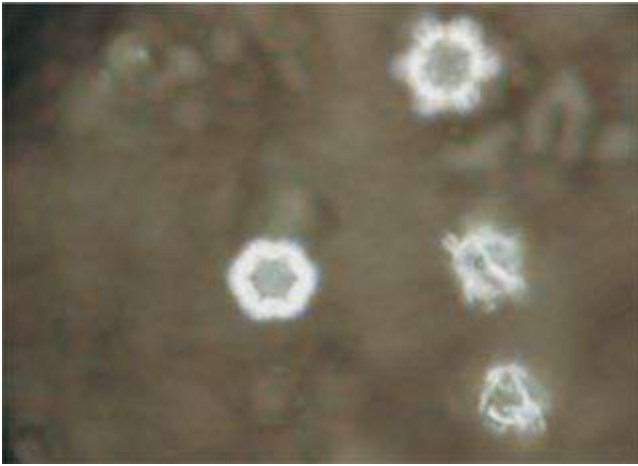
Doryuonotaki Waterfall, Yamanashi prefecture



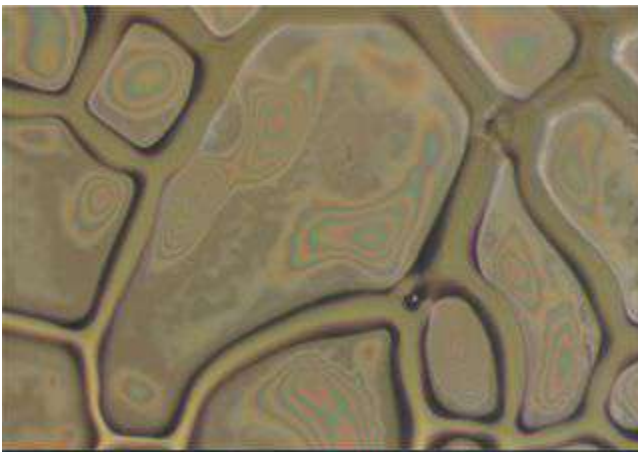
Towada Lake, Tohoku

Doryuonotaki Waterfall is close to the Fuji River. It resulted in a well-formed crystal. Water from Towada Lake in northern Japan has some

degree of pollution, but the crystal was relatively well-balanced.



Hotarunosato springwater, Niigata prefecture



Sumida River, Tokyo

This crystal from Hotarunosato, which means “home to the firefly,” created tiny light-like crystals, as might be expected. Sumida River, one of the main rivers in Tokyo, is now cleaner than it has been in years, but it is still not clean enough to form a crystal.

Crystals from water shown photographs of nature

We took pictures of crystals formed by water that had been shown photographs such as flowers and natural scenery.



A photograph of cherry blossoms



A photograph of a lotus flower



The water was shown a photograph of a fox in the lush forest under-growth. The resulting crystal is bright and sharp but perhaps a little melancholy also.



The photograph is of a tree silhouetted against a crescent moon at dusk. The unique crystal formed seems to mimic the shape of the tree.





The brilliant autumn leaves in the photograph created a crystal that appears to be formed by leaves before they have fallen from the trees.



This photograph of an ancient tree on Yakushima Island resulted in a large, unique crystal that seems to be teeming with life.

Crystals formed by water shown names of various religions

We exposed the water to the names of the world's five major religions.
What might you expect?



Buddhism

Buddhism was the only religion to result in a crystal with a hollow center. Perhaps this indicates the pathway to the next life, per the Buddhist teachings of reincarnation. It is a beautiful and well-balanced crystal.



Christianity

The tips of the crystal seem similar to Christmas trees. The fine detail and shape remind us of the religious ornaments of churches of the Middle Ages.



Judaism

The commandments of Judaism are said to be strict, but this crystal is certainly gorgeous and unconstrained. The overlapping layering of the crystal is also unique.



Islam

This also resulted in a beautiful crystal, perhaps indicative of the religion's comprehensive doctrine.



Hinduism

This crystal hexagon is almost perfectly geometrical, as if you were peering into a kaleidoscope.

The power to heal is the power of life.

We tested Effective Microorganism (EM), a patented microorganism being promoted in Japan in various products, which has the ability to cleanse the environment, along with flower essence and aroma oil.



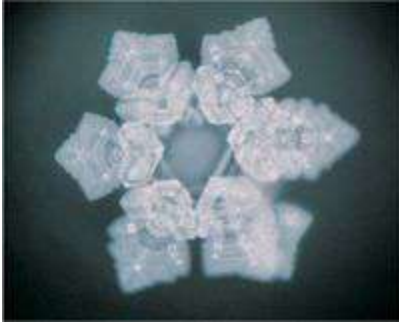
Water with EM added to it

EM is made from a microorganism good for the environment and health. Just a small amount diluted in water resulted in a crystal teeming with vitality.

Findhorn flower essence



Gorse flower

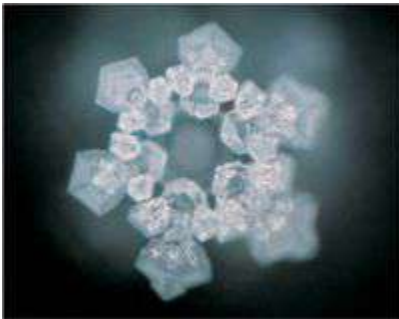


Scottish primrose



Cherry blossom

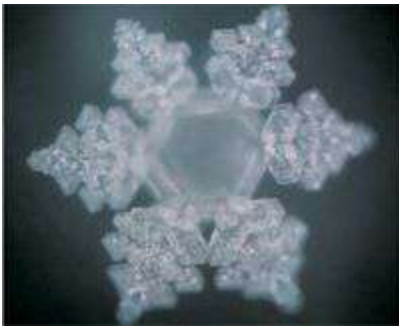
These are photographs of crystals made with the vibration of flowers. They all resemble beautiful, blossoming flowers. The finely detailed crystals seem to have a healing effect.



Iona pennywort



Valerian flower



Elderflower

All of these crystals are charmingly beautiful. Just looking at these pictures may make you feel your mind and body heal.



The vibration of aroma oil reflected in water



Chamomile

The vibration of aromatherapy oil was transferred to water using a device that transmits hado. The result is a crystal almost identical to the flower itself.



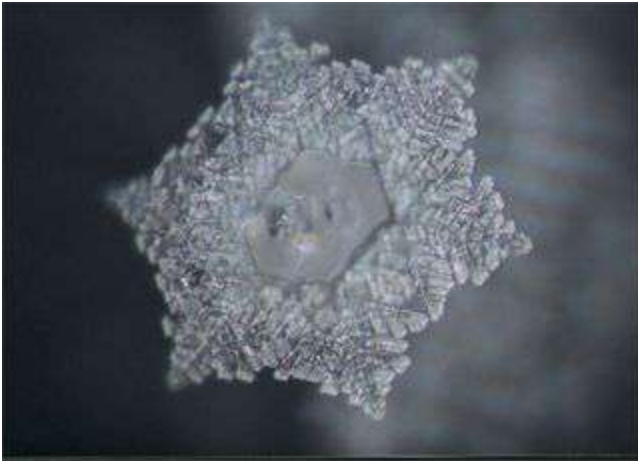
Fennel



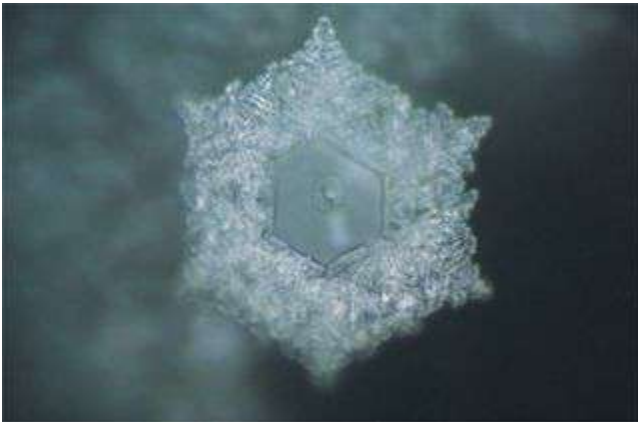
This crystal is influenced by fennel flower essence. Like blossoms floating in the water, the crystal is a brilliant representation of the flower.

Love and Thanks in three languages

The crystals formed when water is exposed to Love and Thanks seem to express all that is beautiful in the world. We compared the results in English, German, and Japanese.



Love and Thanks (English)



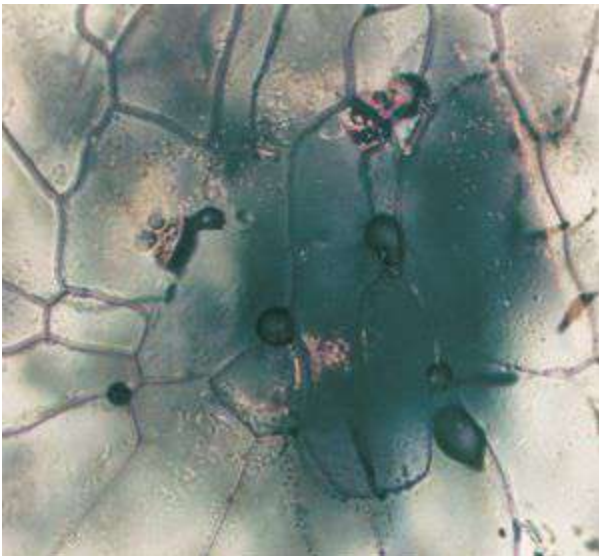
Love and Thanks (German)

The two crystals look almost identical. Maybe this indicates that love and thanks have the same vibration no matter what the language. These are words that can be understood by everyone in the world.



Love and Thanks (Japanese)

Everything begins and ends with love and thanks. Wouldn't it be wonderful to live each day with the beauty of this crystal within your heart?



Rainwater from Tokorozawa in Japan, three years previous

Tokorozawa on the outskirts of Tokyo was known as a dioxin-polluted waste dump.



Rainwater from Tokorozawa in Japan, present

Thanks to the efforts to clean and improve the area by the local citizens, the rainwater has changed, as evidenced in the most recent photo.



“With thanks to all our readers”

Further information on Masaru Emoto's groundbreaking work, as well as related materials, may be found at

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of Water

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CONTENTS

INTRODUCTION

The Positive Energy of Love and Gratitude

CHAPTER ONE

The Relationship Between Words and Water

CHAPTER TWO

Improving Your State of Mind with Crystals

CHAPTER THREE

Understanding Vibration and Resonance

CHAPTER FOUR

Using Resonance in Your Daily Life

CHAPTER FIVE

Water Crystals Can Bring Forth
Your Potential

CHAPTER SIX

Living with Clean Water:
Finding Peace and Comfort

CHAPTER SEVEN

Love and Gratitude and Saving the World

EPILOGUE

Water and the Expanding Circle of Peace

INTRODUCTION

The Positive Energy of Love and Gratitude

What comes to mind when you think of water? Oceans and rivers? Perhaps rain, or the water you drink every day? About 70 percent of this planet that we call home is covered with water, and about 70 percent of the human body is water. Without water, we would not be able to exist, and neither would the earth exist as we know it. Water is as important as it is irreplaceable.

Over the years, I have taken photographs of crystals made by freezing water. But I don't always take pictures of crystals as I find them. I often first expose the water to written words, freeze it, and then compare the various crystals that result.

Different water samples may appear to be all the same, but when one sample is exposed to positive words such as "Thank you" and another sample is exposed to negative words such as "Stupid," the two samples form distinctly different types of crystals. The "Thank you" crystals are balanced and well formed, while the "Stupid" crystals are deformed and broken. The energy of words is reflected in the formation of crystals, and depending on the words, the crystals are either beautiful or unsightly.

Since our bodies consist of 70 percent water, we can infer from the crystals that the water within us also contains the energy of words. It is perhaps not a stretch to think this way, because we often use words such as *thick*, *thin*, *heavy*, and *clean* to describe blood. If you think about water in terms of its quality, then it is easier to understand the energy contained within water.

What can we do to purify all the water within our bodies? I have explained that showing water good words results in the creation of beautiful crystals, and that's the answer. Simply use good words on a daily basis. People whose language is filled with expressions such as "Thank you" and "I love you" have water within them that is pure and beautiful, and likewise, people who use negative expressions such as "You idiot!" and "It's no good" can expect that the water within them will be deformed and distorted.

I am often asked, "What words did you use to create the most beautiful crystal you've ever photographed?" And my answer without hesitation is always, "Love and gratitude." The crystal on the cover of this book happens to be such a crystal. When water is exposed to the words "love and gratitude," it is filled with the most joy. If you look at the crystal on the cover, you'll see why I say this. When you continually think thoughts of love and gratitude, you simply cannot help but be changed. These thoughts will change the water within you, and the result will most certainly be a changed you.

In this book, I will focus on these words—*love and gratitude*—and share some of my ideas for using water's unique role of transporting vibration and resonance to help you welcome change and live a more positive and happy life.

The Balance between Love Given and Gratitude Received

What do you think is the most essential energy necessary for sustaining human life? Love and gratitude, of course. The most important form of energy that we have on this earth is the ability to love someone wholly and purely and to be filled with gratitude when someone rescues us from the edge of despair. You can probably remember a time or two when the energy of love and gratitude has come to you just when you needed it. They are essential forces in our lives.

You might wonder why I didn't show water the words "love" and "gratitude" separately. It was a whim that made me show both words combined, and the resulting crystals were noticeably different. Here's my explanation for why these crystals are the most beautiful: Love is the energy that we give to others, and gratitude is the love that we receive from others. In other words, the greatest form of energy results from the harmony between the energy of giving and the energy of receiving.

To apply this lesson to our own lives, if we hope to use this powerful energy as a guiding force, then just the energy resulting from only giving is not enough, and neither is the energy resulting from only taking. Only when love and gratitude are combined and balanced will they create a beautiful life for us, just as the combination moves

the earth and the universe.

Words Are Vibration

When you look at water crystals formed from pure water and crystals formed from impure water, there isn't an easily discernable difference. So if it is not the type of water, what influences crystal formation? The answer is vibration.

Words are a form of vibration. The Bible states, "In the beginning was the Word," and the Japanese have a saying that, roughly translated, means, "Words bring both good and ill fortune." Words and language are an integral part of our collective history.

The words we use evolve over great expanses of time, not unlike the process of evolution evident in nature. Of all the words that have evolved over time, *love and gratitude* are the most beautiful, in my opinion. We all live in pursuit of these virtues. Love and gratitude create the harmony found in all of nature. This harmony is a force so powerful that it is quite likely beyond our ability to understand. Even if we appear to be seeing chaos in the details, the overall effect is one of harmony.

Therefore, while you may not experience an immediate result when you disrupt the balance of love and gratitude, the negative effects will ultimately catch up with you. Pain and sorrow often result. There are times when, due to a lack of love and gratitude, the harmony of the entire human race is thrown into chaos by natural disasters such as earthquakes or tsunamis. My theory is that disastrous phenomena are the result of disruptions in the energy of love and gratitude.

Some might say that this is a preposterous idea. It is true that this theory lacks solid scientific backing, but the starting point for all science can be found in fantasy and dreams. The preposterous idea of yesteryear is the proven science of today. We can never hope to understand the world unless we practice unlimited thinking.

I hope that each person who picks up this book will become aware of the energy of love and gratitude that he or she possesses and then spread that knowledge to others. Those people will be likewise affected and share their experience with even more people. Knowing the power of love and gratitude has the potential to bring happiness to the people around you—and even to all the people of the world.

Join me in exploring the power of words and vibration, and the energy of love and gratitude, in the following pages of this book.

CHAPTER ONE

The Relationship Between Words and Water

I've already explained that when water is exposed to good words, good crystals result. So if you make it a habit to use positive words, then the water within your body and the water around you will become beautiful and clean, and health and well-being will result. This might sound like the conclusion of the book, but I have only just begun. Let's take a closer look at water and the meaning of our words.

Perhaps you have thought that the words you use day in and day out are tools to enable you to communicate with others. That's true, but they have another valuable function. Words contain the element of vibration, which plays a vital role in the grand scheme of nature.

The water that I experiment with to make crystals is nothing more than ordinary mineral water. However, when the individual water samples are exposed to different written words, the resulting crystal from each sample is quite different, depending on the vibration of the word. We can learn two things from this result.

The first thing is that while water may look the same on the surface, when we consider water's molecular makeup, we can see that it is capable of displaying a vast array of expressions. We might even say that water is like two people who look identical on the surface but are completely different inside. I have found that you can take any two healthy-looking people, and one might have a healthy mind and spirit, while the other has a fatigued mind and organs. Water crystals show us that, because appearances can be deceiving, it is helpful not to rely on ordinary means to look at something. Instead we need to turn our focus to the inside.

As an example, I often see young women diligently drinking copious amounts of water for their health and beauty. Perhaps they would see better results if they focused on purifying the water that makes up 70 percent of their body by using positive words and thoughts. This, I believe, is the best and quickest way to internal beauty and to physical vitality.

The second lesson that the water-crystal photographs teach us is that no matter how pure and tasty the water you drink, careless words and thoughts have the chance to destroy the beautiful crystals that might have formed. Crystals formed from even the purest water available change daily, depending on the environment and the words that it's exposed to in every moment. Keeping your words positive will keep the water within you pure and beautiful.

The Sounds of Nature

So what are words? I was raised in Japan by parents who spoke Japanese, and that's why I speak Japanese. But if, for example, I was separated from my parents soon after birth and raised by Chinese parents, then my mother tongue would, of course, be Chinese. In other words, no matter how much Japanese blood runs through my veins, it's not going to affect my language or the way I speak. Language is learned and not passed down through our DNA.

If we consider the biblical Adam and Eve, who taught them language? Since they had no earthly parents to teach them, I believe that they learned the first language of humankind by listening to the various vibrations and sounds created by nature.

Nature's sounds are indeed numerous. Just consider all the different sounds made by water in a stream as it flows. At the source, the water *bubbles* out of the ground, and then it *trickles* down and joins other creeks to become a *rushing* stream and perhaps even a *roaring* river that *plunges* over falls. The water may eventually form an expansive river that *hums* slowly toward the sea. With each subtle change in the environment, the sound of water changes as it moves along.

A sudden and radical change in nature, such as an earthquake, volcanic eruption, or tidal wave, is also revealed by sound. The ancient people were more attuned to nature than we are, and they knew what it was telling them. When someone heard the sound of water about to rush over the banks, he or she would need to tell others so they could escape to high ground, and the best way to do it was by imitating the sound of the river. By continuing to listen, they would be able to tell when the rain had stopped and the water had retreated. Likewise, they would have wanted to communicate this to others and to indicate that it was safe to return.

Coincidentally, the word in Sanskrit for "sound" is *Nada-Brahman*. *Nada* means "wide river" and *Brahman*

means “the source,” indicating the concept that sound is at the source of the river. My name, Emoto, also happens to mean “source of the river” in Japanese, so I guess it would only make sense that I would travel around the world spreading the message of water.

In any case, the sounds of nature come in many forms. Some are pleasurable sounds while others are mournful, and our distant ancestors understood this from what they experienced on a daily basis. They also understood the sounds of calmness, heat, cold, frustration, comfort, large animals, small animals, and males and females. And through imitation, the sounds of nature became our sounds—and our eventual language. See for yourself: Listen to water in a creek, river, lake, or ocean and try to hear the similarities between nature’s sounds and our own words.

Differences in Environment Account for Different Words

When you think about the role that nature plays in the formation of language, it makes you wonder if there were ancient words that could not be replaced—words so fundamental to a language that they should not and must not be replaced due to the connection to the unchanging principles of nature.

Yet our world contains many different languages. How did this happen?

The principles that exist in nature exist *everywhere* in nature and always have and always will, but the form of nature changes depending on factors in the environment such as temperature and humidity. This accounts for the differences in languages spoken by different peoples. Japanese, for example, has a large array of descriptive words, which may be a result of a generally homogeneous ethnic group being spread from the frigid northern part of the country to its tropical southern tip. And with distinct seasons throughout most of Japan, the weather is in a constant state of flux. Japan is a country blessed with bountiful nature, filling the air with a rich variety of sounds that would, over time, have become the source of an equally rich variety of words, including those used in distinctive forms of Japanese poetry such as haiku and tanka.

By contrast, the tongue of the Ainu, a distinctive and small minority group living in the most northern part of Japan, includes very few words, although they do have some 160 words to describe water. The part of Japan where most of the Ainu live is known for its many streams and lakes and heavy precipitation. These aspects of nature each have distinctive sounds—sounds that over the years evolved into words.

No matter where you go in the world, nature emits sounds with vibrations distinctive to the particular location and environment, accounting for the many different languages spoken by the various peoples of the earth.

The Formation of Crystals Using Different Languages

Unpleasant and pleasant phenomena witnessed by the ancients were expressed by words that conveyed the nature of the phenomena, i.e., ugly words or beautiful words. And by extension, water exposed to beautiful words forms beautiful crystals, while ugly words form ugly crystals. This should be expected, considering that words came from the sounds or vibrations of nature. The ability to distinguish between the fearful sounds, gentle sounds, enjoyable sounds, and worrisome sounds of nature, and the desire to communicate with others, is where language all began.

But here’s something you might not expect. When water is exposed to a word from Japanese, German, English, Korean, or any other language with the same meaning, crystals similar in appearance are formed. “Thank you” and its equivalent expression in Japanese, “Arigato,” despite being completely different words, look surprisingly similar as crystals. Why would different words, albeit with similar meanings, have this effect on crystals?

We already know that differences in nature result in the formation of different words. While the sound of the pig in English is *oink-oink*, the sound in Japanese is something like *bu-bu*. While the English-speaking rooster goes *cock-a-doodle-doo*, the Japanese rooster’s morning call sounds more like *ko-ke-ko-ko*. The reason for the differences is that the way people who grew up in Japan hear a sound is ever so slightly different from the way people born and raised in a different country perceive that same sound. The pigs and chickens of one country are not that different—perhaps not any different—from the animals found in another country, but the way a culture hears these sounds is different.

Although words of different languages may look and sound different, they are all formed according to the principle of nature. So regardless of the language, when water is exposed to words with similar meanings, the crystals formed are similar.

We Are One with the Universe’s Vibrations

The Japanese word for “cosmos,” *uchu*, supposedly came from the sounds the stars make. Perhaps the English word “cosmos” was formed based on the same sound. Although there are many different words for the cosmos, there is only one cosmos, and all the different words are perhaps nothing more than different ways of hearing the same thing.

Knowing that words come to us from the vibrations of the universe should help us to see that we are all one. Going about your life with this understanding is completely different from going about your life thinking only of yourself. Being concerned only with the short term is no way to live. Perhaps worrying only about the immediate future is the best some people can do. But when you have worried yourself sick over the immediate future it's important to broaden your perspective and see that the sky is all one and that we are all one with the sky and the cosmos.

Today more and more people seem to feel lost. Young people no longer know what to do with their future. The reason for this feeling of aimlessness and confusion is that the world we have created seems artificial. In this consumer society where everything we see was made by someone else besides us, what's real is what's natural: the sun, the moon, the stars, and plant and animal life. We gain perspective when we consider these natural wonders. All of us who feel lost can find direction by remembering that we all feel the universe's vibrations and by taking comfort in the common roots of our language.

Changing Yourself with Your Words

Think about the words you use day in and day out. Your words and the way you use them have an important influence on what kind of life you live. This isn't a discovery that's going to catch anyone by surprise.

Words are vibrations, and when our bodies, with all the water coursing through them, are exposed to good words, we cannot help but experience health and well-being. And in the same way, bad words and their bad vibrations will predictably have a negative effect on our bodies, so we should not be surprised when destructive words destroy.

So much can ride on a single word. That's why your life's outcome depends on how you use words and how you relate to their meaning each and every day. More so today than in the past, we are surrounded by negative words on the radio, on television, and in conversation with others. While some negative language used for humor may not be so bad, much of the language we use, and even many of the new words and expressions that enter our language through modern culture, are negative in their vibration.

It is within our power to shift our shared lexicon to the positive. You can start with yourself.

CHAPTER TWO

Improving Your State of Mind with Crystals

Let's take a closer look at some crystals. Look through the crystal photographs in this book and ask yourself which is the most beautiful. The crystal that you think is the most beautiful is the symbol of what you most desire. That is what your heart is searching for and what it wants to resonate with. If, for example, you think the "exhilaration" crystal is the most beautiful, then exhilaration is what you need in your life. You can choose to wake up in the morning and go about your life with exhilaration, even feeling exhilarated by what you eat. If you live your life that way for seven to ten days, you can be sure that your life will become more exhilarating. At that time you can open this book and again ask yourself which crystal you find the most beautiful. Maybe then you'll choose the "hope" crystal, in which case you would go about your daily life with hope being your predominant thought and feeling.

Place your selected crystal's picture in a spot where you can look at it several times a day. Frame or stand the photograph where you can see it out of the corner of your eye as you go about your day. Every time you gaze at it, you will align with the vibrations of love and gratitude, and you will achieve the feeling you desire. You might want to put the "You're beautiful!" crystal next to your mirror as a reminder to appreciate yourself. Or perhaps place the "love and gratitude" crystal near the bathtub where you wash away your fatigue and worries. Surrounding yourself with water-crystal photographs brings a ray of sunshine into your life.

You can change your life by looking at the crystal photographs. No two photographs of crystals are exactly the same. And maybe this is one reason why these photographs have the power to relax and heal. They are one of a kind, and so offer a unique vibration. Even simply having them nearby will create vibrations with which you can resonate.

Let the precious water within your heart become like beautiful crystals. That is where all change begins.

Words of Energy for Achieving Dreams

What is the true message of individual words? What message is hidden in words that can change your life? You can find clues to the answer to these questions and others in water crystals.

The crystal on page 36 was taken after the water was exposed to "I can do it." Solid and beautiful, the crystal seems to be telling us that if we believe we can do something, we can find a way to make it happen, even if it seems impossible. So if your boss says to you, "It's a really tough job, but I'd like you to do it," the outcome will depend on whether you say "I can do it" to your boss and yourself.

Saying words out loud creates the energy you need to accomplish the task in a focused and efficient way. Even if you're all alone when you say it, the water within your body will respond to this powerful affirmation and provide just the right support to get the task done.

In Japanese, words have a spirit. Thinking about words as having a spirit may help us understand their power. One thing I have noticed through research and life experience is that you can better use the spirit of words to help you achieve your dreams by using the past tense. In other words, it's even better to say "I did it" than "I can do it." Saying the same thing as if it has already happened seems to bring about an especially strong level of energy to any effort.

The next time you embark on a goal, try saying, "I did such and such" rather than "I can do such and such." Speaking in the past tense when faced with a difficult task can make all the difference.

By contrast, if you think you can't do something, you'll probably be right, no matter how easy the task may actually be. This seems to be the message of the "I can't do it" crystal found on page 37. "I can do it" results in a beautiful crystal, while "I can't do it" results in a distorted crystal. However, if you make an effort, you can see in the distorted crystal the possibility of a beautiful crystal forming. If you maintain a strong desire, then the people around you will come to your aid. The worst thing you can do is say, "I can't do it."

Why is it that negative statements such as "I can't do it" and "I won't do it" result in deformed crystals? I'm convinced from my research that it is because these concepts are not found anywhere in nature. The power that created our planet and our universe incorporated perfect and complete harmony and purposefulness. Everything that

exists is in a constant state of recirculation. A leaf, for example, falls to the ground and returns to the soil to provide nourishment to the tree from whence it came. Such an environment, where everything has a purpose, leaves no room for vibrations of “I can’t do it.”

Words of Encouragement to Others for Yourself

When you’re thinking about attempting a goal for the first time and you lack confidence, the words “You can do it” have special significance. But when you’re venturing into unknown territory, other people are unlikely to give you this encouragement. Instead you might hear, “You’re not serious?” or “You don’t really think you can do it, do you?” At a time when you need all the confidence you can muster, such words have a negative effect on both the person who hears them and the person who says them.

This is closely related to the main theme of this book: the power and resonance of words. For example, *love and gratitude*: We do know that love comes from the inside and spreads out, and that gratitude is the feeling felt by the receiver of this vibration. However, as I mentioned previously, the person who receives love and feels confidence will then be in a position to emit love, and in this way, love and gratitude spread throughout the world with the vibration of this beautiful energy.

So when you say to someone, “You can do it,” you have done a great service not only to that person but also to yourself. When the response is something like, “When you say that, it makes me feel like I really can do it, and I will,” then the energy will come back to you and the can-do vibration will fill you with confidence.

Now, if you had instead said, “Are you sure?” then what would happen? The other person’s confidence would be crushed, filling the space with negative vibrations, and you, likewise, would be filled with uncertainty. This is why, whenever you can, it makes more sense to speak positive words than negative words. Another case in point can be found by looking at the crystal on page 39: “Everything is going to work out.”

It seems to form two crystals. Perhaps we can see the overlaying of the feelings of the person who says the words and the person who hears them. You can imagine someone saying, “I know you’re worried, but I’m behind you so give it a try.”

Any words that give positive energy to another are certain to result in positive energy for the giver. Try this out at home, with your co-workers, and with your friends—you’ll surely see results. If your words shine a light on those around you, you won’t have to walk in the dark.

The Rewards of Making Others Happy

The crystals formed by “happiness” and “dislike” on pages 40 and 41 form an interesting contrast. The “happiness” crystal looks somewhat like a happy crab with hornlike formations on its hexagonal body. The “dislike” crystal looks similar to the “happy” crystal, but it appears as if it was squashed in its growth process.

To explore the differences, let’s consider for a moment what makes people feel the happiest. Of course, we are happy when we are paid a compliment or given a gift. But I suspect that most people are happiest when they do something for someone that causes happiness for that person. There’s nothing that makes me happier than to see a happy face and to know that this person looks that way because of me.

This, again, is a phenomenon of the love and gratitude that I’ve mentioned. What’s happening is that the feeling of gratitude which the receiver has toward the giver changes form and becomes love. When you understand the happiness that comes from giving, the circle of happiness around you will spread.

The Japanese word for “happiness” is *ureshii*, which is written with a Japanese character formed by two parts. The first means “woman” and the second means “good fortune.” Perhaps the ancients who created the writing system used in Japan knew something about how important it is to make other people, and maybe women in particular, happy. And in fact, the crab-looking crystal seems to resemble a smiling woman.

However, the “dislike” crystal looks like the face of someone who has taken a bite of something bitter. As long as you look at people in such a way, you will continue to dislike them. But if you make a special effort to smile at the people you dislike, you’ll soon sense that your feelings of dislike are dissipating.

Certainly there are some people whom I don’t much care for, but I know that I shouldn’t carry feelings of dislike within me. It only hurts me in the end. So what can we do to get rid of negative feelings? Here’s my suggestion. If you harbor feelings of dislike toward someone, that person will likely also have negative feelings toward you. If you can think that the cause for the dislike lies within you and ponder how that person might be feeling toward you, then you’re halfway to solving the problem.

The next step is to think about how you might be responsible for the different vibrations within that person and then to approach that person again with your negative feelings in check. You might be surprised to discover that all your dislike for that person has suddenly disappeared. Also, if you find yourself in a situation where you’re alone

with someone you dislike, bring a third party into the meeting. I've found that while two people might result in a conflicting frequency, a third person often brings everyone's energy into harmony.

Instead of giving up on improving relations with someone you dislike, try the methods I've mentioned and you might just surprise yourself with a change of heart.

Be Generous with Compliments

Any type of compliment helps create a beautiful crystal. The crystal created by "You tried hard" on page 44 is beautiful and perhaps a little restrained. Let's say that a child needs to study for an hour, but after thirty minutes you can see that he or she can study no more. You say, "You tried hard." What would the child think as a result of this encouraging statement? *I thought I would get in trouble for studying only thirty minutes, but I actually got complimented. If I study more, I might get complimented even more.*

So even a half-compliment can do much more to encourage someone than other expressions such as "Try harder" and "Keep at it." Expressions such as these usually result more in pressure than encouragement. While verbal pressure might result in more study time, it's not likely to result in more motivation. Crystals created by complimentary words seem to support this deduction.

This doesn't just go for children. Instead of telling co-workers and family members to work harder, you can compliment them for trying hard. You will be doing them the favor of energizing the water within them.

This strategy is especially important when you are in a leadership position. When you want improvement, you could demand it directly. However, often a more effective approach is to compliment first and then suggest what could be improved. For example, "You did a nice job. I like what you've done. But maybe you could ..." While we often say that a leader leads by example, it's important not to underestimate the power of words.

For an example of what happens when you criticize, look at the crystal on page 44 made by "It's hopeless." Perhaps you know someone who has a habit of saying, "It's hopeless," or "It's not going to work out." Their words create their future, and every possibility they encounter will have a negative outcome.

There are some people who can take bad news and use it to give them the energy they need to try even harder. For most of us, the best we can do is to avoid bad news. Negative information relays negative vibration, often resulting in a negative chain reaction that at times can lead to a fight, a crime, or perhaps even a war—all things that should be avoided when possible.

But ask yourself this: Why do so many people get enjoyment from watching mean-spirited television shows and hearing malicious gossip about celebrities? What they really get out of this is bad vibration rather than any true enjoyment. When you expose yourself unnecessarily to unhappy vibration, you put your own happiness at risk.

Wouldn't it be much wiser to wish happiness for others as much as you wish happiness for yourself? If everyone did this, the world would indeed be a wonderful place.

Finding Your Natural State of Wellness and Enjoyment

Water crystals also teach us about returning to our natural state: enjoying life and experiencing wellness.

Take a look at the "energetic" crystal on page 42. This healthy and well-balanced crystal seems to be telling us the importance of being healthy and energetic. When we make that choice, we fill the water within our bodies with energy. The "exhaustion" crystal on page 43, on the other hand, looks tired and worn out. When you say you're tired, the water within your body responds accordingly.

The Japanese word for "energetic," perhaps also translated as "health," is written with two characters: 元気. The first means the "source" or "origin," and the second refers to "energy" or "spirit." Our original state is health, and it's only natural that we return to this state and be healthy. If we are not healthy, then we have, somewhere along the way, gotten out of rhythm. For human beings, this energy or natural state of health is the starting point, and it's the point to which we need to continually return. Keep a photograph of the "energetic" crystal close by to help bring you back to your natural state of wellness.

When I exposed water to the word "enjoyment" to make the crystal on page 45, I anticipated a lively and vibrant crystal, but the crystal is actually quite conservative and basic. Perhaps this crystal is telling us that enjoyment is something that's quite normal, something that should catch no one by surprise. "Enjoyment," as well as "energetic," produced a surprisingly typical crystal, and why should we think these elements aren't a typical part of our daily life?

The act of living itself is an act of enjoyment. Some might argue, "That's not true. Life is full of pain." But think about this: At the moment of conception within your mother's womb, one of between 100 million and 400 million sperm was the one to fertilize your mother's egg. That already makes you an exceptional being to begin with. Now you, as the chosen one, carry the responsibility to live and enjoy life to the fullest.

The most natural life we can live is the one that is most enjoyable—and also the one that is best for our bodies. Here’s an interesting way I look at it from my Japanese point of view.

The word for “enjoyment” in Japanese is written with the character 楽. If you add an element or “radical” that means “grass” to the top of this character, then the resulting character becomes “medicine”: 薬. And medicine is what is used to restore the body and mind to a state where enjoyment is once again possible. The “grass” radical at the top refers to nature, and so we might also deduce that when you live close to nature, your body will be healthier and better able to enjoy life. Nature, water, and our natural state of wellness and enjoyment are forever linked.

Keep On Dreaming

When you look at the “Dreams come true” crystal on page 45, you’ll see that it looks somewhat like the “enjoyment” crystal, although it is considerably more complex. This seems to indicate that our dreams are of a different dimension, accounting for the multiple layers seen in the crystal.

Human beings have evolved over the ages in order to achieve their dreams, and this is our natural evolution. Having a dream pushes you forward. Take a moment and think about your dream. It might be a big dream or a little dream. Maybe it’s a dream that others would laugh at. Don’t worry about what others think. Strive for your dream, and when you accomplish it or even a small part of it, celebrate! You will now be able to move ahead with more confidence than before, and soon you’ll find your next dream, and on it goes.

When I was a small boy, I told my friends that my dream was to become the Secretary General of the United Nations. That’s not the direction I pursued in life, but that dream still occupies a corner of my mind. Perhaps it’s the water within my body that remembers it, and perhaps that’s why I have created two opportunities in the last few years to give speeches at the United Nations.

Your body remembers your dreams, which is why it is important to speak your dream. It will help you find the way to make the impossible possible. If all the people around the globe speak their dream of world peace, ten years from now that heretofore unachievable dream will be closer to being a reality.

CHAPTER THREE

Understanding Vibration and Resonance

In this chapter, we will take a further look at the way our words vibrate and resonate between ourselves and others. Let me first explain more about vibration, the force that moves us.

The Vibration of Existence

When we think about the factors necessary for survival, at the top of the list will come breathing, and in order to breathe, we need oxygen. We also need water, food, and sleep. Without an almost constant supply of these elements, survival would be impossible. What do these elements all have in common? The answer is energy.

We are talking about this same energy when we say things like, “I don’t seem to have any energy.” If we really didn’t have any energy, we wouldn’t be able to survive, and neither would anything else that exists on this planet. Whether we’re sitting, standing, working, or playing, everything we do requires energy. In order to regain the energy lost through activity, we need sleep. And so the sustenance of life requires a constant and consistent combination of oxygen, water, food, and sleep.

We can’t talk about energy without talking about vibration. Without vibration, we would be unable to create energy. Vibration is what makes it possible for everything to exist. All that exists is in a state of vibration, and this is the source of energy.

Vibration, the Energy of Life

Imagine an object vibrating. Perhaps you can almost hear the sound of it moving back and forth. Scientists tell us that everything vibrates, and thus everything emits sound—even the pebble lying alongside the road, even though you might pick it up and hear nothing.

The human ear is capable of hearing sounds within the range of approximately 15 to 20,000 hertz. One hertz is equivalent to one vibration per second. Human beings cannot hear anything with a vibration higher or lower than that range. So just because you can’t hear a sound doesn’t mean a sound isn’t being made. As long as a little pebble exists alongside the road, it is vibrating, and that vibration is making sound, no matter how small.

This concept was perhaps better understood by the ancients than by the people of today. A Buddhist saying speaks of Kannon, the goddess of mercy and compassion, as being capable of seeing all and feeling all. All existence is vibration and sound, and vibration is life itself. Without vibration, we would not exist.

The Japanese write the word “life” using the character 命. At the top of the character, you can see a roof, and under the roof is a person sleeping, symbolized by a horizontal line. Under the sleeping person are two symbols that, when combined, refer to “tapping.” We might compare this to the creation of vibration and, thus, the formation of life.

This life force that makes our existence possible is the same life force that makes possible the existence of the pebble alongside the road. To say that something exists is to say it vibrates, and everything that vibrates has life.

Vibration by Way of Water

We now understand that without vibration, it would be impossible for us to live, but since when was simple survival enough? Human beings differentiate themselves from other life forms by seeking a quality of life and happiness in addition to survival. And that leads us on the search for what makes us happy.

I have found in my studies that the phenomenon of resonance causes happiness. Resonance is simply the act of vibration resulting in more vibration. It requires the interaction of two complementary objects or energies. These energies are referred to in the Chinese culture as *yin* and *yang*, or light and dark—or, as I believe, love and gratitude. The love given and the gratitude returned resonate with each other through the vibration of giving and the gratitude of receiving.

Perhaps when you were a child you conducted an experiment using two tuning forks. When one tuning fork is

struck to make a vibrating sound, the other tuning fork placed nearby starts to make the same sound. This is resonance, and in order for it to work, the two objects need to have the same number of vibrations; they need to be on the same frequency. If the two tuning forks are of different frequencies, no matter how hard you strike one, it won't have any effect on the other.

It's not hard to see why something vibrates when you strike it, but it takes some thinking to understand why one object vibrates when you strike a completely separate object. It's a simple experiment, but it is eloquent in expressing the fundamental characteristics of energy.

Let me explain this more thoroughly. If vibration is energy, then resonance is the reverberation of energy, and resonance is thus capable of relaying energy. When you shout in a tunnel, you can hear your voice echoing. This is also a form of resonance. In order for resonance to be created in the tunnel, you need to shout first. In other words, energy cannot be relayed unilaterally. It requires the resonance of two elements, elements such as two friends, parent and child, or husband and wife.

The energy that is all around us wasn't always there. It is the resonance from earlier times passed down to us today. When we trace the energy back to the beginning of this resonance, we will reach the point at the very moment when this universe was created, that very first vibration. Who made this vibration? It was the creator of this universe, however you refer to this being or force. At the moment of the universe's conception, the creator made the first vibration. When this vibration met with vibrations of the same frequency, resonance resulted and energy was created. The vibration continued to resonate and create energy. Thus, the creator used the medium of resonance to create this universe.

Something was required to transmit the energy of resonance necessary for creation, and that substance was water. Water was instrumental for forming and sustaining life, just as it is today. Think of water as a train that transports vibration. Without sufficient water, the energy of vibration will not be able to flow throughout the body. Since vibration is the source of energy, energy would have no way to enter the body without water, and death would be not far behind.

This may not be the way everyone sees it, but more than ten years of research and water-crystal photography has convinced me that water's role is to transport vibration—energy—to the body. More and more people recently seem to be coming to this way of thinking.

Water is not only critical for sustaining life, but it is also necessary for keeping a good outlook on life. I have observed that people who are dehydrated soon lose their sense of humor. It so happens that the words "humor" and "humidity" come from the same Latin word. Even the ancients understood that with sufficient water, people are lighthearted and can enjoy humor, but humor wanes when humidity dwindles. In fact, when humidity drops by 50 percent, life is no longer sustainable. The vibration carried by water is nothing more or less than energy. If we only have half as much water as we need, we'll only have half as much energy as we need, and at that level, we'll not only be unable to resonate, we'll also be unable to vibrate.

By understanding that life is vibration, you'll also see that life after death is possible. Because vibration is life, life does not require a body in order to continue. Think of the body as little more than a tuxedo or dress that you rent for a short period of time. You'll need to return your tuxedo or dress when the time is up, but that fact alone does not mean the end of vibration. The soul, freed of the body, continues to vibrate, making life eternal.

In the next chapter, I'll explain how the principle of resonance can be applied to your daily life to improve your communication, relationships, and health.

CHAPTER FOUR

Using Resonance in Your Daily Life

Perhaps the greatest role that water plays in sustaining life is the transportation of vibration, and the greatest role of vibration is resonance. Resonance is not possible in a vacuum; for people to resonate, they require someone with the same vibration.

Resonance can occur among unrelated people without them even knowing. The British biologist Rupert Sheldrake gives us an example of how written or spoken words can have an effect on other unrelated people all over the world. According to his theory of “morphic resonance,” when a person begins something new, if it’s good and wholesome then the words of that person will go to other people who have similar consciousnesses.

To study this theory, he divided fans of the hugely popular and difficult *London Times* crossword puzzle into two types: those who worked on the puzzle as soon as they got it on Saturday evening, and those who waited until later to do it. The people who waited until later to work on the puzzle did significantly better than those who worked on it right away.

Perhaps what was happening was that when someone filled in a word, the vibration of the word blended into the fabric of the universe and then was attracted to people who resonated with the same appreciation for crossword puzzles. The phenomenon of resonance affects us all, wherever we are.

While we often resonate with people we aren’t even aware of, we resonate on a daily basis with people directly connected to our lives—friends and loved ones. Through this resonance, love and gratitude are exchanged, and energy is created. Because resonance is similar to communication, fully understanding it will help you improve your relationships and communication in all aspects of life.

Resonance for Better Communication

Perfect resonance would make the ideal relationship possible, but people will inevitably have different frequencies. If two people vibrate on vastly different frequencies, it will soon become evident that they need distance between them, and that will take care of the problem. However, when two people’s frequency is only slightly different, then it can cause all sorts of problems.

You see this phenomenon at play in many relationship problems among in-laws. The frequencies of a husband and a mother-in-law, for example, are probably not so different, since they both, at the very least, share a love for the same person. But sometimes even small differences in frequency can create disharmony. The same thing can occur in relationships between co-workers and acquaintances.

To help you get over hurdles in these kinds of relationships, think about a piano keyboard. It consists of black and white keys, each one essential to the formation of the keyboard, just as everything in our world is essential. When played together, some of the keys result in harmony, while other keys of different values result in a sound that is quite unpleasant. For example, the sounds of *do* and *mi*, *do* and *fa*, and *do* and *so* are able to create resonance. But *do* and *re*, sounds that are close to each other, result in a disharmonious sound.

Like the harmonious chords of *do-mi-so*, when people talk with others with whom they naturally resonate, the result is harmony. But what should you do when you have to be with someone with whom you don’t resonate, say a co-worker or mother-in-law? Try adding another person to the mix. When two people just don’t seem to be able to communicate, another person can help harmonize the energies.

Another way to improve relationships is to align your frequency with the frequency of the person you don’t get along with. How? Stand in the shoes of that person and try to see the world through his or her eyes. In order to do that, you need to know that person rather well. If you know someone’s interests, family situation, and past, then you can put yourself in that person’s place and see why he or she is thinking and behaving that way. With the passing of time, people grow and change, and someone you initially rejected might eventually seem not so bad. Consciously and continuously put yourself in the same frequency as another in order to resonate with them. When you become capable of that, then you will be able to share love and gratitude with that person, and the relationship can be mutually fulfilling and nourishing.

By becoming fully aware that your vibration is a living thing, you can become far more skilled at getting along in the world.

Friendship and Resonance

As you can see on page 90, water crystals that were formed by being shown the word “friend” were extremely beautiful and reflected happiness. Moreover, when we look at the concept of “a circle of friends,” we observe that when you make one friend, then, one by one, you make more friends.

Your friends are like a mirror in which you can see a reflection of yourself. By extension, if you notice particular good points in your friends, it’s quite possible that you are lacking these “good points” in yourself. Your friends exist for the important purpose of assisting your growth.

If you are able to express yourself freely on a variety of issues with friends, then it can be said that you are “open.” If you are not open to having discussions with friends about a wide variety of matters, then you are closing yourself off from receiving new knowledge and wisdom. How about making a fresh start today? Henceforth, start to think of your friends as a mirror in which you are able to see your own reflection, and be open to freely exchanging ideas, emotions, and knowledge.

I count myself lucky to have friends who are older than me, friends who are about the same age, and friends who are younger than me. In my organization, there are members of the staff with whom I associate and whom I consider to be my friends. Generally, I am the kind of person who is quick to make new friends regardless of age. I receive energy from these new friends because of the phenomenon of resonance, and this energy helps me continue living in a healthy manner.

Having a huge number of friends is not so important; the main thing is to have high-quality friendships with any number of people you feel comfortable with. This is what makes people happy. I feel that the most important condition of friendship is to be able to hold heart-to-heart discussions with your friends. The ability of people to talk and share ideas with each other is of critical importance, and I feel that people who are unable to do so become part of the cause of various social problems. Finally, in order to bring meaning to your discussions with friends, you need to possess compassion and kindness. Then you will experience the full benefits of energy resonance.

It’s Important to Resonate with Other People, Not with Electromagnetic Fields

It seems that something has been changing in the world in recent times: there are people who seem impossible to resonate with, despite one’s best efforts—such as the type of person who chooses to sit in front of the television and become reclusive, and as a result becomes adverse to communicating with or relating to others.

A major reason for this type of behavior can be found in the electromagnetic fields around us. There can be no doubt that the diverse electromagnetic fields have a negative impact on human beings. Cell phones, televisions, computers, and other electronic devices surround us all the time. When people have weakened immune systems, the electromagnetic fields they surround themselves with may be strong enough to alter their consciousness.

Let’s look at the relationship between the human nervous system and computers. The building blocks for computer systems are *0s* and *1s*, and these two digits are used to provide all the instructions required by the computer to operate. In other words, it is like a world of *yes-no* choices. When we are constantly exposed to the electromagnetic fields of computers, our bodies and our nervous systems begin to harmonize with the machines. Take a look at the photographs on page 98 to see the effects of these devices on water.

The human nervous system is formed by a vastly diverse number of building blocks, making it possible for us to express a vast range of emotions, including even the level of love and gratitude. However, when our bodies begin to harmonize with the electromagnetic field emitted by computers, all sorts of things can happen. Most notably, we lose our ability to harmonize with other people around us. Perhaps you know someone who spends an unhealthy amount of time in chat rooms and mail messaging and have witnessed this phenomenon firsthand.

I venture to say that electromagnetic fields are like synthetic spirit. I believe that the spirit of these machines has the potential to attach to our own spirit and drain us of our energy and health. If you find yourself feeling less energetic than you used to be or than you would like to be, first consider the electromagnetic fields created by the electronic devices around you. Whenever the vibration within your body becomes weak, there will be an equivalent weakening of your health and your energy. If you want to increase your energy, look at what’s giving you energy—in other words, what you are resonating with. For the well-being of ourselves and the planet, it is critical that we seek to harmonize with other people rather than with the electronic devices that are so ubiquitous in our lives.

Achieving True Love

It is one thing to lack resonance with a co-worker or acquaintance, but falling out of resonance with your own life is

another matter entirely. Two people fall in love and form a relationship so close they think it will last forever, but then one or both partners change and sweetness turns to bitterness. In time the relationship ends. It can happen to the best of couples.

When one person changes and the other is unable to detect the change, disharmony is sure to follow. The way to prevent this from happening is simply to continually strive to understand the other person's feelings. Keeping your frequencies aligned depends on striving to see things from your partner's point of view—to change together. If you still find you are unable to resonate with your partner, try putting some space between yourselves. With the distance you need, you may discover who you really are and find how you want to live your life. And then eventually you might be able to return to the situation as before and live in harmony by maintaining your identity and the right amount of space.

To sustain any close relationship, to achieve true love, you need to understand the relationship between love and gratitude and to be willing to show more love and more gratitude.

Loving continually is the secret of happiness—in a relationship, in your career, in yourself. The reason I can say this is because my greatest happiness comes when I give love to someone and they respond with simple gratitude. Love is a feeling of caring and compassion toward the entirety of our world—everyone and everything. Love is sending out vibrations of caring and compassion. Love is the ability to sympathize and empathize with others in a way that makes them a little bit happier.

For some, love and gratitude doesn't get expressed easily. If this sounds like you, even starting out by faking it is all right. Simply saying the words "love and gratitude" more often or writing them in a place where you can see them is a positive step. You might try writing "love and gratitude" on your coffee mug; each time you look at it, you will feel that energy. Do anything you can do to expose yourself to the vibration of love and gratitude.

Once you give love and gratitude a chance to take hold in your own heart, you will be able to experience the joyousness of resonating love and gratitude with others.

CHAPTER FIVE

Water Crystals Can Bring Forth Your Potential

Photographs for Positive Change

We have already seen how resonance results in harmonious vibration and an increase in positive energy. I frequently have the opportunity to meet with people who say to me, “I want to change.” As you already understand from the various photographs of water crystals, positive words result in positive change, and we can also conclude that if we wish to make a positive change within ourselves, we will need to change the purity of the water within our bodies.

Perhaps you’ve seen card decks printed with positive messages. The idea is to pick a card from the deck each morning and then live your life in accordance with the card’s message that day. In this same way, I encourage you to look at one of the positive photographs in this book each morning or to use the *Water Crystal Oracle* that I have created (see www.beyondword.com).

In this chapter, we’ll look at each crystal and explore the meaning of words and how the meaning is reflected in the crystals. We’ll see how each crystal has its own distinct character and unique beauty.

The Amazing Power of Unconscious Words

What do you say to *yourself* each day when you look into the mirror? What words are stirring within your soul? How many of us say such things as “I’m so beautiful” or “I’m really charming”?

Take a look at the crystal at the top of page 47 and you’ll see the effect that words such as “beautiful” and “charming” can have. Perhaps you’re used to using these words when referring to others, but these are also words that you can say to *yourself*. Keep on talking like that and soon the water within you will change and you will become a truly beautiful person from the inside out.

Now consider the crystal at the bottom of page 47. This crystal appears isolated and ignored. In another experiment conducted with rice, we discovered that rice which was ignored spoiled more rapidly than rice which was exposed to words of scorn. From this, we can deduce that apathy about your body, face, or personality cannot help but have a negative effect. Apathy will spoil the water within us, and from the inside out, the cells will age and deteriorate at an accelerated rate. But if you wish to slow down this process, then become aware of your absolute beauty and appreciate and love every body part, from the top of your head to the tips of your toes.

Just as words have the power to generate energy, so does the casual gaze. When someone looks at you in a positive way, it can do wonders for the way you feel, while being ignored seems to suck the energy from you. In the same way, when you look at yourself in a positive way, you will feel positive energy fill your body, while ignoring yourself will have the opposite effect. If you can see the beauty within yourself, that’s the direction in which you’ll move. But if all you can see is what you think makes you unattractive, then that is what you’ll become more like.

The Power of Desire

As a child, I once made a hundred wishes. Upon those fulfilled dreams of a child, I have built the dreams that I now have as an adult. It is important to have big dreams and to desire with passion. By having big dreams, you will meet the people you need to meet, have the experiences you need to have, and your capacity will rise to the level of your dreams. The bigger your dream, the bigger your capacity will be.

I’m quite sure that everyone who has met with some degree of success in his or her life could tell you something similar to this. Expressions such as “I want this to happen” or “I want to do that” are born of the abilities that you already have. There isn’t anything you can honestly wish for that isn’t somehow possible.

Have the biggest dreams possible. Big dreamers live bold and full lives. They may get discouraged at times, but they soon succeed. Perhaps this is what the “hope” crystal on page 48 is telling us. One unique thing about this crystal is that it formed and grew at an incredibly fast speed, telling us that hope, even a little hope, will lead to more hope and more possibilities.

Wouldn't it be wonderful to live in such a way that your hopes and dreams continually expand and branch out? I encourage you to place the photograph of this crystal in a place where you can see it as you go about achieving the dreams within your heart.

The Meaning of Dreams

Water that was shown the word "dream" formed a crystal with a beautiful seven-sided shape (see page 35). To me, this seven-point crystal symbolizes a bridge to the fourth dimension, or the future. I believe that dreams possess an unusual dimensional aspect—namely, that they are between the third and fourth dimensions. In other words, they suggest the future but are not a full representation of the fourth dimension. For this reason, I say that they are part of a 3.5 dimensional world, and the seven-point water crystals formed by "dreams" are also part of this world. The world inhabited by the souls of the departed is also made up of 3.5 dimensions.

We always dream, but the dreams themselves are illusory and often fade into nothingness soon after we awaken. These imprecise, seven-sided water crystals formed by being exposed to "dreams" are part of an in-between world. If we look at phenomena from the world of 3.5 dimensions, these phenomena might also serve as a kind of blueprint for a new future.

Let me explain: In Japan it is believed that dreams transcend limitations of time and space. Through our dreams, we are able to receive communications from previous ages and from our own previous lives. Dreams, then, are a form of reference material that provide us with an almost godlike capacity to understand the future.

Lately in my dreams I see the world coming to an end. Because our dreams give us access to memories from previous generations, we have been given the appointed mission of not allowing the same bad things from the past to be repeated. These dreams give me the resolve to change the direction that civilization is headed.

On this point, through water, an appeal is being made for world peace. Through your dreams, you are able to guide yourself. If you have good dreams, those are the kinds of things that will come to pass. When you experience a bad dream, it should be your hope that the contents of that dream will not come to pass. If the terrible things that you dreamt about are actually coming true, then it is up to you to avoid those undesirable things as you go about your daily life. Because it is good that happy occurrences take place, you should set your life's compass to move in a positive direction.

What I am suggesting here is that dreams give us the opportunity and power to control what we do. We can use this power for positive change in the world. This is the belief system that currently guides my life.

Vocalizing Your Dreams for Stronger Effect

How often do you express positive words rather than just letting them float in and out of your consciousness? The water crystals show us the effect that the simple act of vocalizing good words can have.

When we compare water that has been exposed to words only and water exposed to music, the water exposed to music forms into a crystal much faster. Water exposed for only about thirty minutes to music will form crystals that reflect the music, but the formation of the crystal affected by a written word requires at least one day of exposure. It makes sense: music creates and relays considerably more vibration than that created by writing.

To understand the strength of vibration, think about the volume of a speaker. Music is like a speaker turned to high volume, relaying vibration in a direct way. When I previously suggested that you look at yourself in the mirror and compliment yourself, I suggested that you speak out loud instead of just thinking the thoughts, and that also is a direct way of relaying vibration. Perhaps you think that saying "I love you" or "I respect you" to yourself in the mirror just isn't something you could actually do, but I can promise you that people who are capable of changing themselves for the better are all capable of this simple task. When you become accustomed to this, you'll be able to make changes within yourself that, while not initially noticeable, will nonetheless be real through the water within your body.

Let's take another look at the "ugly" crystal on page 47, which effectively reveals what the word "ugly" can do to us. Considering that just thinking "ugly" has this effect, can you imagine the effect it can have on you when you vocalize it? Avoid casting judgment on yourself, other people, or other things by calling them "ugly."

Despair Is the Beginning of Hope

Life is full of mistakes and failure. We sometimes think that everything that can go wrong usually does—the person you love rejects you, the place where you wanted to work doesn't hire you. If you thought about ending your life every time you failed, life would be short indeed.

But let's look at the crystal formed by the word "despair" on page 48. The formation could hardly be called a crystal. This experiment resulted in one or two scrawny crystals, but that was all. What could this be telling us? I

think the message is that despair is the beginning of hope. Of course, you experience great sadness at times of despair, but it's also an opportunity to go back to and start again with a clean slate. It's the starting point of *new* hope.

Crystals teach us that by looking at despair in this way, we can soften the pain even a little.

Clasping Hands as a Source of Energy

When water was exposed to “clasping hands,” it formed one of the crystals shown on page 49. Think for a moment about why people clasp their hands. No matter what the culture or religion, people clasp their hands together when asking something of the creator or of other people.

A ritual of the ancient Japanese religion of Shinto is to face the sun at about 4:30 in the morning, lifting up your arms and bringing your hands together as if you were absorbing the light into your soul. It is a way of gathering energy. By bringing the hands together, a simple form of energy from resonance forms and expands and enters your body.

Consider the character that the Japanese use to write “sound”: 音. Pronounced *oto*, this character is actually formed of two simple characters, the top part meaning “to stand” and the bottom part meaning “sun.” So it would seem that the people of long ago understood well the relationship between the vibration of sound and the sun.

Of course, modern science has now shown us that light is waves—vibration, if you will—and the source of our energy. And so it's not hard to imagine why people of ancient times faced the sun in the morning and asked to be a vessel of its energy by clasping their hands together.

The Power of Adoration

Is there someone for whom you feel adoration? If there's not, then I would like to encourage you to find such a person. Just looking at someone you adore has a purifying effect. Being around that person raises your spirits and causes you to sit just a little bit straighter.

The crystal influenced by the word “adoration” on page 49 is indicative of the love and respect that a child feels toward his or her parents, or the love and respect shared by an elderly couple.

The crystal influenced by the word “eternal,” also on page 49, is formed around a distinctive hexagonal shape that appears as if it could go on forever. As I mentioned previously, if you consider that life is vibration, then it's not hard to understand how life can go on forever. The experience we know as death can define the extent of our physical life, but our vibration can go on resonating for eternity, regardless of what happens to flesh and bone.

The Power of Your Name

Write down your name and take a look at it—a really good look. Your name has the power for good or evil and the power to influence what road you choose in life. Now with a feeling of gratitude, take another look at your name, and you will then be able to feel something new—energy you've never felt before.

Not long ago in Japan, news was made by a father who tried to name his child “Devil.” Although some argued that parents have the right to give their children any name they choose, the city refused to accept the name, and instead of taking it to court, the father backed down. When we exposed water to the word “devil,” the result was the deformed crystal on page 83. By contrast, when water was exposed to the word “angel,” the result was a beautiful formation of tiny crystals in a circle.

Japanese names are usually written with characters that express a trait the parents would like to instill in their children. Here is one of my favorite names: 真理. Pronounced *Mari*, this name means “truth.” One of the crystals on page 83 was formed after being exposed to this name, and you can see the beautiful results.

The most common character in Japanese names is the character for “harmony”: 和. This character, which formed the crystal on page 83, seems to form a circle, so perhaps it's more than a coincidence that this character is closely related to the word for “circle.” Peace is often symbolized by a circle, and so this crystal with its complex formations seems to be telling us about the importance of peace in our troubled world.

Compliment Yourself for a Change

Compare the two crystals on page 85, which were formed after being exposed to “You're beautiful!” and “You're becoming beautiful.” I have already mentioned the importance of complimenting yourself, but instead of complimenting yourself every day with the same words, try to find a new compliment for each new day. The effect will be slightly different each day as you evolve into a new person. New cells are continually being formed within our bodies, and by changing the words you praise yourself with, you can have a surprising amount of influence over how you change. It may be easier than you think to reset your life and become the person you truly want to be.

Next look at the crystal formed by “unhappiness” on page 88. Everyone knows people who are always complaining about how miserable their life is, but this crystal seems to be telling us just how destructive this word can be. Telling people how unhappy you are can bring little good, so instead let people know when you’re happy.

Positive Words Come Back to You

Now let’s look at the crystals formed by “You did well,” “That’s no good,” “affection,” and “hate” on pages 86 and 87. As you can clearly see, the photographs of the crystals influenced by “That’s no good” and “hate” aren’t pleasant to look at. What this shows is that the positive and negative images of words are clearly reflected in water. I’d like to encourage you to use words with positive images as often as possible. Positive words have the power to give positive vibrations to the people around you, and those same positive vibrations will eventually return to the source. Something similar can be said for negative words: After having a negative influence on those around you, the negative vibrations return to you to create a vicious cycle of negative vibration.

When you look at the crystal formed by “rage and murder” on page 87, perhaps you can imagine a masked person in hiding suddenly attacking an unsuspecting person. Some of the worst crystal formations that I’ve seen are those formed by words having to do with abuse and violence. Perhaps what we can learn from this is that when you seek to do harm or damage to others, you are at the same time inflicting similar harm or damage upon yourself.

Now consider the “Let’s do it” and “Do it” crystals on page 89. While the “Let’s do it” crystal is strikingly beautiful, the “Do it” crystal is somewhat similar to the crystal created by “devil.” As I implied in an earlier chapter, the concept of “Do it” does not exist anywhere in nature. All we know about nature tells us that things happen naturally rather than being forced, and we would be doing ourselves a favor if we avoid using expressions such as “You have to” and “You’d better.” A more attractive alternative is to value the true nature and spontaneity of yourself and others.

Sharing Your Feelings and Yourself

Everyone will agree that the crystal formed by the word “soul” on page 90 is indeed beautiful. The Japanese word for “soul,” pronounced *tameshii*, is written in two parts, like this: 魂. The part on the left side looks like this: 魂. This side of the character means “to speak,” while the part on the right, taken alone, means “evil spirit.” While it is said that silence is golden, keeping your feelings bottled up inside is certainly not recommended. In fact, it may be wise to be wary of people who refuse to share their feelings with you. I have found time and time again in my research of water crystals that the combination of crystal photographs and Japanese characters gives surprising insight into the nature of words.

Making the Most of Positive Words

Consider the different crystals formed by the words “Thank you” and “I’m sorry” on page 92. The different formations are to be expected, considering that we use these two expressions in different circumstances. In the same respect, we choose the words we use depending on how we feel day by day and moment by moment.

As we go about our busy lives, how can we find the time to take advantage of the power of positive words? One possibility is to write or even tattoo good words on your body, but I, for one, have a hard time believing that tattoos are a positive thing. Instead of the body gaining power from the words written on it, I’m concerned that the body might actually become dependent on the power of such words. An old Japanese ghost story tells about a man who writes sutras all over his body to protect himself from devils. But he forgets to write sutras on his ears, so the devils bite them off, illustrating the fallible nature of writing on ourselves when we should be thinking about how we can incorporate these good words as part of our souls. Covering your body with the words *love* and *gratitude* is not nearly as effective as daily making the choice to go about your life with your heart filled with *love* and *gratitude*.

But instead of having only certain words as your constant mantra, I encourage you to consider, for each situation you face, what positive words would match. If you are experiencing something unpleasant, then you can think of a positive word or expression for that situation and focus that word or expression on the water within your body.

As we have seen, the expression “I’m sorry” creates quite a beautiful crystal. We can all think back to a situation where we should have used these words. If this is something you can relate to, I encourage you to look at the “I’m sorry” crystal, speak the offended person’s name, and say, “I’m sorry.”

The crystal on page 93 formed by the words “peace of mind” is stable and steady. It’s not hard to feel peaceful vibrations from this lovely crystal. When you feel troubled or ill at ease, such as when you have an important interview or face a new challenge, look at this photograph and let the peaceful vibration calm your soul.

The Soothing Vibration of Sutras

There are many ways to calm yourself; two popular ways are to keep a diary and to chant. That both of these activities relate to words is, I think, no coincidence. When we exposed two well-known Buddhist sutras to water, the result was the beautiful crystals on page 97. The sutras are known for a lovely chant-like vibration, and so this is the result we expected. It seems to me that the sutras form a conduit to the energy of the universe.

As you may know, there are seven chakras or “energy points” located along the body, from the top of the head and down through the spine, with each chakra having its own frequency. I believe that sutras, like the chakra at the top of the head, serve as portals for the energy of the universe. If you’ve ever heard the chanting of sutras, you’ll know how simple and minimal the sounds are. But perhaps that is what makes them so powerful.

Recently in Japan, stage performances of sutra chants have been quietly gaining popularity. At one such performance by sixty monks, I placed some samples of water on the stage, resulting in the crystal formations on page 97. The soothing effects of these chants are evident in the pure, delicate crystals.

Loving Others Begins with Loving Yourself

The series of “love” photographs on pages 94 to 96 were very telling about the nature of love. In the “self-love” crystal, you can almost see hands clasped together as if in prayer in all four directions, forming what appears to be a high-energy crystal. This indicates just how important it is to love yourself for who you are. The concept of self-love is not easy to grasp, but think about it in terms of vibration and resonance: without your own positive vibration, you will be unable to help others vibrate. Simply put, it’s impossible to love another unless you can first love yourself.

Let me give you an example of what I mean. Let’s say that there’s a 440-hertz tuning fork. If it’s just standing there, there’s not enough vibration to be audible by the human ear. But if you sing “Ah!” at this level the tuning fork will begin to vibrate. By sharing your vibration, you have restored the tuning fork—you have brought it back to life through an act of sharing. In this case, we might even say that the act of singing “Ah!” is a loving act.

Each one of us has an important responsibility to give love in the way that only a human can. Of course everything emits vibration, but not the continuous and conscious vibration that humans can. And we have another quality that makes us special: as human beings, we are capable of resonating with everything else in our world. We can resonate with all the sounds in the octave as well as with higher and even lower octaves. Perhaps you can’t quite sing the *la* sound of a high octave, but you can resonate with that *la* using one from a lower octave. And this is why we are capable of resonating with and giving energy to anything and everything that is.

Neither the tree nor the flower is capable of independent vibration, but by speaking to a plant, you can breathe vibration and energy into its fibers. If you doubt this, just ask anyone who loves spending time with their plants. They’ll tell you that they don’t just take care of their plants, they speak to them. Understanding the principles of vibration and resonance may help give understanding to the unexplainable.

Capable of making all vibrations, the human being has a special place with the creator and has special powers to affect the world we live in. We have the power of thought and the power of free will, and thus the power to make whatever sound we desire, and in this we have the power to be a force for change.

But to give energy to the world around us, we must first have energy within us. You can’t give someone something that you don’t already have. So to have love in your life, begin by respecting, appreciating, and caring for yourself. When you feel secure in your self-love, then and only then will you be ready to share your love and your life with someone else. All successful unions begin with the love of your *self*—not with your love of someone else.

The Power to Make Others Happy

Now take a look at the “spousal love” crystal on page 94. The crystal appears to have two layers, with the smaller one encompassed by the larger one. This perhaps indicates that the secret of a good relationship is that the two are not the same: symbiosis does not require that one be dominant and the other subservient. The ability to reverse roles as needed is an indication of a healthy relationship, one upon which the love of family can be created.

The “family love” crystal on page 95 shows a group of three formations, perhaps indicative of grandparents, parents, and children living together in harmony. It’s rather uncommon nowadays to find three generations living under one roof, but even if families live apart, they can still be of one heart. Grandma and grandpa don’t need to be forgotten. If you take your children to see their grandparents, then your own children will probably do the same when you become the grandparent. The message from the crystal is that the family unit in its fullness—in the past, present, and future—is the combination of three.

When you have love for your family, then it is possible to love your neighbor. The “neighborly love” crystal on page 95 creates a beautiful image of harmony. And after you have become capable of love for your neighbor, you can next love your country.

The “love of country” crystal on page 96 looks as if it’s sitting on a larger crystal in the background, indicating

how our identity is closely related to the country of our origin. You can't help but feel sorry for the millions who have been forced by the dishevelment of these troubled times to give up their homeland. Perhaps the little crown off to the side on this crystal indicates that governance is required for countries to go on existing.

And then, after love of country, you are capable of love for humanity. The "love for humanity" crystal on page 96 seems to be an especially well-balanced and beautiful crystal. This is an important crystal because this type of love will help us solve the problems of war, famine, and worldwide disease.

These six crystals of love are all built on the love of self. If you'd like to have a part in spreading love to the world, then you must first love yourself deeply and completely. Some people might think that they already focus too much on their own needs, but that's actually a good starting point. You will soon realize that having self-love is not being self-centered. Self-love is the energy required for loving another person, your family, your neighbor, your country, and all your fellow human beings.

Moving toward Peace

As I mentioned previously, water that was shown the characters for "peace" formed crystals in a shape that looked like the joined crystals formed when water was shown the words "love and gratitude" (see page 35). I feel this means that when "love" harmonizes with "gratitude," you get "peace."

If thoughts of peace are not coming into your heart, you should recall love and gratitude, especially the latter. Being thankful brings you love; being thankful even helps create love within your being. When you heap love on top of thanks, your soul will be at peace.

Peace must be created first by individuals. In this way, peace will spread to your family. This sense of peace, in turn, evolves into love that permeates a region, an entire nation, and finally the entire world. It is you, yourself, who becomes peace. In order to accomplish this you need to pile thanks on top of love.

I believe that our planet is sick. When people take ill, the weakest parts of their body develop symptoms of illness. People who experience weakness in their throat often eventually develop a disease in their throat. The same holds true for other organs of the body. People with weak lungs are prone to developing a lung disease just as people with a weak stomach are more likely to develop a stomach condition.

Our planet works in much the same way. Earth is like a diseased patient who is sorely in need of medical assistance. For example, look at Afghanistan, Iraq, Israel, the Indian Ocean, Pakistan, Thailand, and Mexico's Yucatan Peninsula. In all of these places, disastrous conditions in the form of wars, earthquakes, tidal waves, and hurricanes are occurring. It is as if the planet's immune system is weak and losing cellular matter as a result.

Why are these things happening? One by one, the earth's harmony is being seriously tampered with. Only through the phenomenon of resonance are the vibrations of energy's essence able to give us beautiful, peaceful energy.

At this time, "harmony" and "peace" are missing in our world. As long as we continue destroying "harmony," the planet is going to experience more and more natural disasters and war. As for us residents of this planet, make no mistake that the conditions of life are going to become tougher and tougher unless we do something to reverse the course.

I am Japanese and must never forget the ancient spirit of my native land, originally called Yamato before it became known as Japan. The Japanese word for "harmony," 和 (pronounced "wa"), makes up half of the Japanese word for "peace," 平和 (pronounced "heiwa"). This character 和 ("harmony") is also seen regularly as part of the ancient word for Japan, 大和 "great harmony" (usually pronounced "Yamato"). In daily Japanese, "harmony" 和 is widely used to represent "Japan" or "Japanese" (food, language, style, architecture and the like). In all these ways, the symbol for "harmony," 和, permeates Japanese life. I feel that it is my task to dispatch this message to the world: "Get back in harmony." The starting point for this endeavor is to create harmony. Bring harmony back to your marriage, bring harmony to your family, and bring harmony to the people in your neighborhood. With this kind of thinking, we can create the foundation for a world that is more and more harmonious.

It is difficult to create world peace by yourself. And yet, by creating harmony within the lives of individuals a broader, more profound harmony will develop, step by step, in our world. When this kind of thinking comes naturally to you, you will be able to make a large contribution to peace.

CHAPTER SIX

Living with Clean Water: Finding Peace and Comfort

Energy Giving Energy

Living life to its fullest requires a considerable degree of positive energy, and to harbor this positive energy within yourself requires resonance. The resonance that I refer to comes from aligning yourself with the resonance of love and gratitude while also emitting vibrations of love and gratitude.

That is easily said, but how do we actually make it a part of who we are and what we do? In this chapter, we'll look at some of the specific ways that you can live life within this positive energy without being distracted by the negative stress that so easily besets us.

I have already mentioned that to vibrate in a positive way requires that you resonate with someone else's positive vibrations. Resonance is what we use to share our energy with each other. In the same way, when we align our words and thoughts to the grand principles of nature and the will of the creator, we can experience positive vibration and happiness. This energy makes us feel alive and full of energy. But when we are out of alignment with this energy, we soon feel stressed and depressed. Of course, the foundation for the grand principles of the universe and the will of the creator is nothing less than love and gratitude.

By giving vibration—energy—to those around us, we give them love. This, the intentional sharing of the energy of love is something that all human beings are uniquely capable of. Positive words have the power to give energy to the receiver while also having the same effect on the giver.

When a person is loved, the natural result is gratitude, and when gratitude and love exist together in the same sphere, the natural result is resonance. When a sick child is nursed back to health by the love of his or her parents, feelings of gratitude result. And then when the roles are reversed, the child, out of gratitude, cares for the parents with love, as the loving giver becomes the grateful receiver.

The Difference between Negative and Positive People

We are all capable of emitting beautiful healing vibrations. These are the vibrations that loving mothers and fathers send to their children.

As I have mentioned before, water, as the ultimate transmitter, is capable of capturing and relaying anything and everything. So if there's something that's not right about the water within your body, you will be unable to receive the positive vibrations that surround you. If the container of water is deformed, the vibration will also be deformed.

A negative person hears positive words as negative. Perhaps you know someone like that. We can easily surmise that the very structure of the water of such a deformed thinker is also deformed. Such people are incapable of enjoying what is right and good about the world, and they have an enormous capacity for creating a dark cloud on the most positive of happenings, serving as an illustration of the importance of good water.

When people have caved in to the stresses of society and daily life, their vibration becomes distorted, and even the kindest of words will have little or no effect on them. When you've reached that point, it becomes difficult to improve the water within yourself on your own. But if you open your eyes, you'll realize that there are people all around you who are able and willing to share their positive energy with you. If you are able to share your love, then I hope you will be willing to do so. Love is one thing you never have to worry about running out of.

When you have made it a habit to extend a loving hand to those around you, whenever you find yourself down and discouraged, loving hands will raise you up.

The Same Wavelength

Think about when you last picked up a little baby. Did you find yourself speaking in a soft, gentle voice? No matter what language you speak or what culture you're from, we all speak to babies in the same way. The reason, simply put, is because we are aligning ourselves with the vibrations of the baby. We all subconsciously understand that a baby's vibration is short, resulting in the soft sounds that all babies make, and when we align ourselves with this

vibration, we make similar sounds.

Perhaps you have also realized that your voice and manner of speaking change depending on whom you talk to. When I talk to someone, I intentionally try to speak in a way that will put me in harmony with that person. But even the vibrations of any one person will change depending on the mood of the moment, as revealed by the speed and pitch of the voice.

I suspect that you have experienced times when your vibration has been in harmony with someone else's. You might have come away from such an experience saying, "We just seemed to resonate." This is something that we do at an instinctive level, so unless you think about it, you might not even be aware that it's happening.

When you align your voice with the vibration of the other person, you can choose what note on the scale you are going to use. If you wish to comfort a friend suffering from a broken heart, are you going to choose *do-mi-so* or *do-fa-la*? You might say, "Heartbreak opens the doors for something new," or maybe, "Better things await you." But whatever you say, you'll speak it in gentle, loving tones.

When you talk to a person in distress, they may vibrate in all the possible notes on the musical scale, but you can use kind and loving words to create the opposing notes to offset the negativity. Perhaps the highest compliment you can pay to someone is to say that they have the ability to see things from another's position. Such people are capable of listening, showing they understand, and then saying the words that make the other person realize that it's not the end of the world. That's what resonating with another means.

If you know someone who seems cold and uncaring, consider that they may just be poor at putting themselves in the position of others and aligning themselves with others' vibrations. You may have sought comfort from such a person only to come away feeling worse than ever. It's simply impossible to comfort others if you can't feel their feelings and align yourself with their vibration.

A Beauty Treatment That Requires Neither Time nor Money

To feel something that stirs your emotions each day is the way to find the energy for a full and rewarding life.

Emotion is motion, which makes it no coincidence that the phenomenon of resonance is the combination of emotion and movement. By resonating with someone, we experience powerful vibration—powerful energy, if you will. And the deeper the emotion, the more clear and pure are the vibrations that we experience.

I often give lectures, and when those lectures go well, I know that there was resonance between myself and the audience, that I have in some way stirred their emotions. I've stirred emotions when what I have said has entered the listener's mind as energy and memory. It happens when the way I see the world becomes the way another person sees the world.

The level of enjoyment, vitality, and meaning of each day is directly related to the degree that we allow our emotions to be stirred by what goes on around us.

Shizue Kato, a well-known women's rights activist, was asked by a newspaper reporter on her hundredth birthday what her secret to longevity was. "Get excited about something at least ten times a day," she replied. "It's exciting to wake up in the morning and realize you're still alive and breathing. It's exciting to have something really delicious for breakfast. It's exciting to see a beautiful morning glory blooming outside. You can get emotional about the charity of the warm sunshine and the blessings of the falling rain. If you just take the time to look around and see even the most insignificant of things, you'll realize that the world is full of things to get emotional about." These are words to live by, indeed.

For Better-Tasting Water

We want to purify the water within our bodies, but we also want to make the water that we drink as pure as possible. Here's an easy way to do that: before you take a drink of water, pause a moment and look at it. With warm, benevolent feelings, say "Thank you" to the water, and then drink it. I do this throughout the day, whenever I take a drink of water, and it makes a noticeable difference.

As I've mentioned previously, vocalizing words strengthens the vibration, so saying "Thank you" to water before drinking it results in a change in water's taste. The moment you say "Thank you," the positive vibration needed for beautiful crystals begins. The vibration spreads to the water in the atmosphere, forming an expanding ring of vibration that your body feels. Water is water, whether it's in a cup, in the atmosphere, or in your body; they are fundamentally linked. The water outside of you resonates with the water within you.

Daily Fulfillment through Water

Ask yourself how conscious you are of water as you go about your daily life. If you're like most people, you probably don't consider it much. I'd like to give you a few suggestions for making water a conscious part of your

life.

First, when you wake up in the morning, take a cup that is labeled with the words “Love and gratitude” and fill it with water. Then, with reverence in your heart, drink the water. After drinking the water, face the sun. The sun is a source of special energy. Just as the ancients of Japan did in the earliest days of Shinto spiritualism, place your hands together and face the sun so as to take in its energy. I also recommend placing your hands together in gratitude before you eat.

Morning is a hectic time for most of us, but I encourage you to make your mornings more relaxing and leisurely. Take time to enjoy the flowers along the way. A Japanese saying goes that if one of the tea leaves in your morning tea stands upright in your cup, you’ll have good luck that day. But maybe the luck will come to the one who takes the time to consider the leaves in the teacup. If you think having a hectic morning is a natural way to start the day, try getting up thirty minutes earlier—not to do more but to do less.

To make your morning more relaxing, think of nature right when you wake up. Greet your pet if you have one or water a plant and say something to it. (“I love you” is always a good choice of words.) When you make a habit of this, the plant will grow to be strong and healthy. But often when we become ill and are unable to give a plant positive energy, the plant will dry up and die—that’s how important the phenomenon of resonance is. Learning to slow down and take your time in the morning will reveal to you the strength of this power.

Now for your evening routine: taking a long, hot bath can be a good way to relax your body and mind after a stressful day. Close your eyes and feel the vibration of water all over your body. Fill your soul with appreciation for the water. The ideal temperature for bathwater is around 104 to 107 degrees Fahrenheit. Heat is a result of vibration, and so covering your body in water of this temperature can be extremely comforting, helping you to expel fatigue and negative vibrations.

Hot springs throughout the world are desired for their ability to aid in relaxation, and one of the things that make them so enjoyable is the vibrational effect of the water. The vibration enters your body and pushes out the negative vibration, resulting in the formation of a healthy and vibrant metabolism.

There’s so much that water does for us: it warms our bodies, replenishes the dry parched throat, and carries away our waste without ever a complaint. When you think about all the things that water does for us, how can you not help but be filled with gratitude?

It shouldn’t be a stretch of the imagination to understand why taking a nice, warm bath can feel akin to what a baby feels like when cradled in its mother’s arms. If you begin to see the water in your bathtub as amniotic fluid, it can make the experience all the more relaxing.

At home in your own bath, you might try various bath salts. And if there’s a baby in the house, I recommend writing the words “love and gratitude” on the baby’s toy. After your bath and before you go to bed, take a drink of love and gratitude in the form of water. Then place your hands together in thanks for your pets, your plants, and your loved ones.

Perhaps you have your own routine for relaxing at night, but I like to listen to relaxing music as I drift off to sleep. This, I believe, helps the water within me return to its pristine, beautiful origin as the stress of the day leaves my body. Near your bed, have access to different types of music—classical, jazz, anything—to help you relax from the particular stresses of the day.

Avoiding Stress-Induced Illnesses

Too much stress leads to illness, which is why you should aim to make every morning and evening relaxing. Stress arises when the vibration that you should be experiencing becomes deformed. Deformed vibration builds up, and the result is ultimately and inevitably illness.

A great variety of vibrations exist within our bodies, and the stresses of daily life often change them slowly and gradually. When the change first begins at the subatomic level, there are no outward signs, but as the change reaches the molecular and cellular levels, symptoms begin to appear. If the stress continues, then the change in vibration will move from the cells to the organs, health will deteriorate, and death will loom. The messenger that carries this deterioration is, of course, water.

As mentioned, vibration is maintained by the phenomenon of resonance. There is nothing stronger or purer than the resonance of two positive vibrations. You can stay healthy and happy by freeing yourself from stress and finding pure resonance created by pure vibration. You can do this by taking time for any activity that helps you forget your troubles and experience moments of quiet peace. Finding moments of peace helps you put your life back together, consciously purify the water within you, and begin to live the life you want to live.

Use the energy you get when talking to a friend to neutralize negative vibrations, or enjoy a massage or some other relaxation technique to calm yourself and get back on your feet. Taking a bus or train ride can help you relax,

too. Let the rumbling of the journey rock and lull you—it might be just the vibration you’ve been looking for. You might want to do some experimenting to find a type of music that helps you relax. Water will hear the music and be purified by its positive effects.

The Nature of Electromagnetic Fields

I mentioned in a previous chapter the danger of too much exposure to electromagnetic fields. (See page 98 for photographs of water exposed to various electromagnetic fields.) While we do not need to throw away our cell phones and become obsessed with avoiding electromagnetic fields, it’s important that we keep our words and thoughts centered around love and gratitude.

We can’t live without cell phones, microwave ovens, televisions, and computers; living with electromagnetic fields just seems to come with the territory. Almost every little thing we do in this modern world seems to require the generation of electromagnetic fields. Understanding their nature will help you get electromagnetic fields to work for you. And that involves making love and gratitude a part of everything you think and do.

It’s not essential that you unplug the television, but you can choose to watch only good and wholesome programs. Your computer is fine where it’s at, just as long as you use it as a positive tool. Go ahead and use your cell phone, but don’t use it to carry on negative or angry conversations.

How about your microwave oven? This device uses microwaves to vibrate the atoms of the food at a rapid enough rate to cause the food to heat up, and to assume that this has an effect on your nervous system requires no great leap of logic. Microwaves are of course designed so as to have only a minimal effect on us, but the water within the heated food has recorded the effect of the microwaves, and you can’t help but wonder if it is the best thing to consume.

If you would rather not get rid of your microwave, then I suggest that you use your microwave with love and gratitude. The best thing you can do is to say “I love you” to the food as it heats up; another, less proactive, measure is to simply place “love and gratitude” stickers on the microwave containers.

Likewise, we need to be conscious of the way we use the Internet. You may be surprised to learn that the words you write in e-mails and text messages have a stronger effect on your body than the words you use in conversations and letters. This is because the vibration of the human nervous system is actually on the same level as the vibration of electronic communication systems such as e-mail and chatrooms. When you write something by hand or print something, the vibration is not fine enough to resonate with your nervous system, limiting the effect that the vibration can have on you. But writing involving electronic fields harmonizes perfectly with the vibration of your nervous system, resulting in the formation of resonance and making it possible for an e-mail or text message to have an enormous effect on your brain and body.

Words carried on electronic waves have the power to go right to the core of the receiver, having a devastating and lasting effect. By contrast, sending warm words of praise can have a positive effect on the well-being of the receiver. If you have something negative to say about someone, e-mail is not the place to do it. Companies are used to getting complaints from clients through e-mail, and many people have received a rebuke from a superior in the form of a text message, but if you wish to limit the harm caused by your negative vibrations, then reserving these kinds of messages for face-to-face meetings is always a good idea. If you feel it’s easier to express your true feelings through e-communication, then try to express yourself with positive and encouraging messages.

Voice communication via cell phone also deserves attention. Unlike the old telephones connected by cable, cell phones use electronic fields, and thus they, too, are a matter of concern. Positive conversations on your cell phone are one thing, but when the discussion turns dark, the danger can range from anything from a harmed relationship to serious physical damage.

Normal words spoken face-to-face with no particular harmful effect can become a damaging weapon through a cell phone. The potential damage of harsh and hateful words communicated by cell phone should be enough to make us all careful about the words we use when we talk on these devices. It is but one more reason to try to keep your thoughts and words positive at all times.

Freedom from Negative Emotions

When you think about negative emotions in light of what we know about vibration, it isn’t hard to realize how and why irritation, frustration, and envy can be detrimental to your health. Anger and excitement raise the rate of vibration in your body and lead to an abnormal physical condition. Anger, for example, can be especially hard on your liver. In Eastern medicine, the close relationship between the emotion of anger and the liver has been accepted as common knowledge for centuries; it is well known that anger will destroy the cells of the liver, explaining why people suffering from cirrhosis and hepatitis tend to have hot tempers.

Sadness can be harmful to the cells of the hippocampus in the brain, increasing the risk of Alzheimer's. Sadness can also affect the blood and lead to leukemia and other blood-related illnesses. Envy can damage the thyroid gland.

Why an emotion can have an effect on a particular organ of the body can be explained by the differing wavelengths caused by each emotion. Day in and day out, our emotions vibrate the atoms and molecules within our bodies. It may be hard to avoid all negative emotions, but with love and gratitude you do have the ability to neutralize all the negative emotions you may experience. When you feel the onset of a negative emotion, then in your mind, just imagine the opposite emotion.

If, for example, you feel pangs of resentment and you don't want that emotion to harm your health, take refuge in the emotion of gratitude, the opposite of resentment. Gratitude can neutralize resentment because they are both on the same wavelength—on the negative side is resentment, and on the positive side is gratitude. But if someone has resentment for you, then responding to that person with gratitude requires the fiber and fortitude that most of us don't have. When in the heat of such a situation, I suggest that you form an image of someone for whom you do feel gratitude. When you get a call from someone who can make your blood boil, think of the pleasant face of someone you know, and soon you'll free yourself from the negative feelings and be able to fill your heart with gratitude.

Keep the recommendations of this chapter in mind and you will be well on your way to making water a conscious part of every day.

CHAPTER SEVEN

Love and Gratitude and Saving the World

Free Energy: One Measure of Love and Two Measures of Gratitude

Let me explain how we can improve the water outside our bodies through the power of crystals of love and gratitude. As I mentioned previously, the act of improving the water within our bodies is at the same time the act of improving the water that covers our planet. So once you love and appreciate the water inside yourself, you can help improve the water of the world.

When we consider water atoms, then we can easily see the role that water plays on our planet. Water has two hydrogen atoms and one oxygen atom, in other words, H₂O. Whenever I consider this chemical formula for water, I cannot help but think of the relationship between love and gratitude, with love being oxygen and gratitude being hydrogen.

There can be no flame without oxygen, and without flame there can be no heat. And without oxygen, life would come to a quick end. So without love, or oxygen, the continuation of life would not be possible. When on the receiving end of love, an extra dose of gratitude is always appropriate. In response to one part love, two parts gratitude forms the balance of life.

When it comes to energy, the structure of one part love and two parts gratitude creates a type of *free energy*. Let me explain: Let's say that I try to tell something to someone. If the other person resonates or gains an understanding of what I'm trying to say, then his or her heart will be stirred and the person will begin to vibrate. And when that happens, they will be open to receiving love at a deep level. The vibration from that person will spread to others, as the receiver of the vibration of love becomes the giver of the vibration of love. Another way of saying this is that one part love becomes two parts of vibration, and this is the basic concept of vibration.

But that is not the end of free energy. Free energy spreads out and the vibration goes on and on. I recently had an interesting experience that illustrates this. On February 6, 2005, I started a lecture tour that would take me from Santa Monica, California, to Hawaii. Two days before the first seminar, only about half of the tickets had been sold, but on the day of the seminar, the tickets started to sell. We soon realized that many more people wanted to come than what we had planned on. What caused this? It was the energy of a few individuals widening and spreading to others. The result was a sold-out event, with many in the audience experiencing love and gratitude when it had been initiated by just a handful.

Water as a Divine Messenger

As we already know, water responds with beautiful crystals when we expose it to positive words, and the opposite is true as well, but let's take a closer look at the mechanism from a different perspective.

To understand the complex nature of the existence of our universe and our own existence in that universe, we need a model in order to make any progress. My model consists of four parts: the creator (vibration), water (messenger), crystals (blueprint), and phenomena (matter and physical bodies).

Water crystals can be described as little blueprints for the design of our world. We can also make the assumption that when the creator set about to create this universe, the first project was the creation of water—the messenger, if you will, needed to deliver the architect's intention. The next question is, what is intention? I like to think that it is love and gratitude. I believe that before the universe was created, there was first a concept, a prelude to conception that could be described as the concept of love and gratitude. And perhaps this is why these two words create crystals more beautiful than any others.

Now let's look at the role water plays in the delivery of this intention. The ancient Greek philosopher Thales said that water is the basic building block of all matter. It's hard to disagree with this, but I'd like to express this concept in a slightly different way, while risking the possibility that some might find my description a little too religious for their tastes.

Of all of the creator's creations, water is unique. It is a type of conductor that can link the various dimensions of

creation. Extending this metaphor, we can say that half of the body is in this third-dimensional world, and half is in a higher-level dimension.

The creator, also being in a higher dimension, is a being of matter and light that vibrates at an inconceivably fast rate. And when you think about it in that way, it shouldn't be hard to consider this divine being as the Sun or the Light of our world who created this world in order for us to have a place where we would be able to grow and develop to prepare for a higher dimension.

The creator saw that a physical body would facilitate the process of growth and development, and so water, entrusted with divine intention, was sent down, and it materialized into the first crystal. And then another crystal was formed, and then another, until intention formed life in all the diversity we know today. So Thales did get it right when he said that all comes from water, but perhaps I like to say that water is the messenger of the intention from the source of all existence. Understanding this helps you see how words can affect the formation of water.

When we show a word to the water—the divine messenger—if the word is a word of the divine, then the water will respond with a “yes,” or beautiful, crystal, and if it is not, the response is a “no,” or deformed, crystal.

However, in the last few decades, we have been facing a serious problem that threatens the underpinnings of the model I have described. The speed at which technology has developed in recent years has had results that are negative and against the natural and divine laws given to us. Harmful and destructive words, the harmonizing with electronic devices, and our disassociation with nature all threaten to disrupt the balance needed to maintain our planet and our existence on it. The corruption of words has become the corruption of country, the corruption of our planet, and perhaps worst of all, the corruption of our souls.

Stemming the Tide of Negativity

If love and gratitude retreat from the world, they will be replaced by negative vibration. In this age, the weakening of love and gratitude in one part of the world can become the cause for wars and disasters on the other side of the planet.

The decline of love and gratitude takes place in war zones like the Middle East, but it reaches beyond the battlefield and makes the I'm-the-only-one-who-matters belief the norm of our age. The decay within the soul seeps out to disrupt the world in ways we can hardly imagine or understand. And water, the mirror of the soul, the messenger of the creator, feels this and knows all, and this includes the imbalance that prevails all around us.

Water forms the world we live in and the universe the world exists in, creating a cosmic soup, if you will. Air, atmosphere, and light are all water in one form or another, but water all the same. Starting from the outer core of our planet to the very center, each layer contains water in either large or small amounts, and that, pretty much alone, is what accounts for their differences.

Since water permeates our entire planet and everything on it, the water of the world cannot help but reflect the decline that takes place within a human soul, as revealed by the formation of beautiful crystals and not-so-beautiful crystals.

The people who lived on earth for millions of years in a balanced relationship with water now worship power, profit, and self-interest. And none of this goes on without being noticed by water. The natural disasters in the world may actually be a little less natural and a little more man-made than we care to think. I realize that convincing a geologist of the relationship between what goes on in your heart and what goes on under the ground is no easy task, but that doesn't stop me from believing that the natural disasters of our age may be nothing more than the buildup of pressure within your heart rather than between continental plates.

Human Consciousness and Disasters

You don't have to go back far in history to find a time when the human population on the planet was much smaller than it is now. On the first day of the Christian era (1 A.D.), the population is estimated to have been about 200 million people, and the figure rose gradually and steadily until 1900, when it reached 1.5 billion. And then from 1900 to 2000, the population exploded, reaching and exceeding 6 billion.

When people were still rare on the planet, the effect of the consciousness of a single person on the water of the earth was probably insignificant, but as the population expanded, perhaps starting from around 1850 when the population exceeded a billion, the negative and evil consciousness of humankind began to be reflected in natural disasters around the planet. Now, with the population exceeding 6.5 billion, perhaps we should not be so surprised by all the fighting and wars going on around us. If 6.5 billion people continue to think the way they do now, we'll be lucky if the planet lasts another twenty years.

The risks our planet faces are not only of the sudden kind. The environment of our planet is moving closer to a planet-wide crisis that is fast approaching the point of no return.

Heat is vibration. You probably already know that heat results when atoms vibrate, and that explains how a microwave oven is able to create a sudden burst of heat. What will happen as the temperature of the planet increases at the current rate? After the temperature rises an average of 2 degrees centigrade, life will still be sustainable, but if it goes up two more degrees, then the earth will no longer be able to provide the environment and food necessary to sustain human life.

It's said that the planet's temperature has already risen 2 degrees in the last hundred years, causing massive melting at the North and South Poles, and it's now expected that the temperature will rise three degrees in the coming one hundred years.

Think about your own body temperature, especially how you feel when you have a fever. There's not an exact parallel between the planet and the human body, but if the planet's temperature does rise as expected, then we will all be living on a very sick planet indeed.

Ourselves and our planet both require stable vibration in order to survive. The vibration that compensates for a loss of love and gratitude can come in the form of a pistol, a bomb, or perhaps terrorism—all negative and abnormal vibration used to rule the world. The war in the Middle East and all the other wars going on around the planet are excessive vibration, leading to the acceleration of the burning up of our planet. It is also the mechanism for the disruption of the water that covers our planet, leading to earthquakes, tsunamis, floods, typhoons, hurricanes, and droughts.

The Process of Self-Realization

Despite the negative outlook we're faced with, all hope is not yet lost. There are things we can do even now. We just have to follow the example of the natural world.

In the microscopic world, 10 percent of the microbes are generally considered bad, and 10 percent are considered good. The remaining 80 percent are neutral. This might have parallels in our own world. The battle for the survival of our planet is between the 10 percent working to destroy it and the 10 percent working to save it. When the 10 percent making up the good population win, then the neutral 80 percent will join them, and so that's why there is still hope. It is this 10 percent of the population that I hope to reach with my message of love and gratitude.

And here's why I think we can win: When the same number of good and bad microbes come together, the good microbes win.

This perspective is also supported by an experiment with water crystals.

When we put two labels—one saying "Thank you" and one saying "You fool!"—on water samples, the result was always the beautiful gratitude crystals. So if ten out of every one hundred people in the world open their eyes to love and gratitude, the planet can be saved.

The earth is the way it is because that is the way the creator made it. It and all the living creatures on it are designed with the ability to return to the point where all is well and right. Every life has a degree of pain and suffering, but there is nothing that is too negative to teach us something.

No matter who you are, there'll never be a shortage of people who come along to ruin your perfect day. That can either bring you down, or it can provide you with an opportunity to learn from responding with love and gratitude. And after you've learned all you need to learn, then you will be ready to graduate from this school of tribulation. And that is what life on earth is.

At three separate times, three different people with spiritual powers have told me that I've been reborn 700 times on this planet. This is nothing to brag about when you consider that it might mean I've failed to graduate 700 times. I'm now attempting to live my life to its fullest so I don't have to wait another lifetime to go to the next level beyond. I try my best to keep love and gratitude in my heart and to share positive vibration with those around me. I hope that you have been inspired by this book and will join me.

EPILOGUE

Water and the Expanding Circle of Peace

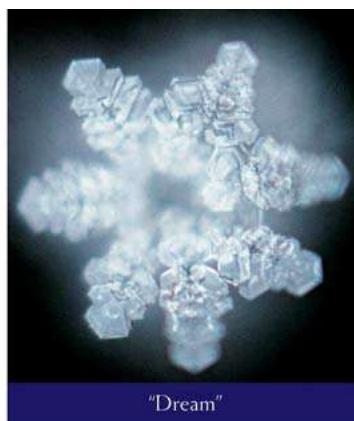
On May 26, 2005, I gave a lecture on the energy of love and gratitude at the United Nations in New York City. The lecture was part of a twelve-part seminar based on themes related to spiritualism, the first of its kind ever for the United Nations.

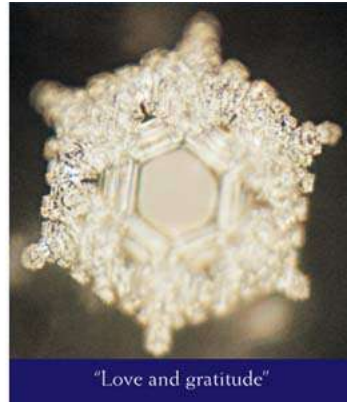
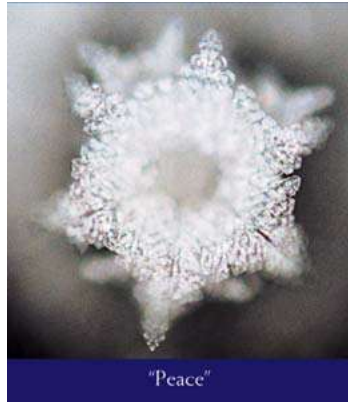
This opportunity came to me by way of Ida Urso of Italy, who chaired the Spiritual Dimensions of Science and Consciousness Subcommittee of the NGO Committee on Spirituality, Values and Global Concerns. Ida had read and resonated with my book *The Hidden Messages in Water*. When she asked me to give a lecture, she said, and I'm paraphrasing, "The way the United Nations and the NGO see the world plays an important role in achieving the UN goals, but there will be very few people in the audience who realize that. As long as we are attached to outdated paradigms, we will never be able to find new solutions. To achieve our goals and to move humankind from a culture of war to a culture of peace, we need to promote the importance of spirituality—the importance of love and kindness. We would like Dr. Emoto to speak on the energy of compassion formed by one part of love and two parts of gratitude."

Of course I accepted her invitation and was able to make considerable progress in showing some of the most important people and greatest thinkers in the world how to create free energy combining one part love and two parts gratitude. The experience reminded me that without a fundamental change in our paradigm, we will never overcome the many serious challenges that we face in our day. It also convinced me that this combination of love and gratitude, a product of twenty years of research and experience into water and vibration, could be used as the yardstick for the creation of a new paradigm and new values throughout the world.

Had it not been for the publication of my books, I would have not been nearly as far down the road on my journey as I am now. The books led to a lecturing tour starting in March 2000 that has made it possible for me to reach even more people around the globe. In this book, I have tried to include the information that people have resonated with the most in lectures given in over three hundred cities over the last six years. I hope it will serve as a kind of primer to help more and more people understand the function and importance of vibration.

I encourage you to frequently revisit the crystal photographs and reread just a section a day. Imagine beautiful words and recall the beautiful crystals created by these words. That's enough. Just love and gratitude. And if you never forget this as you go about your daily life, your life will be one of happiness and joy.





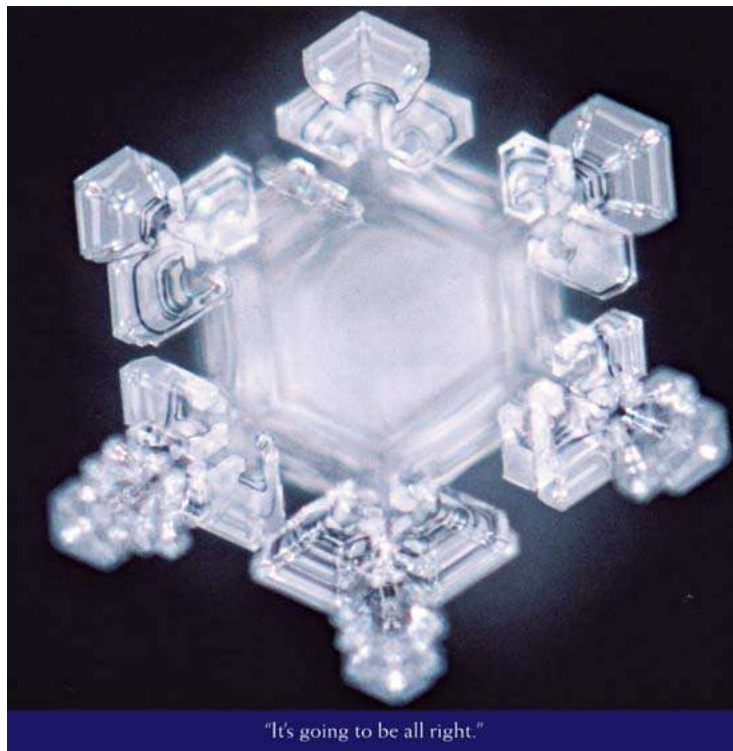
These photographs were taken from water frozen after being placed in four different glass containers with the words taped to the sides. It's easy to see how such positive words would yield these beautiful crystals.



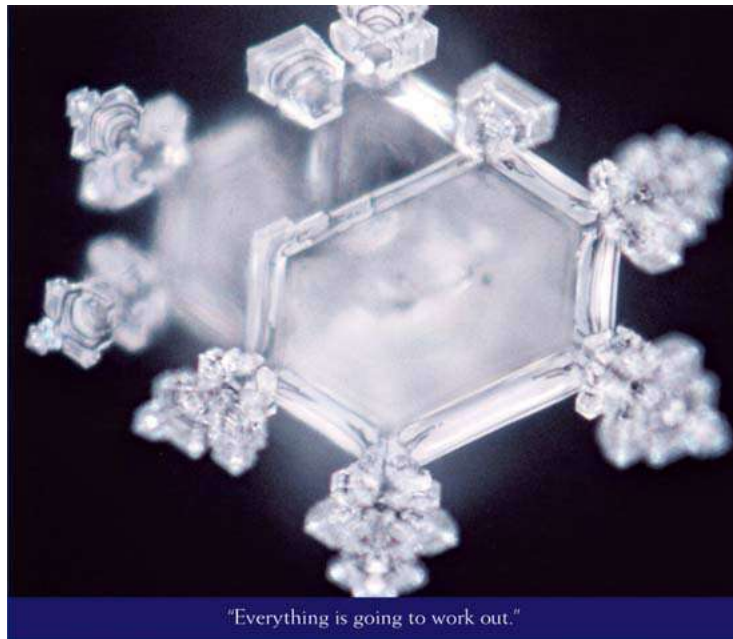
Approach new adventures with a feeling of self-confidence. What you need to do to succeed will become clear. If you have a vision, then there's little else to worry about.



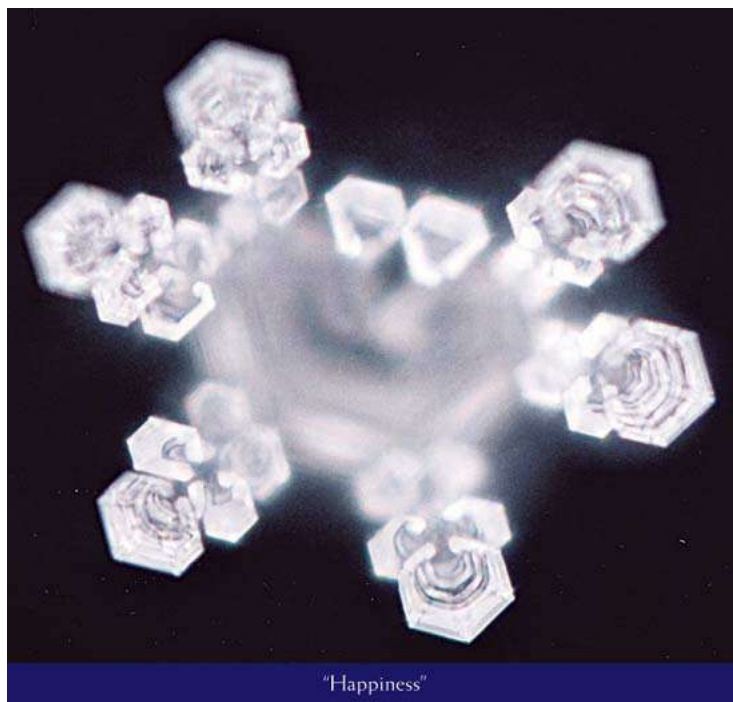
You can't if you think you can't. If you keep on trying and don't give up, you might discover that people around you will come to your aid when you need it the most.



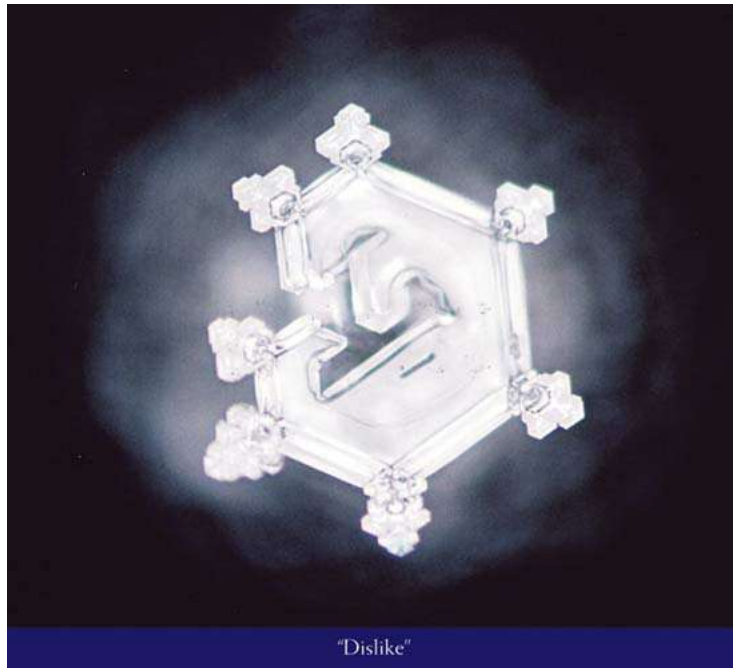
This crystal seems to be beaming with reassurance, like a child full of innocent buoyancy.



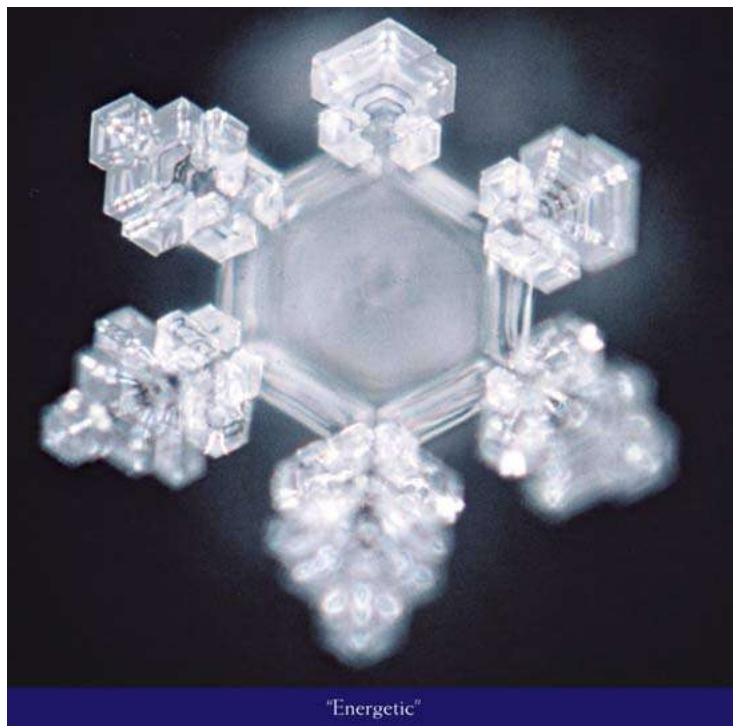
It looks like someone has told this crystal that it's good to try and that a helping hand is always nearby.



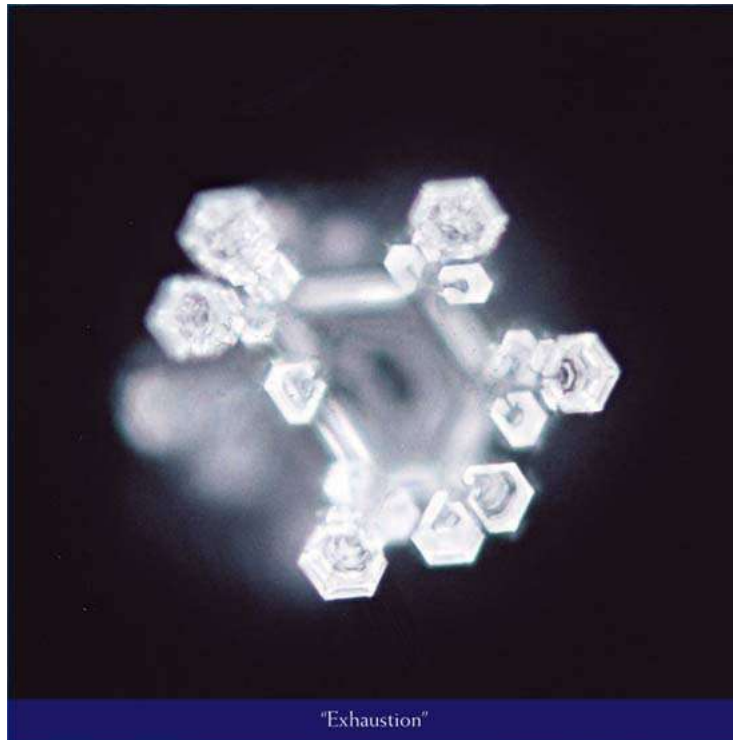
With six legs and two eyes, doesn't this crystal resemble a crab with a joyful face?



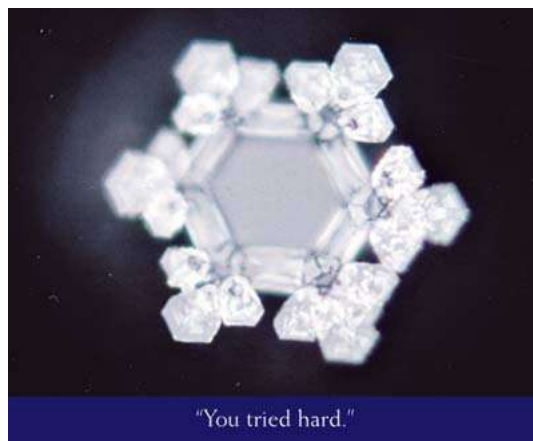
The difference between this crystal and the “happiness” crystal is striking. It looks like this crystal has bitten into something bitter. When you harbor thoughts of dislike, then dislike is internalized. A smile is the best thing to give to those you dislike.



Your health comes from within, and it is affected by your words. If you want to make the water within your body as vibrant as this crystal, then it is important to tell yourself, “I feel great!”



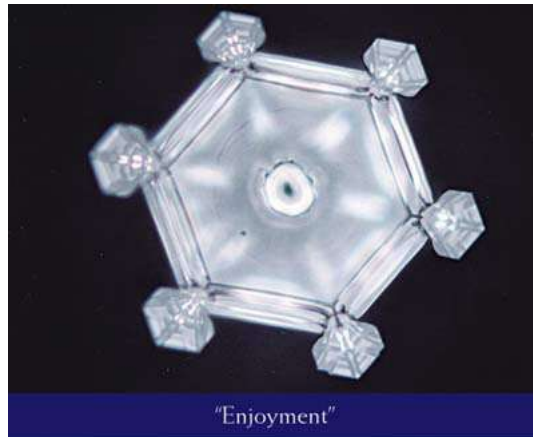
Even saying "exhaustion" makes the water within your body look worn and withered. If you find yourself saying this out of habit, try shifting your thinking.



Words of encouragement always seem to form beautiful crystals. This crystal is well formed, but it appears a little restricted.



Negative words have an immediate, disastrous effect on crystals. Think twice before exposing yourself to negative thoughts.



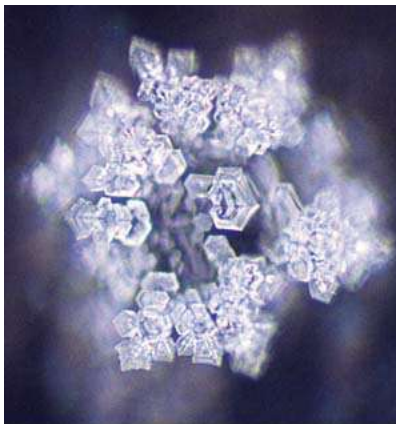
You might expect the "enjoyment" crystal to be more playful and energetic, but this appears to be a rather solid geometric crystal. For water, enjoyment is a completely natural state. You might say that truth can be found in enjoyment.



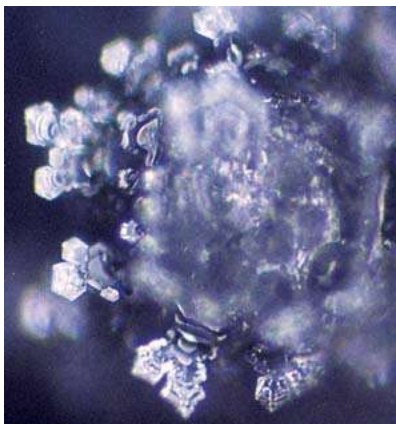
Dreams form a world of their own, and so it seems that this crystal has created a multi-layered shape with rings and light orbiting around it, possibly indicating a dream come to life.



"You're beautiful!" said repeatedly to water yielded this crystal.

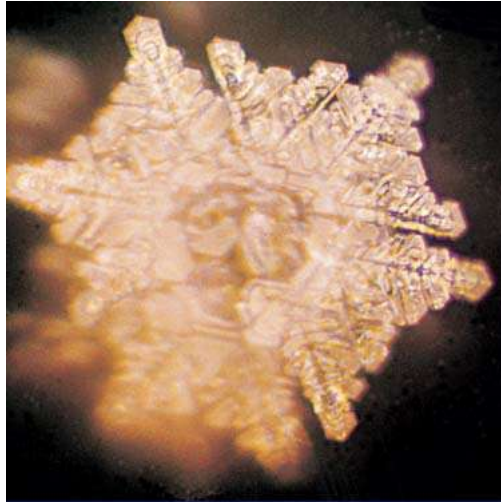


"Your beautiful!" said sometimes to water yielded this crystal.

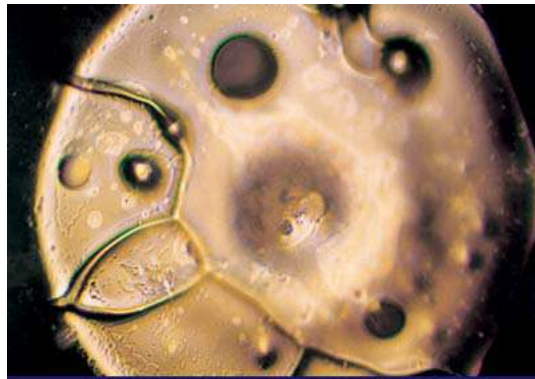


"Isolate, ignore"

Crystals receive even more damage from being ignored than from being exposed to degrading words.



"Beautiful"

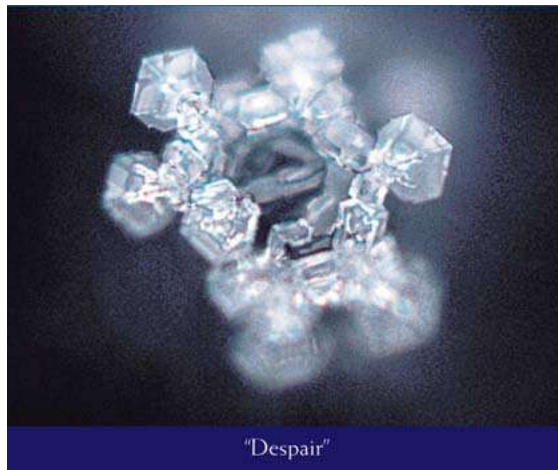


"Ugly"

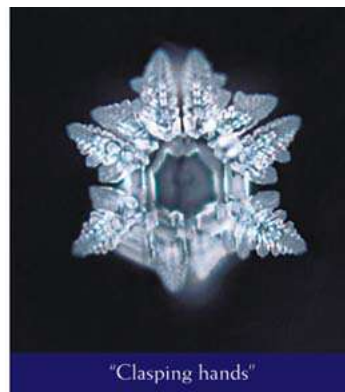
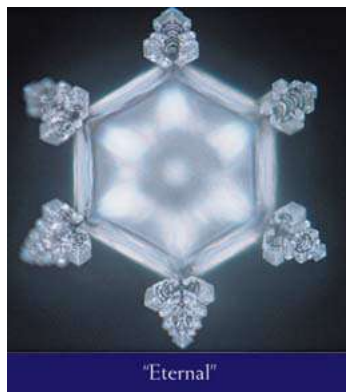
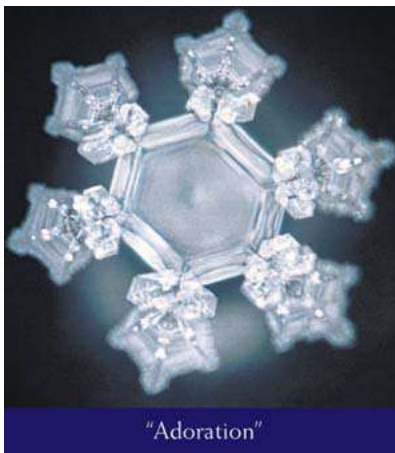
Even thinking of yourself or someone else as ugly rather than beautiful can cause considerable damage.



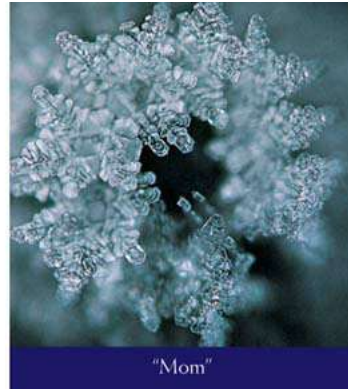
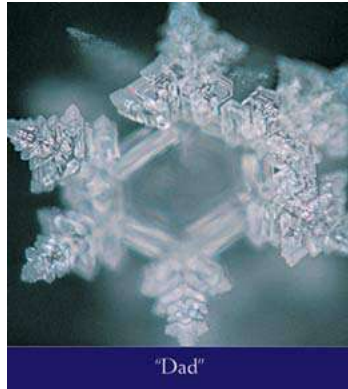
"Hope"



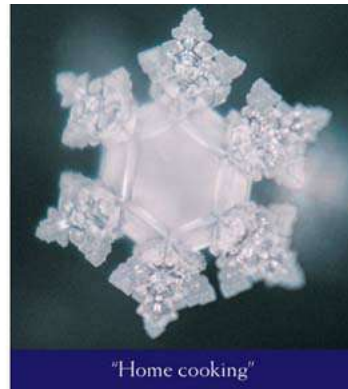
The “hope” crystal appears to have first been tiny, and then it grew into a big and beautiful crystal. Hope can grow and expand with age and experience. The “despair” crystal seems to have created two hexagonal crystals, possibly indicating that new hope can be found within despair.



Do you know someone who can have a healing effect on you just by being nearby? “Adoration” results in an untainted crystal full of life. The “eternal” crystal creates a well-formed hexagonal crystal, almost as a symbol of eternal resonance. “Clasping hands” creates a crystal that appears willing to share its energy.



“Mom” takes a softer bundle of a shape than “Dad.”



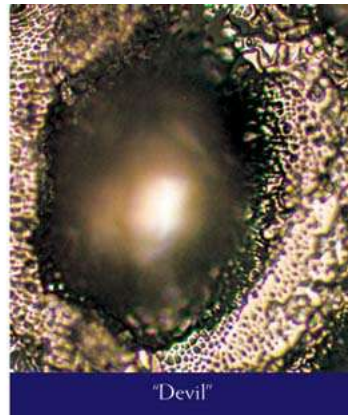
Compared to “home cooking,” “convenience foods” does not even cause the water crystals to form a hexagonal shape.



The crystal formed by the word “truth” has a mysterious beauty. Albert Einstein said, “The most beautiful experience we can have is the mysterious.” Harmony is all-encompassing, and a circle seems to be forming in this crystal when the word “harmony” is shown to it.

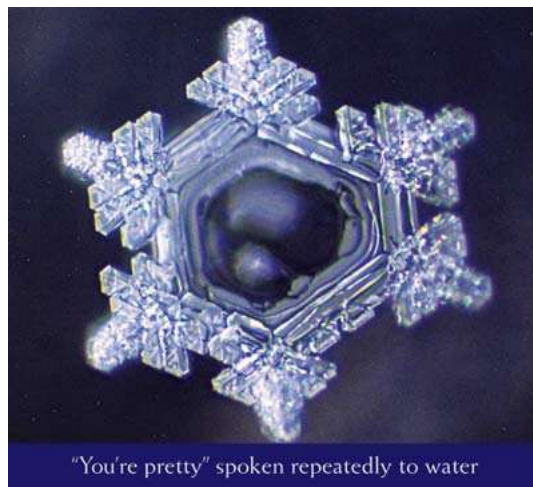


"Angel"

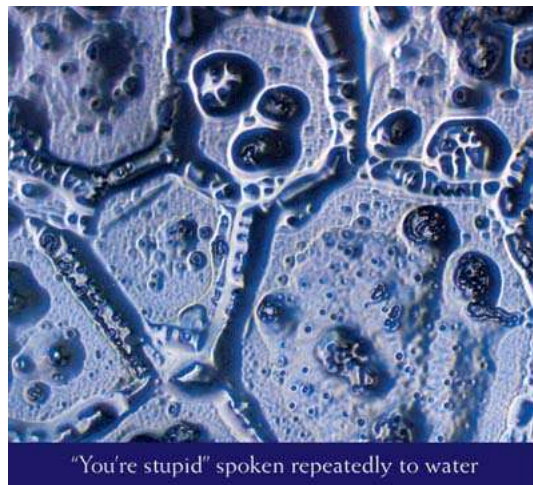


"Devil"

In contrast to the "devil" crystal, the "angel" crystal seems to be formed by an array of tiny crystals linked together.

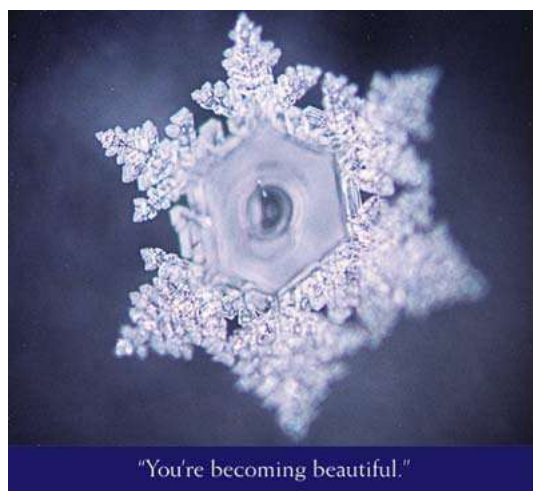
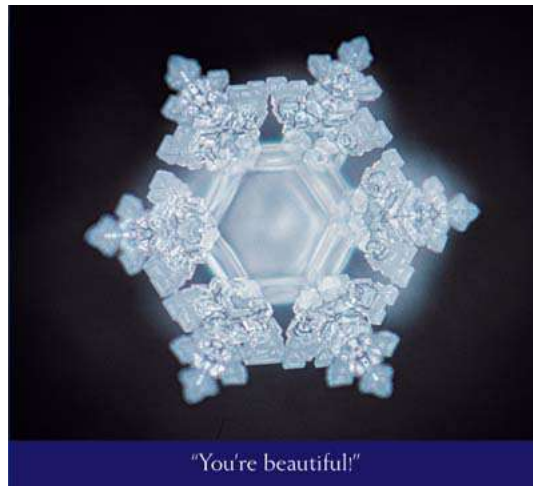


"You're pretty" spoken repeatedly to water

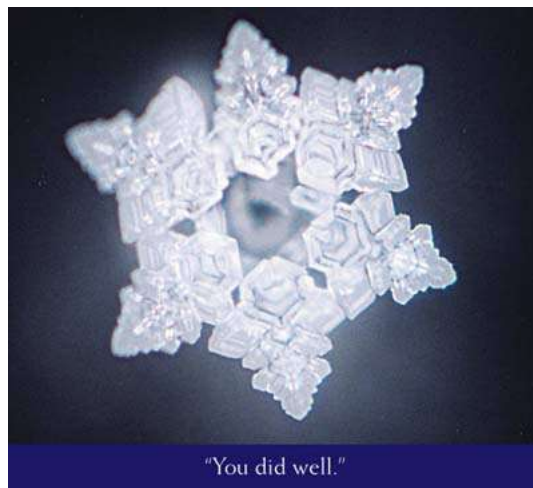


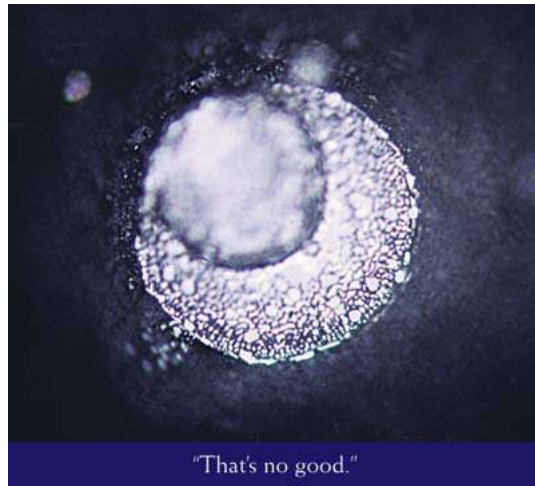
"You're stupid" spoken repeatedly to water

Instead of exposing water to written stimulus, for these two crystals we repeated the expressions over and over. Spoken words seem to have the same effect as written words, which makes sense considering they both emit energy, or vibration.

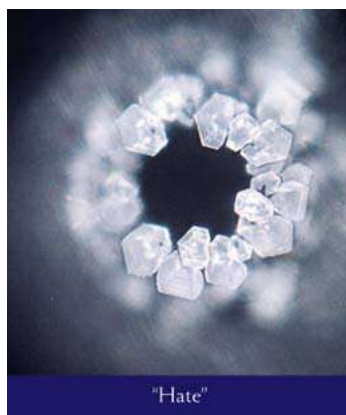
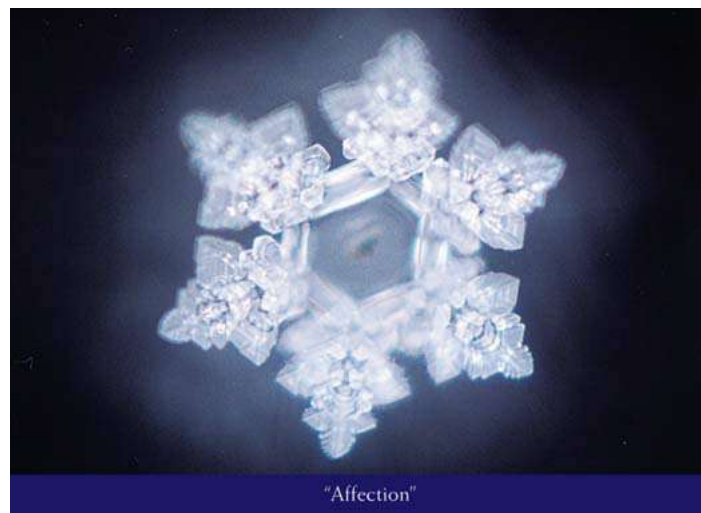


We tried changing the words we used just a little. The result was a gradual change in the crystal, suggesting that we are reborn with each new day.

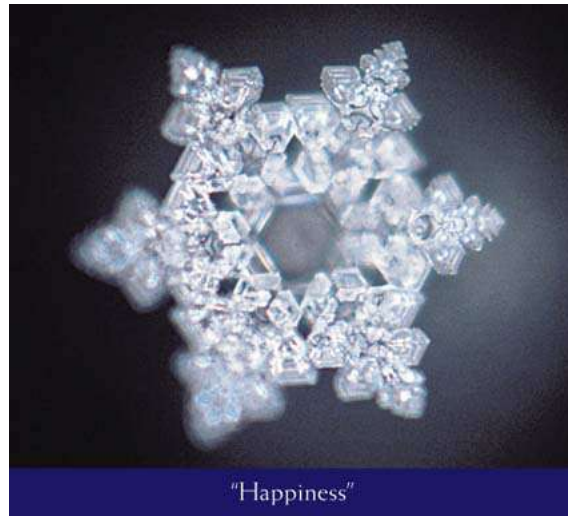




The "You did well" crystal is indeed beautiful, while the "That's no good" crystal failed to form. By using positive words, you'll spread good vibrations to those around you, and those good vibrations will eventually return to you.



While the "affection" crystal appears open and emerging, the "hate" crystal seems to be closed in. The formation from "rage and murder" creates an image of someone hiding and waiting to attack.



"Happiness"

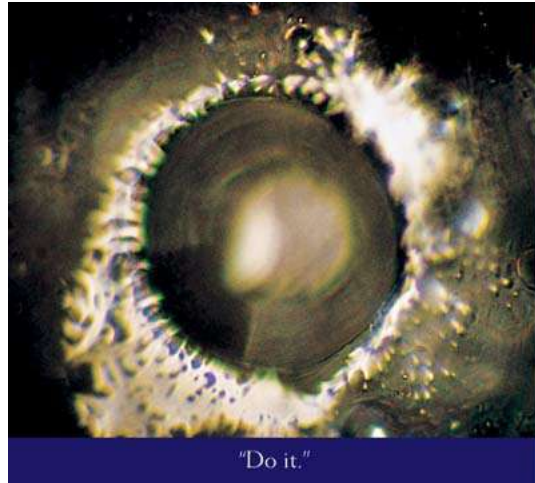


"Unhappiness"

"Happiness" resulted in a refined and highly detailed crystal. The second crystal makes it clear why "unhappiness" is a word that should be avoided.



"Let's do it."



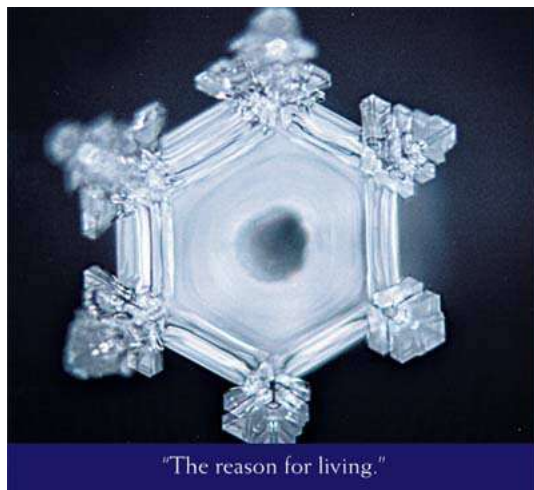
Here we have two vastly different crystals, reflecting the distinctly different energies of these two phrases.



The Japanese character for "soul" is created by combining one character that means "to speak" with another that means "evil spirit," indicating the importance of expressing yourself precisely.

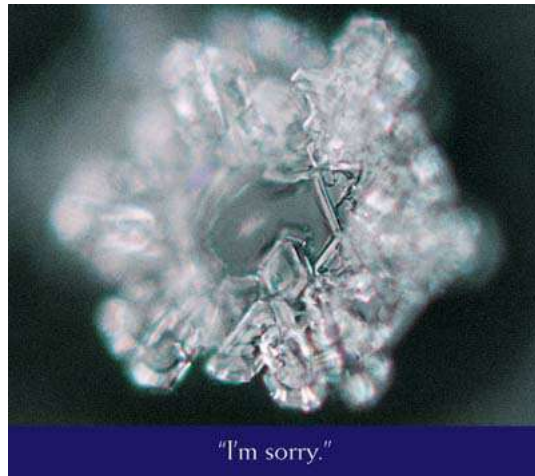


Water crystals formed by the word "friend" were extremely beautiful and reflected happiness. Moreover, when we look at the concept of "a circle of friends," we observe that when you make one friend, then, one by one, you make more friends.

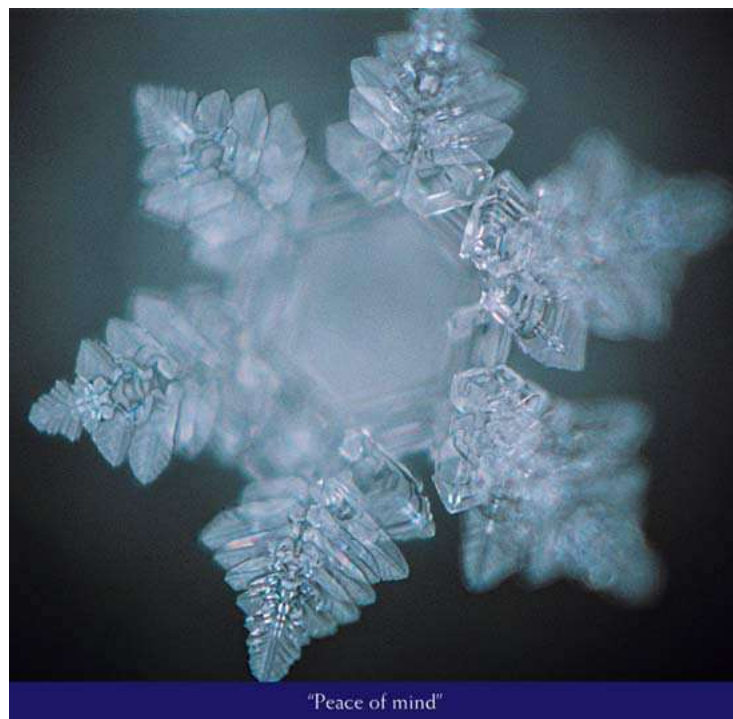


These phrases both created beautiful crystals, indicating that good words resonate and bring about positive results.

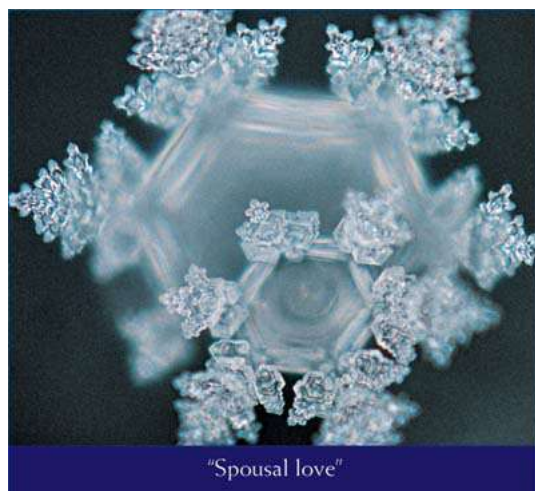
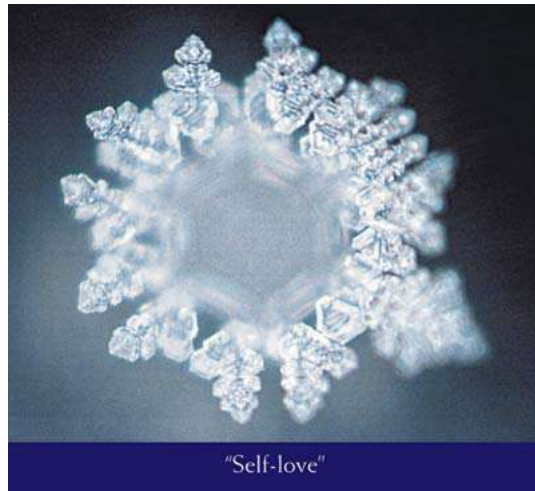




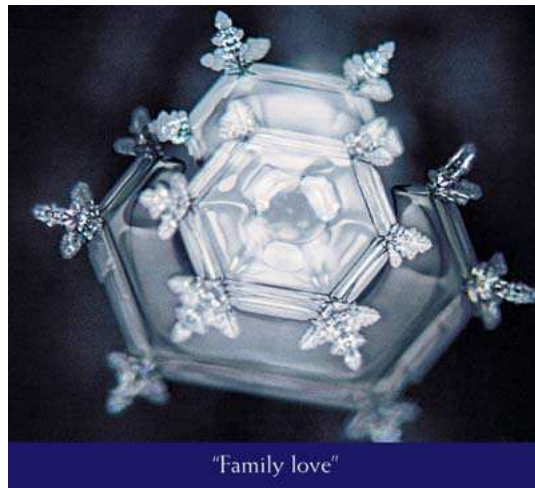
These two crystals indicate the importance of sincere gratitude and apology. If there is someone to whom you should apologize but have not, look at the "I'm sorry" crystal, say the offended person's name, and say, "I'm sorry." Apologizing within your heart is the next best thing to apologizing in person.

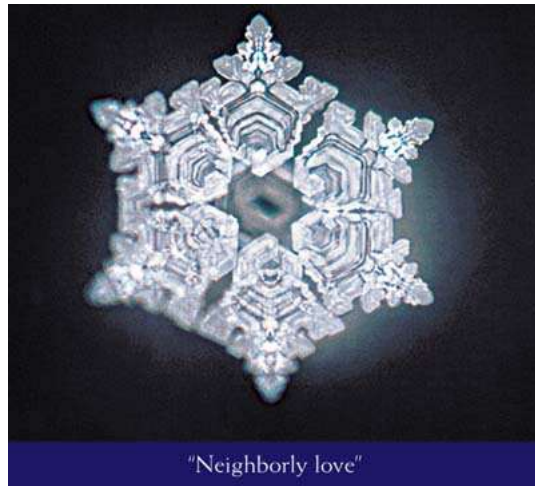


This word created a beautiful and stable crystal. The Japanese character for "peace of mind" is represented by a woman beneath the roof of a home, indicating the role that women can have in creating a calm and stable environment.

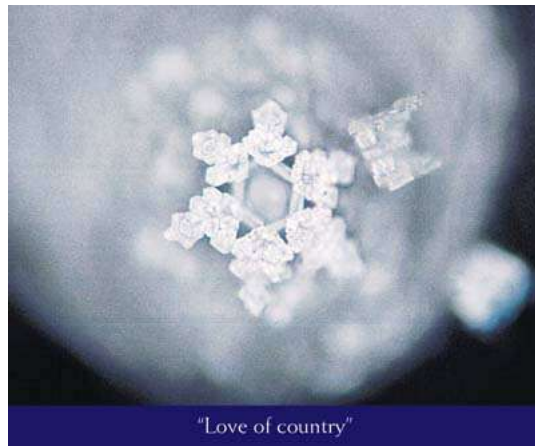


The crystal created by "self-love" is packed full of energy. Perhaps you can see hands raised in prayer in all directions. The "spousal love" crystal appears to be a smaller crystal protected by a larger one.

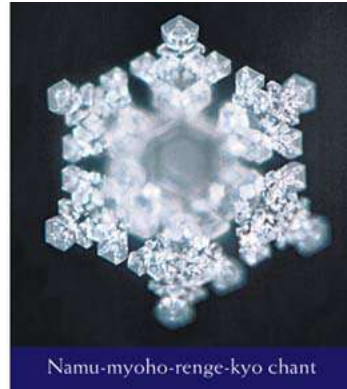
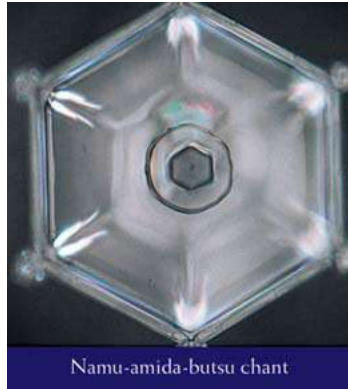




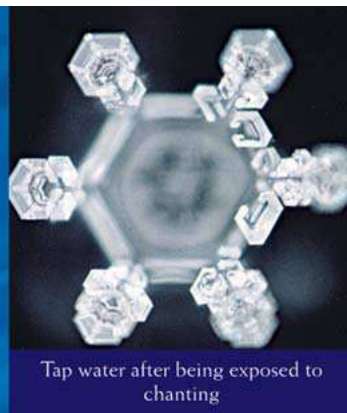
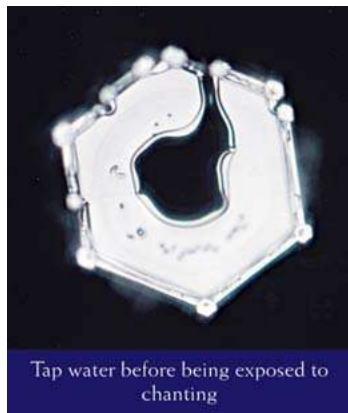
The "family love" crystal appears to consist of three layers of water crystals, perhaps indicating grandparents, parents, and children. The "neighborly love" crystal seems to shine with harmony.



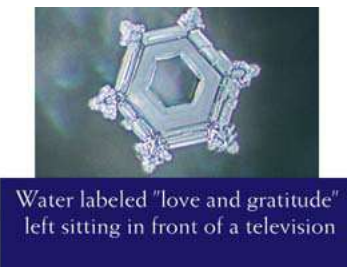
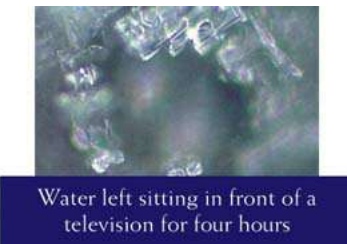
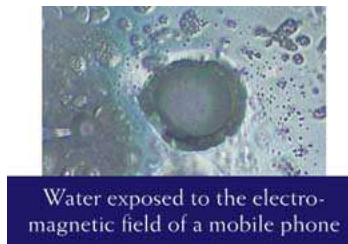
The "love of country" crystal seems to be supported by a larger crystal in the background. It is interesting that a small crownshaped crystal formed off to the side. The "love for humanity" crystal is a beautiful geometrical formation.

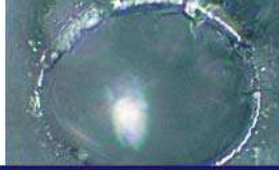


Exposing water to Buddhist sutras resulted in the formation of beautiful crystals, explaining why writing and reading sutras has a soothing effect.

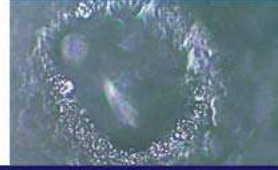


I placed samples of tap water on a stage where sixty Buddhist monks were chanting and recorded this remarkable change in crystal formations.





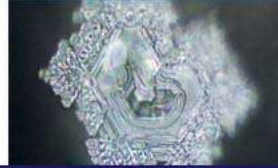
Water heated in a microwave oven



Water left sitting in front of a computer for four hours



Water labeled "love and gratitude"
heated in a microwave oven



Water labeled "love and gratitude" left
sitting in front of a computer

All of the water exposed to electromagnetic fields received some damage, but the words "love and gratitude" counteracted some of the negative effects.

The Hidden Messages in Water



Masaru Emoto

This book has the potential to profoundly transform your world view. Using high-speed photography, Dr. Masaru Emoto discovered that crystals formed in frozen water reveal changes when specific, concentrated thoughts are directed toward them. He found that water from clear springs and water that has been exposed to loving words shows brilliant, complex, and colorful snowflake patterns. In contrast, polluted water, or water exposed to negative thoughts, forms incomplete, asymmetrical patterns with dull colors. The implications of this research create a new awareness of how we can positively impact the earth and our personal health.



The Hidden
Messages
in
Water

Walter
Messinger
1916

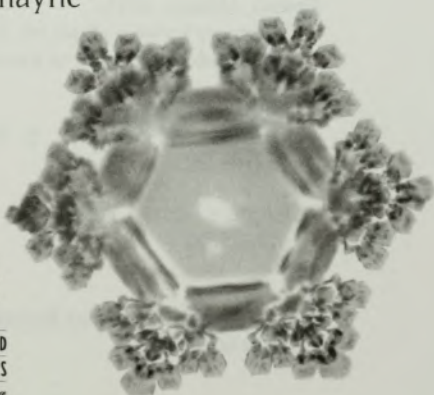


The Hidden Messages in Water



Masaru Emoto

Translated by
David A. Thyne



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*In memory of my maternal grandfather,
aunts, and uncles*

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T A B L E O F C O N T E N T S



Introduction.....ix

Prologue.....xiii

CHAPTER ONE



Of What Is the Universe Made?.....1

CHAPTER TWO



The Portal into a Different World.....53

CHAPTER THREE



Consciousness Creates All.....67

CHAPTER FOUR



The World Will Change in but a Moment.....83

CHAPTER FIVE



A Smile That Fills the World..... 101

Epilogue..... 153

About the Author..... 159

THE HISTORY OF THE UNITED STATES

CHAPTER I

THE EARLY PERIOD

THE DISCOVERY OF AMERICA

THE FIRST SETTLEMENTS

THE GROWTH OF THE COLONIES

THE STRUGGLE FOR INDEPENDENCE

THE CONSTITUTION

THE FEDERAL GOVERNMENT

THE UNION

THE WESTERN EXPLORATIONS

THE FRONTIERS

THE GREAT WESTERN MIGRATION

THE GOLD RUSH

THE PACIFIC RAILROAD

I N T R O D U C T I O N



More than ten years have passed since I began taking photographs of frozen ice crystals.

For years before that I had conducted research into the measurement of wave fluctuations in water, but when I started learning about crystals, I discovered that water expresses itself in a vast variety of ways.

I learned that these photographs of crystals are filled with much wisdom for us. In contrast to tap water, natural water displays a beautiful array of crystals—even more so when the natural water is exposed to beautiful music. There are also fascinating differences generated in the crystals when the water is shown different words, such as “gratitude” or “stupid.” These crystals are filled with lessons concerning how we should—and must—live our lives.

In June 1999, I published a collection of photographs in a book called *The Messages of Water* from a small publishing company that I called Hado Kyoikusha (Wave Fluctuation Publishing). Although this book was self-published and not intended to be sold in the large bookstores, word of mouth resulted in it becoming a bestseller.

INTRODUCTION

This is something that almost never happens in the publishing industry. I was filled half with amazement as this was happening right in front of my eyes, and half with appreciation for the many people who took the time to tell others about the book.

In order to share my book with more people, I had all the Japanese explanations translated for an English version. This led to further successes, and I began receiving requests from Switzerland and other countries throughout the world to give lectures.

The publishing of these crystal photographs, with the many messages that they have for the world, couldn't have come at a more appropriate moment in history, and it may well be a sign of the times that so many people are receptive of these messages. I thank God that I have been given the opportunity to work in this capacity.

I understand that some people have difficulty with the word or concept *God*. The main focus in this book is water. And the more you understand water, the more difficult you will find it to deny the existence of a god. I'd like you to think about your feelings on this topic as you look through the crystal photographs found herein.

When I was first asked to write this book for Sunmark Publishing in Japan, I immediately knew that there were many marvelous things inside me that I wanted to write about, and when I told this to Nobutaka Ueki, President of Sunmark Publishing, he said that was what

INTRODUCTION

he wanted me to focus on. He even sent along a subordinate, Ryuya Saitou, to hear my lectures in Switzerland.

Now that the book is finished, I am filled with a sense of satisfaction. This book has given me a "stage" from which to speak to you about the "fluctuation" theories that I have studied for more than a decade, and also about my own experiences, my research based on the observation of human behavior, and my own thoughts concerning the cosmos.

I wish to take this opportunity to express my appreciation to Shinji Tanigawa, president of Kokoro Inc.; Naoki Uchiki, Chief Editor of Sunmark; Tatsuya Saito; and also to the people who I interviewed for this book.

I also owe appreciation to Tetsuya Taguchi, past president of Nichirei Ice Inc., who provided much of the water that I used to make the crystals introduced in this book.

Thank you to Beyond Words Publishing for publishing this book in English, so that more people around the world can read about our relationship with water.

I must not forget to offer my gratitude to all the readers of this book. And, finally, I must say thank you and pay my respects to the water of the cosmos.

Thank you.

The history of the world is a vast and complex subject, encompassing the lives and actions of countless individuals and the events that have shaped our planet. From the dawn of civilization to the present day, the human story is one of constant change and evolution. The study of history allows us to understand the forces that have driven our progress and the challenges we have overcome. It provides a context for the events of our time and helps us to see the patterns and trends that have shaped our world. The history of the world is a testament to the resilience and ingenuity of the human spirit, and it is a source of inspiration and guidance for the future.

P R O L O G U E



As you begin reading this book, I'd like to ask you to evaluate your life. More specifically, I'd like you to ask yourself if you are happy.

Of course, your definition of happiness will depend upon who you are—but do you have a sense of peace in your heart, a feeling of security about your future, and a feeling of anticipation when you wake up in the morning? If we can call this happiness, then would you say that at this moment you are happy?

I think I can safely say that not many people will be able to reply with a resounding yes. Most people are unable to say that their life is everything they had hoped it would be. What is it that causes us so much pain? What is going on in the world that prevents so many people from simply being happy?

It seems to me that we are living in an age of chaos. Chaos describes a condition of confusion, indicative of the unorganized matter that existed before the creation of the cosmos.

Simply by going about our lives, we find ourselves worn out and fatigued. Newspapers and television bombard us with information, and at work we face

PROLOGUE

problems and misunderstandings. The sources of our problems seem numerous and overwhelming.

This is likely to be a fact of life no matter where in the world we go. This tiny planet of ours is covered with economic conflict, domestic discord, ethnic prejudice, environmental distress, religious wars, and every other type of problem imaginable. And all the bad news about people suffering, people enjoying the suffering, people getting richer, people getting poorer, the oppressed and the oppressors, reaches us within a matter of seconds from the opposite side of the globe.

Who, might we ask, is responsible for all this suffering? The world is becoming an ever more divided, estranged, and complicated place to live. We are already up to our necks in chaos, but the world's troubles seem to be getting deeper and deeper.

One thing we all have in common is that we are looking for a way out. Everyone is looking for an answer—and it is an answer so simple and effective that it has heretofore eluded us.



So what is the cause of all this chaos? What is at the center of it all? Whatever it is, it is pushing the world away from harmony and towards discord.

PROLOGUE

Perhaps this is an inevitable phenomenon. Though we all belong to the same species, if we live in different places and in different skin ways, the way we think is bound to be different.

And to make matters worse, most people have difficulty accepting things that are unlike the things around them. The result is a neverending process of troubles and suffering. It would seem that as long as people are people, any solution proposed is certain to come up short.

And so now we are back where we started. Can there ever be a single solution that can apply to all people on the globe, that everyone can be convinced of, and that is so simple that everyone can understand it?

In fact, I have found the answer, and it is just this: The average human body is 70 percent water.

We start out life being 99 percent water, as fetuses. When we are born, we are 90 percent water, and by the time we reach adulthood we are down to 70 percent. If we die of old age, we will probably be about 50 percent water. In other words, throughout our lives *we exist mostly as water*.

From a physical perspective, humans are water. When I realized this and started to look at the world from this perspective, I began to see things in a whole new way.

First, I realized that this connection to water applies to all peoples. Therefore, what I am about to say applies to everyone, all over the world.

PROLOGUE

I believe I am also starting to see the way that people should live their lives. So how can people live happy and healthy lives? The answer is to purify the water that makes up 70 percent of your body.

Water in a river remains pure because it is moving. When water becomes trapped, it dies. Therefore, water must constantly be circulated. The water—or blood—in the bodies of the sick is usually stagnant. When blood stops flowing, the body starts to decay, and if the blood in your brain stops, it can be life threatening.

But why does blood become stagnant? We can see this condition as the stagnation of the emotions. Modern researchers have shown that the condition of the mind has a direct impact on the condition of the body. When you are living a full and enjoyable life, you feel better physically, and when your life is filled with struggles and sorrow, your body knows it.

So when your emotions flow throughout your body, you feel a sense of joy and you move towards physical health.

Moving, changing, flowing—this is what life is all about.



If we consider that before we became human beings, we existed as water, we get closer to finding the answer

PROLOGUE

to the basic question of what a human being is. If we have a clear understanding of water, we will better understand the human body, and even unlock the mystery of why we were born and exist as we do.

So just what is water? Your first answer might be that it is a life force. If we lose 50 percent of the water in our bodies, we can no longer maintain life. Water, carried by blood and bodily fluids, is the means by which nourishment is circulated throughout our bodies. This flow of water enables us to live active lives. Water serves as the transporter of energy throughout our body.

This transport of energy is similar to a freight car that moves throughout the body. If the body is clogged and soiled, then the cargo in the freight car will also become filthy, and so it is essential that water always remain clean.

More now than in the past, the medical community has begun to see water as a transporter of energy, and it is even being used in the treatment of illness. Homeopathy is one such field where the value of water is recognized.

Homeopathy originated in Germany in the first half of the nineteenth century with the work of Samuel Hahnemann (1791–1843), but its roots go back to the father of medicine, Hippocrates (c. 460–c. 370 BC), who wrote down many treatments similar to those

promoted by homeopathy. In a word, these pioneers of medicine taught us to “treat like with like, fight poison with poison.”

For example, if someone is suffering from lead poisoning, symptoms can be alleviated by drinking water with the minutest amount of lead in it—an amount ranging 1 part in 10^{12} (one trillion) to 1 part in 10^{400} !

At this level, the matter no longer for practical purposes remains in the water, but the *characteristics* of the matter do remain, and this forms the medicine for treating lead poisoning.

Homeopathy proposes that the greater the dilution, the greater the effectiveness. The logical conclusion is that the denser the poison in the body, the higher should be the dilution ratio.

Another way to express this idea is that, instead of the *effect* of the matter being used to get rid of the symptoms, the information *copied* to the water is being used to cancel out the information of the symptoms from the poison.

So water has the ability to *copy* and *memorize* information. We may also say that the water of the oceans has memories of the creatures that live in the ocean. The earth’s glaciers may well contain millions of years of the planet’s history.

Water circulates around the globe, flowing through our bodies and spreading to the rest of the world. If

PROLOGUE

we were capable of reading this information contained in the memory of water, we would read a story of epic proportions.

To understand water is to understand the cosmos, the marvels of nature, and life itself.



I have studied water for many years. The realization that water has the ability to copy information has changed my life. After making this discovery in America, I brought it back with me to Japan, and have since used the information-copying function of water to help people recover their health.

At that time, however, doctors would not even consider the possibility that water by itself had healing capabilities. I was and am fully convinced that water is able to memorize and transport information, but this suggestion has been met with complete rejection by the medical community.

In 1988, the French scientist Jacques Benveniste undertook an experiment to test the basic principles of homeopathy. He diluted a medicine with water to the point where the medicine was no longer detectable by clinical means, and then he discovered that this dilution had the same effect on patients as the undiluted medicine.

A year after he submitted his results to the British scientific journal *Nature*, they were finally published, along with the comment that the results of the experiment were doubtful and without any physical proof. The hypothesis has remained buried and forgotten ever since.

Whenever someone comes along with research and experiments that turn the scientific community on its ear, the reaction, to one degree or another, is usually the same. I long wondered if it might be possible to find physical evidence of the ability of water to memorize information—might there be some way of seeing it with the physical eye?

When your heart is open to possibilities, you start to notice small things that can lead to enormous discoveries. And one day I casually opened a book to words that jumped off the page: "No two snow crystals are exactly the same."

Of course, I had learned this same thing in elementary school. The faces of all the snowflakes that have fallen on the earth for millions of years have all been different. However, I read this sentence as if it had a completely different meaning because my heart was open and receptive to its message. The next moment I thought, *If I freeze water and look at the crystals, each one will look totally unique.* And that moment marked my first step on an adventure into a new and unexplored world. My plan was to freeze water and take pictures of the crystals.

PROLOGUE

It's my nature not to want to sit on a fresh idea. I immediately asked a young researcher in my company to start experimenting, but this was a field that no one knew anything about. There was nothing to assure us that our efforts would eventually pay off. Oddly enough, I never doubted that they would. I knew with certainty that my hypothesis was correct and that the experiments would go well—I *just knew it*. I usually suffer from a critical shortage of perseverance, but this time I refused to give up.

My first step was to lease an extremely accurate microscope and look at water frozen in a kitchen refrigerator. However, since the photographs were taken at room temperature, the ice would soon melt. It took us quite some time before we were able to get any photographs of crystals.

Late each evening, I would take the young researcher to dinner and try to encourage him. I told him that I only expected him to do his best.

After two months of experiments, we finally succeeded in getting one photograph. The water gave us a photograph of a beautiful hexagonal crystal. I was filled with excitement when the researcher came to me with the news.

I now have a large walk-in refrigerator where the temperature is maintained at -5°C (23°F) for experimenting, but it all started with that first photograph.

PROLOGUE

Considering the method we used and what I know now, it was quite miraculous that we were able to get that first photograph at all.

What you really know is possible in your heart is possible. We make it possible by our will. What we imagine in our minds becomes our world. That's just one of many things that I have learned from water.



The crystal photographs that I started taking proved to be extremely eloquent in expressing the world. I found within them a profound philosophy. Crystals emerge for only twenty or thirty seconds as the temperature rises and the ice starts to melt. The truths of the cosmos take shape and become visible, if only for a few moments. This short window of time gives us a glimpse into a world that is indeed magical.

Let me explain how I go about taking photographs of crystals.

I put fifty different types of water in fifty different Petri dishes. (I used one hundred during the first few years.) I then freeze the dishes at -20°C (-4°F) for three hours in a freezer. The result is that surface tension forms drops of ice in the Petri dishes about one millimeter across. The crystal appears when you shine a light on the crown of the drop of ice.

PROLOGUE

Of course, the result is never fifty similar crystals, and sometimes no crystals at all are formed. When we graphed the formation of the crystals, we realized that different water formed different crystals. Some of them were clearly similar, some were deformed, and in some types of water, no crystals at all formed.

First I looked at the crystals of tap water from different locations. The water of Tokyo was a disaster—not a single complete crystal was formed. Tap water includes a dose of chlorine used to sanitize it, utterly destroying the structure found in natural water.

However, within natural water, no matter where it came from—natural springs, underground rivers, glaciers, and the upper reaches of rivers—complete crystals formed.

My efforts to photograph ice crystals and conduct research began to move ahead. Then one day the researcher—who was as caught up in the project as I—said something completely out of left field: "Let's see what happens when we expose the water to music."

I knew that it was possible for the vibrations of music to have an effect on the water. I myself enjoy music immensely, and had even had hopes of becoming a professional musician as a child, and so I was all in favor of this off-the-wall experiment.

At first we had no idea what music we would use and under what conditions we would conduct the

PROLOGUE

experiment. But after considerable trial and error, we reached the conclusion that the best method was probably the simplest—put a bottle of water on a table between two speakers and expose it to a volume at which a person might normally listen to music. We would also need to use the same water that we had used in previous experiments.

We first tried distilled water from a drugstore.

The results astounded us. Beethoven's Pastoral Symphony, with its bright and clear tones, resulted in beautiful and well-formed crystals. Mozart's 40th Symphony, a graceful prayer to beauty, created crystals that were delicate and elegant. And the crystals formed by exposure to Chopin's Etude in E, Op. 10, No. 3, surprised us with their lovely detail.

All the classical music that we exposed the water to resulted in well-formed crystals with distinct characteristics. In contrast, the water exposed to violent heavy-metal music resulted in fragmented and malformed crystals at best.

But our experimenting didn't stop there. We next thought about what would happen if we wrote words or phrases like "Thank you" and "Fool" on pieces of paper, and wrapped the paper around the bottles of water with the words facing in. It didn't seem logical for water to "read" the writing, understand the meaning, and change its form accordingly. But I knew from

the experiment with music that strange things could happen. We felt as if we were explorers setting out on a journey through an unmapped jungle.

The results of the experiments didn't disappoint us. Water exposed to "Thank you" formed beautiful hexagonal crystals, but water exposed to the word "Fool" produced crystals similar to the water exposed to heavy-metal music, malformed and fragmented.

Further experimenting showed that water exposed to positive expressions like "Let's do it!" created attractive, well-formed crystals, but that water exposed to negative expressions like "Do it!" barely formed any crystals at all.

The lesson that we can learn from this experiment has to do with the power of words. The vibration of good words has a positive effect on our world, whereas the vibration from negative words has the power to destroy.



Learning about water is like an exploration to discover how the cosmos works, and the crystals revealed through water are like the portal into another dimension. As we continued with our experiments in taking photographs of crystals, we found that we were setting

PROLOGUE

out to climb the stairs toward an understanding of the profound truths of the cosmos.

I particularly remember one photograph. It was the most beautiful and delicate crystal that I had so far seen—formed by being exposed to the words "love and gratitude." It was if the water had rejoiced and celebrated by creating a flower in bloom. It was so beautiful that I can say that it actually changed my life from that moment on.

Water had taught me the delicacy of the human soul, and the impact that "love and gratitude" can have on the world.

In Japan, it is said that words of the soul reside in a spirit called *kotodama* or the *spirit of words*, and the act of speaking words has the power to change the world. We all know that words have an enormous influence on the way we think and feel, and that things generally go more smoothly when positive words are used. However, up until now we have never been able to physically see the effect of positive words.

Words are an expression of the soul. And the condition of our soul is very likely to have an enormous impact on the water that composes as much as 70 percent of our body, and this impact will in no small way affect our bodies. People who are in good health are also generally in good spirits. Indeed, a healthy spirit most comfortably resides in a healthy body.

PROLOGUE

Out of desire to help as many people as possible remain or become healthy, I had worked for years taking care of the sick. And the more afflicted people that I see, the more I become convinced that illness is not just an individual problem, but a result of the deformation of society as a whole.

Unless something is done about the deformed world that we live in, and unless we can heal the wounded soul, the number of people suffering from physical illnesses will not decline.

So what are the deformities of the world? These are the deformities of the soul, and such deformities have an impact on the cosmos itself. Just as a drop in a pond creates a ripple that spreads out endlessly, the deformity of even one soul spreads throughout the world, resulting in global deformities.

But all is not lost—there is hope. There is salvation, and it's called "love and gratitude."

The earth is searching. It wants to be beautiful. It wants to be the most beautiful that it can be. Earlier I said that we could define the human being as water. I am quite certain that the water in the people who look at the photographs of crystals undergoes some form of change.

And I have found the most beautiful crystal of all—the one created by "love and gratitude." This is supposedly what all the world's religions are founded on, and

PROLOGUE

if that were true, there would be no need for laws. You already know the answer. "Love and gratitude" are the words that must serve as the guide for the world.

Water teaches in a very clear way how we must live our lives. The story of water reaches from every individual cell to encompass the entire cosmos. I hope that you will feel the same anticipation and excitement that I felt as I discovered the unfolding of this drama.

2

C H A P T E R O N E



Of What Is the Universe Made?

Understanding the fact that we are essentially water is the key to uncovering the mysteries of the universe. If you reexamine the world around you from this new perspective, you will start to see things as you have never seen them before.

The various events that unfold throughout a person's life are events reflected in water. The individual and society make up one enormous ocean; by adding our individual drops to this ocean, we participate in the formation of society.

I wanted as many people as possible to hear the message that water has for us, and so I decided to publish the

photographs of the ice crystals. This act was only a small drop, but it created a ripple that resulted in an ever-expanding wave that has had enormous impact on my life, and the lives of many others.

I first published my photographs in 1999, six long years after I started out on this unusual venture. During those first six years, a mountain of photographs had accumulated and was just sitting there in my office.

To prepare the photographs for publication, I tried to put them in some sort of order, and as I did so I started to realize that there was a story unfolding before my eyes. I began to realize that there was a grand and marvelous story that each individual crystal was trying to tell me.

As soon as I latched onto the idea of publishing my photographs, I talked to several publishers about my idea, but no one seemed interested. Rejection didn't change my determination to have my photographs published, and so I decided that I would publish them on my own. But I soon realized that though I could afford to have the photographs printed and bound into a book, the restrictive distribution system in Japan wouldn't allow me to have the books sold in bookstores.

This seemed like a formidable obstacle, but I just decided not to worry about it. When the completed books arrived, we packed up the books for the few

hundred friends and acquaintances who had reserved copies and sent them off. Not long after sending off these first copies, a strange thing started to happen. We started getting reorders from the people who had reserved copies. They had told their friends and acquaintances about the book, and those people had told others. Some people bought five or even ten copies and distributed them to their friends. It indeed seemed like the drop in the pond had become a fast-spreading ripple.

My expectations quickly expanded, and I next wanted people around the world to know what was in this book of photographs, and so I had a translation company translate all the explanations into English. Happily, people from around the world did see the book: Shizuko Ouwehand, a woman who would later serve as my interpreter, sent the book to friends in Europe and America, and this resulted in invitations from people who had seen the photographs to visit those countries and present lectures. Over the years, I have been blessed with opportunities to visit Switzerland, Germany, Australia, the Netherlands, Italy, England, the United States, Canada, and many other countries to introduce the crystals to the people of the world.

Everything seemed to happen at just the right time. People are looking for a way to make sense of this

world of chaos that we find ourselves in. This photograph album became a small but meaningful drop that created a ripple, which has since spread throughout the world.

I would like here to introduce only a small portion of the photographs that I have taken. Some of them are included in the work *The Messages of Water*, and some from the second collection of photographs called *The Messages of Water II*, and other photographs were taken especially for this book. You yourself will be able to clearly see the effect that words, photographs, and music can have on water.

These photographs were seen by Japanese as well by people from around the world, many of whom sent me letters with their opinions and thoughts. The pebble that I threw into the pond had indeed created a large ripple that now started to come back to me.

I was astounded to see that so many people were impressed by the effect that the energy of human consciousness and words had on the formation of ice crystals, despite the fact that this idea—that words and thoughts have the power to change water and other substances—may certainly seem like far-out religion or philosophy.

(Text continues on page 37.)

We showed words to water

We wrapped a piece of paper with words typed on it
around a bottle of water.



Love and gratitude

This crystal is as perfect as can be. This indicates that
love and gratitude are fundamental to the phenomenon
of life in all of nature.



Thank you (Japanese)

We showed words meaning "thank you" in different languages, always resulting in crystals that were beautiful and complete.



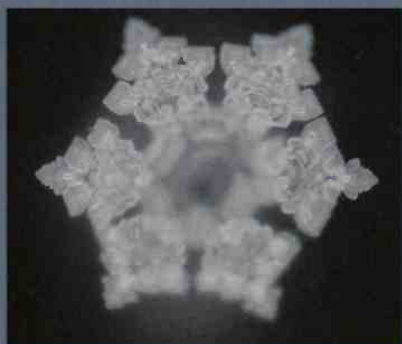
Thank you (English)



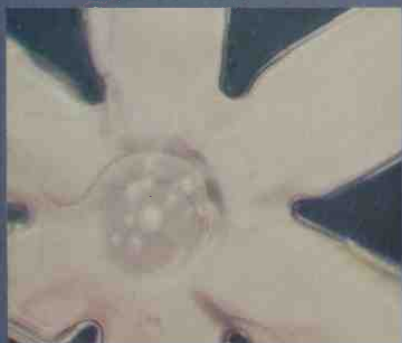
Thank you (Chinese)



Danke (German)



Merci (French)



Thank you (Korean)



Crazie (Italian)



You fool! (Japanese)



You fool! (English)

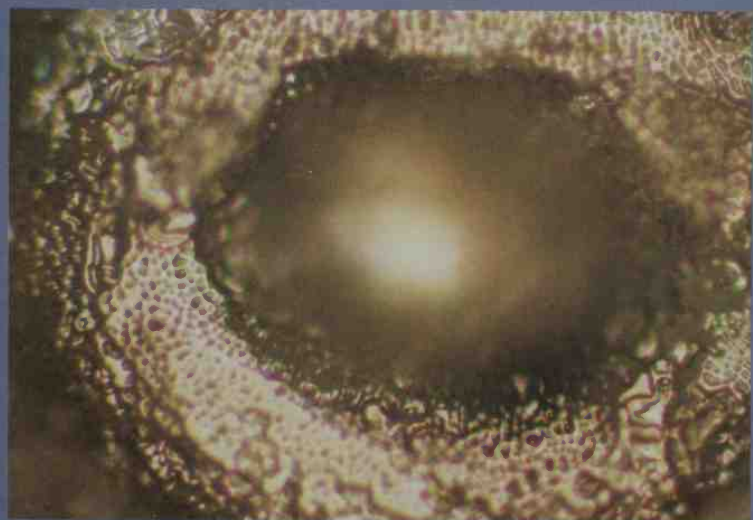


You make me sick. I will kill you. (Japanese)

When words that indicated harm to humans were shown to the water, no crystals formed. It even appears that the words "You make me sick" created the shape of a man with a gun.



Angel (Japanese)

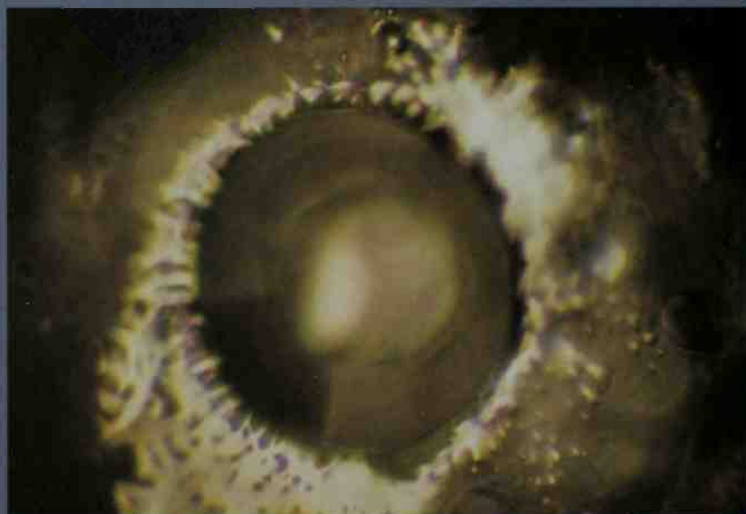


Satan (Japanese)

The word "angel" resulted in a ring of small crystals linked together, while the word "Satan" formed a crystal with a dark lump in the center as if ready to attack.

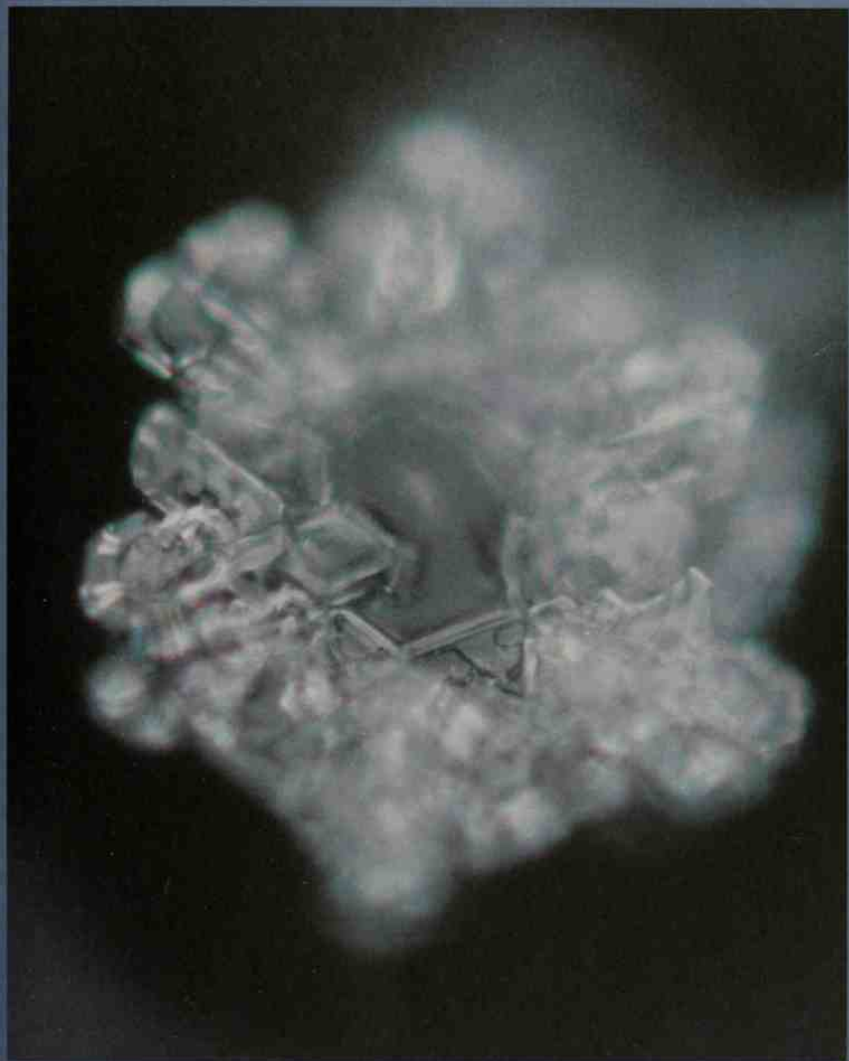


Let's do it! (Japanese)



Do it! (Japanese)

"Let's do it!" creates a lovely shape, while "Do it!" creates a crystal similar to that created by the word "Satan." This might indicate that force and commands are alien to the principles of nature.



I'm sorry (Japanese)

This shows what a simple "I'm sorry" can result in. Perhaps the reason the crystal is blurred is because a simple "I'm sorry" can sound more sincere than a more elaborate apology.



Wisdom (Japanese)



Wisdom (English)

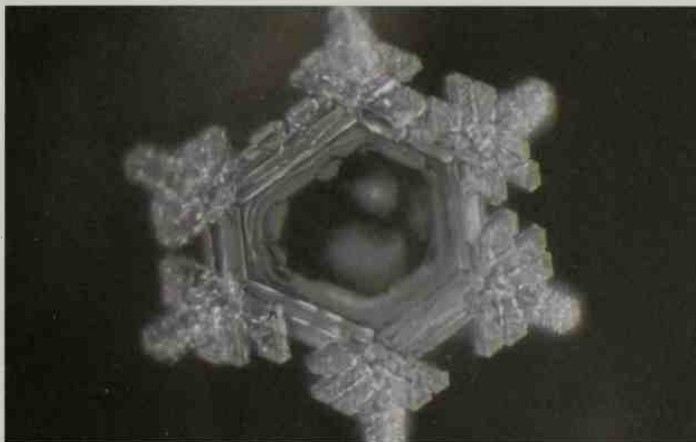


Weisheit (German)

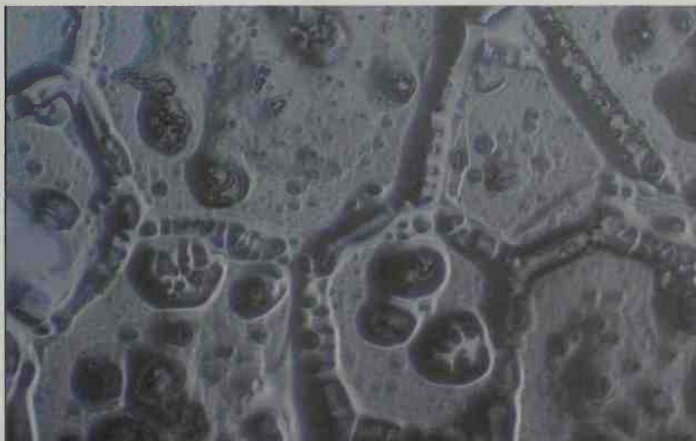
The word "wisdom" in various languages created beautifully formed crystals. This may indicate that wisdom is a basic principle of nature throughout the world.

A test conducted at an elementary school

Here are some photographs taken after children at a Japanese elementary school spoke to the water, and also one photograph of water that was ignored.

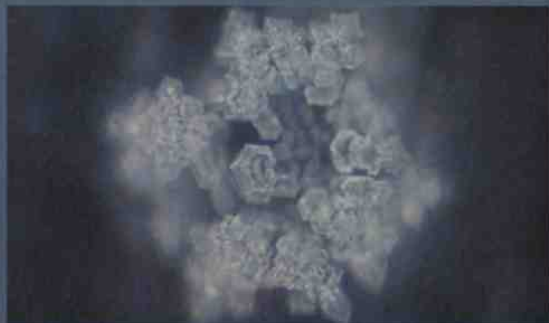


You're cute



You fool

The children said different things to different bottles of water. When the children said "You're cute" to the water, cute crystals formed, but "You fool" had the opposite effect.



When the children said "You're beautiful" a few times



When the children said "You're beautiful" several times

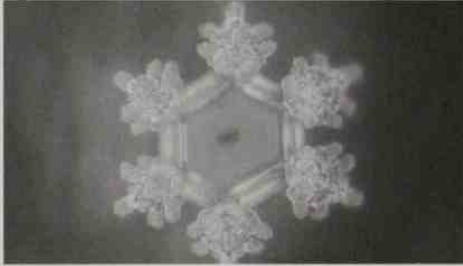


When the water was ignored

When the water was told "You're beautiful" several times, it resulted in crystals more well-formed than when the water was only told this a few times. The crystal formed by the ignored water was the least complete.

What does the face of the cosmos look like?

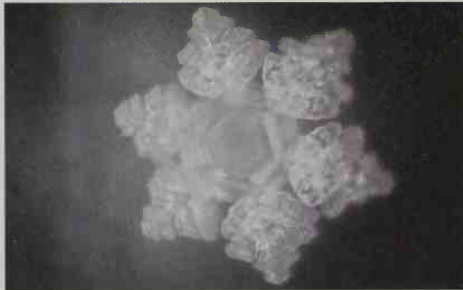
Here are photographs of crystals made from water exposed to the word "cosmos" in Japanese, English, and German, and also a crystal formed using a photograph of the earth.



Cosmos (Japanese)

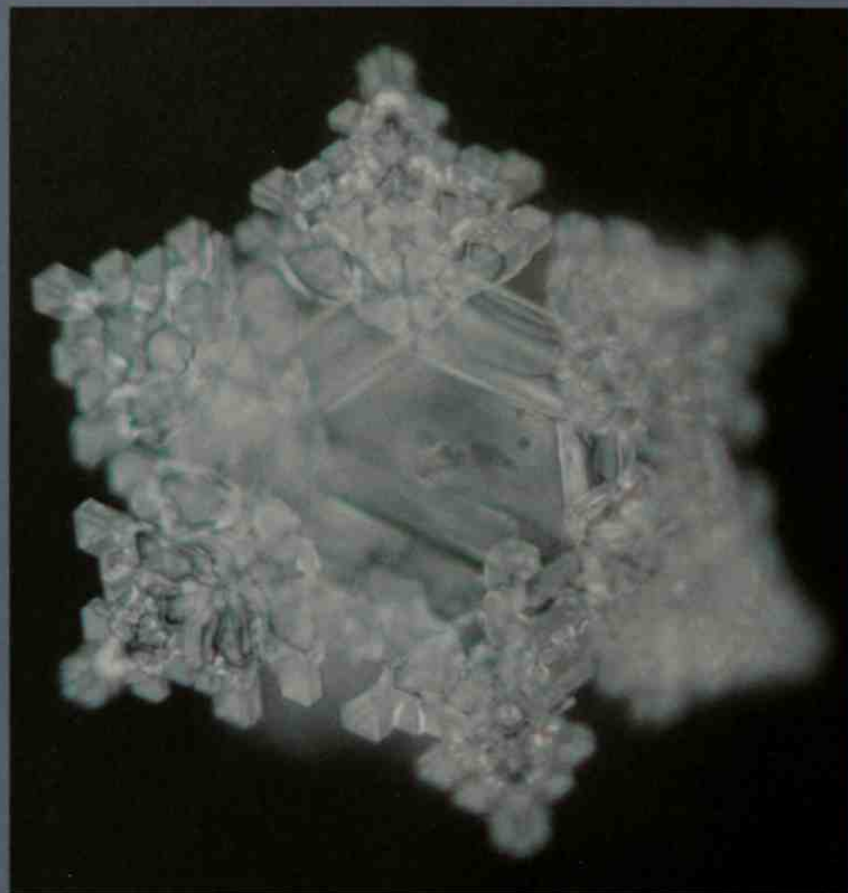


Cosmos (English)



Kosmos (German)

All three crystals are similar, with clearly formed crystals. It appears that the principles of the cosmos transcend language differences.

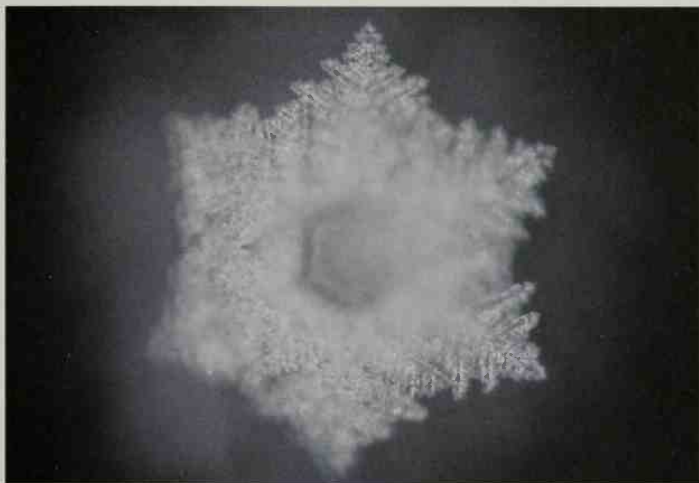


When shown a photograph of the Earth

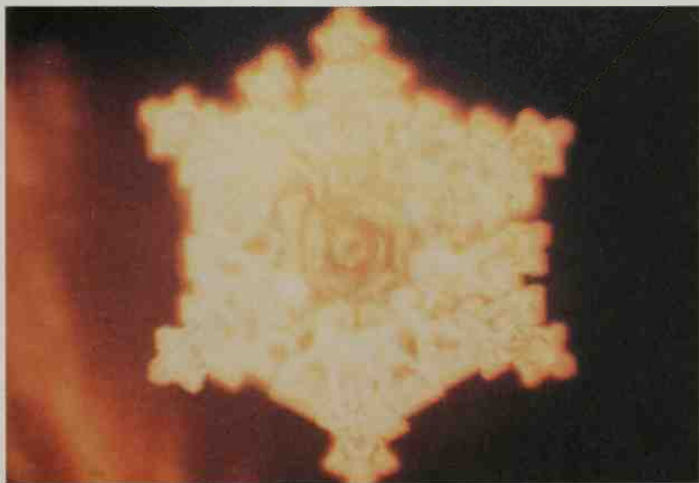
The crystal is beautiful, but we can't help but notice that it is a little deformed. If not for this deformity, it would be as beautiful as any complete crystal.

What happens when water is exposed to music?

The following crystal photographs were produced when glass bottles of water were placed between two speakers.



Beethoven: Symphony No. 5



Beethoven: Symphony No. 6 ("Pastoral")

Beethoven's music resulted in fanciful crystals with great detail and exactness, creating a healing effect.



Mozart: Symphony No. 40

This beautiful crystal reflects the beauty of this piece of music. The crystal seems to indicate the unreserved way that Mozart lived his life.



"Air on the C string"

This flowing melody by Bach (in the famous arrangement for violin and piano) is well represented by this crystal.

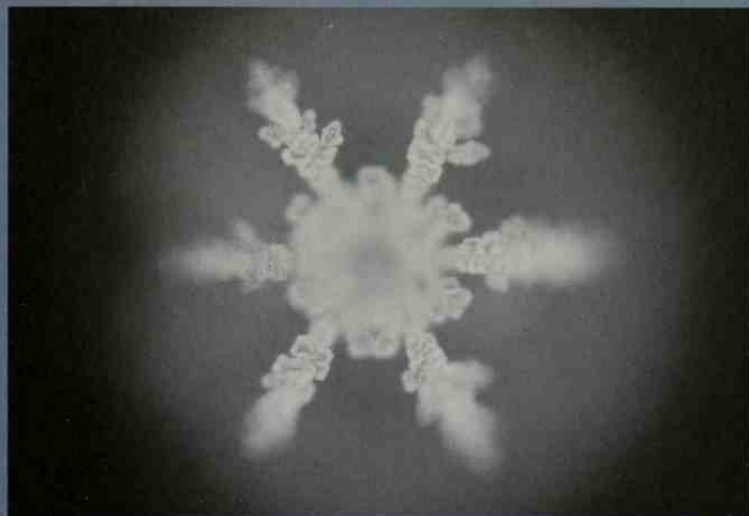


Chopin: Etude in E major



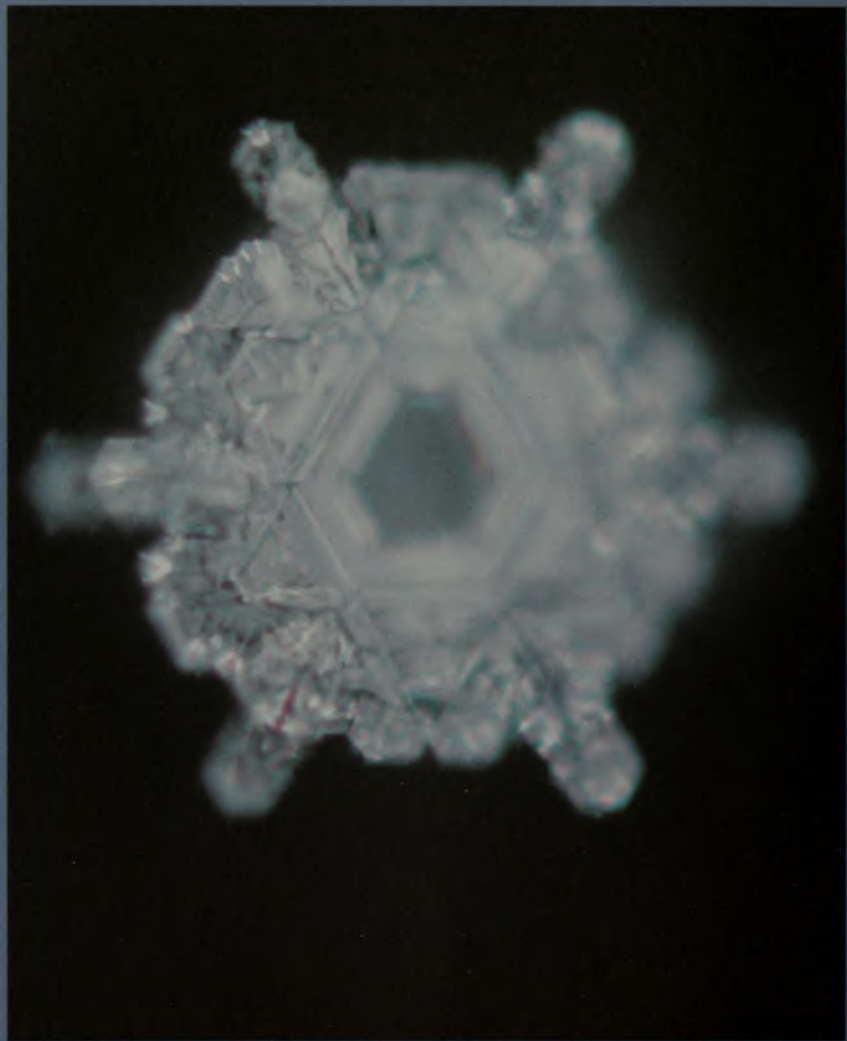
Chopin: Prelude in D flat major

Piano music seems to create droplet-like crystals.



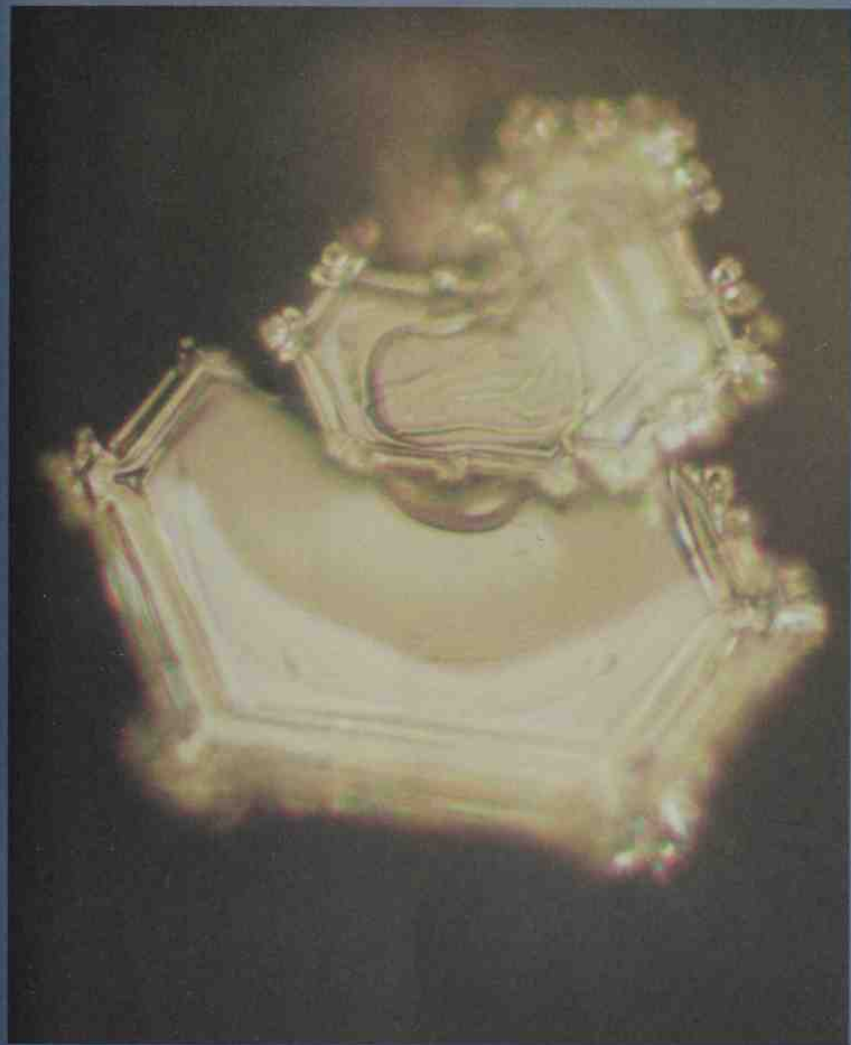
Tchaikovsky: *Swan Lake*

The top crystal indicates a swan, while the rainbow colors of the bottom crystal seem to represent the light of hope, perhaps affected by the story of *Swan Lake*.



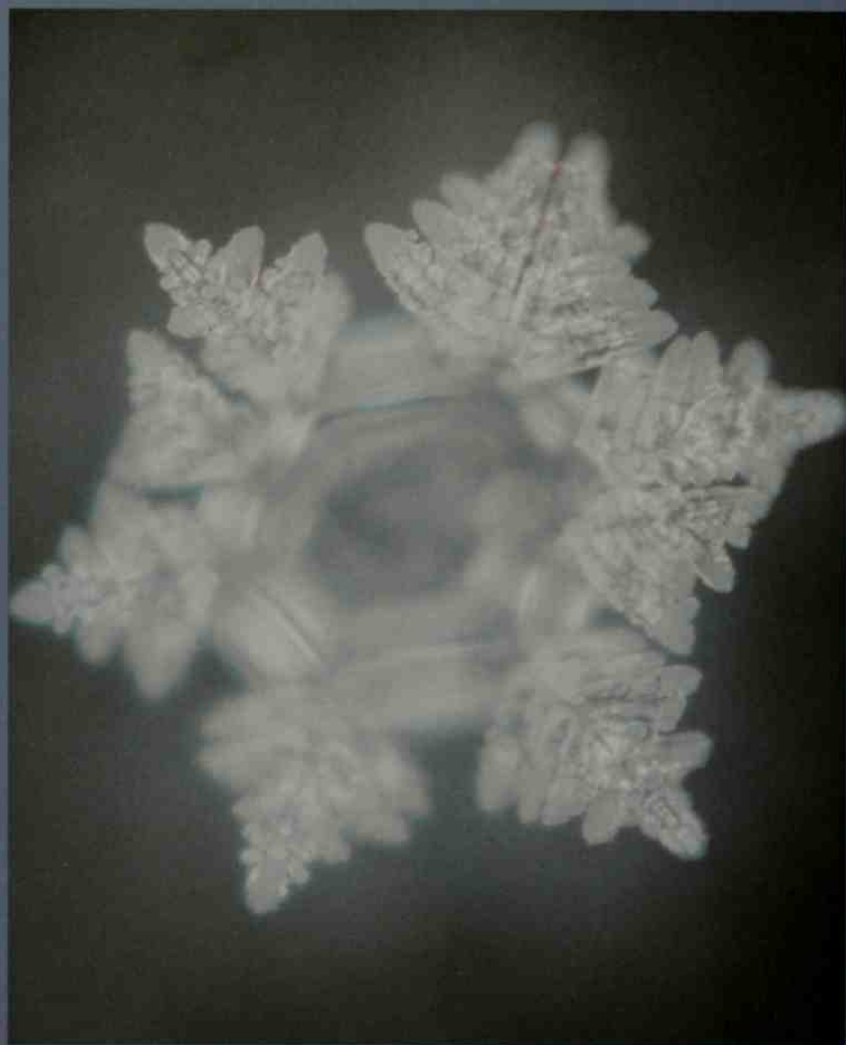
The Beatles: *Yesterday*

The orthodox form was unexpected. Perhaps this is a result of this song being a favorite throughout the world.



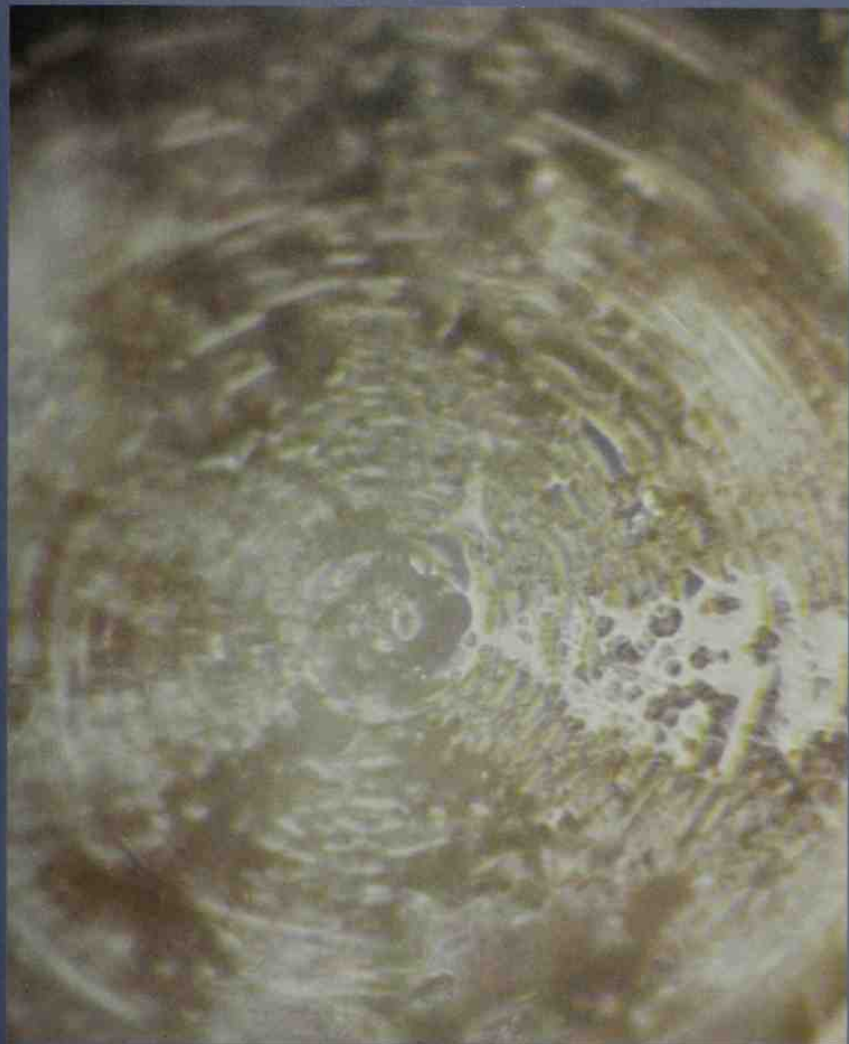
Elvis Presley: *Heartbreak Hotel*

As if to mimic the song, the crystal is divided into two parts.



Bud Powell: *Cleopatra's Dream*

Modern jazz from the 1950s created this beautiful crystal, indicative of the healing qualities of this music, created during a period of turmoil.



Heavy-metal music

This is the result of loud music full of angry and vulgar lyrics. The result is similar to that created by "You fool!" indicating that water responds more to words than to music.



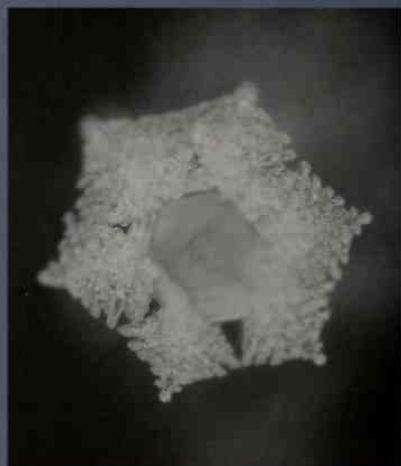
Spring



Autumn



Summer



Winter

Vivaldi: Four Seasons

The four seasons are well represented by these crystals: the blossoming of spring, the flowery summer, the promise of new life in mature fall, and the quiet steadiness of winter.



I found a little autumn (from a Japanese nursery song)



Red dragonfly (from a Japanese nursery song)

The words "I found a little autumn" resulted in a small crystal with grains that look like fallen leaves, and the crystal resulting from "Red dragonfly" could be interpreted as six dragonflies with their petal-like wings spread open.



Blooming tangerine trees on a hill

The color of this crystal changed every ten seconds, showing that water also breathes. Perhaps the changing of the center to red indicates the changing color of the tangerine.

Harmful effects of electromagnetic waves

Samples of distilled water and water shown the words "love and gratitude" were placed next to televisions, computers, and mobile telephones, and heated by microwave ovens.

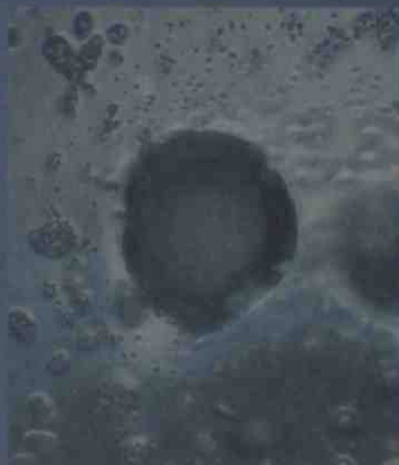


Television

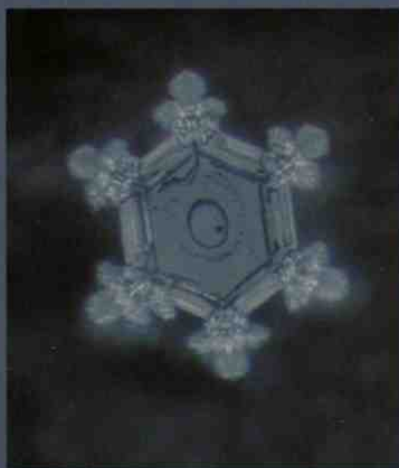


Computer

The water samples shown "love and gratitude" on the left created more complete crystals than the distilled water samples on the right. This would indicate that moderation is needed with televisions and computers.

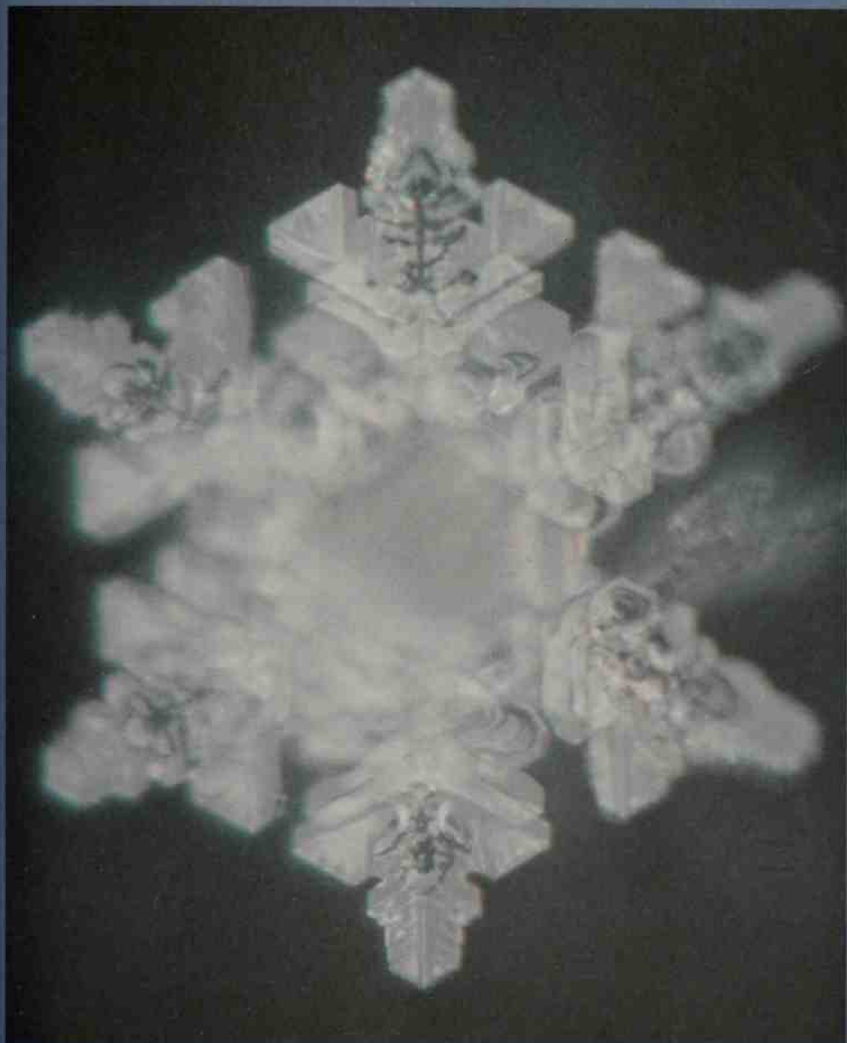


Mobile telephone



Microwave oven

The distilled water heated in the microwave resulted in a crystal similar to that created by the word "Satan," and the water exposed to the mobile telephone can't be much better for your body.



Water shown a wholesome television show

This beautiful crystal is made from water shown a program about the mysteries of life, showing that the danger of electromagnetic waves changes with the content of the information.

Some unusual crystals

On the following pages are photographs of crystals made from lake water that has been prayed over; water shown the name of Amaterasu, the Shinto sun goddess; and water shown images of crop circles, dolphins, and ground water right before and after an earthquake.



Lake water before and after a Buddhist healing prayer

A priest repeated a healing prayer facing the lake. The first crystal before the prayer looks like a distorted face, but the crystal formed after the prayer looks like a light shining from the galaxy.



Water shown the name of the Amaterasu goddess

This crystal looks like a beautiful mirror or perhaps the outline of the sun. In addition to being beautiful, it radiates with grandeur or even holiness.



A crystal shown the photograph of a crop circle



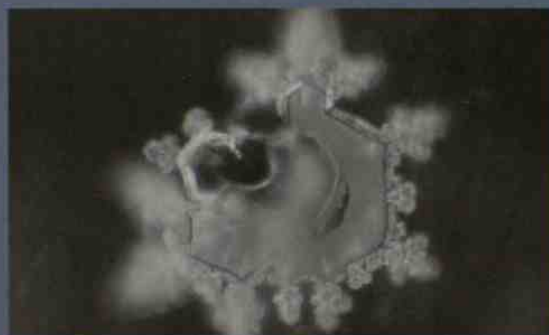
Water from a washbasin at the East entrance
of the Heitate Shrine in Kumamoto prefecture

The crystal shown a crop circle looked like a UFO. The water from Japan's oldest shrine resulted in a crystal that resembles the shape of the character in Japanese that means "gratitude."



Water shown a photograph of a dolphin

Dolphins are said to be as intelligent as or more intelligent than human beings, and are said to have healing powers. This noble crystal seems to radiate with healing.



Ground water right before and after an earthquake in Shimane Prefecture, and later in the same place

Before the earthquake, no crystals were formed, as if the water were predicting the earthquake. As time passed after the earthquake, the ability of the water to form crystals returned.

While some water resulted in crystals of grandeur, as if to symbolize all the beauty of this world, the crystals formed from other water were deformed or nonexistent, as if to tell us something about the dark recesses dormant within the soul.

When I give lectures, I use slides to show my photographs of ice crystals. The reactions to these slides are quite varied. I often hear people gasp in surprise and sometimes even see them shed tears. I have discovered that a single drop of water can have various ripple effects on an individual.

Manuela Kihm, the person who first invited me to give a lecture in Switzerland, expressed her feelings this way when she reacted to the photographs:

We can see the wonder of the water crystal photographs with our own eyes. As a result, our consciousness makes a rapid leap. This awakening of the consciousness happens almost instantly. The fact that things that we have thought and felt can be seen with our eyes accelerates this change.

Another Swiss participant responded,

Through the photographs, I could see that the energy of our consciousness and words can

change things that we can actually see with our eyes. This is the first and only way that this elusive energy can be viewed. We don't believe what we can't see, but the ice crystals show us everything—it's no longer about whether you believe or disbelieve. Using this method, anyone can conduct their own experiment and prove it for themselves.

And a Japanese reader wrote,

Water is not just another substance—it is the life force of majestic nature. It made me once again realize the mysterious ability of water to cleanse and give life to all living. I can see that the soul, feelings, and vibration have an effect on the formation of ice crystals, and through this I can feel the importance of the soul and words. This information is extremely wonderful and uniquely impressive.

It appears that ice crystals are closely and permanently linked to the human soul. When I think about why ice crystals have spoken to so many people, I know that it is because they contain the key to the mysteries of the universe, and this key can unlock the consciousness required to understand the proper order of the universe, and our role in it.

Water is the mirror of the soul. It has many faces, formed by aligning itself with the consciousness of human beings. What gives water its ability to reflect what is in people's souls? In order to answer that question, I would first like to make sure that you understand this fact: Existence is vibration.

The entire universe is in a state of vibration, and each thing generates its own frequency, which is unique. All that I have to say in this book is based on this one fact. My years of research into water have taught me that this is the fundamental principle of the universe.

It can be said in just three words, but for people who have never heard them, these are very difficult words to understand.

You might think, *Existence is vibration? Even this table? This chair? My body? How can everything that can be seen and touched be vibration?* It is indeed difficult to believe that things that you can pick up with your hands and examine—things like wood, rocks, and concrete—are all vibrating.

But now the science of quantum mechanics generally acknowledges that substance is nothing more than vibration. When we separate something into its smallest parts, we always enter a strange world where all that exists is particles and waves.

Let's imagine that you could reduce your body to microscopic size, and that you set off on an exploration

to discover the secrets of this universe called *you*. You would soon see that each thing consists of nothing more than atoms, each atom being a nucleus with electrons rotating around it. The number and shape of these electrons and their orbits give each substance a particular set of vibrational frequencies. You would discover that whatever the substance, nothing is solid. Instead there is only a nucleus surrounded by an endlessly rotating wave.

Everything is eternally moving and vibrating—on and off, at an incredible speed.

According to the *Hanyashingyo*, the Buddhist *Wisdom and Heart Sutra*, "That which can be seen has no form, and that which cannot be seen has form." We can now say that this strange contradiction, spoken ages ago by the Buddha, has been proved true by modern science.

Our eyes can see objects, but they can't see vibration. However, I'd like you to ask yourself if you haven't had an experience similar to the following:

You are talking with someone in a room, and the mood is warm, friendly, and free-flowing. Then another person enters the room. The moment they open the door, you notice a change in the atmosphere, and now instead of warmth filling the room, the space is encased in a dark and cold mood.

You look at the new arrival's face and see a haggard expression and humped-over shoulders, someone who

looks like they are just tired with life. What could be the cause of this pain? Maybe a broken heart, a mistake at work, or just general disgust with life—I'll leave it up to you. What I want you to think about is why the mood in the room changed the moment that the door was opened.

Human beings are also vibrating, and each individual vibrates at a unique frequency. Each one of us has the sensory skills necessary to feel the vibrations of others.

A person experiencing great sadness will emit a sadness frequency, and someone who is always joyful and living life fully will emit a corresponding frequency. A person who loves others will send out a frequency of love, but from a person who acts out evil will come a dark and evil frequency.

This same principle also applies to objects and locations. For example, there are locations where accidents frequently happen, locations where businesses succeed, and locations that create happiness. And you might have heard about a jewel that brings tragedy to successive owners.

This applies not only to physical objects, but the various phenomena that go on in the world also emit characteristic frequencies. A change in the energy of the atmosphere results in lightning and storms. Intense energy will result in natural disasters, but we need to

realize that these are not evil events. If we consider the enormous amount of evil energy being blown away, perhaps we should actually be appreciative of lightning and storms.

For another illustration, think about the fact that people around the world enjoy coming together to celebrate. When people gather, wear special clothes, sing and dance, and are festive, the result is that stagnant and evil vibrations are dissipated and joyous vibrations are created.

All things vibrate, and they vibrate at their own frequencies. When you understand this, you will significantly broaden your understanding of the universe. With this understanding, your eyes will open to things you have never seen before—things previously pushed to the back of your consciousness—and these discoveries and feelings will give new life to your soul.

The fact that everything is in a state of vibration also means that everything is creating sound.

This doesn't mean that we can hear every sound, although there are some people who apparently hear the voices of trees and who can communicate with plants. Whether we can hear the sound or not, we can say that the unique frequency of all objects can be interpreted as sound.

It is said that the human ear is generally capable of hearing frequencies from approximately 15 Hz to

20,000 Hz (Hz, or Hertz, indicates the number of cycles of the repetitive waveform per second). Actually, it's a good thing that our ears have such limits—otherwise we probably wouldn't be able to sleep at night.

The natural world is indeed well designed—everything is in balance. And as sound is created, there is a *master listener* to receive the sound: water.

Let me ask you to think about why crystal formation would be affected by music, and why completely different results would be reached depending on the spoken and written words water was exposed to. The answer is found, again, in the fact that everything is vibration. Water—so sensitive to the unique frequencies being emitted by the world—essentially and efficiently mirrors the outside world.

Music and spoken words are vibration, they are easily understood and interpreted by just about anyone. Sounds like the chant created by a human voice at a Buddhist funeral create a healing frequency.

But how can we interpret the phenomena of crystal formation being affected by words written on paper and shown to water? The written words themselves actually emit a unique vibration that the water is capable of sensing. Water faithfully mirrors all the vibrations created in the world, and changes these vibrations into a form that can be seen with the human eye. When water is shown a written word, it receives it as

vibration, and expresses the message in a specific form. (You might think of letters as being a visual code for expressing words.)

But what, fundamentally, are words? The Old Testament states, "In the beginning there was the Word." This would mean that before the creation of the universe, there existed "the Word." My interpretation of this is that "the Word" created human beings, and human beings then learned *words* from nature.

In primeval times, when people lived within nature, they needed to protect themselves, and so they were sensitive to the frequencies and sounds generated by nature, in order to detect danger before it could sneak up on them.

The sound of the wind blowing, the sound of water flowing, the sound of an animal walking through the grass—the ability to understand these sounds and relay them to others using one's voice was required for survival. It is likely that these attempts at language were simple messages of a few words, but with the development of culture and accumulation of experience, our vocabulary expanded.

Why, then, are the languages that people speak so diverse? This is quite easy to understand if you consider that language is learned from the vibrations of the natural environment. The natural environment varies greatly with location, and each environment will create

different vibrations. The volatile weather climate of Europe and the humid islands of Asia all create different vibrations that flow out of nature. In Japan, there are four distinct seasons, and so the Japanese language reflects this with a beautiful lexicon of weather-related words.

Water exposed to the words "Thank you" formed beautiful geometric crystals, no matter what the language. But water exposed to "You fool" and other degrading words resulted in obviously broken and deformed crystals.

According to the Bible, before the Tower of Babel all people spoke the same language. Perhaps this is telling us that even though location and natural environment differ, the fundamental principles of nature are the same.

We can surmise that when a complete geometric crystal is formed, water is in alignment with nature and the phenomenon we call life. The crystals do not form in water that has been polluted by the results of our failure to remember the laws of nature. When we tried taking photographs of crystals from Tokyo's tap water, the results were pitiful. This is because the water is sanitized with chlorine, thus damaging the innate ability of water to form crystals.

When water freezes, the particles of water link together to form the crystal nucleus, and when the

nucleus grows in a stable way into a hexagonal shape, a visible water crystal appears; but when information in conflict with nature is present, an incomplete crystal will be formed.

The words *gratitude* and *love* form the fundamental principles of the laws of nature and the phenomenon of life. Therefore, water in its natural form is required to create the hexagonal form. By contrast, words such as "You fool" do not exist in nature and are instead unnatural elements created by people. Words that revile, harm, and ridicule are the result of the culture created by humans.

It's likely that only vibrations of love and gratitude appear in nature, and observation of nature shows this to be true. The trees and plants show respect for each other by the way they live in harmony. This also applies to the animal kingdom. Even lions only kill when hungry, and never at random. The plants in the shadows of the trees do not complain, and the animals do not try to take more food than they require.

In an article in the March–April 1989 issue of the American scientific journal *21st Century Science and Technology*, Warren J. Hamerman wrote that the organic matter that forms human beings generates a frequency that can be represented by sound at approximately forty-two octaves above middle C (the note near the center of the piano keyboard). The modern standard

for middle C is approximately 262 Hz, so this means that the sound reaches roughly 570 trillion Hz. Since Hz means vibrations per second, this indicates that human beings vibrate 570 trillion times a second, a number that exceeds the imagination and indicates incredible and wonderful hidden potential.

It is difficult to conceive forty-two octaves, but just realize that the frequency of the human being is immensely diverse and unparalleled. The human being holds a universe within, filled with overlapping frequencies, and the result is a symphony of cosmic proportions.

When I talk to people about vibration and frequency, I use what I like to call the "*Do-re-mi-fa-so-la-ti* theory." This simple theory just means that the frequency of everything in the cosmos can be summarized in seven parts—*do, re, mi, fa, so, la, and ti*.

The universe consists of an uncountable number of things ranging from the lowest to the highest frequency. It might help to imagine keys aligned in order on a piano keyboard, starting from the lowest sound. If you press down on the white keys, you will hit *do, re, mi, fa, so, la, and ti*. When you move up the keyboard one octave, from one *do* to the next, the frequency doubles. In other words, the doubling of frequencies divided into seven parts is *do, re, mi, fa, so, la, and ti*. Therefore, the repeating of these seven sounds expresses all sound from the lowest to the highest.

But what enlightenment can be obtained by seeing frequency as sound?

The most important revelation is that of resonance. Sounds of the same frequency resonate. This can be understood by making use of a tuning fork, a Y-shaped instrument used to tune the pitch of an instrument or voice.

When a tuning fork is hit with a rubber hammer, creating a *la* sound, and a singer responds with a *la*, the tuning fork and the voice create a single frequency sound wave. This is called resonance. When one side creates a frequency and the other responds with the same sound, they resonate. It's said that likes attract, and so it would appear that vibrations attract and interact with each other.

With some careful observation, you'll see that this same phenomenon is going on all around you. A dog walking along the street may not respond to other animals it passes but will be very responsive to a dog on the other side of the street. Dogs will often howl when they hear the sound of a siren, and this could also be a type of resonance.

And we see this in human relationships: people who generate similar frequencies are attracted to each other, resulting in friendship. Certain people remain uninterested in each other, no matter how physically close they may be. However, if someone you don't like

approaches you and you react, this also means that you are resonating in some way with that person.

The greatest secret of Japanese martial arts is referred to as "winning without fighting." This essentially means avoiding resonating with the enemy. To fight and win results in resonance with the enemy, and so the level of the relationship is very low.

When frequencies are fundamentally incompatible, they cannot resonate. We cannot accept what is fundamentally different from us.

However, an interesting fact is that resonance can result even when frequencies are not identical. This happens, for instance, when the frequency is doubled. Playing the *la* key on the piano at 440 Hz and the *la* key an octave lower at 220 Hz creates quite a pleasant resonating sound, and responding to a tuning fork with a sound one octave lower also creates nice resonance.

When the frequency difference is twofold, fourfold, eightfold, and so on—or one-half, one-quarter, and so on—the result is resonance. The principle of this relationship extends to infinity. No matter how distant the frequencies, resonance will result if one of the two numbers is a multiple of the other. We can also say that for every sound on each level there is a resonating sound on every other level.

When you think about it, people are attracted to Christ, Buddha, and others who emit a high level of

vibration, but we also find ourselves attracted to the low-level outlaws of society (such as Bonnie and Clyde). This may seem like an inconsistency, but it can be explained by the fact that people resonate with others on various levels. Perhaps this dichotomy is a natural part of life.

It might help our understanding in this area to consider how to interpret, from a vibration-frequency perspective, the phenomenon of two people falling in love.

Love is one type of resonance. If, for example, you have a frequency-level capability of 10, you will resonate with others on that same level, or perhaps with someone on a level a little higher, say 12.

When people resonate and fall in love, they rise to their highest level of capability. If a person with a capability of 10 who has only been using 5 parts of that capacity falls in love with someone with a level of 12, then he or she will naturally make use of the level-10 capability and show an increase in frequency.

When you are in love, you perform better at work, and the work that you do (and often your environment) may well change without you realizing it. People who continue to do superior work well into old age are almost inevitably in love. Of course, this love is not limited to romantic love. It also can include a loving respect and attraction towards other people. Love has the effect of raising our frequency level and

making us shine. Wouldn't it be wonderful if we could be in love for a lifetime?

Most of the objects found in nature emit stable frequencies. Each sparrow sounds basically the same (though the sparrows themselves might recognize slight differences), and the sounds made by dogs or cats do not have a great deal of variation. By contrast, the human being is able to make full use of the *do, re, mi, fa, so, la, ti* scale to create beautiful melodies. Wouldn't you agree that this is indeed a marvelous ability?

Humans are the only creatures that have the capacity to resonate with all other creatures and objects found in nature. We can speak with all that exists in the universe. We can give out energy and also receive energy in return. However, this ability is a two-edged sword. When people act out only on their own greed, they emit an energy that serves to destroy the harmony within nature.

The defiling of our earth is the result of an unremitting hunger for convenience and the fulfillment of greed, initiated by the industrial revolution. This has led to lifestyles of mass consumption that seriously threaten the global environment.

We have embarked on a new century, a time in history when we must make serious changes in the way that we think. Only the human can resonate with the


rest of the world, and this is why it is so essential that we change our thinking, so we can live in harmony with nature and not go on destroying the earth. What vibration we give to the earth and what kind of planet we create depends on each one of us as individuals.

How will you choose to live your life?

If you fill your heart with love and gratitude, you will find yourself surrounded by so much that you can love and that you can feel grateful for, and you can even get closer to enjoying the life of health and happiness that you seek. But what will happen if you emit signals of hate, dissatisfaction, and sadness? Then you will probably find yourself in a situation that makes you hateful, dissatisfied, and sad.

The life you live and the world you live in are up to you.

CHAPTER TWO



The Portal into a Different World

Now I'd like to ask you to put down this book, pour a glass of water, and place it on the table before you. (Or, if that's not possible, imagine that you have done it.)

What do you see in the glass?

You can see the room that you're in, the scenery from the window, and the overall feeling around you—all recorded by the water.

Water is something so common that we seldom pause to think about it. Although we drink it, wash with it, and cook with it every day of our lives, few people spend much time seriously thinking about water. But there is probably nothing more mysterious.

One of the most mysterious things about water is the simple fact that ice floats in it. When other substances move from the liquid to the solid state, the density of the molecules and atoms that form the solid increases, and the substance becomes relatively heavier. However, water particles align in a very regulated way, with many large spaces between them. When ice returns to water, the particles become hundreds of thousands of times more active. As the particles become more active, the spaces fill in, making the liquid form of water denser and heavier than the solid form.

Water is at its heaviest at 4°C (39°F). This is the temperature at which the active water particles fill the empty spaces of the molecular structure. As the temperature increases, the particles become even more active, which then lowers the density.

For this reason, no matter how cold the temperature is above a lake (or other such body of water), the temperature at the bottom remains stable at 4°C . The result is that the living creatures of the lake are able to survive long winters under the ice.

If water behaved like other substances, and ice sank to the bottom, then what would happen? For one thing, we would probably not be here. Every time the temperature dropped, the bottoms of the lakes and oceans would become solid ice, and all living creatures would die.

Due to the fact that ice floats, even when the surface of water becomes covered in ice, the environment below the ice allows life to go on.

Water also has the unique ability to dissolve other substances and carry them away. Think about how much matter can be dissolved into water, and how difficult it is to return water to its original pure state. At semiconductor plants and chemical factories, special water purifiers are used to secure water that is extremely pure, but as soon as this water is placed in a container made of plastic (or most other substances), impurities begin to dissolve. Maintaining water in a completely pure state is extremely difficult. It will not surprise you to learn that even tap water and water from streams that look perfectly clear contains many impurities and minerals.

This ability of water to dissolve other substances creates a type of "soup of life" that supplies the oceans with the necessary nutrients that enable life. This *soup* became the birthplace of all living creatures on the earth.

Indeed, water is the force that creates and gives life. Without water, particles wouldn't mix together or circulate. Water created chaos on the earth and it also gave birth to order—resulting in a planet overflowing with life.

It is an ancient belief that where there is water there is life. In Japan, a place where water rose up from

the ground was considered to be sacred and to have high energy levels, making it the ideal spot for erecting a shrine. Other spots were also designated as sacred because of the "path of energy" they emitted, and such spots were almost inevitably found to be above underground water.

Water is the mother of life, while also being the energy for life. This is possible because of the unique characteristics of water.

My investigation into the mysteries of water makes me think that water is something not of this earth.

Why do you think there is so much water on the earth? Most explanations say that when the earth was formed some 4.6 billion years ago, water turned to steam, evaporated, and formed rain that fell on the earth, resulting in the creation of the oceans.

But it all started with the birth of the sun. Lumps of gas came together and started rotating, forming a red ball. The remaining dust and gasses came together and formed the earth and the other planets in the solar system. At this time, the earth was still a ball of burning magma that contained hydrogen. As the magma cooled, the hydrogen evaporated into the newly formed atmosphere.

But not all scholars agree with this theory, and some offer radically different alternatives. One such scholar is Louis Frank of the University of Iowa, who

has proposed that water arrived on this planet in the form of lumps of ice from outer space.

Professor Frank began his investigation when he became puzzled by the fact that satellite photographs showed black spots; he reached the conclusion that these black spots were small comets that were falling to earth.

These mini-comets are actually balls of water and ice weighing a hundred tons or more, and falling into the earth's atmosphere at a rate of about twenty per minute (or ten million per year). The theory is that these balls of ice bombarded the earth forty billion years ago, creating the seas and oceans, and this same phenomenon continues today.

As the earth's gravity pulls these ice comets into the atmosphere, the heat of the sun evaporates them and turns them into gas. As they fall fifty-five kilometers from outer space, the gas particles mix with the air in the atmosphere and are blown about, falling to the earth as rain or snow.

A few years ago, an announcement by NASA and the University of Hawaii that Dr. Frank's theory does have credibility was widely publicized by the media, but there are still many scientists who refuse to accept this new way of looking at the world.

If this new approach were to gain widespread credibility, it would require many of the books in the world's

libraries to be rewritten. It would have an impact on almost all of the scientific theories related to life on this planet, such as the origin of man and Darwin's theory of evolution.

It is universally accepted that there can be no life without water, and if we accept that water, the source of all life, was sent from outer space, then logic leads us to the conclusion that all life, include that of human beings, is alien to this planet.

But if we go along with this theory of water being extraterrestrial, then perhaps we can better understand the many unusual characteristics of water.

Why does ice float? Why is water able to dissolve so much? Why is a towel able to soak up water, seemingly in defiance of the laws of gravity? From the standpoint that water is not of this world, these and other mysteries surrounding water may seem a little less difficult to understand.

Water from outer space—it might seem a little too farfetched. But doesn't it also tickle your imagination? After water has completed its long journey through the cosmos, it begins its next phase of travels on our planet.

The lumps of ice arrive on earth, and then they become clouds and eventually fall to the earth as rain or snow. The water then washes the mountains, seeps into the ground becoming rich in minerals, and then

rises to the surface again. From rivers to oceans, the sun evaporates water and returns it to the atmosphere to once again form clouds.

This water, and the minerals that it carries through this cycle, are what make life possible. The carbon dioxide in the atmosphere melts into the oceans and enables photosynthesis, creating a perfectly balanced ecological system.

The ocean is where the first speck of life emerged, some 3.8 billion years ago. The speck evolved into algae capable of photosynthesis, resulting in the first supply of oxygen. This oxygen, interacting with ultraviolet rays from the sun, encased the earth in a protective vale called the ozone layer.

Then, some 420 million years ago, life took its first step out of the water, and freed itself from the depths of the ocean with the help of oxygen and the ozone layer.

The birth of our humanoid parents is believed to have taken place only 20 million years ago in Africa. If we consider the earth's 4.6 billion year history as constituting one "year," the human being was born at eight o'clock in the evening on the final day—all made possible by the formation of oxygen and the ozone layer.

And the force that created life and allowed life to evolve was, of course, water. Water was able to do this because it has the unique ability to dissolve the required

nutrients for life and carry them from the mountains and rivers into the oceans.

So next we ask ourselves if this grand drama of life is just an accident. When we think of the plot that began at a time so distant in the past as to tax our imaginations—the birth of life on this planet, leading to the creation of a perfect system that enabled evolution—we cannot help but feel that a grand intention was somehow involved.

Kazuo Murakami, professor emeritus of Tsukuba University, received global attention for interpreting the oxide DNA code called *renin*. His take on this question is that the more you understand DNA, the more you are forced to admit that some hand played a role in the recording of so much minute and elaborate information in such small spaces. The term he uses to describe this existence is *something great*.

The grand drama of water and life cannot be explained if we exclude the existence of *something great*. Even now the storyboard continues to unfold, in accordance with the scenario written by the grand intentions of the cosmos.

What information did ancient water bring with it when it left outer space and fell to earth? We can assume that it carried the program needed for the development of life. And now I hope you are beginning to get a clearer image of what life is all about.

Water that falls from the sky takes scores or sometimes hundreds of years to seep into the ground and become groundwater. Joan S. Davis of the Zurich Technical University has conducted research into river water for some thirty years in Switzerland, and she refers to it with the expression *wise water*. By contrast, she refers to water that has recently fallen as *juvenile water*.

In the process of falling to the earth, seeping into the ground, and then emerging, water obtains information from various minerals and becomes *wise*.

After thirty years as a professor, Joan has retired from the university, and now conducts her own research. At a symposium in Switzerland, I had the honor of giving a presentation alongside her. The focus of her research is water processing. The current system of supplying water through long pipes results in water that is not extremely healthy for the body. When water is exposed to high pressure and flows straight through pipes, the water clusters break down, letting minerals escape.

And so Joan has focused her attention on finding simple ways to supply healthy water to large numbers of people, including the poor. One of her suggestions is to use crystals: when small ice crystals are introduced into water, the minerals in the water are retained, resulting in water that grows healthier crops. She has also conducted research into improving the quality of

water using magnets, and designing water taps to give circular movement to the water. She wants to know how natural movement can be introduced into the way water is supplied.

Joan has the following to say about her research:

I have heard from many people with interest in your research into ice crystals. I think that this research will give people some important suggestions. One suggestion is to give more respect to water. Another is to become aware that water responds to even delicate energy. I also want to let scientists and officials know that there is almost no protection currently being provided for water.

I feel that my research can be used in the fields of health and medical care. There is not much interest in the importance of the physical characteristics of water. For example, it is said that mineral water is good for you, but there are few people who know that the minerals of mineral water can cause hardening of the arteries. Also, mineral water that is carbonated has a high acidity, making it unhealthy for the body. In any case, we need to avoid water that comes in a bottle and replace it with naturally flowing water. Water wants to be free.

Joan also relayed the following:

The important thing is that we recover our desire to treat water with respect. In our modern culture, we have lost our attitude of respect for water. In ancient Greece, people paid true respect to water, and many Greek myths are based on the protection of water. But then science appeared, and rejected these myths because they were not scientific. Water lost its mystique and became just another substance that technology could clean up as necessary. We sometimes say, "Purified water is not pure." Water processed in treatment plants is not the water that forms beautiful crystals. What water requires is not purification but respect.

These wise words are the result of many years spent observing water. It was extremely encouraging to have such an accomplished scientist express interest in my research into crystals, out of respect for water.

And finally, Joan gave me the following advice:

If you are able to establish the physical foundations for your theories concerning ice crystals, you will be able to make an announcement to the world as very convincing research here,

since Switzerland is highly recognized throughout the world for its research into water.

This was indeed encouraging for me at a time when I was planning to establish a center in Switzerland to promote my research into water.

Water records information, and then while circulating throughout the earth distributes information. This water sent from the universe is full of the information of life, and one way to decipher this information is through the observation of ice crystals.

When I see the many beautiful crystals formed from water, I get the feeling that I'm looking at the materialization of life before my eyes. The crystals that are formed when water is shown positive words are simply beautiful. The response of water to *love* and *gratitude* is nothing less than grandeur. These positive words give spirit to water, which materializes it, to reveal life at its fullest.

I also have the impression that the act of looking at water crystals is an act of creating life. This is because when we look at the crystals, the water changes its appearance moment by moment. Your gaze has a special energy of its own, and while a gaze of good intentions will give courage, an evil gaze will actual take it away.

A family that subscribed to our magazine conducted an interesting experiment. They put rice in two

glass jars, and every day for a month said "Thank you" to one jar and "You fool" to the other, and then they tracked how the rice changed over the period. Even the children, when they got home from school, would speak these words to the jars of rice.

After a month, the rice that was told "Thank you" started to ferment, with a mellow smell like that of malt, while the rice that was exposed to "You fool" rotted and turned black.

I wrote about this experiment in the book that I published, and as a result hundreds of families throughout Japan conducted this same experiment for themselves. Everyone reported the same results. One family tried a variation of the experiment: like the others, they said "Thank you" to the first bottle of rice and "You fool" to the second bottle, and then they prepared a third bottle of rice that they simply ignored.

What do you think happened? The rice that was ignored actually rotted before the rice that was exposed to "You fool." When others tried this same experiment, the results were again the same. It seems that being ridiculed is actually not as damaging as being ignored.

To give your positive or negative attention to something is a way of giving energy. The most damaging form of behavior is withholding your attention.

I think that this experiment has the potential to teach us a very important lesson. We must take care to

give our children our attention, and to talk with them. Speaking words of kindness and love should begin from the time of conception.

Treating your houseplants gently—looking on them kindly, and speaking words of praise—will help to make them healthy and alive. This also applies to pets and even insects.

Through this book, I hope that many more people will gain respect for water and look at water in a kinder way. The result will be that water will produce more beautiful crystals, and in this way we will be participating in the creation of a small but beautiful world.

I have no doubt that God greatly enjoys his work and wants to give us the same ability that he has—the ability of creation. Then he will look down upon us with gentle eyes, as we use our free agency to choose how we will use this ability.

The memory of life arrived on this earth carried by the soul of water. From this memory, life awoke, the human being emerged, and finally you and I were born. And now once again we look at water and breathe life into it. Your consciousness, awareness, and good will, and your smile from a feeling of love, all give new life to water and result in the creation of a new and glorious universe.

CHAPTER THREE



Consciousness Creates All

Since becoming entranced by the wondrous powers of water, I have been blessed with the opportunity to see and conduct experiments on many types of water from around the world. Each sample of water from a different part of the world has its own unique and beautiful characteristics.

I have also seen with my own eyes how the water of the world is becoming polluted. The World Trade Organization has stated that the twentieth century started with wars for oil, but that in the twenty-first century we will see wars for water.

I mentioned that there is no tap water in Japan that is capable of forming complete and whole crystals, due to the use of chlorine. Chlorine, introduced at the beginning of the twentieth century in London, has been used in Japan for more than fifty years now.

In contrast to tap water, the water from springs, the upper reaches of rivers, and other such natural sources creates beautiful crystals. However, most of the water that is now emerging from the ground fell from the clouds more than fifty years ago—about the time that industrialization began in Japan.

Pollution of rainwater has reached a global scale. I tried to take photographs of crystals formed using tap water from a city in Japan which had been polluted with dioxin, but I couldn't get the water to produce even a shadow of a crystal. Industrial waste circulates, polluting water as it goes, and spreading toxins throughout the world.

But there is hope. The people of the city with the dioxin-polluted water have become very interested in protecting their water, and now each year it is becoming easier and easier to form crystals.

Pollution originated within our own consciousness. We started to think that we wanted a bountiful and convenient lifestyle at any cost, and this selfishness led to the pollution of the environment that now affects every corner of the globe.

We have seen through the crystal photographs that water is the mirror of our souls. What do our souls look like—and how should they look? These are questions that can also be answered by water.

In what direction are we headed? What is our role in protecting this planet? Such questions can only be considered when we recognize the greatness of the human being. Perhaps it is time that we stop seeing the human being as the evil agent. I think we underestimate the innate abilities that we each have. We have enormous power.

Scientists estimate that there are between 108 and 111 elements. (I suspect that the number is 108—for reasons which I'll explain.) Thus far, 90 elements have been verified in the human body—of all the creatures alive, only the human body contains so many elements. But I suspect that there are still elements left to be discovered within us (or that we will obtain the remaining elements as we evolve, moving closer to becoming complete human beings).

The more evolved creatures contain a greater array of elements. Compared with human beings, plants contain far fewer elements, and what is the result of having fewer elements? We can deduce that fewer elements means a smaller capacity for emotions. Other animals can feel pain, but it's most likely that only humans (and other animals close in evolution to

humans) are capable of the higher emotions of sadness and passion.

If we consider that the human body is a universe within itself, it is only natural to conclude that we carry within us all the elements. According to Buddhism, the human being is born with 108 earthly desires (such as confusion, attachment, jealousy, and vanity), which torture us throughout our lives. I think it is logical to conclude that these 108 earthly desires have counterparts in the 108 elements.

In fact, the first vibration-detection device that I introduced to Japan went a long way toward proving this. The device was capable of measuring the unique vibrations emitted around us and then transcribing them into water. I was able to measure the vibrations coming from many different people, and I realized that the negative vibrations that we emit correspond to the vibrations emitted by the various elements.

For example, the vibrations created by irritation are equivalent to those of mercury, by anger to those of lead, and by sadness and sorrow to those of aluminum. In the same way, uncertainty is related to cadmium, despair to steel, and stress to zinc.

In recent years, it has been pointed out that the use of aluminum pans and cooking utensils may be a contributing factor in Alzheimer's disease. If this is true, then it is likely that it is because aluminum has the same

vibrational frequency as sadness, and so the sadness and sorrow of old age calls out to aluminum, leading to the onset of Alzheimer's.

Joan Davis, the water scientist in the previous chapter, related the following interesting episode:

A physicist conducted an experiment in which he studied how the positions of the stars affected water. Using water containing various minerals, he tested how easily paper soaked up the water when the stars were in certain positions.

What he found was that when Saturn has a large influence on Earth, lead responded by being soaked up by the paper, while other elements such as copper, silver, and steel showed little or no response.

We can deduce from this that there is a close connection between Saturn and lead. Metals resonate the emotions and moods of people, and so the next logical deduction is that Saturn is closely related to the emotion of anger.

Perhaps the relationship between the constellations and personality talked about by astrologers and others may have something to do with the relationship with metals.

This is a very meaningful theory for me, especially since I have my own ideas about the relationship between the 108 earthly desires and the elements. The number of planets in the solar system is 9, a number that when multiplied by 12 gives us 108. Using the periodic table, we may someday be able to identify which planets correlate to which elements.

Even as I wrote the draft for this book, I saw a television program that said all the elements on earth were created by the high heat of a star exploding in distant outer space. Just one more interesting piece of the puzzle.

Throughout our lives, we will be subject to the 108 earthly desires, but how should we deal with these negative emotions that seem so impossible to avoid? Knowing how to deal with these negative feelings is the same knowledge that we need to get along well in this life. So what should we do if we find our minds full of anger, sadness, envy, or other negative thoughts?

We first need to understand that is not possible or necessary to rid ourselves of our emotions. There isn't anyone who is completely free from negative thoughts. We all carry within us a memory of our ancestors from the distant past, beginning with the awakening of the first human being, and we are all destined to inherit a portion of their negativity.

However, it is indeed painful to be unable to free ourselves from constant negative thoughts and feel-

ings that eat away at our souls. If only for a moment, how can we go about freeing ourselves from all of the negativity?

Based on the principles of vibration, the answer is very clear. All we need to do is emit the emotion that is opposite to the negative emotion. By combining two opposite waves, the negative emotion disappears.

A few years back, a university in Japan developed a method for erasing sound with sound. They would create one noise that would serve to erase the unwanted noise, and thus create a quiet space (for example, around a telephone). By identifying the wavelength of the unwanted noise, the researchers were able to create the exact opposite noise and broadcast it from speakers, completely wiping out the sound in a specific area. This same method has already been used to negate the noise made by automobile engines.

There are parallels to this principle for human emotions. For every negative emotion, there is an exactly opposite positive emotion. The following list contains emotions that create opposing frequencies:

hate	gratitude
anger	kindness
fear	courage
anxiety	peace of mind
pressure	presence of mind

The fact that two opposite emotions issue the same wave is significant for two reasons. First, like Jekyll and Hyde, we all have two faces. You probably are aware that people with short tempers tend to be quick to cry, and that it's not uncommon for someone who everyone sees as being a good person to suddenly commit a crime. We frequently hear about a man who is kind and gentle to his girlfriend, but who becomes threatening and violent as soon as she talks about leaving him.

While there is no one who hasn't an evil bone in their body, there is also no one who is totally evil to the core. The fact that someone harbors opposing emotions simply makes them human.

If you have been made sick by the emotion of hate, then you need to look for healing in the emotion of appreciation.

But even if you know this, it still may be difficult to fill your heart with gratitude if it is already filled with hate for others. At such times, it might be helpful to rely on the services of a healer. Perhaps it is possible that the miracle water of Lourdes in France, which is said to have healing powers, is filled with the feelings of appreciation of the Mother Mary. As a result, people who have been made ill by the vibrations of hate can be miraculously healed by drinking this holy water.

This is the same principle involved in homeopathy. Why, when a poison is diluted in water to the point

where it can no longer be physically detected, does the previously toxic solution then become therapeutic? When the substance itself is gone, and all that is left is the information from the vibration, both poison and medicine become the same.

Logically thinking, medicine is not good for the body. It may alleviate symptoms and get rid of pain, but medicine can also become a powerful poison.

Medicine that gets rid of pain happens to have the opposite vibrational frequency of the targeted pain. By mixing various substances together in a lab, you'll be able to find the frequency that you are looking for. When you inject the substance into a mouse and get the desired effect, you can then try giving the substance to humans.

When the medicine enters the body and stops the pain, the vibrations from the combined substances stop, and the various substances return to their original states, in which they emit their original vibrations. However, if these vibrations happen to damage other cell structures, then harmful side effects will result.

Medicine is useful in the treatment of illness, but we don't really understand why medicine works. When you look at medicine from the standpoint of vibration, you get a totally different picture. For example, during an operation the damaged vibrational frequency is treated with a much more powerful frequency. Let's say

that you fall from a building and hit the ground. At the moment of impact, your body's frequency increases many hundreds of times, creating an obviously critical situation. Dramatic and sudden changes in the body's frequency result in great pain and damage. In such cases, treatment must involve equal or stronger frequencies to be effective—often having to do with the scalpel. Sharp instruments, by nature, have a high frequency, and it's the surgeon's job to use such instruments to cut into the body and return the patient's frequency to normal.

In my opinion, a doctor who treats the human body must first be a philosopher. In the past, the doctor was the community shaman or priest, exhorting people to follow the laws of nature, live their lives correctly, and make use of the healing powers found in nature.

If doctors were to treat not only the sick parts of the body but also the human consciousness, then I think we would see a great reduction in the need for doctors and hospitals. People with ailments would go to their nearby philosopher, for help in understanding the mistakes they have made, and then go home determined to live a better life. It may well be that the physicians of the future will be more like counselors than the doctors we have today.

I have talked with many people about their health problems, and I have come to see that ailments are

largely a result of negative emotions. If you can erase the cause of such emotions, you have an innate capacity to recover from illness. The importance of being positive cannot be underestimated.

Positive thinking will strengthen your immune system and help to set you moving towards recovery—a fact that the medical community is starting to wake up to. For instance, there is a doctor who treats his cancer patients with mountain climbing. Giving people a reason to live boosts their spirits and their immune systems.

There is also an increase in interest in holistic medicine—not only treating the symptoms of the illness, but overseeing the patient's lifestyle and psychological well-being. In fact, doctors have recently formed an organization, called the Japan Holistic Medical Society, to promote this type of medicine in Japan.

The days of believing only that which can be seen by the naked eye have passed, and we are now starting to open our eyes to the importance of the soul. It's a move in the right direction, and I think it will become the way the majority thinks within this century.

The human body is essentially water, and consciousness is the soul. Methods that help water to flow smoothly are superior to all other medical methods available to us. It's all about keeping the soul in an unpolluted state. Can you imagine what it would be

like to have water capable of forming beautiful crystals flowing throughout your entire body? It can happen if you let it.

Among all medicines, there are none with the healing powers of love. Since I came to this realization, I have continued to tell people that *immunity is love*. What could be more effective at overcome negative powers and returning vitality to the body?

However, I have recently felt the need to change my terminology. I now know that it is not love alone that forms immunity, but love and gratitude. I became convinced of this from the following experiment.

I heated water in a microwave oven and then attempted to see the impact of the magnetic field on crystals. I used two types of water: distilled water, and water from the tap shown the words *love* and *gratitude*. The crystals formed from the distilled water were deformed and incomplete, but the water shown the words *love* and *gratitude* formed complete crystals. In other words, *love* and *gratitude* were able to make the water immune to the damaging effects of the magnetic field.

I have mentioned that water shown the words *love* and *gratitude* forms the most beautiful crystals. Of course the word *love* alone has the ability to create wonderful crystals, but *love* and *gratitude* combine to give the crystals a unique depth and refinement, a diamond-like brilliance.

I also discovered that the *love* and *gratitude* crystals actually look more like the *gratitude* crystals than the *love* crystals. What this indicates is that the *gratitude* vibration is more powerful and has a greater influence. Love tends to be a more active energy, the act of giving oneself unconditionally. By contrast, gratitude is a more passive energy, a feeling that results from having been given something—knowing that you have been given the gift of life and reaching out to receive it joyously with both hands.

The relationship between love and gratitude may be similar to the relationship between sun and shade. If love is the sun, gratitude is the moon. If love is man, gratitude is woman.

So then what does it mean to say that the passive energy of the shade or gratitude is stronger than love? When I was thinking about this question, I stumbled upon an interesting concept, which became an important clue to answering the question concerning how we can and should live our lives.

What is the relationship between love and gratitude? For an answer to this question, we can use water as a model. A water molecule consists of two hydrogen atoms and one oxygen atom, represented by H_2O . If love and gratitude, like oxygen and hydrogen, were linked together in a ratio of 1 to 2, gratitude would be twice as large as love.

I suggest that having twice the amount of gratitude as love is the balance we should strive for. At a seminar, after I had mentioned this in my presentation, two young women came up to me and said, "We were very impressed. Weren't you saying that people have one mouth for speaking and two ears for listening?"

"That's right—that's absolutely right!" I exclaimed, and I knew that I had become a little wiser.

When we observe the natural world, we can see that the passive energy has greater strength. The fish of the sea produce enormous numbers of eggs, but not all of them hatch. Only a small portion reach the stage where they hatch, while the remaining eggs are offered as food to other creatures.

Have human beings lived in a ratio of two parts gratitude and one part love? I suspect that the exact opposite is true.

Of course, the grandeur of love cannot be denied, and most people do have a general understanding of the power of love. However, we have been raised in a culture where all our focus is placed on the energy of love, while the other side of the formula receives little attention.

The focus of the human race has been drawn away from that which cannot be seen, and towards the obvious physical world. And in order to make as much of this physical world our own as possible, we have cut

down forests and fought back deserts in an effort to insure the supreme domination of our culture.

Such advancements by human society may indeed be the result of love—for our families and our countries—but as long as we continue to live our lives based on this strategy, there will be no end to conflict. The history of the twentieth century was the history of fighting and warfare.


Perhaps we are finally beginning to see that the direction we are moving in leads nowhere. We have sacrificed too much in order to secure the riches of life. Forests have been destroyed and clean water lost, and we have cut up and sold the earth itself.

What the world needs now is gratitude. We must begin by learning what it means to have enough. We need to feel gratitude for having been born on a planet so rich in nature, and gratitude for the water that makes our life possible. Do we really know how wonderful it is to be able to breathe a big breath of clean air?

If you open your eyes, you will see that the world is full of so much that deserves your gratitude.

When you have become the embodiment of gratitude, think about how pure the water that fills your body will be. When this happens, you yourself will be a beautiful, shining crystal of light.

CHAPTER FOUR



The World Will Change in but a Moment

Do you know where you can obtain really good water?

Perhaps at the foot of the Swiss Alps, or maybe at the North or South pole? It's not hard nowadays to find bottled water claiming to be the best in the world, but can good water really be purchased?

Water is not simply about H₂O. No matter how natural or pure the water you drink, without a pure soul, it will not taste good.

Let me ask you: How clear is your soul? Are you weighed down by trouble at work? What about family problems? Is your consciousness troubled? If it is,

then you may find that the water you drink tastes plain and dull.

After you've enjoyed participating in a sport or other exercise, water—even just tap water—tastes delicious and refreshing. In other words, it's what's inside you that counts the most.

I know it sounds like I'm saying that it's all in your mind, but what I'm actually trying to say is that when you drink water with a feeling of gratitude the water itself is physically different than when you drink the same water with clouded feelings in your soul.

Our emotions and feelings have an effect on the world moment by moment. If you send out words and images of creativity, then you will be contributing to the creation of a beautiful world. However, emitting messages of destruction, you contribute to the destruction of the universe.

If you become aware of this, you will no longer be able to speak words of anger to those around you, or blame others for your own mistakes and weaknesses. You have the capacity to change the world within a moment. All you must do is make a simple choice. *Are you going to choose a world of love and gratitude, or a tortured world filled with discontent and impoverishment?* The answer will depend on your attitude at this very moment.

According to the teachings of Buddhism, everything in the world is constantly changing, and nothing

ever changes. Speaking from the principles of vibration, the energy of vibration must go on forever in continuous motion.

Understanding that everything exists in this one moment will give hope and light to your life. You no longer need to be troubled by the past, and can know that the future can be anything that you *will* it to be. You, as you are, in this very moment hold the key to everything.

If you want to see how much of an impact your consciousness can have on the world, I suggest that you conduct a little experiment by playing a game we'll call "cloud erasing." I want you to try to erase clouds using the power of your thoughts.

On a partially clear day, look up in the sky and target just one cloud, maybe one not too large. Your thoughts are very important in playing this game, and so it's important to believe that the cloud will disappear, but you shouldn't try too hard. Focusing too hard will actually have the effect of preventing your energy from being sent out.

When you are ready, imagine an invisible beam of energy being sent from your consciousness towards the cloud, breaking it into pieces. See in your mind how the laser-beam targets the entire cloud and not just one part.

Then say, in the past tense, "The cloud has disappeared"; at the same time, say to the energy (again in

the past tense), "Thank you for doing that." If you follow these steps, I'm sure that the cloud will start to thin out and disappear in a matter of minutes.

As this shows, human consciousness can have an enormous impact on the world around us. Clouds consist of water in the gaseous state, and so it responds especially quickly to our will.

Traditionally speaking, anyone who says that consciousness has an effect on the physical world risks certain ostracization for being unscientific. However, science has progressed to a point where the failure to understand consciousness and the mind limits our understanding of much of the world around us.

Quantum mechanics, certain psychological theories (such as the flow talked about by Jung), and genetic engineering have all taught us that there is a world other than the one we know so well. You can't see this other world with your eyes, and you can't touch it with your fingers. It's a world in which time itself does not exist.

The famous quantum theorist David Bohm has called the world available to our senses the "explicate order," and the existence within, the "implicate order." He envisions that everything that exists in the explicate order has been enfolded in the implicate order, and each part of the explicate order includes all the information of the implicate order.

This may be difficult to understand, but what he is saying is that every part of the universe contains the information of *all* the parts of the universe. In other words, within an individual—and even within a single cell—exists all the information of the universe.

The information of the universe includes *time*. In other words, the fact that you exist in the here-and-now is included in the information of the universe, along with all present, past, and future information. So the changing of the entire world in a moment isn't just a fantasy.

But let's think about *this* moment for a moment. How can we interpret it using physical science? David Bohm explained that an aspect of the universe within is projected into each moment in time, creating the present. The next moment in time is also a projection of a different aspect, and so on. In other words, with each moment, a different world is being shown to us. However, one momentary world will have an impact on the next momentary world, and so it appears to us as one continuous world.

Based on this theory, the world is changing every moment, and being created anew. Our consciousness has a role to play in this creation of the world. If you become aware of this, I suspect that your life will never be the same.

I've talked about some complicated things, and may have caused some confusion. But if we reconsider

crystals, it will help to answer many questions. This world is changing moment by moment, and water is the first to recognize the change.

I mentioned that I made a device for measuring vibration, and used it to better understand water. On the afternoon of the invasion of Iraq at the onset of the first Gulf War, I measured the vibration of the tap water in Tokyo, and found an unusually sharp increase in the values of vibrations produced by mercury, lead, aluminum, and other substances harmful to the human body. There seemed to be no apparent explanation for this; at first I suspected that there was something wrong with my equipment, but repeated measurements indicated otherwise. It wasn't until the following day, when I read the newspaper, that I made the connection. News of the start of the Gulf War covered the front page. It's been said that the weight of the bombs dropped on this first day of war was equivalent to all the bombs dropped throughout the Vietnam War.

In Japan, thousands of miles from the Middle East, I was able to measure the vibrations from harmful substances at almost the exact time that war broke out. You might ask, *Is this really possible?*

Of course, the harmful by-products of the bombs in the Middle East weren't immediately transported to Japan. However, the harmful vibrations of the bombs being dropped on one side of the earth did reach the

corners of the earth immediately. These vibrations spread out beyond the limits of time and space.

I suspect that vibrations exist not in our three-dimensional world, and not in the unseen world of a different dimension, but in a middle world. When something occurs on the earth, in no matter what world, water is the first to detect it and relay this new information to us.

At the time of the Gulf War, I hadn't yet started taking photographs of crystals, but if I had taken photographs, I'm sure they would have been very interesting.

Let me give you one more example in which vibrations had an immediate impact on the physical world. In this case, the power of prayer was used to purify water.

At Fujiwara Dam in central Japan, we had a Shinto priest of the Shingon Sect named Houki Kato repeat an incantation. When I first met him, he showed me two photographs that made a lasting impression, and so I wanted to see for myself what was recorded in the photographs. One of the photographs had been taken before an incantation, and the other after; the second photograph showed a remarkable difference—the water was considerably clearer.

The power of the incantation had come from the *spirit of words*, and so it is possible that the energy from the *spirit of words* had purified the water in the lake. In

order to verify this, I wanted to take photographs of crystals formed from water before and after such an incantation.

The priest stood on the edge of the lake and performed the incantation for about an hour, all of which I videotaped. After the incantation, the priest and I conversed; within fifteen minutes, my crew called me over.

"This is incredible! The water is getting clearer right in front of our eyes," someone said. And it was absolutely true. You could clearly see that the water was becoming more and more transparent as we looked at it. We were even able to make out the foliage at the bottom of the lake, which had been hidden by the cloudy water.

We next took photographs of crystals. The crystals made with water from before the incantation were distorted, and looked like the face of someone in great pain. But the crystals from water taken after the incantation were complete and grand. Within one hexagonal shape there was a smaller hexagonal shape, all enclosed by a halo-like pattern of light.

Of course, it did take some time after the incantation for the water to become clear, indicating that changes in substances that can be seen with the naked eye are somewhat gradual. But there is no doubt that the vibrations of prayer are relayed to nearby objects in an immediate way, affecting the nearby water. This was

a physical phenomenon that can't be explained unless we accept that another world exists within the one we call our own.

But the story doesn't end there. A few days after this experiment, an incident was reported in the press. The body of a woman was found in the lake, and when I heard about this I remembered the crystals created from the water before the prayer, and remembered how the crystals had looked like a face in agony.

Perhaps through the crystals, the spirit of this woman was trying to tell us something. I would like to think that her suffering was alleviated in part by the incantation.

There is another world in addition to the one that we live in. When looking at our world from that world, we can see things that we cannot see now.

Dr. Rupert Sheldrake of England is a researcher who focuses on furthering the understanding of a new worldview, in association with this world that we cannot see. After receiving a doctorate in biochemistry from Cambridge University, he served as a lecturer in biochemistry and biology at Cambridge, while also serving as a Fellow of the Royal Society.

Dr. Sheldrake's theory is outlined in a book that he wrote more than twenty years ago, but the scientific journal *Nature* dismissed the book by saying that it should be burned. Despite this rejection, his theory

reached the hearts of many, and research into his theory continues. What was it that drew so much attention?

It's often said that if something happens twice it will happen again. Perhaps you have found it strange that accidents and crimes tend to happen in series. Looking at history and social trends, you can see that over long periods of time, events do generally repeat themselves. How can we explain this strange repetition of events? Dr. Sheldrake attempted to use scientific means to find an answer.

Scientists normally approach objects that they can't see with their eyes by using reductionism to isolate a physical phenomenon. However, Dr. Sheldrake took an entirely different approach.

According to his theory, when the same thing repeats itself, a *morphic field* is formed, and resonance with this morphic field increases the likelihood that the event will happen again. A morphic field is not energy-based information, but more like a blueprint for building a house.

We can see this as an example of resonance theory. Dr. Sheldrake has proposed that events are also capable of resonating in the same way that sound resonates. He refers to the location where such events take place as the morphic field, and the phenomena of repeated similar events as *morphic resonance*.

Although his theory was quickly dismissed by *Nature*, the announcement of his theory was taken seriously by the more open-minded, resulting in serious discussion. There is no doubt that Dr. Sheldrake has departed from the existing paths laid out by science, but you have to admit that his theory goes a long way toward explaining mysteries that traditional science has been unable to deal with.

During typical discussions of such mysteries, the talk often turns to glycerin crystals. For the first forty or so years after glycerin was discovered, it was generally accepted that it didn't form crystals. Then one day at the beginning of the nineteenth century, a drum of glycerin en route from Vienna to London suddenly started to crystallize.

A short time later, in a completely different location, another batch of glycerin also crystallized. This crystallization began to spread, and now it is generally accepted that glycerin forms crystals when temperatures drop below 17°C (63°F).

So what should we make of this?

When the crystals first formed (for whatever reason), a morphic field was created, and eventually all glycerin, in compliance with the morphic field, started to form crystals. This type of phenomenon has occurred in many other substances as well. Despite all the randomness in the world, once a substance begins

to form crystals, then it often becomes common for it to form crystals thereafter.

Not too many years ago, a television station in England decided to conduct a public experiment to see if they could test the validity of Dr. Sheldrake's theory of morphic resonance. They first prepared two paintings: both looked like random patterns, but within one was hidden the figure of a woman wearing a hat, and within the other a man with a mustache. The figures were designed such that it was impossible to see them.

The experiment took place in three steps. First, before the live program, a group of participants were asked to identify what they saw in the paintings. Second, during the program, the secret of the painting of the man with the mustache was revealed. Third, after the program, another group of participants, who weren't allowed to watch the program, were likewise asked to identify the paintings.

What do you think the results were? The second group did a far better job than the first in identifying the man with a mustache. The experimenters did their best to account for all possible factors, such as removing the data from viewers in countries other than England and Ireland, but the results still showed that the second did three times better than the first.

This experiment tells us that when someone becomes aware of something, other people also tend to

become aware. It was the effect of the morphic field that led to the remarkable increase in correct responses.

According to Dr. Shel Drake, DNA isn't the only reason that people in the same family share similar features—morphic resonance also plays a part. Dr. Shel Drake's theory also helps us to understand so-called coincidences (referred to as "synchronicity"), and the phenomena of group consciousness (collective memory) and archetypal patterns.

The important thing about Dr. Shel Drake's theory is that once the morphic resonance has spread, it extends to all space and all time. In other words, if a morphic field is formed, it will have an instantaneous impact on all other locations, resulting in an instantaneous worldwide change.

When I first heard about Dr. Shel Drake's theory, I couldn't contain my interest, because my research into water crystals was nothing less than an attempt to express the resonance of the morphic field in a way that can be seen with the naked eye.

When I first attempted to take photographs of crystals, I had no success at all for the first two months, but once I was able to capture the first photograph, other researchers also started to succeed. Perhaps this is also a result of morphic resonance.

I first learned about Dr. Shel Drake's work from a bestselling book in Japan, called *Why Does That Occur?*

by Eiichi Hojiri, but I became truly interested when I saw Shel Drake in a television documentary called *Six Scientists of Interest*. Four years later, as luck would have it, I had the opportunity to meet Dr. Shel Drake during a lecture tour of Europe. A friend who attended the seminar happened to know Shel Drake's wife, and so I found myself invited to their home in London.

I was pleased to learn that he already knew about my research into water crystals; he said, "At least once every week I get a letter from someone telling me about you." I had many questions for Dr. Shel Drake, but he was also extremely interested in my work, and as it turned out he had as many or more questions for me.

He also shared the following with me:

I have conducted research into living organisms and their behavior but not water; and so I'm not that familiar with water. However, it's likely that in the future there will be connections between my research and your research into water crystals.

The area that I'm most interested in is the effect that observation has on the observed. There are people who know when someone is looking at them from behind. I want to do research to try and express this in a statistical way.

There's a risk that the documentation on this research will be subjective, so I'm wondering if we can't use water in the experiment. I'm going to try to take photographs of crystals and see how water changes under various conditions, such as when the water is ignored, and when it is observed by people with special talents, normal people, and then extremely evil people.

This sounded remarkably similar to the experiment in which the rice in the ignored bottle rotted faster than the rice in the bottles exposed to "Thank you" and "You fool." When I told him about this experiment, he became even more interested, and he suggested that if I tested the effect of just looking at water, it would be easier to get results than using rice (which involves the complicated growth process of microbes).

Dr. Shel Drake currently has a strong interest in the phenomena of telepathy. He conducted an experiment to find out if dogs showed a response when their masters started to head home. Using video equipment to make observations, he has been able to verify this phenomenon in more than two hundred cases.

I would like to pass on to you a message that I received from Dr. Shel Drake:

Our lives are made possible by the movement of an unseen energy. Therefore, I would hope that we'll always be aware of this and pay attention to those around us and the things going on around us. This is something that is very important. This is because the act of looking at something has an effect on it. Everyone seems to be aware of this, but we don't put it into practice. In the home, parents need to pay attention to their children. It's the same thing.

Focusing your attention—on anything—serves as an expression of love. Dr. Shel Drake is on the leading edge of this study of the impact of consciousness on objects, and so his words come with special significance.

If we combine the lessons that water teaches us with the theories proposed by Dr. Shel Drake, we go a long way toward unlocking the many mysteries of our world. Each one of us has a magical ability to change the world. We have all been granted the power of creation by God. If we use this power to the maximum, we will be able to change the world in but a moment.

For people who see no end to their worries and suffering, this perspective should come as considerable comfort. You—yes *you*—have the ability to change the world!

Everything in the world is linked. Whatever you are doing now is being done by someone else at the same time. So what type of morphic field should we be interested in creating? Are we creating fields of pain and viciousness, or are we creating a world filled with love and gratitude?

Whenever you sit in front of water and send out messages of love and gratitude, somewhere in the world, someone is being filled with love and gratitude. You don't need to go anywhere. The water right in front of you is linked to the all the water in the world. The water you're looking at will resonate with water everywhere, and your message of love will reach the souls of all the people of the world.

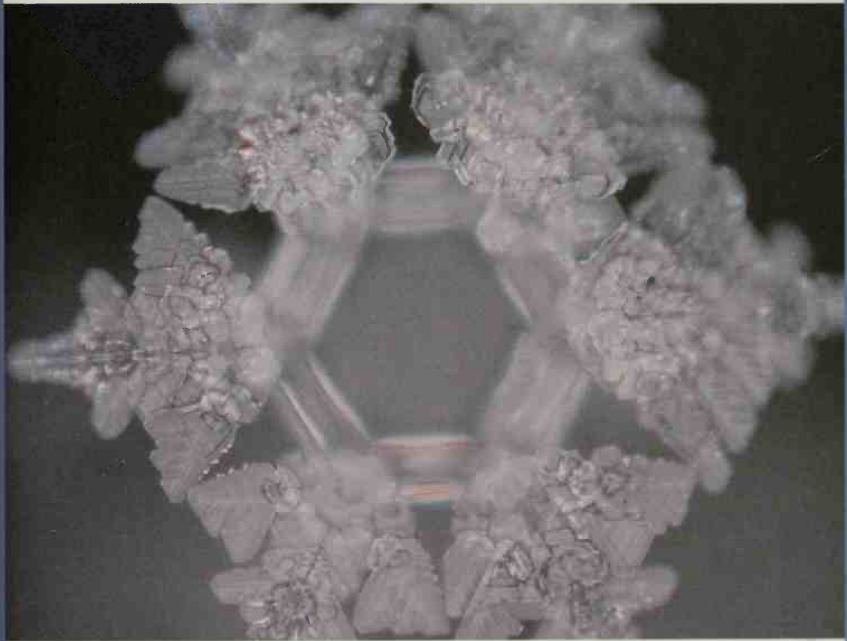
We can cover the world in love and gratitude. This will become a glorious morphic field that will change the world. It's not about time and space; now, here, wonderful and marvelous things are possible.

Note: The following color photographs on pages 101 to 132 are referred to in chapter 5, page 133.

Faint, illegible text, likely bleed-through from the reverse side of the page.

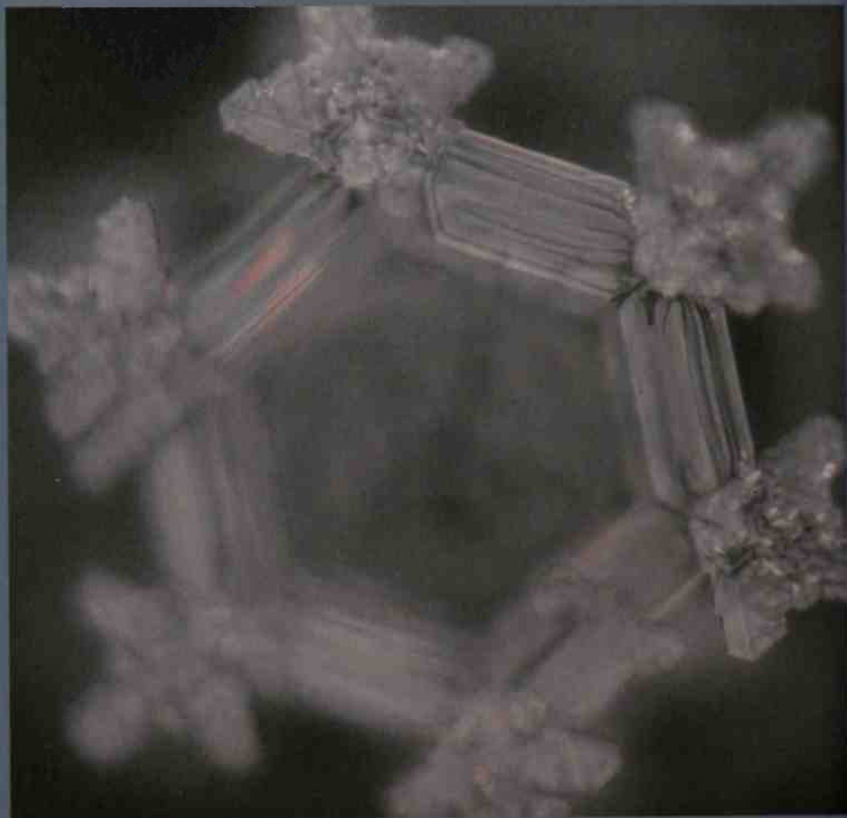
Water shown photographs of natural scenery

We placed a jar of water on photographs of beautiful scenery, then photographed the crystals that formed. We see here how water responded to the photographs.



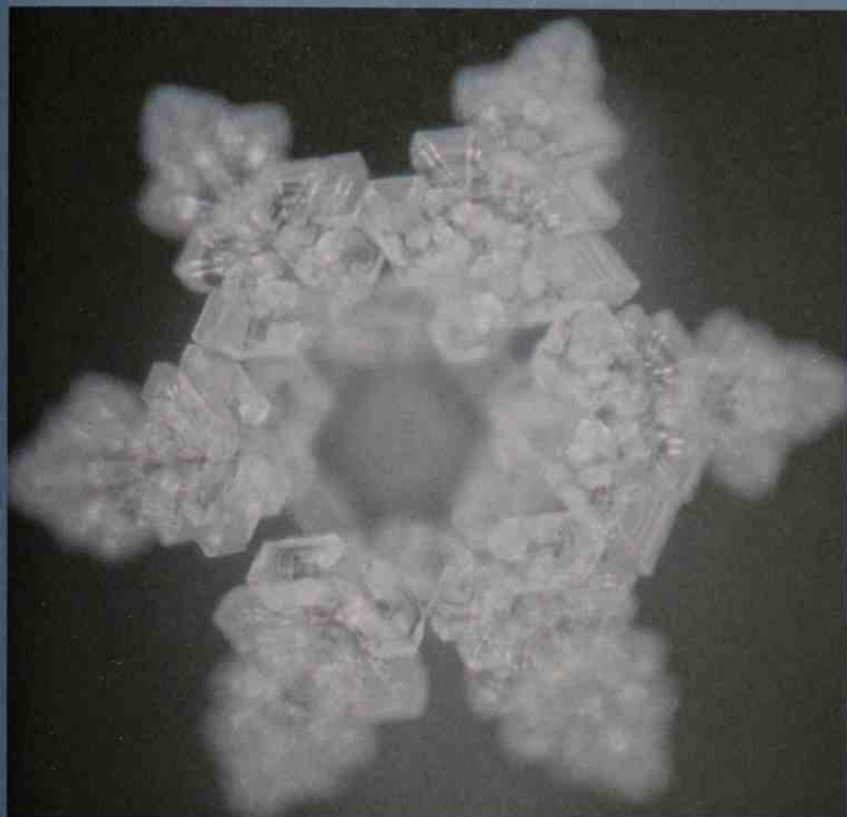
Sun

The crystal, resulting from exposure to the photograph of the sun, is large and beautiful, not unlike the sun itself.



Mt. Fuji

The symbolic mountain of Japan. Perhaps incidentally, the crystal looks as though it were being enveloped by the first rays of morning.



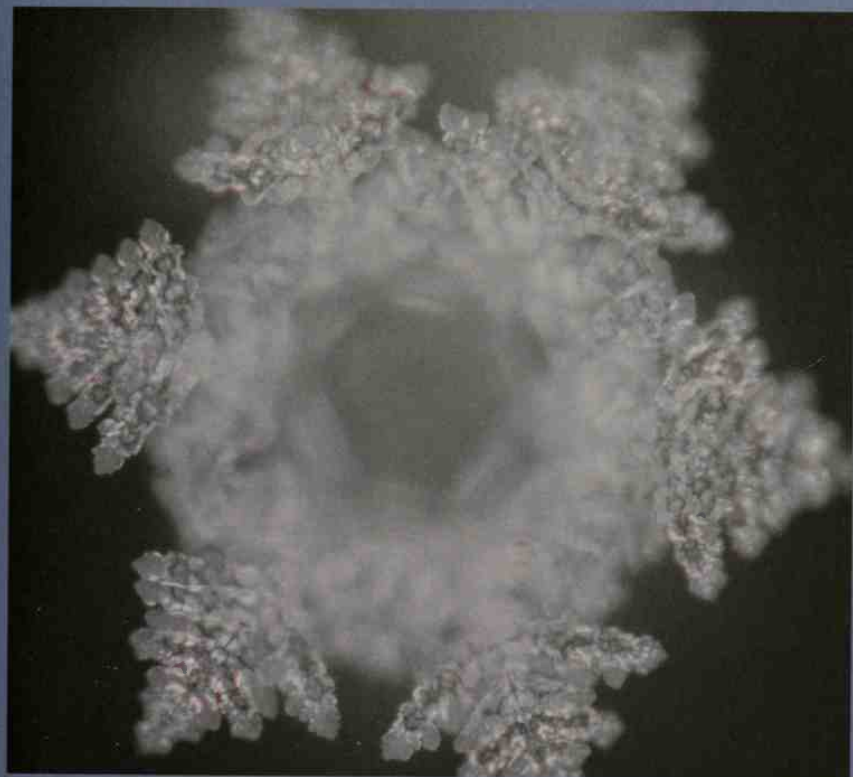
Rocky Mountains

The tips of the Rocky Mountains, the backbone of North America, are covered in glaciers. The crystal also looks like it is encased in snow.



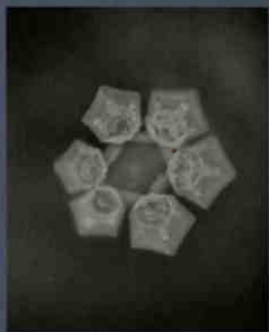
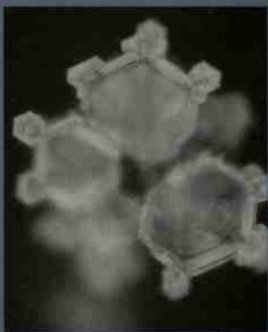
Victoria Falls

An enormous waterfall in Zimbabwe. As if to represent the plunging water, the crystal is formed of broad columns.



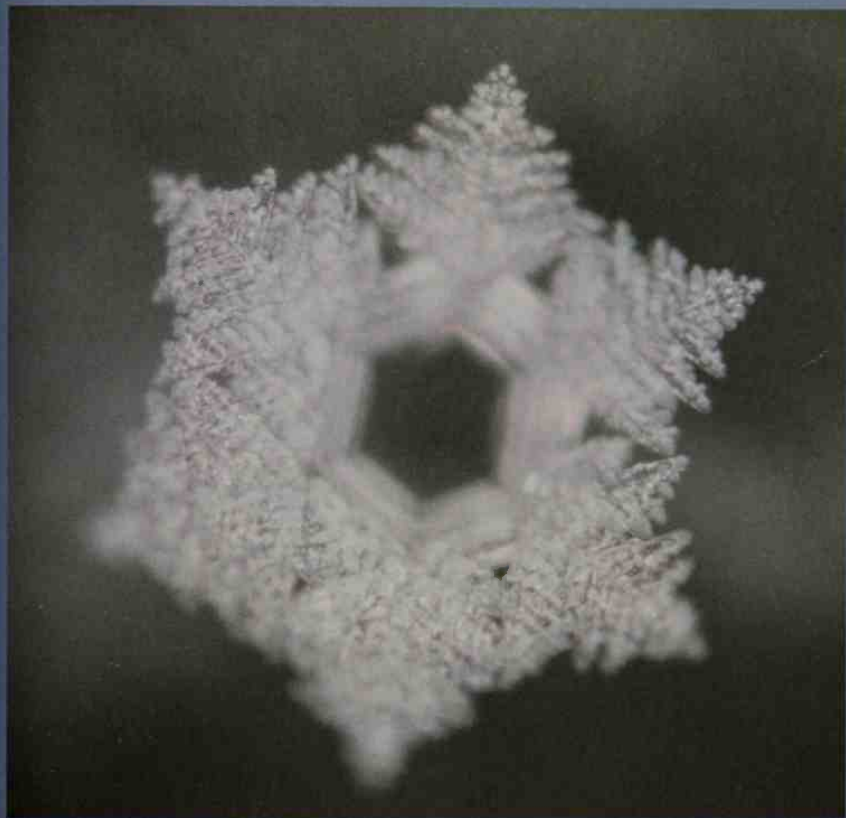
Stonehenge

Stonehenge, the giant stone structure in England, is built on a site of high energy, and the crystal also appears full of energy.



Coral reef

All three of the crystals are unique, but formed of smaller detailed crystals. Their form and color does seem somewhat similar to the beautiful and life-filled corals of the ocean.



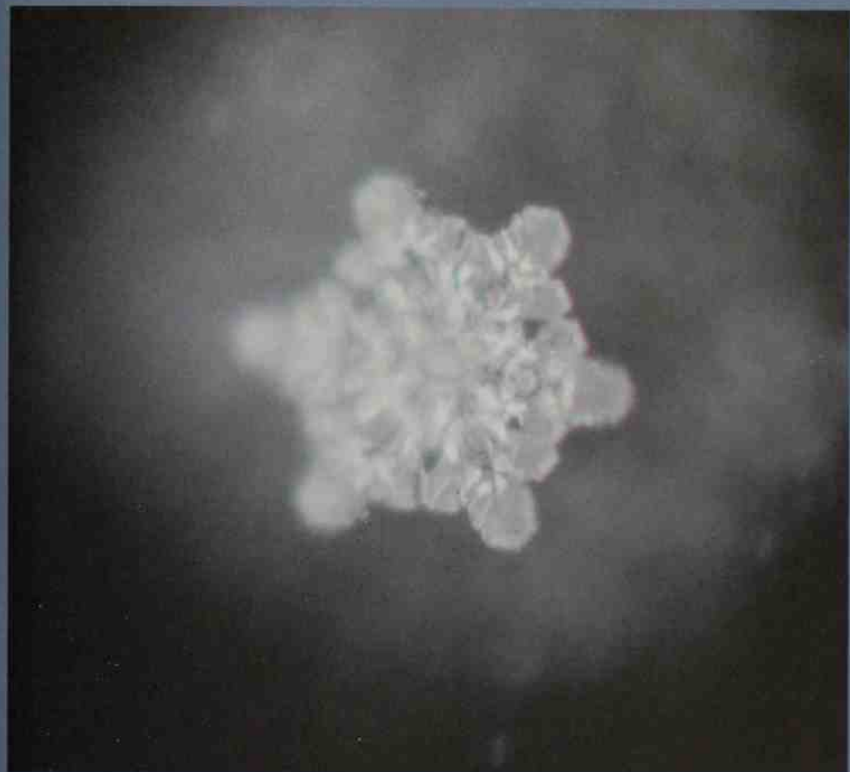
African savanna

The crystals seem to represent the finite and nurturing foliage of the savanna.



Rainforest, Southeast Asia

This rainforest, overflowing with life, protects an ecological system dating back millions of years. The crystal appears to be formed by a steady and finite balance.



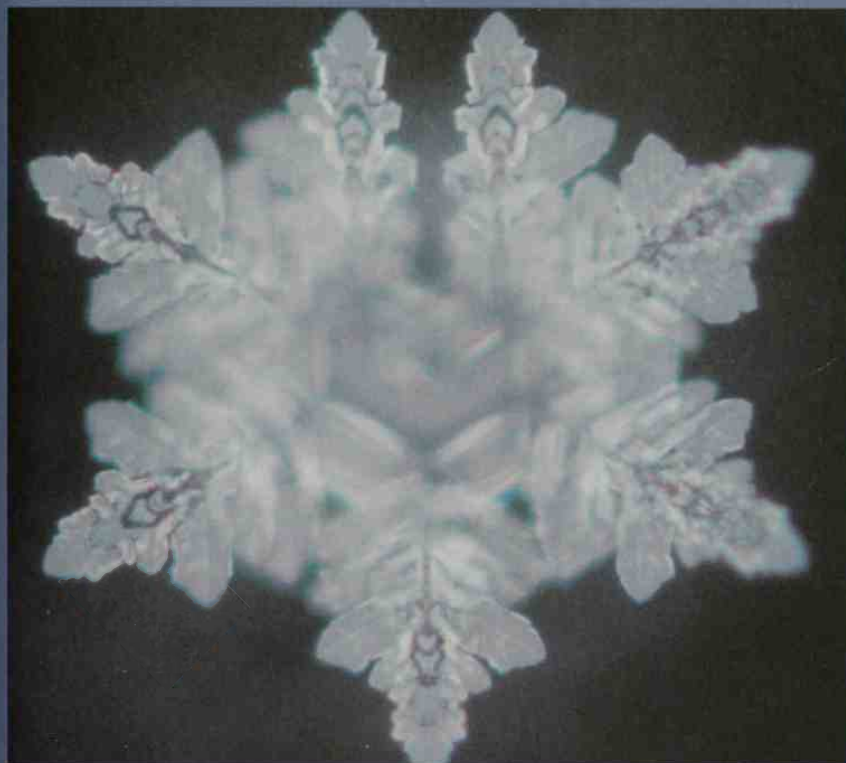
Machu Picchu, Peru

Small yet beautiful like a diamond, the crystal reminds us of the glory of the Inca Empire.



A pool in Yellowstone

This is a beautiful, clear-blue pool in Yellowstone National Park. The crystal is indicative of the stunning color of a fine jewel.

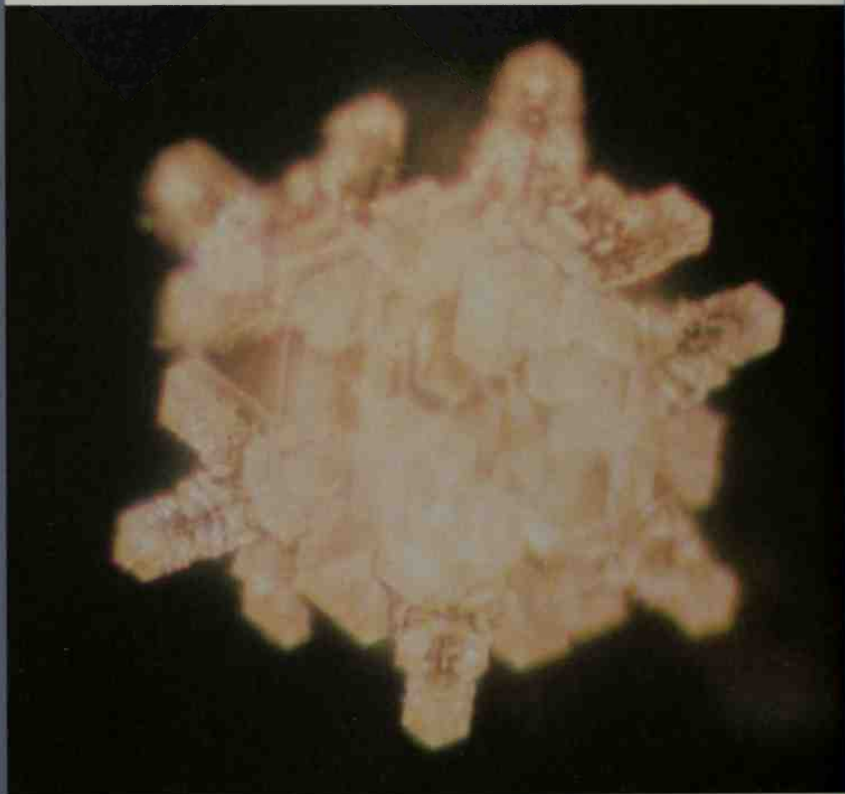


Heitate Shrine

The oldest in Japan, the Heitate Shrine was mostly unknown until a few years ago when this area was identified as the location of mythological stone gates. The crystals look like two gates being opened.

Water exposed to music of the world

The music from the various cultures of the world has similarly various rhythms and melodies. Water captures these characteristics and reveals them to us through crystals.

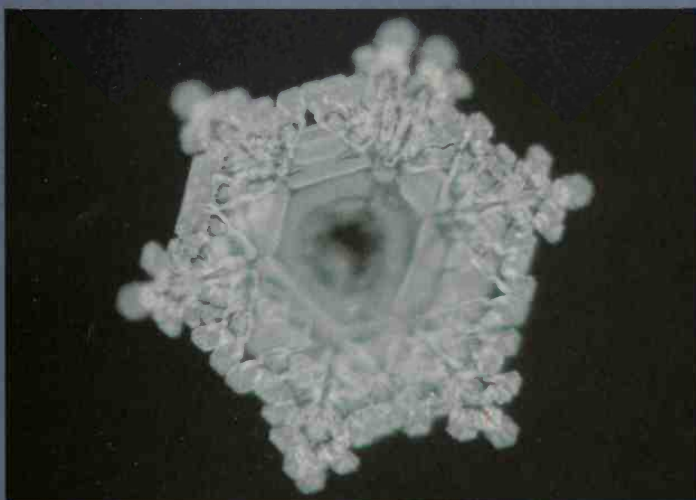


Tibetan Buddhist chant

The detailed interlocking crystal indicates strength, somewhat like the temples of Tibet.

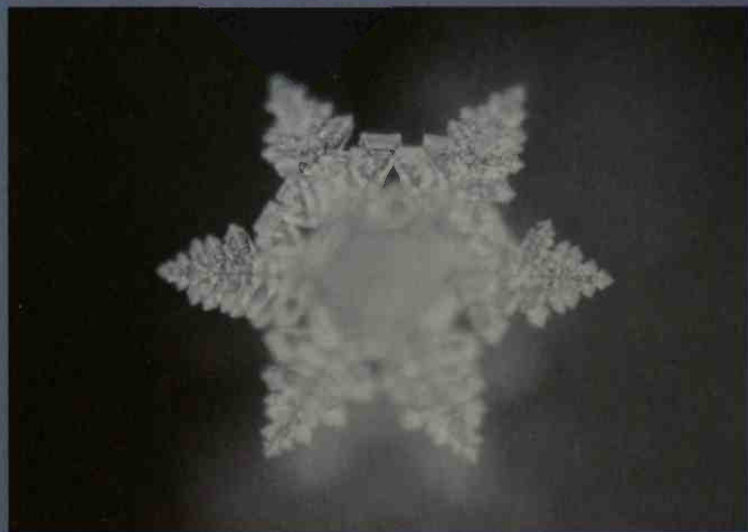
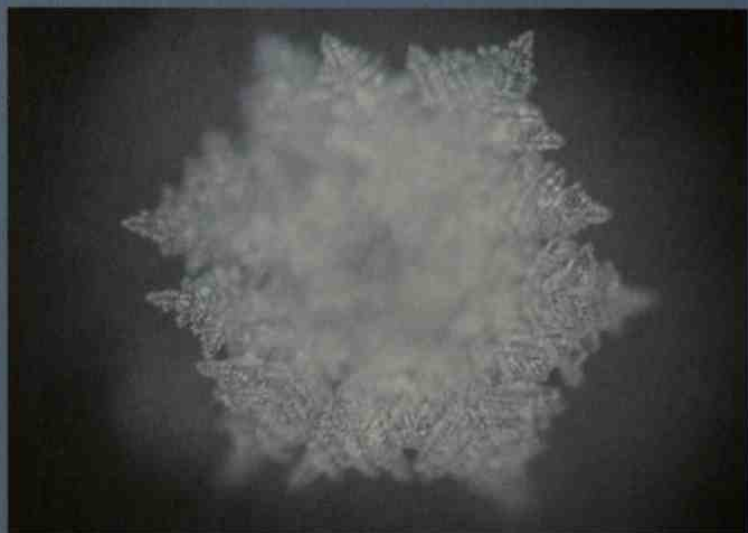


Arirang (Korean folk song)



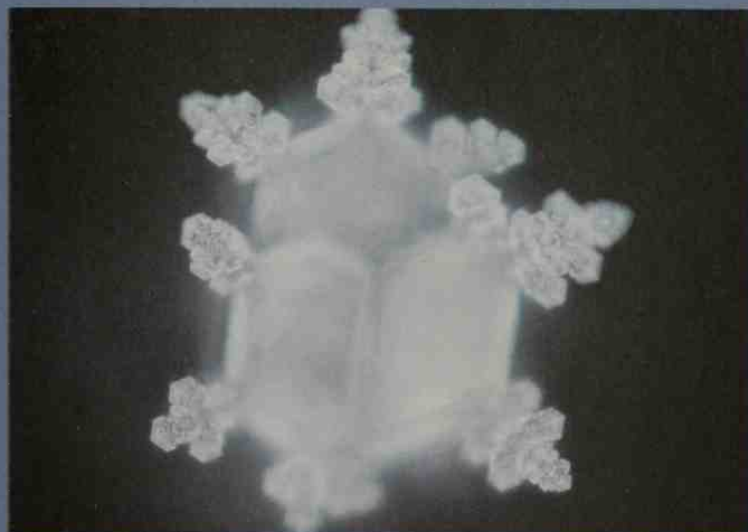
Ketjak (music of Bali)

Arirang is a sad song about lovers being separated, and the crystal seems to indicate a broken heart. Ketjak produced a detailed crystal, making us see why music can heal the soul.



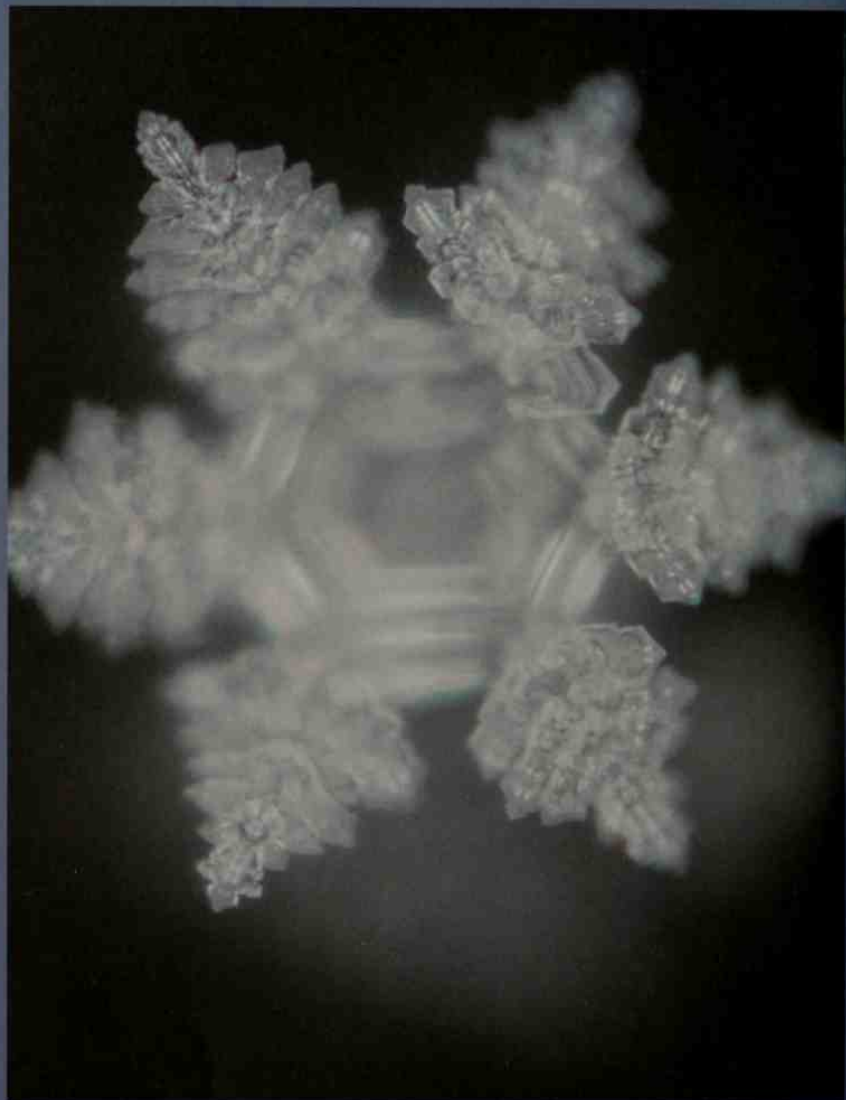
Brazilian music

Both crystals are in the shape of stars. They seem to be telling us that moving your body and singing in a loud voice serves to strengthen your immune system.



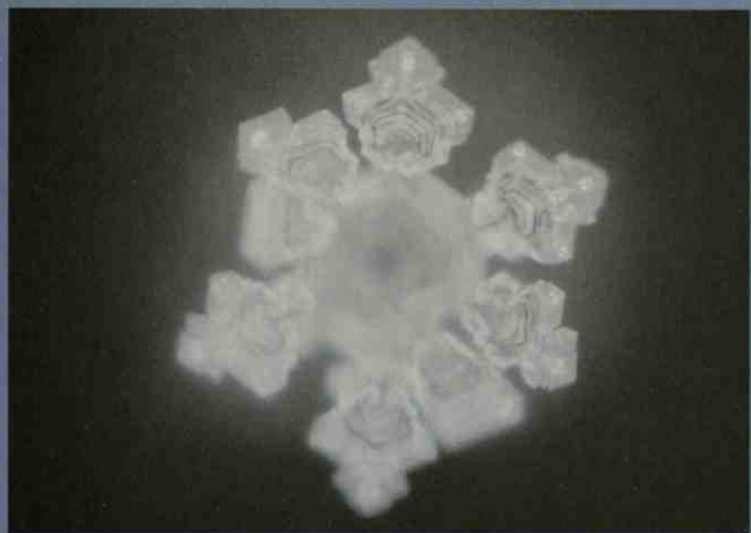
Argentine tango

Both crystals formed unique pair crystals, indicating a dancing couple. It's fun just to look at them!



Gospel music

The form seems to represent the desires of people to resonate with God. Music from around the world has the capacity to heal.

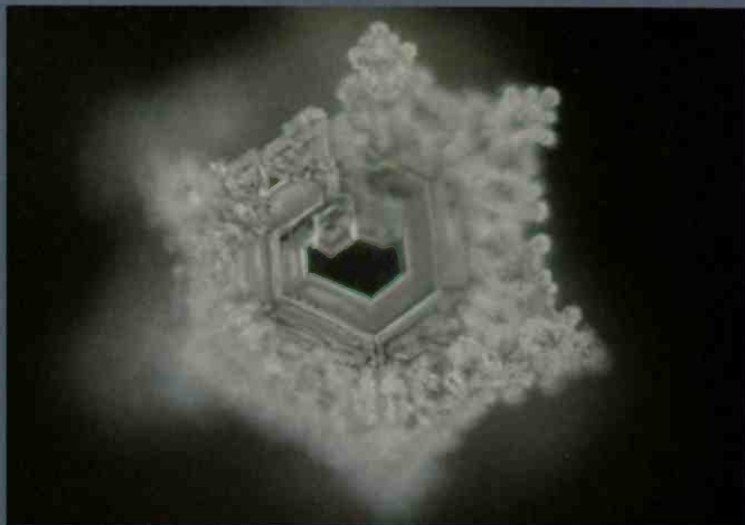


Polka from Czechoslovakia



Beer-keg polka from Austria

Czechoslovakia and Austria, although distant from each other, form similar-looking crystals.



Yodeling from Austria



Tyrolean lullaby from Austria

These crystals are also unique. The top crystal reminds one of a mouth yodeling, while in the center of the lower crystal we can see what appears to be a child.

Tap water of the world

Due to water treatment methods, it's difficult to form crystals using tap water from almost anywhere in the world. Perhaps it is time that we cooperate, and learn from each other how to better care for our water.



Paris



London



Tokyo

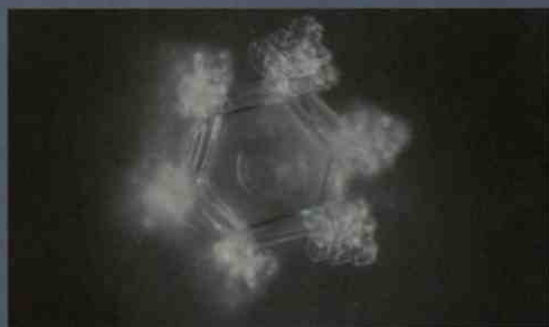
Water crystals fail to form, a result of using substances that harm the natural life-giving force of nature.



Rome



Venice



Bern

Even in Venice, the city of water, crystals failed to form in the tap water. Crystals just barely formed from the water of Bern in Switzerland.

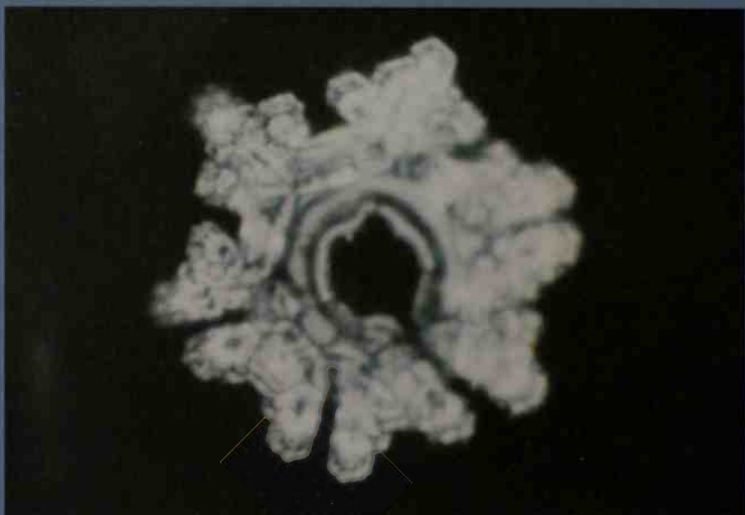


Washington D.C.



New York

Surprisingly, the water of some large cities in the United States formed beautiful crystals. This may be the result of efforts to protect water, such as the use of cedar tanks in Manhattan.

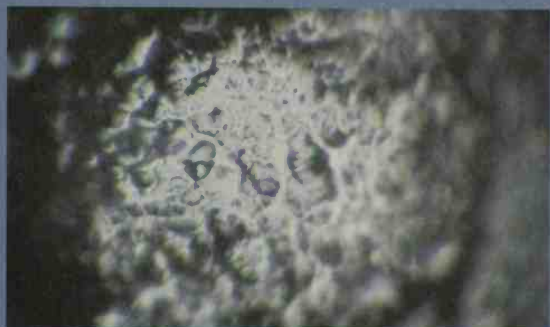


Vancouver



Sydney

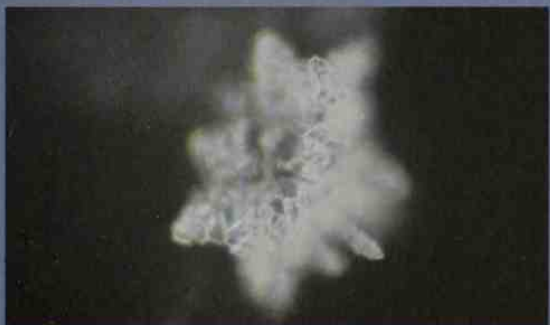
The water from Vancouver produced relatively complete crystals, perhaps because of the bountiful supply of water in the Rocky Mountains. The water from Sydney resulted in a surprisingly deformed crystal.



Bangkok



Hong Kong

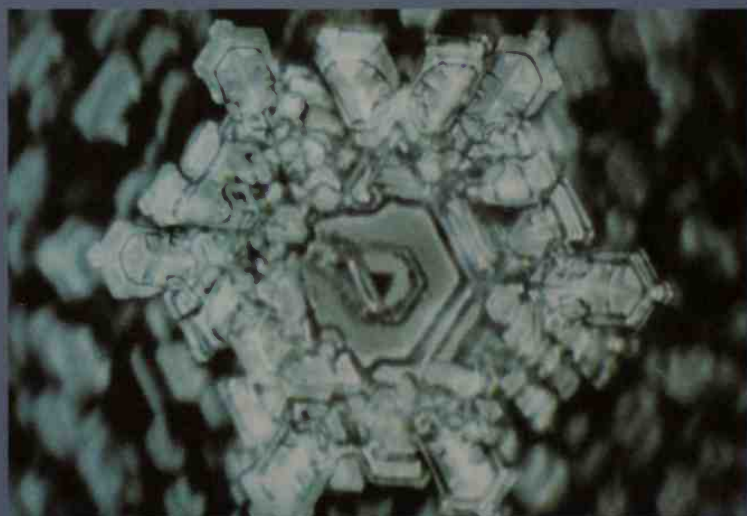


Macao

It seems that the water of Asia is at least as bad as that of many cities in Europe and America.



Buenos Aires

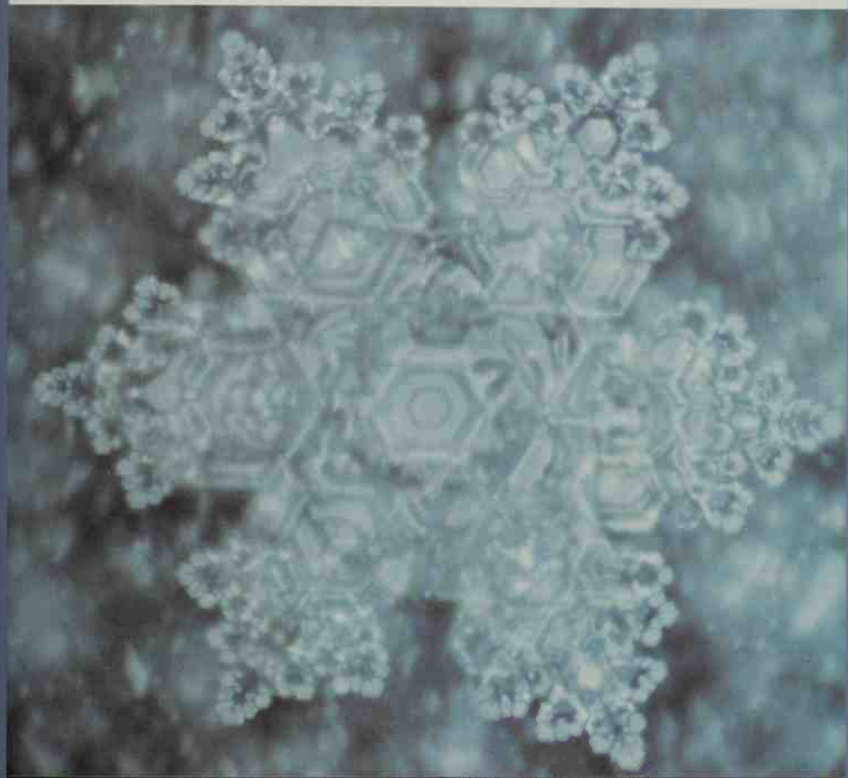


Manaus

These crystals are from two cities in South America. Manaus is located on the banks of the bountiful Amazon River, in Brazil. Beautiful crystals came from the water of Buenos Aires.

The beautiful glory of natural water

Well-formed and jewellike crystals were formed from natural water from glaciers, springs, and rivers.



Spring water from Saijo, Hiroshima

This detailed crystal looks like a beautiful ornament made of silver. Some of the best-tasting water (and sake) in Japan comes from Saijo.



Sanbu-ichi Yusui spring water from Kita-koma-gun, Yamanashi prefecture

The crystal seems to shine like the sun. Melted snow runs off Yatsugatake peaks and seeps into the ground to emerge as spring water. This is an expression of the true beauty of nature.

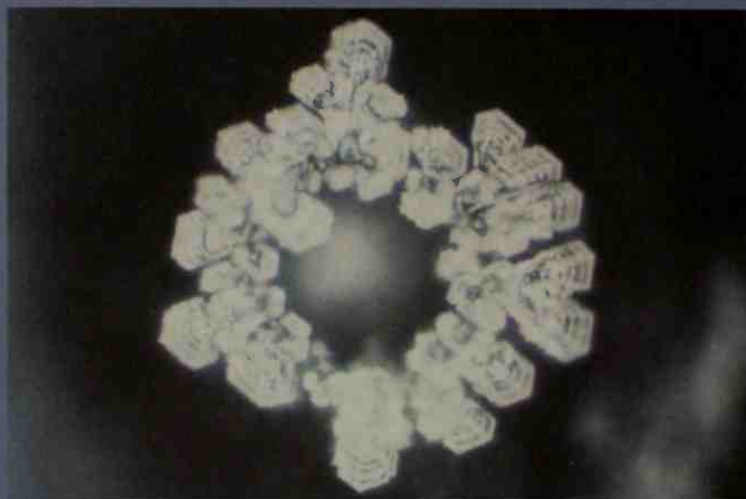


Spring water from Chuzenji Lake



Spring water from Chuzenji Lake, treated with chlorine

The top crystal was made using spring water at a hotel on the banks of Chuzenji Lake. Chlorinating the water, at the instructions of the local government, resulted in a marked change, as shown in the bottom crystal.



Lourdes spring water



Fontana di Trevi

The water of Lourdes spring in France appears similar to the crystal formed from water shown the word "angel." The crystal from the Fontana di Trevi in Italy is unique, and appears similar to the gold coins that people throw in the fountain.



Tasmanian spring water

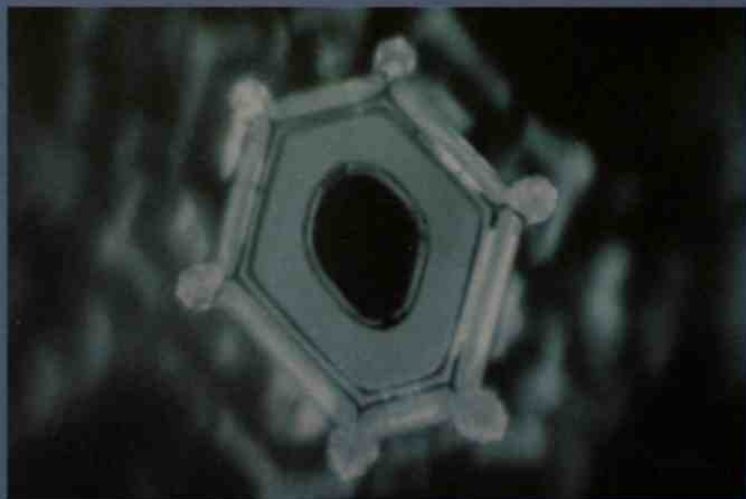


New Zealand groundwater

Spring water from a diamond-rich area of Tasmania produced crystals that look like little diamonds. The groundwater of New Zealand also created beautiful crystals.

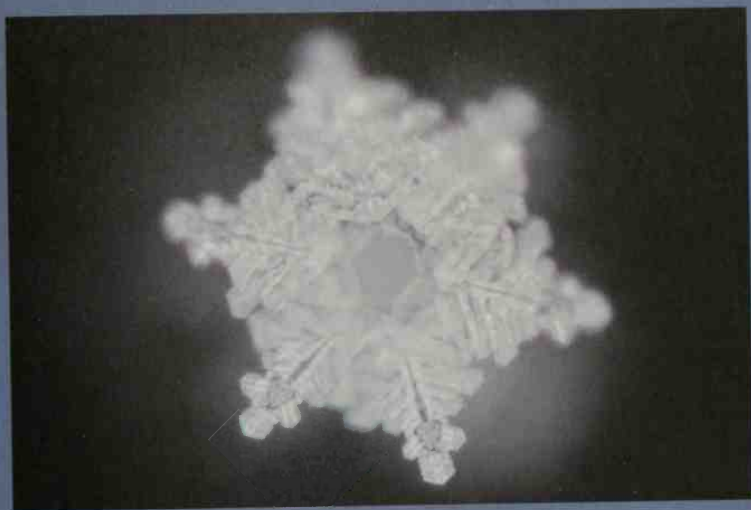


South Pole



Columbia Glacier, Canada

At the South Pole, snow from thousands of years has become hardened, resulting in the sturdy-looking crystal at the top. The water for both crystals was made from snow on the surface, and so it did include a small amount of modern-day pollution.



Tenderfoot Lake, Wisconsin



A lake near Mount Myohyang, North Korea

I gathered the water from Tenderfoot Lake at the bottom of a ravine. The water from North Korea was the first I received from that country, and the result was a beautiful and fanciful crystal.



Lake Brienz



Lake Maggiore

These crystals are from water that I gathered myself in Switzerland. It's not surprising that the crystals came from Switzerland, the water capital of Europe.

CHAPTER FIVE



A Smile That Fills the World

Wanting as many people as possible to know about the wonderful mysteries of the universe as revealed through water crystals, I published the collection of my water crystal photographs in Japan, but I actually got a larger response from Europe. It seems that a ripple effect in people's souls resulted, which spread at a speed far faster than I could have imagined.

What could it be that caught the interest of so many people in so many different countries? I think that when a person looks at the photographs of water crystals, a physical change takes place in the water

within that person's body. Water has a message for the world: *The world is linked together by love and gratitude.*

Love and gratitude are fundamental principles of nature. At the end of its long journey through the cosmos, water arrived on the earth with love and gratitude in its bosom. This love and gratitude created the first inkling of life, and then provided the tender nurturing required for growth. Looking at the water crystal photographs awakens a primeval memory contained deep within the water in each of our cells.

The message of water is love and gratitude.

Review the photographs of crystals found on pages 101–132 of this book. These images reflect our beautiful world. The photographs indicate the change in water resulting from scenery and music from around the world, and include a comparison between tap water and natural water.

As mentioned in the first chapter, the world first learned about my work through my first collection of photographs of water crystals. This was made possible by the efforts of Shizuko Ouwehand, a Japanese woman with Dutch citizenship, who now serves as my interpreter.

Through the introduction of a common acquaintance, Shizuko visited my office less than a month after this collection of photographs was first published in Japan, and I showed her a copy of the book.

The moment she looked at the photographs, I could tell that she was impressed. Right then and there, she purchased seventy-seven copies, which she sent to friends and acquaintances in the Netherlands, Switzerland, Germany, the United States, Australia, and other countries.

Not long after sending out the books, she started getting a flood of responses in return. It was as if the crystals were exactly what so many people were looking for—what these difficult times that we live in require. Shizuko subsequently invited me to give a presentation at a small annual seminar that she holds in Zurich, Switzerland, entitled "Looking for Human Jewels."

A week after this event, there was to be a major annual gathering; with Shizuko's assistance I would have the opportunity to lecture before several reporters, and to be interviewed for articles in a few magazines. The result would be an enormous wave of interest in and understanding of my work.

One of the people behind this major event was Manuela Kihm, another person who saw the collection of photographs and became enchanted. She sent the following message:

I have two children, and I know that there's a completely different effect when you speak to

children with love and when you just order them. It's the difference between "Let's do it," and "Do it." I also clearly understand that this is felt in each one of our cells.

In our daily lives, water crystals teach us very important things. Every day we are surrounded by magnetic fields. We find it impossible to live without computers. But we can clearly see that there is a great difference between being unaware of the risk of magnetic fields and being aware and careful. I was very impressed.

After seeing the photographs, Manuela invited me to give a seminar that she would organize. She first talked to the environmental agency of a small town called Sanglant about a lecture on the theme of water and the environment, but they said they couldn't help because the topic was too delicate. She then turned to those more open to spiritual matters, and gathered groups of people who had a desire to explore that which cannot be seen with the naked eye. All those who heard about the water crystals were visibly impressed and inspired.

Thanks to Manuela's efforts, in the course of a week I gave presentations in three cities in Switzerland, and I returned to Japan knowing that there were vast num-

bers of people with a desire to learn more about what I was doing.

Manuela's first invitation was followed by many others, and wherever I have spoken on the topic of water crystals, the response has been marvelous. I have had the opportunity to make many trips to Europe to give lectures and presentations at halls overflowing with people with a personal and professional interest in water.

The ensuing articles in magazines led to further interest abroad, and as more and more people showed interest in the collection of photographs, I was flooded with requests to give lectures and presentations.

Information about my work spread from Europe to the United States, where I was invited to speak at Harvard, and also at a "free school" in the suburbs of Boston, attended by children who did not fit into the American society stained by guns, drugs, and violence. It was probably this sensitivity of the students that made them more receptive to information about water crystals. I'm quite sure that the students left with the realization that saying unkind words causes damage to water as well as to other people. I imagine with a smile that they returned home that day and told their parents not to say things like "Do your homework!" or "Clean your room!"

But this is just one more aspect of the resonance phenomenon. As people who have had their tender

souls damaged in some way learn about water crystals, the message of water spreads ever more quickly around the world.

Perhaps we can also say that this is the result of people searching for answers during these troubled times. I have no doubt that water crystals will become a common focal point for people all over the world who are trying to make sense of chaos.

My visits to Germany, Switzerland, the Netherlands, England, France, Italy, Canada, and the United States have given me the opportunity to meet and correspond with many others around the world who are also conducting research into water. Perhaps because water is so mysterious, the approaches are varied and unconventional.

All this interest in water means that symposiums and other gatherings are always being held around the world, making me quite busy—sometimes too busy. The symposium in Switzerland has since been held twice more in Lucerne, and it is likely to continue to grow and become more international as time goes by. I have also participated in symposiums in Australia and England.

I first wondered how much interest there would be in water in Europe and other countries, but now I know that other countries have as much or more interest than Japan. I remember hearing about a group of Japanese

visiting Zurich Lake. The lake was so beautiful that one of the participants asked the Swiss tour guide, "Why isn't there any trash at all around?" The guide, who took it for granted that the lake would be clean, didn't know quite how to reply, and instead asked the Japanese, "Why do you ask such a question?"

Wherever I go, I take slides of the water crystal photographs, and then I show audiences the crystals formed from their own local water. When they hear my message and see the slides, Europeans are visibly surprised and impressed. Such forthright responses indicate that they have a high consciousness concerning water.

However, my research is limited when I make crystals in Japan, and so people have requested that I open a research facility in Europe. In response I have begun to talk about a concept that has been floating around in my head for a long time.

The concept is grand and unique—I want to create a research facility that is itself in the shape of a hexagonal water crystal. The laboratory for studying water crystals will be located at the center, and six other laboratories will be located around the center to study other subjects and fields of science: physics and mathematics, biology and medicine, astronomy and oceanography, philosophy and religion, and chemistry and engineering. Each of the labs will focus on 18 categories of research, for a total of 108.

I have been thinking about this for a long time, prompted when I started to think about why the environment of the earth is in such a bad state, why people are so confused, and why our civilization is such as it is. Pondering these questions led me to the conclusion that it is a result of the combination of, first, pride and corruption in the scientific community, and second, those in authority consciously allowing and encouraging the formation of such a society.

Of course, there are scientists who have their own will, and work according to their own consciousness. However, when we consider the condition of society, we realize that there are really very few who have conducted their activities with a mind to perpetuating the human race and cleansing this planet that we occupy.

This does not describe, for example, scientists at the beck and call of those in authority in Japan who insist that water must be tainted with chlorine, resulting in an overall decay of society.

Of course, scientists aren't the only ones responsible for the problem. The foundations of society have become so weak that it is no longer possible for a handful of scientists to change the deplorable direction in which we are headed.

How can we change direction, and do something to significantly improve the depressing state of affairs that permeates the scientific community? I think we

must start by changing the environment and systems related to the scientific community.

In the laboratory that I have in mind, the local community will come together to support scientists, who will focus on their own field and also interact with scientists of other interests, giving them a wide perspective from which to structure their courses of research. The community will also help secure the necessary financing and other assistance that individual researchers are currently unable to obtain on their own. I expect that the result will be discoveries and advances that will truly contribute to the future of the earth and humankind.

I have an image of the researchers gathering at the central cafeteria for discussion during their morning and midday meals, and in the evening announcing the results of their research.

Of course, there are a great many obstacles that must be overcome to make this dream a reality, but I now feel that the first step has been taken.

No matter what your intentions, announcing them is an important step. I can say this with confidence based on many years of experience in business. From the time when I was a child, I was always telling people what I was thinking and what I wanted to do, and I was constantly being told that I talked too much. But the simple act of saying something is a way to gather

energy towards you. Especially when you say something to other people, energy flows in your direction and helps you to achieve your aims.

If you express your intentions, the realization of those intentions will follow. Of course, I'm not proposing that you make irresponsible statements—it's important to say what you really feel inside. Your word is your promise, so when you say something you must have the determination to commit yourself. Letting other people know your intentions also often leads to the arrival of required assistance from unexpected sources.

Words have their individual and unique vibrational frequencies, and we've already seen how words have energy that influences the universe. The words from your mouth have a power of their own that influences the entire world. We can even say that the words that teach us about nature are the words of the Creator.

I know a man who has proven the power and benefits of words, using his own body. Nobuo Shioya is a man who I am proud to call my master. He is 101 years old, but his back is straight and he appears strong and healthy to anyone who sees him. Even now, he stands for one or two hours to give lectures several times a year. He also practices his golf swing every day, and goes to the course once a week. His ability to maintain his health is nothing less than miraculous.

Master Shioya says that his secret for health is his own unique breathing method. This method involves breathing in until air fills the lungs, providing oxygen to the entire body, while thinking about the energy of the universe gathering around him and providing him with invigorating energy. This method also indicates to us the power of affirmations. Master Shioya recommends that at the end of his breathing exercise, you say the following affirmation: "The infinite power of the universe *will* be concentrated and bring true peace to the world." This statement is a type of prayer, but what is important is his strong determination expressed by the word *will*.

According to Master Shioya, there are ghostly particles that cannot be seen by the means of today's science because they exist on the border between the third and fourth dimensions. Words spoken with determination have a strong power that gathers these ghost particles, making it possible to accomplish things in the three-dimensional world.

In September 1999, I had the opportunity to actually feel the power of words as expressed by Master Shioya. On this day, approximately 350 people had gathered on the banks of Lake Biwa, Japan's largest lake. I had gathered the group together in an attempt to clean the lake. There's an old saying in Japan that when the water of Lake Biwa is clean, the water of all

Japan will be clean. Another purpose of the gathering was to pray for peace for the entire world as we entered the new century.

Under the direction of Master Shioya, who was 97 at the time, this large crowd joined forces in an affirmation for world peace that brought our voices and hearts together. Our chants could be heard around the entire lake, and there was a special feeling that made our spines tingle.

Just a month after this event took place, a strange thing happened to Lake Biwa. The newspapers reported that the putrid algae that appeared each year and caused an unbearable stench had not appeared that year.

If you don't understand the principles of the *spirit of words*, this happening will indeed seem strange, but we know that this spirit of words has the power to influence all of existence and change the world almost immediately. I have no doubt that the spirit of words generated from the determined prayers for world peace had the affect of cleansing the water in the lake in only a matter of moments. Another important point is the fact that 350 people gathered and chanted together. The combined will of so many people acted as a force to change the universe.

I sometimes use Einstein's theory of relativity ($E = MC^2$) to explain this principle. This formula has an

additional important meaning. The general understanding is that $E = MC^2$ means "energy equals mass times the speed of light squared." However, we can also interpret C as *consciousness* instead of the speed of light. Since M represents mass, we can interpret it as the number of people consciously focused.

This interpretation was taught to me by Professor Hoang Van Duc, a scholar of psychoimmunology born in Vietnam. More than ten years ago, when I invited him to attend a seminar I was holding in Japan, he mentioned in casual conversation that the " C " of $E = MC^2$ referred not to the speed of light, but to consciousness. This perspective made a deep and lasting impression on me; later, when I was thinking about vibration and how people should live their lives, I suddenly recalled those words.

Almost a century has passed since Einstein announced this formula to the world. There is no way of knowing if Einstein himself considered the possibility of C representing consciousness, but since everything in the universe is relative, you can't say that it is a mistake to see the formula in this new way.

It is said that people make use of at most 30 percent of their abilities, but if we can increase our abilities by just 1 percent, then this amount, according to the formula, will be squared, doubling the amount of energy. If people around the world were all to increase their

consciousness at the same time, the difference in energy would be enormous.

If we fill our lives with love and gratitude for all, this consciousness will become a wonderful power that will spread throughout the world. And *this* is what water crystals are trying to tell us.

I have just described how the earnest prayer and thoughts of a group of people were able to cleanse the water of a lake, but those who have seen the photographs of the crystals should not be surprised by the fact that our thoughts have the ability to change water. Several years back, I had a desire to take another step toward establishing the scientific foundations for my theories, but I wasn't quite sure how to go about it. I found the hint I was looking for one day when I happened to open the newspaper. The headline that captured my eye spoke of the ability to use ultrasound to decompose dioxin in water. The article reported on the development of a technology to expose water to 1,100 kHz of ultrasound, creating tiny air bubbles that decompose dioxin and other deadly toxins when they burst.

When I read this article, I couldn't contain my excitement. I knew that I had finally found a way to analyze the energy from the spirit of words. When the 350 people gathered on the banks of Lake Biwa to chant and pray for world peace, it is possible that they also created 2,000 kHz of ultrasound. Ultra-

sound is in the range that cannot be detected by the human ear, so they didn't create this ultrasound with their voices. However, it is possible, based on the principle of resonance of tuning with the same sounds in different octaves, that the conditions were right for creating ultrasound.

It must be said that the power of the spirit of words is indeed marvelous, but if we combined the ultrasound technology for purifying water with water vibration technology, the effect on water would be much greater.

For example, after water polluted with industrial chemicals is treated with ultrasound, it could then be treated in a second process with vibration. When polluted water is exposed to 1,100 kHz of ultrasound, the chemicals are decomposed when the air bubbles break up; although the toxins have decomposed, they are still there. To rid the water of these toxins, it is necessary to expose the water to information with the opposite vibrational frequency of the toxins.

Using just one of these two methods may not be sufficient, but by combining them it may be possible to completely rid the water of any harmful pollutants. And it might just be possible to use this same combined technology to get rid of the harmful substances within our own bodies.

What does the future hold for research into water crystals? To answer this question, we need to think

more about how much scientific recognition this research will receive. When I show the photographs at my lectures abroad, I'm bombarded with a variety of questions. For example: What are the differences in crystal formation when the water is exposed to digital versus analog music? What about live music? In order to answer such questions, I need to continue research and conduct more tests under a variety of circumstances.

Another important issue is test repeatability. Many times we have seen that crystal formation depends on the observer's consciousness. When water samples are put into Petri dishes—we usually make fifty samples—the resulting crystals differ, depending on how the water is handled and on the thoughts of the researcher. And the condition of the fifty samples of water changes moment by moment.

It may be practically impossible to control all of these factors to the point where we can say scientifically that all conditions are equal. However, our approach has been to get as close to these conditions as possible, by using the most accurate scientific methods available.

Our efforts include the use of blinds to remove the possibility of change from the researchers' thoughts. We do this because we don't want the thought that the water being told "Thank you" will produce a more

beautiful crystal than that being told "You fool" to have an impact on the results. We label the sample dishes with letters of the alphabet, and don't reveal which water is which until after the results have been seen. We hope that this method will remove the effect of the researchers' thoughts as much as possible.

For each of the fifty dishes, we make graphs showing the number of crystals in each dish that are considered beautiful, hexagonal, incomplete, and so on. For each pattern, we establish a coefficient, and give number values to the crystals. This gives us a clear picture of the characteristics of the crystals in each individual sample, and we then can classify the samples into the categories of beautiful, hexagonal, and so forth. Then we choose one crystal to photograph that best represents the characteristics of that particular sample.

Water crystals change depending on the thoughts and even the health of the observers. To account for this, we have several experienced researchers observe the samples. The intention of our research is to use these methods to discover the messages that are contained in this most delicate of messengers.

Perhaps one area in which research into water crystals can be most helpful is the prediction of earthquakes. It is believed that water is capable of detecting a forthcoming earthquake earlier than any other substance.

I envision a time when water samples will be taken from groundwater daily, and by observing the changes in crystal formation, we will detect changes in the earth's crust. When an earthquake takes place, we can compare photographs of crystals made from water taken before and after the earthquake. By accumulating data on the crystals leading up to the earthquake, we will be able to find similarities, and ultimately be able to use this information to predict future earthquakes.

Having lost my grandparents and an aunt on my mother's side in a terrible earthquake in 1923, and considering the pain and destruction caused by the earthquake that hit Kobe in 1995, I can personally say that being able to use water crystals to predict earthquakes would be an enormous contribution to humankind.

It is also quite possible that this technology could someday be used to predict other forms of destruction, such as storms, floods, epidemics, and even the planning of a secret attack from a hostile country.

I am also working on finding a way for everyone, with or without scientific equipment and knowledge, to take photographs of crystals. With the use of new materials, it appears that this will be possible in the not-too-distant future. We are looking at super-thermoconductive materials that are twenty times more efficient than normal thermoconductive materials, making it possible to freeze water at room temperature;

it will no longer be necessary to take photographs in a special room cooled to -5°C (23°F). Researchers are now developing a device based on this technology that will allow anyone to take crystal photographs almost anywhere.

I suspect that water crystal technology will in the future be shared by all humankind. However, this could also be a double-edged sword. Used correctly, water has the potential to bring unlimited glory and happiness to humankind, but such technology can also be used for gain, or to cause harm.

Our bodies are mostly water, and so life cannot continue without it. But we cannot forget that water also has the potential to wash away civilization and cause destruction. It all depends on what's in our souls. The human soul has the potential to bring happiness to the world, but also to bring pain. This is a fact that water crystals clearly reveal.

So how can we go about finding our path in life? I have constantly stressed the importance of love and gratitude. Gratitude is the creator of a heart filled with love. Love leads the feelings of gratitude in the right direction. As the water crystals show us, gratitude and love can spread throughout the world.

We all have an important mission: To make water clean again, and to create a world that is easy and healthy to live in. In order to accomplish our mission,

we must first make sure that our hearts are clear and unpolluted.

Over the centuries, humankind has constantly robbed from the earth, and left it ever more polluted—the history of which is recorded by water. Now, water is beginning to speak to us. Through water crystals, it is telling us what we need to know.

Starting today, we must begin to carve out a new history. Water is carefully and quietly watching the direction that we take—the direction that *you* take at this very moment—and watching over us all.

I only ask that you listen to and absorb what water has to say—to all of humankind, and to you.

E P I L O G U E



I sincerely hope that we can continue this wonderful discovery of water, and of the universe.

When I first heard that water constantly continues to arrive on the earth from the distant reaches of the universe, I was filled with wonderment. I began to think that if water continued to arrive at this pace, the earth would soon be flooded.

From ancient times, the human race has constantly been subject to damage and destruction caused by water. Almost all cultures of the world have a story of a great flood, and there is even scientific evidence that indicates that the earth was once covered in water. We cannot completely discount Noah and the great flood, and the tales of the civilization of Atlantis and the Mu continent lost to the sea.

The saying that history repeats itself is ultimately true, and so even now there exists the risk that water will arrive from space and once again cover our planet. This event may still be a thousand or ten thousand years in the future, but perhaps it is not too early to take action to ward off this disaster. Even now we frequently hear about floods in all parts of the world.

But once, when I found myself fretting about this possibility, another completely different thought came to me. Everything that exists in the universe is parallel. The micro world is a faithful reproduction of the macro world, and the universe is an enormous mandala (which means "circle" in Sanskrit). This way of thinking leads us to the conclusion that everything that takes place in the universe also takes place within our own bodies.

The human body requires the circulation of water, and we can conclude that this is what the universe also requires. If large volumes of water flow in only one direction, toward the earth, the circulation of water in the universe will ultimately come to a standstill. Water arrives on the earth and then ultimately returns to the far reaches of the universe on an unending marvelous journey. The water on this planet will someday set off on the outer leg of its journey into the cosmos.

But what does the fact that water is constantly arriving on the earth mean for us? Perhaps the earth is not the only destination for these lumps of water. But while there may be other stopovers, no other planet we know about has the necessary conditions required to pool water. If we compare the solar system to the human body, I suspect that the earth plays the role of the liver.

Each day, your liver filters two hundred liters of water and sends this purified water to the other organs

in your body. Considering this, it's not hard to imagine that the earth plays the vital role of purifying the water circulating in the solar system, and then returning it to the universe.

Then whose responsibility is it to purify this water that has arrived on the earth? It is ours, humankind's. And this is because we are ourselves water. Having been born here, we all have the responsibility to purify the water on the earth.

As I ponder the long and marvelous journey that water takes through the universe, I find myself thinking about such things as the origin and future of humankind. But if we consider that we are water, then the answer to many of these mysteries becomes clear. Water makes up 70 percent of our bodies, and there is little doubt that the information in the water goes a long way in the formation of our personalities.

I have often heard cases of people injured in automobile or other accidents, who, while receiving blood transfusions, saw images of places they had never been, or had memories of a past that wasn't theirs. Sometimes transfusions have even been known to cause a change in personality.

It could be that the events we experience throughout our lives become memories recorded by water, which remain in our bodies, and may be what we call the soul.

EPILOGUE

There are still many questions left unanswered about the soul, rebirths, and the existence of spirits, but I suspect that the day will someday come when many of these questions will be answered by scientific means—using water.

Where does our soul come from? We have seen the possibility that it comes from the distant universe, carried by water.

So we ask next, what is in store for the soul? Since we are water itself, some day all our memories of experiences on this planet will be launched into space. And our responsibility before this happens is to become pure water on this earth.

To make this possible, we must first and foremost live life to the fullest. Our consciousness is what will purify water, and through this we send messages of beauty and strength to all life.

Wouldn't it be wonderful if we could cover the world in the most beautiful of water crystals?

How do we go about this? The answer is love and gratitude. I'd like to ask you to take another look at the beauty of the crystals. If all the people of the world can have love and gratitude, the pristine beauty of the earth will once again return.

We live our short lives on this planet and then we set out on a journey into the universe. I'm not sure how this process works, but we can leave this up to the laws

EPILOGUE

of the universe. Of course, when we make this journey we will not be in our current physical form, but in the form of water or mist.

When my soul is ready to set out on its journey to the cosmos, I fully intend to call out to everyone and say, "We're off to see the universe! Let's go to Mars!"

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A B O U T T H E A U T H O R



Masaru Emoto was born in Yokohama in July, 1943. He is a graduate of the Yokohama Municipal University's department of humanities and sciences, with a focus on International Relations. In 1986 he established the IHM Corporation in Tokyo. In October of 1992 he received certification from the Open International University as a Doctor of Alternative Medicine. Subsequently he was introduced to the concept of micro-cluster water in the United States, and Magnetic Resonance Analysis technology. The quest thus began to discover the mystery of water.

Dr. Emoto undertook extensive research into water around the planet, not so much as a scientific researcher but more from the perspective of an original thinker. At length he realized that it was in the frozen crystal form that water showed us its true nature. He continues with this experimentation, and has written a variety of well-received books in Japanese, as well as the seminal *Messages from Water*, published bilingually. He is married to Kazuko Emoto who shares his passion and is head of Kyoikusha, the publishing arm of his company. They have three children.

ABOUT THE AUTHOR

Masaru Emoto's self published books, *The Message from Water volumes 1 and 2*, are available in English with Japanese subtitles from Source Books & Sacred Spaces.

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Joy and humor open our hearts to growth.

It is important to remind ourselves of love.



Dr. Masaru Emoto was born in Japan and is a graduate of the Yokohama Municipal University and the Open International University as a Doctor of Alternative Medicine. His photographs were first featured in his self-published books *Messages from Water 1* and *2*. *The Hidden Messages in Water* was first published in Japan, with over 400,000 copies sold internationally.



Crystal photographs on cover © Masaru Emoto

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"*The Hidden Messages in Water* is magnificent. Through his genius photography and superb scientific skill, Dr. Masaru Emoto has created a book that is truly a mystical treasure. His contribution to research in spiritual consciousness is positively masterful."

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"Dr. Emoto's work with water beautifully illustrates the healing power of love and gratitude. These building blocks of appreciation support our well-being in body, mind, heart, and soul. *The Hidden Messages in Water* is a most valuable contribution to the creation of a positive future for our world."

—Noelle C. Nelson, Ph.D., co-author, *The Power of Appreciation*



The Hidden Messages in Water introduces the revolutionary work of internationally renowned Japanese scientist Masaru Emoto, who has discovered that molecules of water are affected by our thoughts, words, and feelings. Since humans and the earth are composed mostly of water, his message is one of personal health, global environmental renewal, and a practical plan for peace that starts with each one of us.

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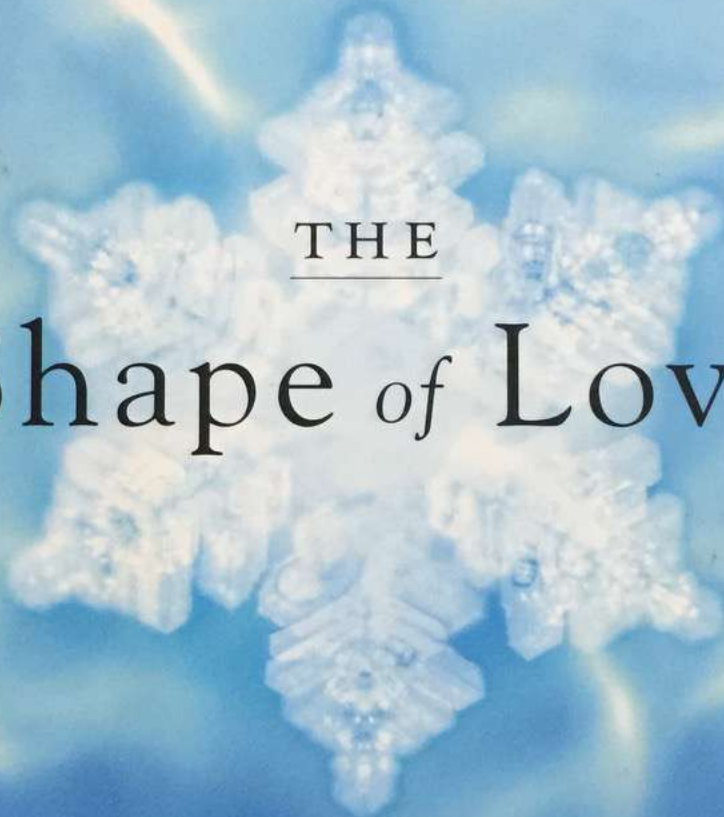
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AUTHOR OF THE *New York Times* BESTSELLER *The Hidden Messages in Water*

Masaru Emoto



THE
Shape of Love

DISCOVERING WHO WE ARE, WHERE WE
CAME FROM, AND WHERE WE'RE GOING

This cutting-edge new work, by the author of the *New York Times* bestseller *The Hidden Messages in Water*, presents a revolutionary understanding of life and consciousness and provides answers to the most profound questions of existence.

Introduced in the bestselling *The Hidden Messages in Water* and the hit cult film *What the Bleep Do We Know?*, the groundbreaking work of Japanese scientist Masaru Emoto captured the popular imagination and launched a worldwide movement. Using high-speed photography, Dr. Emoto discovered that crystals formed in frozen water are affected by our thoughts, words, and feelings. Since humans and the earth are composed mostly of water, his findings have far-reaching ramifications for individuals, for human society, and for the global environment.

In *The Shape of Love*, Dr. Emoto shares new images from his research and for the first time draws out the significant lessons of his work. In a clear, conversational style, he interprets the messages hidden in his extraordinary photographs and explains how his discoveries can help us find answers to these eternal questions: Where did we come from? Why are we here? Where will we go after we die? Providing a new way of looking at

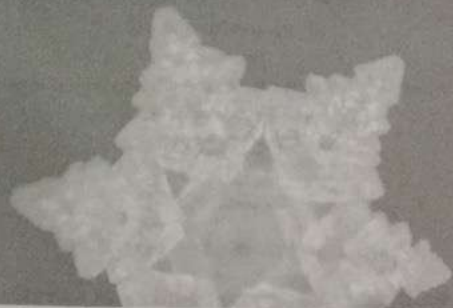
THE
SHAPE
OF
LOVE

THE
SHAPE
OF
LOVE

THE
SHAPE
OF
LOVE

MASARU EMOTO

Translated by Noriko Hosoyamada



DOUBLEDAY

New York London Toronto Sydney Auckland



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CONTENTS

PREFACE

vii

One

THE SHAPES OF LOVE IN WATER

1

Two

WHO ARE YOU?

27

Three

THE BEGINNING OF LOVE

37

Four
THE JOURNEY OF WATER

59

Five
THE POWER OF PRAYER

111

Six
TUNE IN TO THE
VIBRATION OF LOVE

125

EPILOGUE

147

P R E F A C E

My first book on water, *Messages from Water*, was published in June 1999, and new readers continue to discover it year after year. In fact, it has been (or is in the process of being) translated into fourteen languages. My later title *The Hidden Messages in Water* was a collection of water crystal photographs; in that book I kept verbal explanations to a minimum so as to encourage readers to explore their own interpretations and sensibilities. It worked. The book spread by word of mouth throughout the world, like widening rings on water.

The Hidden Messages in Water was also intended to be a collection of messages about how to live: the messages I had learned from water through my research on *hado* (magnetic resonance) and water over fifteen years. With that purpose in mind, the book included many of my thoughts and inspirations.

The Hidden Messages in Water made the best-seller list in Japan and many other countries, and that success gave me courage and confidence. The book ended as follows: "When my soul is ready to set out on its journey to the cosmos, I fully intend to call out to everyone and say 'We're off to see the universe! Let's go to Mars!'" The widespread acceptance of my books encouraged me to pursue what I had wanted to write on for some time—that is, my thoughts on the eternal themes of human beings: Where did we come from? Why are we here? Where will we go after we die?

At the same time, Ms. Yumiko Toyoshima of the Tokuma Shoten Publishing Company really wanted me to write a book on the subject. But I hesitated because the number of requests for my seminars was rapidly increasing, and I was also already committed to some other writing projects. Furthermore, this book had a very tight schedule,

giving me little time to write on these lofty, eternal themes. But Ms. Toyoshima's enthusiasm eventually made me agree to undertake this book, despite my extremely busy schedule. That was in the early summer of 2003. In the end, by twice confining myself to a hotel room, I managed to finish writing.

The reader may find shortcomings, but this book was meant to convey my thoughts on this subject. I believe that these themes by their very nature require all human beings to think about them on their own. It will be a great pleasure for me to hear criticisms and opinions from readers.

I must acknowledge the efforts of Ms. Toyoshima of Tokuma Shoten, who oversaw the entire publishing process of this book in Japanese. I thank her for putting it into such a wonderful form.

Masaru Emoto
September 2003

One

THE
SHAPES
OF
LOVE
IN
WATER



HOPE

There is an expression, "The heart is filled up with hope."

The water crystal depicted in Figure 1 might bring to mind an image of a child's chest filled with hope; his or her dreams are growing and growing. Note how the tips of the crystal seem to be growing farther out and the beautiful hexagon at its core. To have hope, people need a solid base, such as the one seen in this photograph. The source of the base is paternal and maternal love and education. In looking back at my life, I realize my mother's love enabled me to continue to hope to become a man who could contribute to world peace. I am grateful for her plentiful love.

THE
SHAPE
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LOVE

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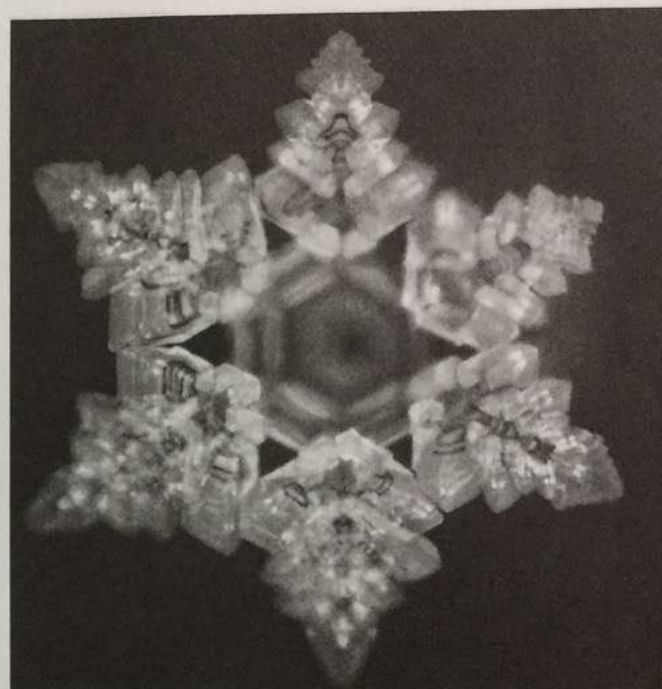


Figure 1. The tips of this crystal seem to be growing farther out, just like the image of the word. Let us be the source of hope for others.

I was the youngest of four children, and I received my mother's full attention. My brothers did very well at school. Because I was the youngest child, not too much was expected of me. So I was brought up without many restrictions. After I married, my wife became the the bulwark of my life, just as my mother had been. Both my mother and my wife are like a big ocean that surrounds me

THE
SHAPES
OF LOVE
IN WATER

3

in a relaxing way and lets me swim freely. I am grateful to these two women for enabling me to think that I can help build a unified world.

I hope that women who become mothers develop great love within themselves. Perhaps those who fully received maternal love in childhood find it easier to warmly love their children when they become mothers.

More and more women these days seem to feel uncomfortable in relationships of mutual dependence. If you are one of them, I hope you find someone you feel comfortable with. If you wish deeply in your heart, I am sure your wish will be granted.

Others may not like the person you choose to depend on. However, you and that person may be on the same wavelength, and that will make you feel at ease. Such a person may be near you, and may be of the same gender.

Dependence requires getting closer to someone, and this requires courage. I am positive that you can find someone you feel natural and comfortable with to build such a relationship. Once you become comfortable with depending on someone else, you will be able to let others depend on you.

With such great love, which allows others to depend on you, you can expect to become a source for giving hope to people around you.

By looking at the photograph of the water crystal of "hope," you may remember the mother ocean. The memory of the expansive, vast sea may remind you of a state of being surrounded by great love.

When I first saw the picture, I was reminded of my mother's love and of my wife's love, and I felt my love toward them redouble. I felt very much encouraged.

PURPOSE AND DESPAIR

If someone were to ask you, "What do you live for?" how would you respond? Even now I am unable to give an immediate answer. Why? Because the purpose of life changes over time. Try to remember: What did you live for when you were twenty, thirty, or forty? You are very likely to find that it has changed. The life purpose we choose is not necessarily always beautiful and noble.

The water crystal in Figure 2 shows a beautiful hexagon. It indicates the positive nature of what

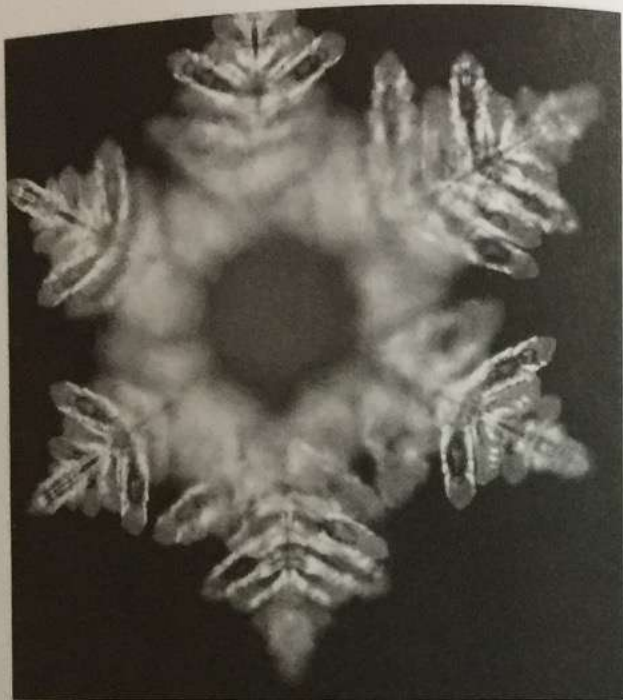


Figure 2. The outer, feather-like parts have sparkling spots. Is your life purpose something sparkling for you?

makes us feel that life is worth living. What is noticeable in this crystal is that the outer, feather-like parts have sparkling spots. They are unique to this crystal. Perhaps the purpose of life is something that shines on us.

Please take a moment to remember when you found the purpose of your life. When something takes your breath away, when amazement gives you

goose bumps, and when an excitement makes you restless, your heart is thrilled. The purpose of life may be found through encountering thrilling experiences; such an encounter is what shines for you.

The purpose of life may further fortify your strengths, or it may complement your weaknesses. If you can develop your strengths more, you will be radiant and feel a greater purpose in life.

As for weaknesses, you might find yourself naturally drawn to something that helps resolve them. As we humans have a sense of balance, we tend to be attracted to what we feel is lacking in ourselves. When you encounter what you were looking for, you will probably find brilliance in it. Thus it will become your life purpose.

An encounter with a person, an encounter with a meaningful job, a dream that you want to chase for the rest of your life—all of these are leading you toward your purpose in life.

On the other hand, when we give up all hope, our immune system weakens, and our natural healing power diminishes.

Initially, I didn't think that water would make a crystal after being shown the word "despair." However, the crystal in Figure 3 looks like the making

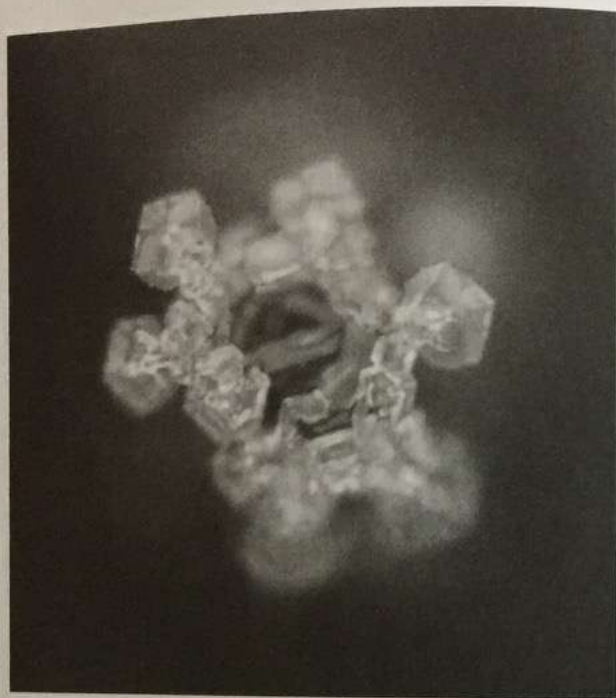


Figure 3. This crystal teaches us that any despair has hope within it. It is a sign of hope. In the world of water, there is no such thing as total despair.

of a hexagon. It may be saying that any despair has hope within it. I didn't want to show you the pictures that were too distorted, so I picked a relatively good-looking one.

The water crystal in Figure 3 seems to have shrunk. We, too, shrink when we despair. We stoop down and turn in upon ourselves. However, when

we say we despair, feeling despair amounts to perhaps 80 percent, while the remaining 20 percent is our dormant hope.

Though small, a sign of hope does come through in this crystal. In the world of water, I don't believe there is such a thing as total despair because water circulates. Water can pass from one form to another and finally come back to its beauty. So, too, can we humans.

Even when we feel we are at the bottom of despair, we have latent faculties that bounce us back to life and allow us to find the purpose to live again.

THANKS TO (OKAGESAMA)

Strangely, the water crystal in Figure 4 has a shadow. I was surprised because water seemed to capture the word *okagesama* ("thanks to" in Japanese, or more literally "thanks to the shadow of"). Among the water crystal photographs I took, one was shaped like an elephant's trunk and one like the rope ornament of a shrine. I realize that water has a mystical power to show its surroundings.

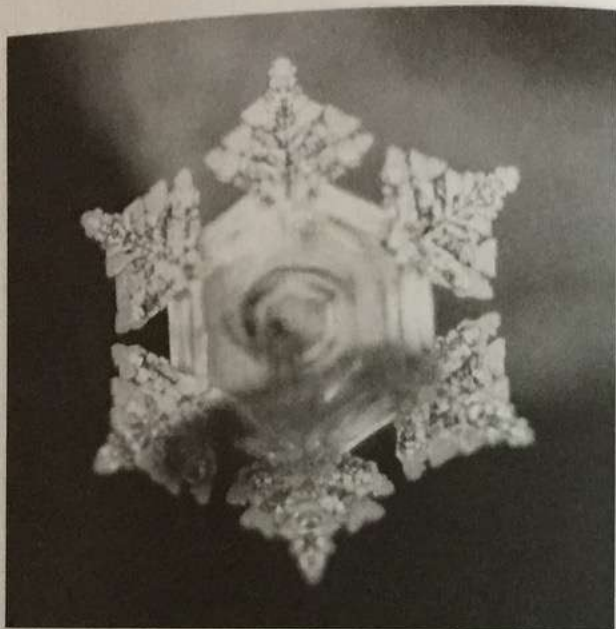


Figure 4. *Okagesama* (thanks to the shadow of) is a unique and beautiful Japanese expression of gratitude. As the word indicates, a shadow appeared in this crystal. It's a mysterious phenomenon, isn't it?

Maybe we could say that water is a blueprint of reality. I sincerely think that you can find the systems of the universe in this blueprint.

An important Buddhist text, the Heart Sutra, states, "Form is emptiness; emptiness is form." I take this to mean something that exists is in fact void (emptiness) and void does in fact exist. A shadow is certainly empty. Therefore, I believe that

a shadow must have a high potential within itself to create something anew. It is a wonder to me that *okagesama* is an expression used exclusively by the Japanese. It is a beautiful phrase that everybody knows in Japan. The feeling of gratitude contained in *okagesama* gives off positive energy to others and transforms itself into love in their hearts. It would be splendid for people to frequently exchange such a beautiful expression. Have you said *okagesama* lately?

YOU FOOL

"In the beginning was the Word," says the Bible. There is no doubt that words have a strong influence on people. The same is true with water; after being exposed to the words "you fool," water has never formed beautiful crystals.

In the beginning, the world probably had only beautiful and creative words. Thus it must have been filled with creative energies to produce new things. Then the words with negative energies appeared, for example, "you fool" and "no good."

The crystal depicted in Figure 5 gives us the impression of a swirling typhoon with the force to



Figure 5. This crystal tells us about the destructive power that negative words carry. Negative words are hurtful not only to humans but also to animals and plants.

destroy everything. Looking at this crystal makes me wonder if saying "you fool" to someone has a similar effect on that person's heart, making it corrupt and ugly like the crystal in this photograph. Simultaneously, the person who calls others

names is inevitably tainted by the same negative influence. Words affect our heart and create vibrations. A good vibration creates good energy; a bad vibration amplifies bad energy.

Happiness will never come from a negative and destructive phrase such as this one. Your words have the potential to change everything.

CONFIDENCE

The crystal in Figure 6 makes me realize that confidence is created by the accumulation of experiences. Overconfidence, or behaving with too much confidence not backed up by solid practices, is merely a pretense and bound to be exposed sooner or later. True confidence comes from trusting yourself as well as others. That is how one attains real, unswerving confidence. Having been shown the word "confidence," the water creates a crystal with a complete and beautiful shape. Ideas that have positive energies produce beautiful crystals. We've all heard the saying "Silence is golden." Silence—"no talk but act"—is often valued as a virtue among the Japanese. However, I myself tend

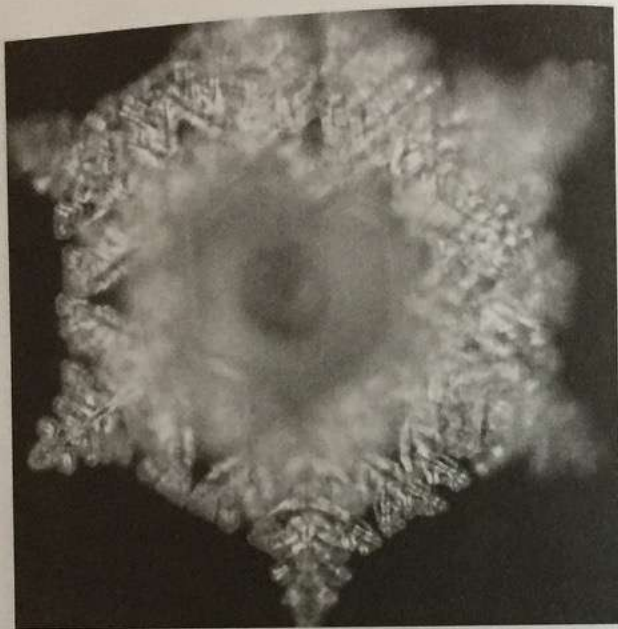


Figure 6. A complete and beautiful crystal resulted from the word "confidence." "Self-trusting," as the word may be defined, has a positive energy.

to "talk and act." I believe that confidence can be built by taking responsible actions after you have announced what you are going to do.

Those who wish to gain confidence may want to look at this water crystal photograph frequently and always have it on hand, perhaps by carrying it in a breast pocket, placing it in a pocketbook, or putting it up on the wall.

True confidence is generated by behaving responsibly. All of your experiences, whether successes or failures, will turn into confidence that will support you and help you shine.

I LOVE YOU

The water that was shown the phrase "I love you" made a big, dynamic crystal, as seen in Figure 7. This crystal also had a very large, beautiful base. When a person says to someone, "I love you"—for example, a mother to her child, a husband to his wife, or a wife to her husband—the one who hears the words will shine beautifully. Compared with crystals that were formed after water was shown the phrase "love and thanks" (which I'll discuss later), this one, having been shown "I love you," seems less restricted. I wonder if it has something to do with the present progressive form used in Japanese for "I love you": "I *am* loving you."

In love, agape (unconditional, self-sacrificing love) is often compared with eros (passionate love

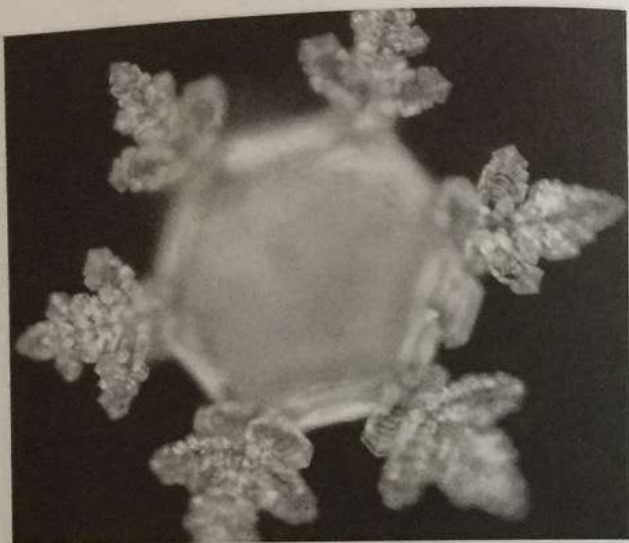


Figure 7. This crystal has the expansive feel of growing farther out. By continually being shown "I love you," water yields crystals that grow bigger and shinier.

with sensual desire). I believe that eros is changeable while agape is not. Thus eros can generate more energy. When eros changes into agape, vast love will wrap you in gentle warmth.

Westerners frequently use the expression "I love you," whereas the Japanese don't. Japanese men in middle age or older tend to be especially shy about expressing their love for someone, and may do so only on very rare occasions. I was no exception until about ten years ago, but now I often say it to my employees and family members. Some

people say, "Love doesn't have to be expressed in words." For those who have the vibration of divinely pure consciousness, it may be a different story, but most of us ordinary folks are better off verbalizing it.

Of course, the accompanying emotion is important. Water does not respond in beautiful crystals when "I love you" is communicated obligatorily and carelessly. So the best way of saying "I love you" would be to do so naturally and wholeheartedly, when the moment and the emotion arise.

Of course, I hope that women also feel comfortable saying "I love you," without worrying that they are imposing themselves on others. To children, sweethearts, husbands, and friends, women should freely express it. When you say these words, the water inside of you is affected by beautiful radiance.

TOUCHED

The crystal in Figure 8 shows a shape of hands in prayer in one of its outer parts. I believe that people feel touched when their prayers come true, or when their latent desire or hope is fulfilled. I won-

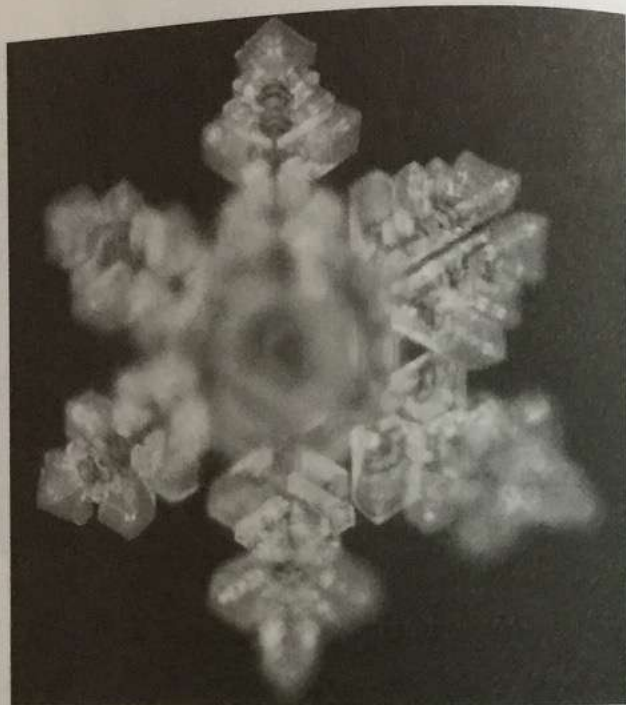


Figure 8. "Touched" implies "feeling grateful and moving." It is a base for a resonance phenomenon. Let's cherish our feeling of being "touched," no matter how small it may be.

der if this is why the shape of prayer appeared in this water crystal. As indicated in the two Japanese characters (*kanji*) that mean "touched"—"feel" and "move"—the word has a strong power to affect our hearts.

Without having experiences of "being touched," people find it difficult to live with vigor and health.

Mrs. Suzue Kato, who lived to be 104 years old, used to say, "Live each and every day having ten 'touched' experiences." Even busy people, I hope, will have at least three "touched" experiences in a day—in the morning, during the day, and in the evening.

One of the most moving experiences I have ever had since I started to take photographs of water crystals was when I saw the picture of a water crystal from Fujiwara Dam. We had initially gone to the dam to collect a sample; the water looked very dirty, as it contained impurities such as bacteria. I couldn't believe my eyes when I saw the picture of an amazingly beautiful crystal. At the time I had no idea why we could take such a beautiful picture. Later it occurred to me that the crystal might have been formed at the level of subatomic particles that we cannot see even with an electron microscope. Yet somehow we were able to capture the picture of it.

Between the soul of the person who took the picture and the intrinsically exquisite energy of the water, there must have been a beautiful phenomenon of resonance. Thus it was possible for us to take the wonderful picture of the water crystal. It was a moving experience for me to understand

this. I was also touched by the fact that such a beautiful picture came about due to some power beyond the natural world.

Do you know the character Jean Valjean in *Les Misérables*? He is a criminal who one night steals silver from a church. When the police take him back to the church the next day, the bishop protects Valjean by telling the police that he gave the silver to him and proceeds to hand him some silver candleholders, too. Valjean feels as if he's been struck by lightning. The goodness starts to grow in him. Actually, I would say that what is awakened in him is the innate goodness that has quietly remained within him together with other qualities such as truth and beauty.

As you probably know, after Valjean has this experience, he lives a wonderful life and does many things to help others. I would think that the bishop, who has had such an impact on Valjean, would also receive substantial energy of gratitude in return.

Touching experiences such as these aren't confined to great works of literature, however: they can be found in our daily lives. One example for me was when my company went bankrupt with a 100 million yen—about \$1 million—debt. We had a

family council that included all of my brothers, and they said, "It will be very difficult to clear such a big debt. You should declare personal bankruptcy and divorce your wife." I felt half-resigned and thought I had no other choice but to accept their advice. In reality, I didn't have the energy to argue. However, my wife decidedly said, "I will not divorce him. I know he can get back on his feet again." For the next seven years, she worked as a saleslady for an insurance company, and we lived off her income. She made it possible for me to focus on working hard to repay my debt.

Perhaps "touching" is an act of love. It is a great gift from the soul for those who live their lives wholeheartedly.

FAMILY LOVE

The crystal in Figure 9 seems to tell us that the ideal family involves three generations—grandparents, parents, and children. I feel that the most beautiful part of this crystal is the faint layer in the background that supports the other two layers. I believe this layer represents grandparents. They are big, but they are not forward. They seem to

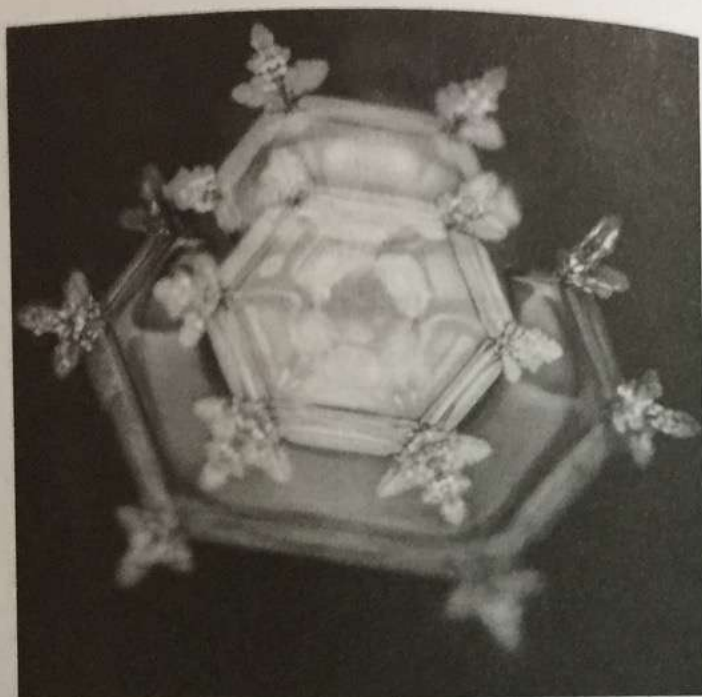


Figure 9. This is a unique crystal formed as if showing a family of three generations—grandparents, parents, and children. Family love that gives us strength lasts forever.

shine for their children and grandchildren from the back. What an admirable way of life they are demonstrating!

Modern society seems to give the cold shoulder to grandparents. I don't know how this came about, but it saddens me. This water crystal reminds us of the fact that the parents' and children's generations exist because of grandparents. Although

each individual's life is finite, life keeps going forever, from generation to generation in a family. Whether we notice or not, the love of our family, a love that asks nothing in return, is always there to give us great strength.

BENEVOLENCE

Benevolence is a kind of love that symbolizes the affection of parents for their children. The crystal in Figure 10 also shows multiple layers. Behind the one in the foreground, which is growing bigger, there is a larger structure that seems to support the one in front with unstinting love.

Personally, I treasure this word, "benevolence." My father died at the age of fifty-seven, when I was a sophomore in college. He was poor, but he lived frugally to raise his children and send them to college. He was a very loving family man. As far as I know, he had never met his biological parents. He was the illegitimate child of a village headman's daughter in Gigu (which is in the middle of Japan) and a schoolteacher. Soon after his birth, he was abandoned at a brothel. Three months later, the Emoto family adopted him, and

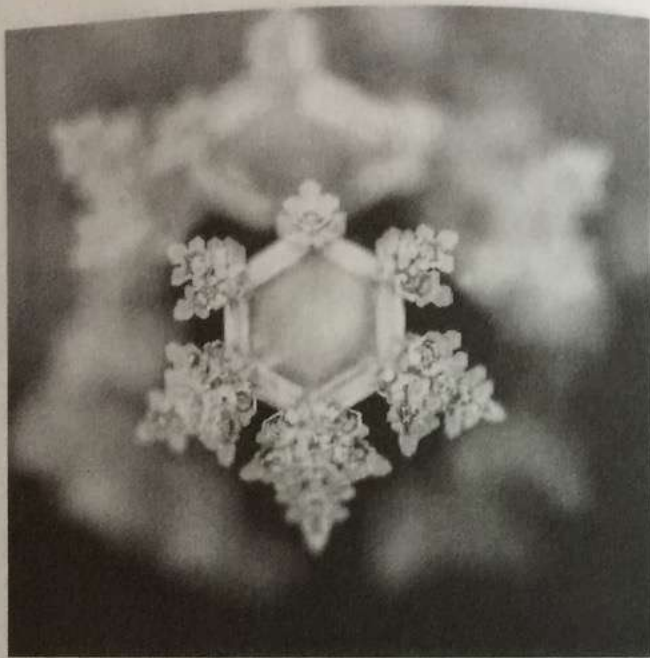


Figure 10. This crystal reminded me of my father. He didn't make himself stand out, but he looked after his children lovingly and with a big heart.

he was raised by loving foster parents. However, his foster mother passed away when he was five years old.

His foster father married another woman, who was also nice, but my father started to feel somewhat uncomfortable after his stepbrothers were born. When he grew up and got a job, he requested a transfer to Tokyo, where he met the woman who was to become my mother.

Until he received the family registration document that he needed in order to marry, my father never knew that he was adopted and that his biological parents were elsewhere. He was shocked and decided to look for his biological mother; after much searching he was able to discover her whereabouts. He visited her husband's family, but he wasn't allowed to meet her. I believe that because he had such a background, he wanted to choose a family-oriented lifestyle. Thanks to my father's choice, my siblings and I grew up very happily, receiving plenty of love from our parents. The inscription on my father's tombstone reads "Lived in benevolence." This is the phrase that we, his children, selected for him. In looking back, I feel his life was a demonstration of this important virtue.

Two

WHO
ARE
YOU?



It has been seventeen years since I first became involved in studying water. During that time—and especially over the past nine years, since I started to take photographs of crystals—water has taught me many things. I learned things about myself, family, work, society, nation, world, universe, energy, life, diseases, the afterlife, and nature. I became quite knowledgeable, and I want to share the important matters I learned from water with as many people as possible.

Thus I walk around the world as if I were a missionary in the Middle Ages or a street preacher in Japan. I wonder if, thanks to modern transportation, I could have done as much work in three years by myself as they did in a hundred years.

Yet I still don't feel that I have walked enough.

I still don't feel that I have talked enough. I wish to continue my journey. However, I have learned from the great Zen priest and poet Ikkyu—his name literally means "a short rest" in Japanese—that it is no good to rush things. I shall take a rest here so that I can organize and write down what I learned from water. I shall pour what is in me onto paper. As I empty my head, I anticipate water's further teachings. I anxiously look forward to my head being filled with delightful knowledge again. With a water refill, I can get back to my enjoyable journey. Till then, please stay with me for a while.

WHO ARE YOU? I AM WATER

Some years back a philosophical novel, *Sophie's World* by Jostein Gaarder, made best-seller lists around the world. In the book there is a question: "Who are you?" Since my childhood, I've asked myself the same question many times. I've wondered who I was and why I was here.

In high school I often discussed these questions (rather naively, I must say) with friends in my literary circle. Our talks would go on late into the night. Alongside these discussions I would read

many of the great literary works of Japan and other countries, checking books out of the school library one after another. Among the books I read that had a big impact on me were Fyodor Dostoyevsky's *The Idiot*, Leo Tolstoy's *War and Peace*, and Victor Hugo's *Les Misérables*. But when I went to college, I had different priorities, and I wound up joining the rugby club. Rugby was a lot of fun, and I put all my spare energy into it, so much so that I completely forgot about the questions I had asked earlier in my life. Then I went out into the world.

In the twenty-five years after college, I was an unremarkable workaholic, never resisting or questioning anything about Japan's capitalistic society—the rapid economic growth, the bubble economy that followed, and finally the bursting of the bubble. Eventually, I was beaten and burned out. Though I wasn't conscious of it then, I now see that I had to live an intense life with many ups and downs.

As you might imagine, at this time I was far from asking myself a question such as "Who am I?" My life continued to take twists and turns, but as I worked hard, I was blessed with meeting interesting people.

Eventually, I became independent and started

a small trading company (IHM), which imported medical devices from the United States. It began to change my life completely, and I returned to the frame of mind where I would ask the question "Who am I?"

Now I can clearly answer that question: "I am water." Why and how did I arrive at this answer? I will explain it in the subsequent sections about my work and the events that followed.

WATER AND VIBRATION

I became aware that I am water when my company shifted the products it handled from medical devices to water. For some reason, I was given a great business break dealing with water. I became fascinated by this opportunity, as if I were destined for this work. Because I lacked a background in chemistry and natural science, I began an intense study of water from the perspective of my favorite field, literature.

My inquiry led me to understand that water had a *hado* (vibratory) nature. As a result of this realization, I imported a device for measuring magnetic resonance (*hado*). I then measured the

properties of water using the device, developed a product called *Hado* Water, and established a therapeutic method called *Hado* Water Therapy.

Having achieved remarkable results with *Hado* Water, I wrote a book titled *Hado Jidai eno Jyomaku* (The Prelude to the *Hado* Age) in 1992, six years after my water investigations had commenced.

Although the book was written by an unknown author and published by a small press, it was well received and much talked about, thanks to the introduction and recommendation by Mr. Yukio Funai, chairman of Funai Consulting. It was the first book to introduce the concept of *hado* to the general public.

However, soon after the book was published, disturbing phenomena involving cult groups (including Aum Shinrikyo) became widely discussed in Japan. Some people even started to talk about *hado* in association with them. Moreover, others interpreted *hado* in their own way and introduced many dubious *hado* products to the market.

Like quantum mechanics, *hado* should have been understood as an important science that clarified the root of all phenomena. However, partially due to the efforts of some scientists and

authorities, it failed to become accepted in this way.

For that reason I was compelled to find a straightforward way to have the general public understand this essential and fundamental concept. The invisible world of *hado* must be made visible somehow. How could I do it? I contemplated it day after day, even while I was sleeping.

The idea that finally came to me, as you might have guessed, was to freeze water and take pictures of the crystals, as if they were snowflakes.

TAKING PICTURES OF FROZEN WATER CRYSTALS

It was in July 1994 that the idea hit me. I happened to be reading a Japanese translation of *The Day That Lightning Chased the Housewife: And Other Mysteries of Science* by Julia Leigh and David Savold. At one point they discuss the wonderful fact that no two snowflakes are identical. As I read it, I thought, "I've got it. Snow is water! I must be able to see water crystals if I freeze water."

Immediately, I put the idea into practice at my

company. After two months of struggles, we finally succeeded in taking the first photograph of a water crystal. We went on to perform many experiments, and I indeed learned many things from water. What I learned went into my books, including *Messages from Water*, *The Hidden Messages in Water*, *Kessho Monogatari* (Crystal Story), *Mizuwa Kataru* (Water Talk), and *The True Power of Water*.

My hope to see *hado* take root has progressed just to the first stage, but it was realized nonetheless. *Hado* has become a term that many readers of my books understand and use. This work has also taught me even more important things, some of which cause a sort of cultural shock to many people when I share them.

THE RATIO OF WATER IN A HUMAN BODY

Let's get into the core subject: Why are we water? As you know, 70 percent of the human body is water. Of course, the percentage differs depending on age; the younger the person is, the higher the percentage. For example, a newborn baby's body is more than 80 percent water. When a human life

THE
SHAPE
OF
LOVE

34

begins as a fertilized egg, the percentage of water is about 96 percent. On average, the percentage of water in an adult's body is 70 percent. It goes down to about 60 percent when a person reaches sixty years of age. As we grow older, the percentage of water in our bodies is further reduced, and the skin wrinkles more. In Japanese, a person with young and fresh skin is described as *mizumizushii hito* (a person full of water). (Incidentally, the next-highest atom is carbon, which counts for 10 percent, followed by nitrogen at 2.4 percent.)

When the amount of water in the body drops below 50 percent, the physical body ends its life. My mother had a long life and lived to be ninety-three years old. In the last five years of her life, her body became smaller and smaller. Shrinking must have been her genes' strategy to keep her body's water level above the required 50 percent. By understanding the relationship between age and the amount of water in the body, one can see why water is considered the source of life.

Because water is the single largest component in human beings, we can say we are water. Please remember this point, as it will be the premise for understanding the rest of this book.

Let me repeat: "We are made up of water."

WHO
ARE
YOU?

35

Three

THE
BEGINNING
OF
LOVE



THE ESSENTIALS FOR ALL BEINGS

The earth's environment is filled with wonders. Why are we always surrounded by oxygen, water, and moderate temperatures? How does our planet constantly move in an orbit? It is indeed amazing.

What's more, a vast number of beings exist on earth. There are more than six billion people; domesticated animals such as dogs, cats, cattle, horses, sheep, pigs, and chickens; wild animals such as monkeys, raccoons, foxes, deer, bears, lions, tigers, panthers, giraffes, elephants, camels, kangaroos, and snakes; birds such as sparrows, peacocks, hawks, and butcher-birds; and insects such as ladybugs and other beetles. Additionally,

there are reptiles, small creatures like earthworms and microbes, fish, sea creatures, plants, and minerals.

There are so many beings on this earth that it's impossible to list them all. Why are there so many? How were they born? Why do they exist? Only God knows the answers to these questions. Yet even though there are so many beings, they all have one thing in common. Every one of them has energy. From another point of view, we could say, "Everything is made by energy." In other words, all beings need energy. What, then, is that energy?

WHAT WAS THE BEGINNING OF ALL?

Let me tell you the conclusion first: energy means vibration. All beings are made up of atoms, and all atoms vibrate at their core. Each and every thing is vibrating. Yes, I mean everything—a dog, a cat, and a computer. Also, I mean a book, a plant, clothes, shoes, and perfume, as well as bread, rice, and everyday dishes.

Things exist because of vibration. Therefore, vibration is energy. An atom, a vibrating atom, in-

variably makes a sound. A pebble at the roadside, too, is vibrating and making a sound. A beautiful tulip blooming in your garden is also making a sound. For that matter, even the book you are now holding is making a sound. Still, we cannot hear these sounds, because we are not designed to hear them.

The Divine that created human beings designed our hearing abilities within the range of 15 hertz (fifteen vibrations per second) to 20,000 hertz. This is called the range of audible sounds. The Creator must have made this arrangement so that we could sleep at night. What if we could hear the sounds that a bed or a pillow gives off constantly? Surely, we would have difficulty sleeping.

Another important point is that vibration means life. The Japanese character (*kanji*) for "life" has the symbol meaning "to beat" at its center. This character must have been developed to show that beating is necessary to continue life, because vibration means life. In another sense, life also means rhythm.

How are we informed of someone's death? A doctor takes the person's pulse and says, "I am sorry, but he is dead." Death is pronounced when the heart stops beating.

The issue of brain death is controversial. I do not believe that brain death is really death, nor do I think that someone in the vegetable state is dead. When the heart's beating or vibration stops, that is death. Unless the heart stops beating, or vibrating, a doctor cannot pronounce death.

From this point of view, we can say, "Everything in this world is alive." We tend to think that only the things that move and grow are living. If we take the view that vibration equals life, even a pebble at the roadside is decisively alive. Perhaps Kannon (the goddess of mercy in Buddhism) sees the world that way. Literally speaking, the name Kannon means "one who can observe all sounds"—not hear them, only observe or see all sounds. Thus, I suppose, she teaches that "all things have life; so love and respect them."

Then where does vibration come from? The Japanese character for "sound" has two parts: "to stand" and "the sun." The character points out that the source of energy is the sun. Not until the sun "stands" does a sound, or vibration, exist. The sun is the source of all energies. No wonder so many parts of the world have the practice of worshipping the sun, including Amaterasu Omikami (goddess of the sun) in Japan.

THE SECRETS OF VIBRATION (SOUND)

Since 1987, when I started to import magnetic resonance analyzers (MRAs), I have been a *hado* and water researcher. For the next ten years I devoted all my energies to making *hado* water and helping more than fifteen thousand people recover from illness.

When I published *Messages from Water* (which included the world's first water crystal photograph) in June 1999, I became more confident about my concept of *hado*, having seen many people appreciate what I had to offer in that book. Today many sad and confusing things are happening in the world. Thinking about what is going to happen next gives me some anxiety and fear. However, I believe that we can deepen our understanding of the world by simply understanding the nature of vibration (sound). Vibration has many secrets, and once we understand its nature, we will understand many things about life and human beings. My theory of vibration consists of three parts: resonance, purity, and similarity. The various phenomena in the world, I believe, can be understood by using

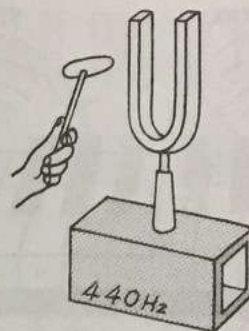


Figure 11. Tuning fork.

these three concepts. Allow me to explain them one by one.

GETTING ENERGIZED— RESONANCE

In musical terms, tuning means to put instruments into proper pitch, as needs to be done in an orchestra. A tuning fork is a device used for this purpose. The device has the shape shown in Figure II.

A tuning fork is made to give off a fixed tone when struck. The most commonly used tuning

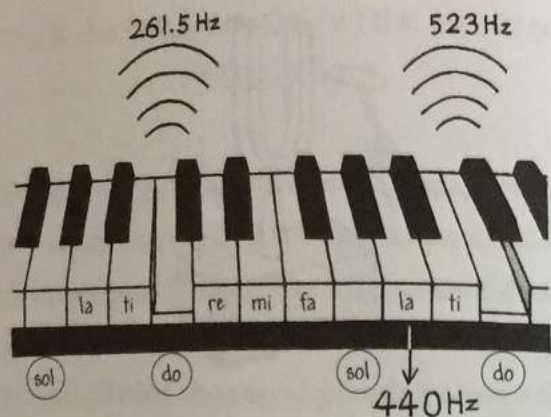


Figure 12. Top: Resonate. Middle: Hit (below 261.5 hertz and 523 hertz). Bottom left to right on the keys: la, ti, re, mi, fa, la, ti. Bottom left to right below the keys: sol, do, sol, do.

fork is one of 440 hertz. (Lately, 442 hertz is a more common frequency for tuning. Due to the change in the earth's terrestrial magnetism, the tone our ears can hear most easily seems to be rising.)

As shown in Figure 12, 440 hertz is the sound of the first A note on a piano keyboard above middle C. The sound of 261.5 hertz is the middle C, and its multiple of two, 523 hertz, is the C one octave above. As for A, it goes from a low pitch of 27.5 hertz to higher pitches of 55, 110, 220, 440, 880, 1,760, 3,520 hertz, and so on.

Let's suppose we have two tuning forks of 440

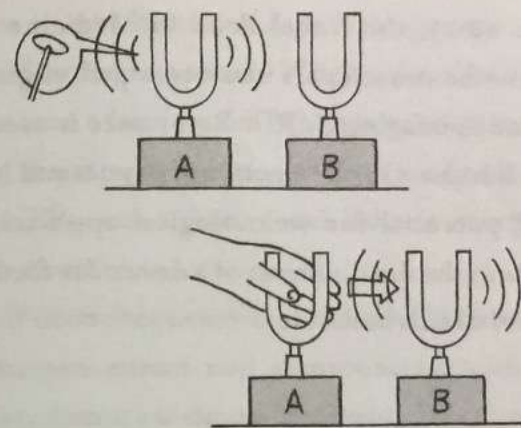


Figure 13. Top: Hit. Energy = vibration. Bottom: Energy from A to B. B continues to vibrate even after A is stopped.

hertz (Figure 13). When a tuning fork of 440 hertz is hit with a rubber hammer, we will hear the note A. When the fork is grabbed to stop the sound, the other tuning fork of 440 hertz, which is near the first one, will start to make the sound even though it is not hit. When both tuning forks have the same frequency, the second one invariably echoes automatically. This phenomenon is called resonance.

It is an awesome phenomenon, if you think about it. The second tuning fork is neither hit nor touched, but it starts to vibrate, even though it is made out of hard steel that has a large mass. This phenomenon is proof that energy is vibration.

In 2003, the Nobel Prize in Medicine was given to the two scholars who developed magnetic resonance imaging (MRI). Resonance is used in MRI. It is also a basic principle of physics and has a broad potential for technological application, such as in the development of a device for finding a school of fish in the sea.

ENERGY EXCHANGE—PURITY

Now let's switch one of the two tuning forks to 442 hertz and do the same thing as we did above. The tuning fork of 440 hertz is hit with a rubber hammer. This time, the second one does not seem to give off a sound. However, if we listen very carefully, we can hear a faint vibration. Though the sound is difficult to hear, the second tuning fork is resonating with the first one.

To our ears, the tone of 440 hertz sounds the same as that of 442 hertz. The difference is only 2 hertz, yet it makes a big difference in terms of resonance. In other words, the amount of energy produced drops significantly, and productivity goes down.

If we were to change the tuning fork of 442

hertz to 445 hertz and repeat the process, there would be no resonance. We would not be able to hear even a faint sound. When two things have exactly the same frequency, their resonance is perfect. They can enhance each other's energy in a pure manner.

If their frequency is absolutely the same, two items can attract and communicate with each other; distance is almost irrelevant. This phenomenon is called energy exchange. For example, some mobile phones can be used to call overseas, while others can't. The difference is due to the purity of the frequency transmitted by the phone.

The same is true with people's thoughts. When we tune in to the same thoughts or prayers together, we can expect to generate powerful energy. The world population is approximately 6 billion. How powerful can it be if 10 percent, or 600 million people, hope and pray for something wonderful?

VIBRATION (SOUND)—SIMILARITY

All things are vibrating; thus they have sounds. This means we can sort everything on a scale

according to its sound. The scale I mean is the musical scale of "do, re, mi, fa, sol, la, ti, do." On the keyboard of a piano, the black keys are halftones raised from do, re, fa, sol, and la in the key of C major. When halftones are included, we have twelve basic notes within an octave.

This means that we can recognize only twelve different kinds of sounds with our ears. Interestingly, there are twelve signs of the zodiac and twelve horary signs in Chinese astrology.

Let's take two tuning forks—in this case, one of 523 hertz (a higher "do" of C major) and the other of 261.5 hertz (a lower "do" of C major). When we hit the tuning fork of 523 hertz with a rubber hammer, the tuning fork of 261.5 hertz will resonate. The reverse is also true.

What does this mean? The tuning forks of two different frequencies resonate. A note of "do" on a musical scale resonates with any other "do." No matter how high or low the other "do" may be, as long as it is "do," it resonates. Notes that have the relationship of octave intervals resonate with each other. What does the relationship of octave inter-

vals mean? It's the relationship of notes in which each successive note has a frequency of vibration twice that of the previous, lower note.

For example, the notes that have the relationship of octave intervals of 100 hertz are 200, 400, 800, 1,600, 3,200, 6,400, 12,800, 25,600, 51,200, 102,400, 204,800, 409,600, 819,200 hertz, and so on. The numbers go on from the original number to ones multiplied by 2, 4, 8, 16, and so on.

I call this relationship "the similarity in vibration."

The important point here is that everything has a sound; therefore, we can say every phenomenon and every object has a relationship of similarity with something else. A simple example can be found in the relationship of a violin, a viola, a cello, and a contrabass.

In an atom, electrons circulate around the core. In the solar system, the planets circulate around the sun. These are other examples of the similarity relationship.

WHAT IS OUR SOURCE?

The existence of subatomic particles has been well known for some time. Dr. Masatoshi Koshiha, a Nobel Prize winner in 2002, and others have contributed to this knowledge. The size of a particle is as minute as $1/100,000,000$ of an atom, which is 0.1 nanometer (10^{-9} m). Naturally, the world of subatomic particles is invisible and inaudible to us. It is a world that most of us have difficulty understanding or even imagining.

Let's think about it, however. Does every phenomenon start big or small? Of course, the answer is the latter. In the case of us humans, our birth may be said to begin with a fertilized egg, when a mother's egg meets with a father's sperm. Do you know the size of the egg? It is currently thought to be 0.1 mm to 0.2 mm, a size that we can barely see with our naked eyes.

However, I believe that our start can actually be found at a much smaller state. That's right, we begin at the size of a subatomic particle. Everything begins at the subatomic particle level, the smallest unit recognized today. It is often said that we should go back to our origins when we get lost. It seems that today we are lost as a natural consequence of a ma-

terialistic development process. Now may be the time for us to go back to our origin as subatomic particles and reconsider which is the right path to take.

Some people may argue, "It certainly sounds all right in theory. But how much do we know about subatomic particles anyway? We hardly know them. How is it possible to think about the unknown world?"

The science of such a field is quantum mechanics. Roughly speaking, the conclusion that this science has arrived at so far is: "The world of quanta (subatomic particles) is chaotic, because the observation results vary depending on the observers."

I think of it differently. My idea is the concept of similarity that we have been discussing in this section. More specifically, it is the similarity of vibration. This concept leads to the idea of the human body as a microcosm.

I saw a wonderful videotape that led me to this idea. It was called *Powers of Ten* and produced for IBM more than twenty-five years ago. Easy-to-understand computer graphics presented visually the relationship of similarity between a human body and the cosmos. I believe you can now find

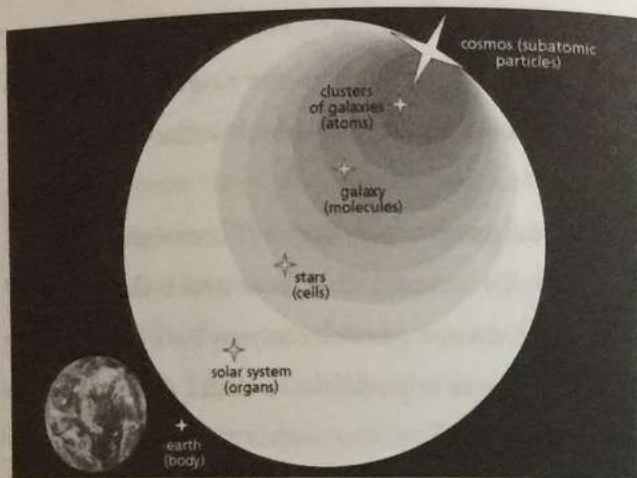


Figure 14.

this film on the Internet, and I highly recommend that you watch it.

Based on my memory of the film, I had a colleague at my company's laboratory make the drawing shown in Figure 14. Only recently have we begun to understand the size of subatomic particles. It is therefore amazing that the film had its origins fifty years ago in a 1957 essay by Kees Boeke.

As discussed earlier, everything, be it a particle or an atom, is vibrating and making a sound, and all sounds are included in the scale of "do" to "do." I have no hesitation in saying this, because there is no sound that is not included in the scale of do, re, mi, fa, sol, la, ti, do. (Of course, there are in-

between sounds, such as halftones between "do" and "re," but even these sounds are included in the scale.) Even the sounds in the world of subatomic particles are expressed along the scale of do, re, mi, fa, sol, la, ti, do.

When we accept the human body is a microcosm, we can no longer say that we don't understand the world of subatomic particles. If we view the human body in smaller and smaller increments, we can see that it goes from cell to molecule to atom and finally to subatomic particle. The smallest unit of consciousness and material is a subatomic particle.

Subatomic particles are influenced by our consciousness (positive thoughts, love, and gratitude), good water, and good music. If we shift our path toward deepening our understanding of the science of vibration, we may be able to go back to our origin.

LOVE MEANS GIVING A VIBRATION

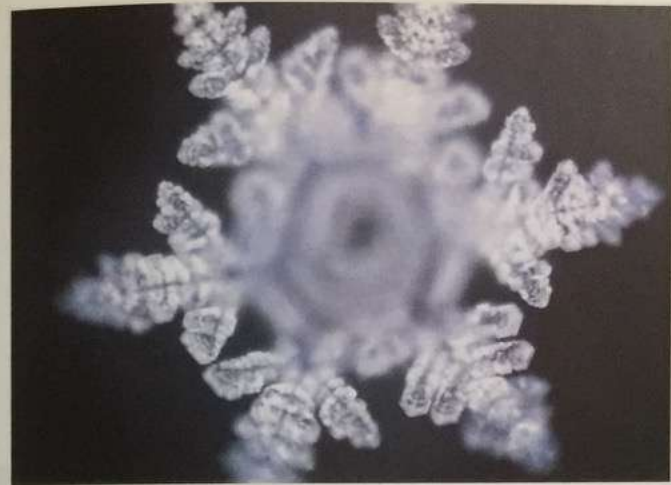
Many people became interested in the method of showing words to water and taking pictures of

THE
BEGINNING
OF
LOVE

frozen water crystals after reading *Messages from Water*. Naturally, while many people accepted this unconventional method, many others were skeptical. What I most wanted to present in the book was the fundamental meaning of vibration. In *The Hidden Messages in Water* I wrote:

All things vibrate, and they vibrate at their own frequencies. When you understand this, you will significantly broaden your understanding of the universe . . . In the scientific world of quantum mechanics, it is common knowledge that substances are basically nothing more than vibration. When we look at a substance in an increasingly microscopic manner, we reach the mysterious world where everything is both particles and waves.

Suppose you have a microscopic body and you are off to explore how the universe is made. When you are reduced to the size of an atom, you will only see that electrons are revolving around atomic nuclei. An atom has its own unique frequency according to the number and configuration of electrons. Whatever it is, in the microscopic



"RESPECT"

A person you respect is perhaps one who has a lofty and generous heart.



"NO GOOD"

Negative words, including forceful expressions such as "Do it," can deny life in all its forms.

These words can prevent children from growing freely and easily.



"CLEAN"

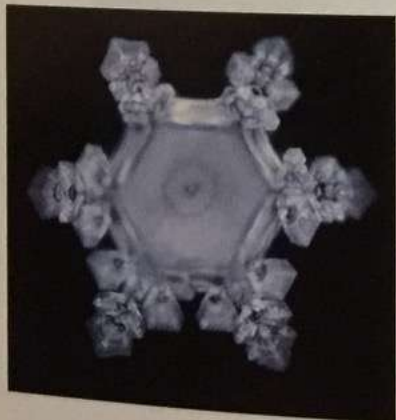
This crystal seems to indicate that "clean" is one quality of a person who does not exaggerate his or her self-importance or show off. "Clean" describes someone who is honest.

"LOVE OF ONE'S NEIGHBORS"
"Neighbors both sides and three across" is a common Japanese expression. This crystal looks more like "neighbors both sides and six across." It is nice to have good neighbors with whom you can cooperate.



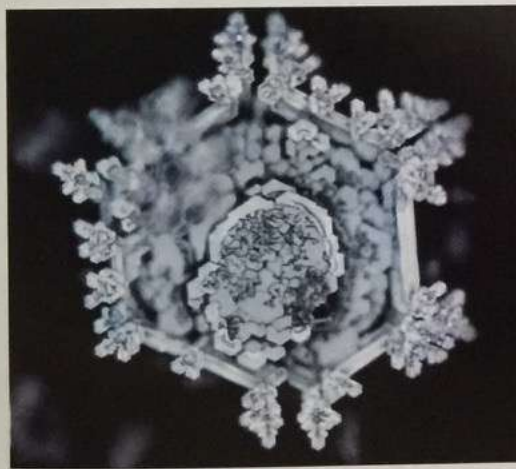
"PHILANTHROPY"

In the same way that philanthropy is felt to be universal, knowing no limits, so too this crystal grew out evenly, reaching in all directions.



"LOVE OF HUMANITY"

As the crystal depicting "love of one's neighbors" grows farther, it will become like this one. The shape is closer to perfection.



"BLIND LOVE"

Perhaps blind desperate love, in which one is grasping at straws, or love that is based on wishful thinking, is not true love. Here, with the center distorted, water did not yield a beautiful crystal.

"LOVE AND THANKS"

Interestingly, no other crystals formed after water was exposed to words are more beautiful than this one. This teaches us a very important lesson.



"I WILL KILL YOU"

The spiral in this frightening crystal resembles a snake lying in a coil.

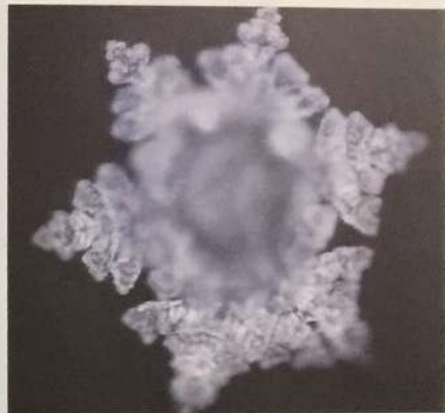
"HONESTY"

This crystal seems to indicate past, present, and future. The center, representing the present, looks like a mirror that reflects things as they are.



"FRIENDSHIP"

Can you help friends when they are in the midst of hardship? Doing so is not always easy, but imagine how good it would be if we could help them without hesitation.



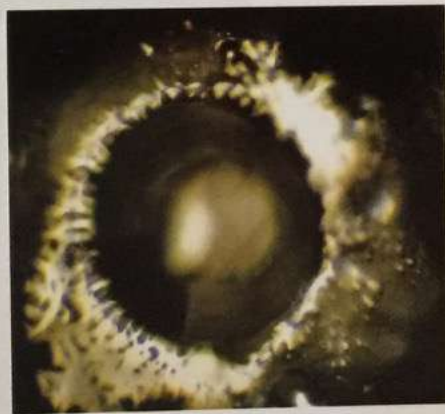
"LOVE OF SELF"

A person cannot love others without first loving him- or herself.



"DO IT!"

It seems no life-form wants to be forced to do something. To live by one's own will is the essence of life.



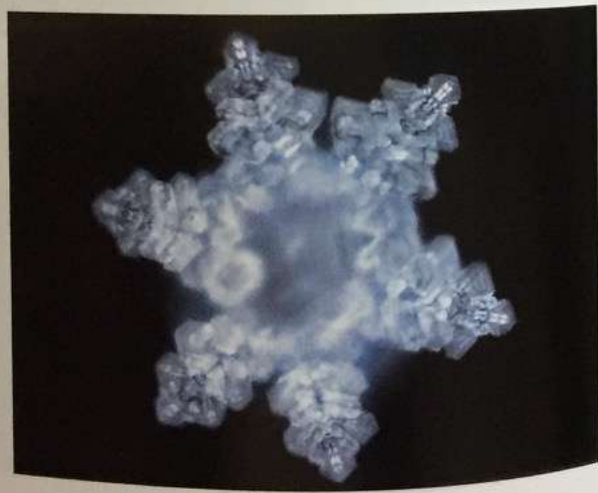
THE CHILDREN OF KITAKAWABE ELEMENTARY SCHOOL

Along with their families, the children of Kitakawabe Elementary School drew water from a nearby reservoir. Then these thirty people made a circle, clasped hands, and recited to the water: "Water, I love you." "Water, I thank you." "Water, I respect you."

Top: Before prayerful recitation.



Bottom: After prayerful recitation.



KIYOMASA WELL AT MEIJI SHRINE

Seeing a beautiful crystal like this one form in spring water from the middle of a city as large as Tokyo is rare. The water crystal shown here must be reflecting the devout prayers that men and women of all ages have offered while visiting this famous shrine.

THE SEA

Water that was exposed to "the sea" resulted in a crystal that rapidly grew into intricate shapes, in a way depicting the power of the changing sea of Nature itself.



SHOWING WATER "HADO"

All things are created by *hado* (vibration). The crystal here showed remarkable growth, almost as if it were making a large mandala.



"IMAGINE" BY JOHN LENNON

Playing this song resulted in a beautiful dreamy-looking crystal that it is not connected at its center. Perhaps "imagination" is something light and floating.



SENDING WORDS FROM ISRAEL TO TOKYO

The feeling of "love and gratitude" was sent from my seminar site in Israel to the tap water in a Tokyo office. We all recited, "Water, I love you. Water, I thank you. Water, I respect you." That message reached across space and resulted in this beautiful crystal.

world, you will feel everything is not solid, but moving waves. Everything is constantly vibrating and blinking at super high speed.

In the same book, I commented on the relationship between vibration and photographs of water crystals:

How should we explain that water changes its crystals after being exposed to the words written on paper? A written word itself has its own vibration, and water is sensitive to that vibration. Water can accurately copy the vibration of all things in this world and make invisible vibrations visible to our eyes. When water is shown a word written on paper, it catches the word's vibration and expresses the image in a specific shape.

Among the words that water was exposed to, "love and thanks" sparked the most beautiful response. In *The Hidden Messages in Water*, I explained it as follows:

The most beautiful crystal we have ever obtained was from the water shown the words

THE
BEGINNING
OF
LOVE

"Love & Thanks." Of course, "Love" alone results in a beautiful crystal. However, when both "Love & Thanks" together are shown, the water crystal added grace to beauty. As if it were a diamond, the crystal sparkled radiantly. Relatively speaking, the water crystal of "Love & Thanks" looked more like the crystal of "Gratitude" than that of "Love." It means that the water crystal reflected a more powerful and stronger influence of "Thanks" it received.

Love is a more active energy. Love is an act of giving heartfelt, unconditional affection. On the other hand, gratitude is a more passive energy—being thankful for something, or thankful for being allowed to live. In one of his poems, Housai Ozaki says, "No container I have, / With my hands I receive." As depicted in his poem, gratitude, I believe, is an act of receiving securely with both hands.

Love and thanks have the relationship of yin and yang. If love is the sun, gratitude is the moon. If love is male, gratitude is female.

WHAT IS OUR ROLE?

The topic of love and gratitude is my favorite, and I always include it in my talks. In general, people express feelings of wonder and acceptance. Lately, I have talked about it along the following lines: Love touches the other person's heart, and the other person responds in gratitude. Like an echo, these feelings move back and forth between people. In nature and the universe, this complementary relationship seems to exist. It is based on the phenomena I observed in my tuning-fork experiments.

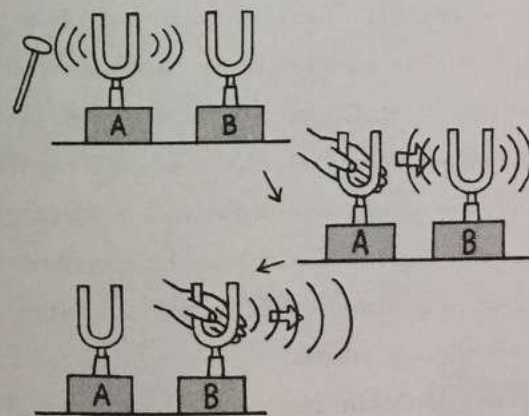


Figure 15. Top: Hit. Middle: Stop. Bottom: Echo phenomenon.

As shown in Figure 15, after tuning fork A of 440 hertz is hit with a rubber hammer, it is grabbed to stop its vibration. Then tuning fork B starts to vibrate. Tuning fork A transmitted the energy to tuning fork B.

Next, tuning fork B is grabbed to stop its vibration. Tuning fork A, which had stopped vibrating, now vibrates. This is the echo phenomenon. One tuning fork is hit, and then the other one vibrates and gives off a sound. The energy of vibration generated by A causes B to vibrate. Isn't the resonance between these two objects like a love-and-gratitude relationship?

Love is in all acts of cheering up others or giving them energy. Therefore, our role is to give energy to others. In other words, our role is to love everything. By doing so, we try to coordinate all things to be in harmony. I believe this is the way to live and this is the divine role we have been given to play on this globe. By making the most beautiful crystal when shown "love and thanks," water renders this concept visible.

All things, including human beings, are incapable of vibrating on their own, so let's give love to others unsparingly.

Four

THE
JOURNEY
OF
WATER



WONDERS OF WATER

No matter how small and powerless we may feel, as long as the energy we give off is pure and continuous, I believe we can change the whole universe at any given phase according to our will.

Why can water catch the vibration we give off in such a pure manner? Have you ever thought about what water is? Perhaps many would say, "No, I haven't, because water is water. It is such a common commodity." That's true. I myself had never thought about water until I became involved with it professionally. As you learn more about water, you will discover what a wondrous commodity it is. Suppose there is a glass of water in front of you. You put an ice cube in the water. The ice floats,

doesn't it? Like many others, you may not think much of it. However, it is truly wondrous.

Normally, the density of substances is higher—that is, heavier—in the solid state than in the liquid state. Therefore, with most substances, the solid doesn't float, but sinks in the liquid. Water, however, is different. Specifically, the density of water is said to be 1 g/cm^3 , whereas that of ice is 0.92 g/cm^3 .

Moreover, in general the density of a substance decreases as the temperature increases. The density of water, however, is highest—in other words, heaviest—at the temperature of 4°C .

Specific heat is the amount of heat required to raise the temperature of 1 g of a substance by 1°C . This is also more familiarly known as a calorie. The specific heat of water is the highest among substances. Also, the surface tension of water is so strong that it produces a capillary phenomenon. Among its many wondrous properties, water is an excellent solvent. Water can dissolve and carry most everything; there is no other substance that can do this.

While these properties are understood scientifically, the fundamental reasons for these behaviors have yet to be discovered. The one thing we

know is that these properties are very important to support life.

If ice were heavier than liquid water, it would cover the bottoms of the lakes and the seas in the polar regions. If seas and lakes were to freeze from the bottom upward, they would form a gigantic mass of ice, which would not allow the creation of life.

However, because water is heaviest at 4°C , the bottoms of the lakes and seas are maintained at 4°C even in the coldest weather. In terms of specific heat, water ranks the highest among substances. Water's boiling point of 100°C means that it is not easily vaporized. Because of this property, water shortage does not happen rapidly, and a sudden increase is prevented in body and earth temperatures. Water works wonderfully well in retaining heat (when a substance vaporizes, it requires heat).

Moreover, the surface tension of water is so strong that it produces capillary action. This means that water can go up to the tops of tall trees against the force of gravity. This property of water is indispensable to maintaining life. A good example of water's great dissolving ability is the blood in

our bodies. Because of water, in the form of blood, necessary nutrients (vibrations needed for each cell) can be distributed all over the body.

Indeed, water has many wondrous properties. Most of these properties are needed for the formation and maintenance of life. As I mentioned earlier, we still don't know why water has such properties. This reality seems to be reflected in the fact that this field has never produced a Nobel Prize winner.

We are water—and yet we hardly understand it. As a result, we don't know ourselves very well, either.

Maybe this is why, after tens of thousands of years of human history, we still engage in acts of war and killing which are against divine Providence. We need to understand water.

Other fields of science have made great progress. Now we need to collect all human intelligence to understand water, the source of life and the "one basic stuff for everything in nature," as the Greek philosopher Thales said. When our questions are answered, we will be able to understand ourselves. The first step is to know the origin of water.

My book *Hado no Shinri* (The Truth of *Hado*), published in 1994, is not yet available in English and so would not be familiar to readers of my other titles. Since the concepts presented in that book are the foundation for my current thinking, let me cite some relevant passages.

HOW LONG HAS WATER BEEN ON THE EARTH?

I have come to realize that we know almost nothing about water, the source of all life-forms on this planet. I have set forth the theory "water equals *hado*"; therefore, if we don't understand water, we don't understand *hado*, either.

Essentially, I thought that the mystery of water had been solved a long time ago. While I was contemplating deeply why water was so different from other substances and why it had such a complex and incomprehensible nature, I got an inspiration. It occurred to me that maybe the water on this earth came from another planet in the universe!

Later, I found the answer had already been

given by Dr. Louis A. Frank of the University of Iowa in his book *The Big Splash*. As a matter of fact, one of my staff members had given me a copy of the book a few months before I had my inspiration, saying, "This is a very interesting book. I hope you will read it." It ended up on my bookshelf.

The following is a brief biography of Dr. Frank.

Louis A. Frank was born in Chicago in 1938 and became professor of physics at the University of Iowa. Since his involvement in the calibration of the first U.S. lunar probe, he has been an experimenter or investigator for instruments on more than forty spacecraft. The types of instruments include those for energetic charged particles, plasmas, and auroral imaging, which led him to his recent discovery of comets.

Dr. Frank's accomplishments have put him on the cutting edge of plasma research and include the first direct measurements of the terrestrial ring current and of the polar cusp, the current systems in earth's magnetotail, the plasma tori at Jupiter and at Saturn, and global imaging of earth's auroral zones and atmosphere.

Dr. Frank was the first to observe with a scien-

tific instrument the belt of ions around the earth that is now known as the ring current. And he discovered the theta aurora.

Currently, Dr. Frank serves on various NASA space programs and is a member of the National Academy of Sciences, the American Physical Society, the American Astronomical Society, and the American Association for the Advancement of Science.

Dr. Frank is an active scientist and has many brilliant achievements. This well-known scientist, who used to hold conservative opinions, published his findings in *The Big Splash*. The promotional copy on the book cover of the Japanese version reads as follows: "Humans were born from the storms of small comets poured on earth."

Every minute, twenty small comets of about a hundred tons come into the earth's atmosphere. The comets that arrived on the earth over four billion years ago created the rivers, lakes, and oceans. The necessary materials for life were also brought by these comets. A temporary increase in the number of comets contributed to the Ice Age, when dinosaurs and other creatures died out. It's a long-awaited book by a world-renown physicist, in

which his new theory explodes the common knowledge on the origin of the earth.

Dr. Frank's new theory flatly denied the belief that water was on the earth all along. If it is correct, it will shake up today's physical chemistry, and it will inevitably lead to *hado* science.

At the time *Hado no Shinri* (The Truth of *Hado*) was published, Dr. Frank's theory (expressed in *The Big Splash*) was considered to be merely his personal opinion, and his book was published in the private sector, not within the scientific community. However, NASA officially announced this theory in May 1997. It was picked up by major news agencies such as the Associated Press and distributed widely throughout the world. In Japan, the news was broadcast by NHK (Japan Broadcasting Corporation) and was picked up by many national and local newspapers.

The following is an excerpt from an article that appeared in the evening edition of the *Asahi Shimbun* newspaper on June 2, 1997:

**NASA Observed and Announced:
Snowballs from the Universe,
Supplies for Seawater?**

On May 28, the National Aeronautics and Space Administration (NASA) announced that its polar satellite took pictures of numerous small astronomical bodies like snowballs falling into the atmosphere of the earth. These snowballs are small astronomical bodies with a diameter of around fifteen meters. Every day, thousands of them fly in and become parts of clouds as they get closer to the earth's surface. Considering the length of time since the birth of the earth, these astronomical bodies were possibly the source of seawater . . .

In 1986, Dr. Louis Frank of the University of Iowa claimed that water originated from the universe based on photographs taken by a U.S. satellite. His view was not widely accepted, due to lack of evidence.

Three months later, the Institute for Astronomy at the University of Hawaii made an an-

nouncement endorsing Dr. Frank's theory. On August 24, 1997, the morning edition of the *Mainichi Shimbun* newspaper reported as follows:

Comets Are the Mother of the Sea

The Institute for Astronomy at the University of Hawaii stated that their observation of the Hyakutake and Hale-Bopp comets yielded results in support of the theory that "the comets fallen to the earth are the source of seawater." The announcement was made at the General Assembly of the International Astronomical Union held in Kyoto on the twenty-third . . .

Mr. Junichi Watanabe, Section Chief, Public Information Office, National Astronomical Observatory of Japan, said, "It is very convincing that two comets yielded similar results. While all seawater may not be from comets, it can be said that comets played an important role in the formation of the sea."

SO WE ARE ALIENS

If water is, in fact, not a material intrinsic to earth, our biological origin and evolution must be explained quite differently from the way they are explained today. One thing regarded as absolutely true in today's science is that "no life can be born or maintained without water." I believe this is 100 percent correct, and no one would argue about it. If so, it can be said that all life-forms, including humans, have their origin outside of the earth.

Once this new theory of water origin is accepted, many fields—such as biology, anthropology, physics, astronomy, medicine, psychology, theology, chemistry, and pedagogy—will have to completely revise their textbooks. It will be too much to take for scientists who believe that water originated on earth, because it will undermine many of their accomplishments. Ignoring the new theory might be an easy solution. Despite the reports made by two authoritative sources, NASA and the University of Hawaii, no one seems to have dealt squarely with it.

However, by accepting the new theory, we have a chance to understand many inexplicable myster-

ies in our history. For example, there are the stories that continents such as Atlantis, Lemuria, and Mu existed but were lost underwater. Many under-sea ruins were discovered in the Sakishima Islands of Japan. Could they be the proofs of such stories? How authentic is the allegedly true history in the old Takeuchi documents and Heitate shrine of Mount Aso in Japan? How about a new theory regarding when the pyramids and the sphinxes were built? What is the true nature of the photon belt? If a catastrophe will come, when will it take place? These questions may be answered if we assume that human beings originated outside of the earth. By understanding this correctly, our alternatives will be expanded because our view of human history will shift from the earth to the universe.

I feel I have a role to play in this shift, because it will be difficult for scientists to take up such daring ideas within the framework of today's society. I am free; I have no constraints to worry about and no honor to be damaged. Even if others think I am crazy, I don't care. I just do not want to live my life without expressing what I think.

Even if my theory should turn out to be off the mark, it will not hurt anyone, as it has a positive nature. In such a case, I imagine that the Divine

would scold and forgive me, simply saying, "You careless man."

OUR TRUE HOME— THE BIG DIPPER

Let's start a fairy tale with the assumption that water came from the universe to the earth and resulted in the birth of human beings.

How did we come to this planet? I believe we came to earth on comets, as in the NASA report. Well, "on comets" may not be accurate. Perhaps I should say "in the form of water crystals in comets." A water crystal is like a phantom because it disappears at 0°C. With a microscope, we can see water crystals at temperatures between -15°C and 1°C. The shape of crystals is three-dimensional. I wonder if frozen water crystals are between three- and four-dimensional.

Water in liquid form is like a state where we humans are living, and water in crystal form is a state where we are spirit. Perhaps when water is transmitted, it is in a four-dimensional state. Somewhere in the universe, water is sent in the form of ice in a four-dimensional state. As it gets

closer to the earth, the temperature increases, and it assumes a three-and-a-half-dimensional state. When it arrives, it becomes liquid in a three-dimensional state.

As you know, water changes its form within the atmosphere on earth. These forms include haze, fog, hail, snow, cloud, sleet, ice, and liquid water. I think the changes that water goes through in the universe are far more numerous than we can imagine. In this vein, I even wonder if light could be a form of water.

The question is where in the universe we came from and why. I originally thought that we were exiles of the universe because we seem to have a hard time giving up our egos and sins. Let me cite the following, again from *Hado no Shinri* (The Truth of *Hado*).

ARE WE THE DESCENDANTS OF EXILES OF THE UNIVERSE?

Could we be the descendants of exiles of the universe? Could it be possible that our ancestors committed a crime on a faraway star in the universe?

Perhaps that star was like a utopia. Our ancestors, however, happened to develop ego, and committed a crime. According to the rule there, they were banished. Their destination was determined by the degree of their crime. Of course, there is no way of knowing where earth ranked. However, earth might have been for major criminals, because under the spell of gravity on earth it is impossible to escape.

Our ancestors were changed into ice and blasted off to earth. After an unimaginably long trip, they finally came close to earth like a comet and flew into the atmosphere. Naturally, the heat melted our ancestors in the form of ice, and they vaporized instantaneously. Then they became clouds and eventually arrived as rain on the earth's surface for the first time. After an unimaginably long time, they were born as human beings. As they lost all memories of the past, they had to start their lives all over again and build civilization.

Under the influence of gravity, which might have contributed to the formation of the yin and yang theory, we cannot get off earth so easily, and we are currently at the crucial moment. This story ends here.

Lately, however, I have developed a theory that

we are graduates from the school of the universe. I have grown uncomfortable with the earlier story that we are the descendants of exiles because of its negativity.

ARE WE GRADUATES FROM THE SCHOOL OF THE UNIVERSE?

What if we were sent to earth as missionaries, not as the descendants of exiles? Let me introduce another story, using myself as an example:

I was born on a star far, far away from the earth. The star was much more peaceful and advanced than the earth. The star had a missionary system, and everyone had to teach its precepts on the other stars or planets.

When I graduated from school, I perhaps wrote a thesis that said, "My mission is to go to earth to spread love." I received a passing grade and graduated from the school of the universe. A planetary rocket was launched to Japan, since I requested Japan to be my destination. As usual, all of my memories were erased, except for the necessary information to become a human, which was left in the crystals of ice. In terms of geophysics,

the distance between my home star and earth was enormous. Perhaps, due to a different dimension of time, I arrived at earth instantaneously.

On July 22, 1943, I made my first cry as a child of my parents, Hiroshi and Kazu Emoto. (The first cry of a newborn baby is 440 hertz—I remember having read it in a book. This cry may be a signal to let the home star know of a baby's safe arrival.)

I grew up in a loving environment, receiving my parents' deep love and understanding. The most important period is believed to be the first ten years of life, when cranial nerves fully develop and stabilize in a human. I was blessed with having good brothers, and my childhood was filled with the pleasures of a happy home, even though we were poor.

I was the youngest of my parents' four children. My parents, my father in particular, tended to be stricter with my brothers, but I was raised freely and easily. I am really grateful for the way my parents brought me up.

In my youth, I was a serious student who also very much enjoyed music and sports. I liked to play musical instruments, and I was clever with my hands, which made me a quick learner. This exper-

ience seems to have helped me later in my work with MRA, the *hado*-measuring device, which was like a musical instrument.

After I went into the world, I worked very hard. My hard work resulted in both successes and failures. For the first twenty-five years, I experienced many ups and downs. I made my wife, who is my business partner as well, go through hardships, including a bankruptcy with a large debt and so many other difficulties that I cannot list them all here. She cheered me up by saying that these are the results of trying to be "right and just."

In retrospect, I now realize that these hardships were touchstones leading me to my current work. During those twenty-plus years, I stood at the crossroads many times. When I had to decide to go right or left, I made my choices based on what was "right and just." As if it were a game, I chose right or left at each intersection and came to the place where MRA and *hado* technology were.

After all, I hadn't forgotten my thesis upon graduating from the school of the universe. My work has just begun, but I feel that I have reached the door of the house of my destination. I knocked at the door, and the door opened smoothly. I feel I am in the first room.

I have no idea how many more rooms there are, but I feel excited, like the leader of an expedition team. My intention is to go as far as I can and to broadcast what I see to as many people as possible.

I keenly think about the importance of childhood upbringing. I owe the role I am playing now to my parents' unconditional love.

CHILDREN, THE GIFT FROM THE DIVINE

Let's continue the story of the graduates from the school of the universe. Since I was born on July 22, 1943, I must have arrived on earth during the fall equinox of 1942. So I graduated from the school of the universe about sixty-five years ago. My home star must also be constantly advancing. Therefore, even if the information I brought with me from the star were fully revealed, it is already sixty-five years old. (If I had an excellent antenna to receive up-to-date correspondence courses from my home star, it would be a different story, but I don't think I do.)

Let's think about the babies arriving today.

They graduated from the school of the universe some sixty years later than I did. They are awesome, because they exist on this planet with information potentially more advanced than we currently have.

What should those of us who came here earlier do for the newly arrived babies? They must also have written their theses. Therefore, we need to secure the environment so that the newly arrived will not forget their missions. Let's put our hopes in them. Let's trust them. Let's not force wrong education on them. Let's provide them with a comfortable and healthy environment. It is our role to prepare such a field for them. What specifically should we do? The following is my ten-point proposal for future education:

1. Let's remember that adults do not own a child, just because he or she is temporarily entrusted to them by the Divine.
2. Let's not compare our children with other children and worry about the differences.
3. Each child has written his or her own thesis. Each thesis is different and reflects its writer's personality. The role of an adult as a guardian

is to fully bring out the child's unique individuality.

4. The first ten years of the child's life are especially important, because cranial nerve cells keep developing during that time. By observing attentively, you will understand what the child wants or what his or her actions are for. Let's try to understand the child as much as possible. If we can't, let's not worry by ourselves. Let's find a support group and learn together.
5. Let's select our children's kindergarten and elementary school from the children's viewpoint, not from the parents'. When children are three or four years old, they can express their own opinions. The role of adults is to provide children with the correct information and alternatives, and let them make their decision.
6. Let's refrain from using negative expressions such as "don't" and "no good." Instead, let's use more positive expressions such as "let's" and "shall we." If we understand the princi-

ples of *hado*, we will know how much influence our words have on our children's positive thinking.

7. Let's treat a child not as a child but as a person with a sound personality, including consciousness and responsibilities.
8. Let's think together with a child when he or she asks "why?" Perhaps we won't be able to answer many of the questions, but it would be wonderful to make it a habit to learn and think with the child. Let's not make irresponsible remarks. Especially in the realm of natural sciences, let's study until we can answer the child's questions confidently.
9. Let's pay attention to the information coming by electromagnetic waves. But keep in mind that when the information is bad, children may receive fatally bad influences. Let's give children no violent TV programs and games.
10. It is important for adults to have their own clear understanding of sexuality (though it may be difficult to do so). If necessary, let's share our understanding with children with-

out flinching. The children's resolute attitude, more than what the parents say, will give them a good signpost.

ALL LIVES ALSO CAME FROM THE UNIVERSE

Water didn't exist on the earth in the beginning. If water is the source of everything, as Thales, a Greek philosopher, said, not only human beings but all other lives that require water have their origin somewhere in the universe. Of course, I have no way of knowing if it was the Divine who sent us to the earth. We weren't just sent to the desolate wild earth without water. Whoever it was had a kind heart to program the basic necessities in water so that we could live on this planet. Dogs may hold the key to evidence of some sort of divine intervention.

For example, unlike for many other animals, the Japanese character (*kanji*) for "dog" doesn't have a part indicating animals. According to a story I heard directly from Dr. Hoang Van Duke, a medical scientist originally from Vietnam and a

professor emeritus at the University of Southern California, what is implied in the Japanese character for "dog" is that Heaven (God) sent dogs to earth to have them help human beings and let them be good cooperators. As dogs are sent by Heaven, the Japanese character for "dog" resembles the character for "Heaven." The English word "dog" is "god" when reversed. I now totally believe this story.

Incidentally, other domestic animals that are said to have followed include horses, sheep, cattle, and rabbits, which also do not have a part indicating animals in their Japanese characters. Animals that do have the characters with a part indicating animals, such as cats, raccoons, and wolves, are said to have been changed from dogs later on for some reason.

I find Japanese *kanji* fascinating. Through studying how each character is developed, we may be able to accurately identify the origin of each letter and perhaps therein solve many of today's remaining mysteries.

For example, the Japanese character for "darkness" symbolizes enclosing a sound inside a gate. This perfectly reflects a concept of quantum me-

chanics. No matter how small a thing may be, as long as it has energy, it gives off a sound. Darkness must have been perceived as the world with no sound.

A lexicon of Japanese *kanji* begins with indexes for the left-hand side, the right-hand side, and the top parts of characters. In terms of animals, the list includes only a limited number of parts, such as dog, cattle, sheep, insect, boar, shellfish, horse, fish, and bird. The Japanese character for each of the other animals has one of these portions, and the remaining part of the character is something that indicates that particular animal's characteristics.

I believe these animals that became the parts in *kanji* are the ones that were sent to earth first; later in the process of evolution, the other animals were created.

THE MYSTERIOUS LIFE OF PLANTS

A little more than thirty years ago an interesting book titled *The Secret Life of Plants* was published in the United States. It became a best seller in America, its German edition sold more than a hundred

thousand copies, and in 1987 it was translated into Japanese. (Some of you may also remember the popular 1979 soundtrack Stevie Wonder composed for the film documentary based on the book.) I refer to this book because it includes a lot of data to support the idea that all life came from the universe. For example, plants respond to human consciousness, plants synchronize with certain people, and plants have personalities.

Some of the book's chapter titles are listed below, and we should seriously think about the book's contents and the results of the experiments described therein.*

- "Plants and ESP"
- "Plants Can Read Your Mind"
- "Plants That Open Doors"
- "Visitors from Space"
- "The Metamorphosis of Plants"
- "Plants Will Grow to Please You"

*In Japan, Akira Mikami actually put the concepts of the book into practice and wrote several highly respected books on this subject, including *Joint Research with Plants* and *Plants Warn Us*.

- "The Harmonic Life of Plants"
- "Plants and Electromagnetism"
- "Force Fields, Humans, and Plants"
- "The Mystery of Plant and Human Auras"
- "Soil: The Staff of Life"
- "Mind over Matter"

Many scientists started to pay attention to the unique informational abilities of plants, and now many of these once revolutionary ideas are commonly accepted as fact.

Unlike humans and animals, plants can't move. I don't think that plants feel stress about this fact. In terms of atomic compositions, I believe that plants are simpler beings than humans and animals.

Let's suppose one plant is made up of atoms A, B, C, D, and E, while another one is composed of B, E, F, G, and H. I have no doubt that plants have emotions, but I think different plants have different emotions.

The simpler atomic composition of a plant means its *hado* is purer and has stronger energy for

specific types of information. This may explain why plants have better communication abilities than humans and animals, and they can communicate with other plants on this planet as well as with the home base somewhere in the universe.

Due to excess stresses and pressures, we humans seem to have lost our ability to fully utilize our communication potentials, but I believe any of us can obtain necessary information through plants, as long as our intention is in accordance with the benevolence of the universe (love).

A STORY OF A PLANET

If humans, animals, and plants were sent here from the same star somewhere in the universe, the reasons and purposes must be the same for all beings.

The mission that all beings received must have been "to transform the wild earth into a friendly, peaceful, and plentiful planet." For this common purpose, I believe that the three parties were supposed to get along well and help one another. All beings were expected to live on earth by utilizing the soils and atoms that had been sent here in advance.

The first comers might have been heat-

resistant plants—for example, ferns. The information came in the form of rain and arrived on the ground. It resonated with certain kinds of atoms and manifested as ferns that had green leaves, for example. Through photosynthesis, a special ability given to them, ferns were made to absorb carbon dioxide, which was abundant on the surface of the earth, and to produce oxygen.

Because of the advance party's efforts over tens of thousands of years, the earth's environment became gentler. During this time, the atoms needed for synthesizing certain animals must have been cultivated. The sender then encoded the information about animals, perhaps microorganisms at first, into water and launched them to earth.

Many more years later, the planet's environment finally became suitable for humans. All of the 108 atoms were on earth at that time, and the temperature averaged around 30°C. The seas, rivers, lakes, and ponds were in place. There was now ample oxygen thanks to plant presence over tens of thousands of years. Then humans came to the earth accompanied by domestic animals.

The arrival of humans and animals was also needed for plants, because in order for the plants, which required carbon dioxide to survive, to con-

tinue to produce oxygen, they needed the beings that consumed oxygen.

Thus the soil, which existed on the earth from the beginning; the water, which came from far away in the universe; and the oxygen produced by plants were all in place on this planet. The issue then became how to maintain the balance of the four parties (humans, animals, plants, and soil) under the leadership of humans.

Naturally, humans must have come full of gratitude for the other beings—soil, plants, animals, and water—that created the environment where they could also exist. However, for some reason, humans lessened their gratitude as time passed and came to think only about themselves.

As a result, there is something wrong at this time. Unless we humans reconsider our origins, worse things are yet to come. I believe we are now at a turning point where we must choose our future direction.

HUMANS HAVE INNATE GOODNESS

Some readers will undoubtedly view what I have just described as totally absurd. They may want to

scold me, saying, "Outrageous! Don't talk nonsense!" Nevertheless, what I really wanted to convey is that most of us pay so little attention to our origins. I believe that we share a common desire to live humanely. If so, I believe it is important to continue our search for our origin and challenge ourselves to discover it.

As I said earlier, I initially thought we were the exiles of the universe. This was based on a view of human nature as fundamentally depraved. However, I changed my mind after the arrival of new theories, such as that about Indigo Children.* As I studied more about water through taking photographs of frozen water crystals, the new way of thinking became much clearer to me. I now have no doubt that we were sent here with missions and roles. It is a view of human nature as fundamentally good and is based on something I observed. No matter how polluted the lake or tap water looked initially, water responded to our thoughts and prayers. Even the water that previously produced only ugly crystals was able to form beautiful crystals when we sent it our pure thoughts and

*This is the name of a new type of children identified by Lee Carroll and Jan Tober in their 1999 book, *The Indigo Children*.

prayers. The beauty seemed to be a function of how pure our thoughts and prayers were.

I have observed this phenomenon in more than twenty cases and have included the results in my books: for example, the water at Fujiwara Dam after the prayer on the cover of the first volume of *Messages from Water*; the tap water of Tokyo after the children's prayer in the video version of the book; the water of Lake Picchu Cava in São Paulo, Brazil, after the prayer; and the water after five hundred *hado* instructors' simultaneous distant prayers.

These facts convinced me that all humans have innate goodness, because the water in the above circumstances was contaminated environmentally or by antiseptic chemicals and it would produce absolutely no crystal in normal circumstances, yet it created beautiful hexagons after the prayers. This reminded me of the Buddha's metaphor about lotus flowers.

As you know, lotuses grow in mud; however, they yield lovely blossoms. Using lotus flowers as a metaphor, the Buddha told us, "Even in the worst environment, people can still blossom beautifully."

As I have been saying, we are water. No matter how contaminated or dirty water may become, it

can still form exquisite crystals reflecting people's beautiful thoughts and prayers. What this implies is that we humans, too, can open our lovely flowers even in adverse circumstances. By meeting with beautiful minds and receiving their help, we can transform as Jean Valjean does after meeting the bishop with a merciful heart.

In other words, even an evil man is intrinsically good at the subatomic level. I now deeply believe this. Humans are affected at the atomic or molecular level, just as the environment is polluted especially at the molecular level.

So, with what missions were we, as good beings, sent to earth? Before I get into this subject, I would like to share my perspective on God and religions.

DOES GOD EXIST?

Growing up, I didn't know much about God and religions. I was raised in a family with no religious practices. Moreover, I grew up in a city and didn't learn much about everyday Buddhist rituals, either.

One thing I remember is attending Sunday school (a traveling church) provided by the occu-

pying forces right after World War II. I still remember some of the hymns I learned at that time. My motivation was the chocolate and cookies that I was given for attending the school.

So I never deeply thought about God. Even when I was a high school student naively discussing the big questions of life with my friends, we generally talked about philosophy, not about God and religions. It may be because of my attitude toward God and religions that the first twenty-five years of my working life were lacking God's blessings.

However, my attitude changed after I turned forty-five and became involved with *hado* and water. My thoughts particularly changed as I started *hado* consultations for those who suffered from diseases by using MRA, the *hado* measuring device, and transcribing the necessary information onto distilled water called "micro-clustered water." In ten years, I treated more than fifteen thousand people with *hado* water, and I got increasingly more accurate results as I gained more experience. During that time, I noticed that those who reflected upon themselves according to their religious teachings and deepened their understandings of the basics—love and gratitude—had a better improvement rate than those who didn't. Empiri-

cally, I came to realize that all diseases are derived from lack of love and gratitude at the DNA level, including karma from past lives. Thus I couldn't help but believe in the existence of the Divine.

I realized the following: Christ and Buddha were the sons of God. If a person strayed from their teachings, he or she would get sick. If the diseases turned very severe, the person would die. Death means the negation of being as a human. Therefore, as long as we want to live as human beings, we need to believe in the existence of the Divine and follow the teachings. The concept of God is love and gratitude.

From another perspective, I believe it is reasonable to assume the existence of the Divine.

"How was the universe—complex and subtle—created?" This is an eternal theme for humans to ponder. Perhaps it will remain an eternal question as long as we stay in the three-dimensional realm—as long as our soul stays in the physical body. Nonetheless, we shouldn't stop our quest for the answer, because I believe that our ultimate goal is to seek and find the answer. This is an exciting and interesting challenge. At the same time, answering this question will be more difficult than solving a

complex mathematical equation. I tend to think that the answer will turn out to be very simple when we finally figure it out.

I certainly hope that we can get as close to the truth as possible. I imagine finding the answer in this three-dimensional world would be more profound and exciting than in the otherworld. Such an experience might be called a true pleasure.

When we work on a difficult mathematical equation, it is sometimes easier to proceed if we assume the answer and work back to see if it is correct.

In this case, the variable x in our equation is God. Dr. Kazuo Murakami, professor emeritus at the University of Tsukuba, uses the term "Something Great" instead. "God" is not just a term we should use in a religious sense; rather, I believe, it should be included in scientific terminology as well.

Some people dislike and feel embarrassed to use the term "God." "Authoritative" scientists tend to be found in this group. They tend to remain in their specialized fields, rather than coordinating with others holistically. In such an environment, it is impossible to reach the most important truth.

So, in order to find the answer, we shall assume that God exists. The Bible and the Sutras, which contain the teachings of Christ and Buddha, respectively, will be our reference books.

I am sure that there are other great religions as well, but my knowledge is superficial even with the Bible and the Sutras. Therefore, I rely on the realm of my subconscious, which I believe exists somewhere in my brain. I feel that the realm is now getting quite close to the surface and within my reach, more so than with most people.

I suppose my experience of *hado* measuring and consulting for more than fifteen thousand people contributed to bringing my subconscious to the surface, as I was able to help these people bring their subconscious memories up. Additionally, water taught me a lot after I acquired the technology of water crystal photography. I am especially blessed in this respect.

In the next section, I would like to share my hypothesis (or fairy tale?). If it's contradictory to the teachings of the Bible, the Sutras, or other religious writings, I would very much appreciate the input of clergy and other religious scholars.

WHERE DID THE WORD COME FROM?

The Bible says that God created the universe in seven days. It also says, "In the beginning was the Word." I am not going to talk about the "seven days," but what does this reference to the Word mean?

For more than a decade, I conducted many experiments with water and took photographs of water crystals. The most amazing thing I observed about water was that when water was shown words, it responded positively to the positive words and negatively to the negative words. For example, water responded by forming beautiful crystals when it was exposed to "thank you." It responded horribly to "you fool." At first, I considered an experiment of talking to water. However, because of the great variance among people in talking, I adopted the method of typing a word on a sheet of paper and exposing it to water for one day and one night. Empirically, I had known that words had their own *hado* (vibrations).

The water's responses were the same when it was shown not only Japanese words but also words in other languages, such as English, German, Ko-

rean, and French. Naturally, many people who read my books or came to my seminars asked me why water responded in these ways. I usually explain it like this.

Since I was born in Japan and raised by Japanese-speaking parents, I speak Japanese fluently. If I were raised by a wolf, I would be speaking a wolf language, but not a single word in Japanese. The same is true for everybody.

For example, many people in Brazil have pure Japanese DNA. If their parents didn't teach them Japanese, they cannot speak Japanese. So the language is not in our DNA but something we learn after birth.

Then what about the first humans, let's say Adam and Eve? Who taught them words? Nature! They must have learned various vibrations and sounds from nature and started to imitate them to communicate with other humans. Great nature has all kinds of vibrations and sounds. For example, there are the roars of lions and tigers, which are dangerous to humans, and the calls of goats and rabbits, which have safe and gentle natures. Also, the sounds in nature include the murmur of streams and the rumbling of flooding water.

As humans accumulated many experiences

over a very long time, the function of the vocal cords developed proportionately. Thus humans gradually created words and increased their vocabulary.

With this line of thought, it is easier to understand why there are so many languages. It is because aspects of natural environments, such as temperature and humidity, differ depending on where people live. For example, the Japanese archipelago is long and narrow. The north end lies in the subarctic zone, and the south end is in the subtropical zone. It has four distinct seasons. Each season has a different climate. Thus I believe that Japanese has more kinds and greater numbers of words than most other languages.

On the other hand, in Siberia and Alaska the climates are cold, and the seasons don't vary very much. As a result, the natural environment tends to be more uniform than in a place like the Japanese archipelago. Therefore, I believe, the vocabulary of the languages developed in these regions is much smaller than that of Japanese. However, I have heard that Inuit has more than 170 words for ice. This is because there are many aspects of ice in the arctic. It also indicates that the words were developed from natural phenomena.

This essence of nature appears to be the same everywhere. In most countries, snakes are feared and detested, while almost all flowers are viewed as sweet and lovable. However, the difference in temperature and humidity influences frequencies. The climate in each region gives off a different frequency. Thus the difference in sounds resulted in the different names or words for the same plants or animals. For example, the sound of a pig is expressed "oink, oink" in English, but "boo, boo" in Japanese.

BEAUTIFUL WORDS CREATE BEAUTIFUL NATURE

As we analyze the development of languages, we realize an important concept about words. No matter what language it is, it is absolute. Words are not the result of random creations.

Of course, I am referring to the original languages that were developed when humans lived in nature. Their five senses must have been keen, as humans were at the mercy of nature, collected food in nature, and died in nature. Therefore, as discussed earlier, they must have made frantic efforts

to feel the indications and *hado* of nature, and over a very long time they built the words as their vocal cords developed.

Naturally, when we pronounce *uchu* (cosmos) in Japanese, it must resonate with the vibration of the universe. When things have the same frequency, they resonate. In other words, they exchange energies. In this manner, they converse.

For our ancestors, the *hado* of the universe they felt in Japan was *uchu*. Similarly, the *hado* of the universe must have sounded like *kosmos* to the ancient Greeks, "cosmos" to the ancestors of the Anglo-Saxons. It is expressed as *cosmos* in French, *cosmo* in Italian, *cosmos* in Spanish, *cosmos* in Portuguese, *kosmos* in Dutch, *Kosmos* in German, *kocmoc* in Russian, *cosmos* in Latin, and *yuzhou* in Chinese.

The word for the universe in many of these languages is very similar. As the universe is vast and something to be felt by looking up, there might not have been so many regional influences regarding this word in different languages.

Let's consider water, a very common substance. The word for water in different languages is *eau* in French, *acqua* in Italian, *agua* in Spanish, *água* in Portuguese, *water* in Dutch, *Wasser* in German, *aqua* in Latin, and *shuy* in Chinese.

Anyway, Japanese has the word *kotodama* (the spirit of languages). *Kotodama* does not refer to the spirit world; rather, it is a science that can be explained by the theory of quantum vibration.

In my seminar, I usually summarize the discussion above by saying that it underlines the importance of using correct and positive words in our daily lives.

Words are *hado* (vibration).

Words are the products of nature.

Therefore, beautiful words create beautiful nature.

Dirty words create dirty nature.

This is the essence of the universe.

WHAT WATER IS TELLING US

When we go back to the origin and explore how words were developed, we can better understand the biblical phrase "In the beginning was the Word." I think that the Word was made by God and

used by God. God must have thought to create a utopia on earth.

At first, several stars (seven stars)* were allotted to deliver the substances (atoms) to make the foundation of the earth in the form of meteorites. The meteorites collided with the earth, creating enormous energy that resulted in the formation of a large amount of magma at the core of the earth.

When the earth eventually became the size it is today, meteorites stopped flying in; but the earth was still a huge ball of fire and exploding gases. Observing the earth from high above, God created something and sent it to the earth to extinguish the fire and cool the heat down at just the right time. This was water. Every time God sent water to the earth, he gave water words and messages, which encoded his blueprint. Also, God designed water so as to store memories. Since the distance to the earth was great, God transformed water into ice, a more stable form, so that water could remember the messages. At this stage, God gave water the information about creating life later and the neces-

*More about this later.

sary wisdom for sustaining life in the form of vibrations, or words.

Right before water arrived on the earth, it woke up. It checked the entrusted messages that were in the form of crystals. Water crystals do not appear when the ice is very hard, that is, with a temperature lower than -15°C .

Upon its arrival on the earth, water worked on the atoms sent there in advance to create life phenomena. The base for the phenomena was hydrogen bonds, which enabled chemical reactions to take place.

According to God's plan, the first life-form was created. Now God decided to send his children with the basic concept of love and gratitude. What slipped God's mind was that he created the earth in three dimensions.

First, love was absolute; second, gratitude was relative; and the third thing needed was direction—for example, respect based on love and gratitude. This concept is founded on an ancient tradition in Japan—that of one, two, and three.

Of course, God noticed this missing element immediately and tried to add it to the basic design, but he had another idea. "It would not be so inter-

esting to make everything perfect from the beginning. Let's keep the earth as it is now. I will watch in which direction my children lead the earth."

The humans who were sent to the earth in the form of water crystals were confused, as they didn't know which way to go. After struggles, they started to learn their direction from nature. It was a natural consequence, as they had to find food in nature and live in harmony with nature.

Humans were not equipped with weapons. They could not fly, did not have the destructive power of dinosaurs, and could not run fast like cheetahs. Moreover, humans had neither sharp fangs like lions and tigers nor the ability to live in water like fish. What humans could do was limited to sharpening their five senses and using their wisdom. So they did.

The most reliable human sense was hearing. Humans listened carefully to the vibrations/sounds that nature gave off and learned which were safe and which weren't. When it was safe, they went out and looked for food. When it wasn't, they hid inside caves. They soon learned that it was more efficient

to work together as a group than to work alone. Thus they formed a community, an extension of their families.

To communicate with one another, they first used hand signs. However, the signs were not effective unless they were displayed within a visible distance. Next, they imitated and vocalized the sounds in nature. As their vocal cords developed over a very long time, they created words. In the beginning, the words were the copies of the vibrations/sounds in nature. The words created from great nature were themselves the words of God. Through great nature, I believe humans acquired the words of God. Thus they acquired the ability to converse with God.

OUR HOME STAR

Where does God reside?

Assuming that we are the children of God, I would think that God resides at the center of the universe. Although it is arguable where the center is, I would go with the thought of the North Star as the center.

One thing that puzzles me is that although the location of the North Star remains unchanged, it is said that the star has a cycle of twenty-six thousand years and is replaced by other stars.

Five thousand years ago the North Star was Thuban; in twenty-five hundred years it will be Errai in Cepheus; ten thousand years later it will be Deneb in Cygnus; thirteen thousand years later, it will be Vega in Lyra; and Polaris, currently in the Little Dipper, is expected to return as the North Star in twenty-six thousand years.

What should we make of this? Is it possible that God is on a rotation or shift system? I will save the exploration of these questions until later; for now let's think about where we came from.

I believe we came from the Big Dipper, which may sound startling; but the reason may be explained by my special attachment to the number 7.

Why do we have the seven basic notes?
(sound)

Why does a rainbow have seven colors?
(color)

Why are there seven days in a week? (time)

Why do we have the seven chakras in our bodies? (body)

I am sure you can think of many other examples associated with 7. For instance, we have many expressions in Japanese with the number 7, including lucky seven, the seven spring herbs, the seventh day after death ceremony, the forty-ninth (the square of 7) day after death ceremony, the seventh evening Star Festival (the seventh day of the seventh month), the seven downs and eight ups, seven lights, seven gods, seven misfortunes, seven changes, and seven mysteries. No doubt there are many mysterious expressions related to 7 in other languages as well. I am fascinated by the fact that the important elements for humans (sound, color, time, and body) are related to the number 7.

So when a friend of mine and I were talking about our origin, he said it must be the Big Dipper, seven stars. I was immediately convinced.

The Japanese character for "star" has two components—"day" and "coming into life." There must be a relationship between a birthday and the home star. By understanding the relationship between our

home star and the Big Dipper, we may be able to get closer to knowing whether this concept is correct.

As I've discussed previously, I believe that *kanji* contain very reliable information and that when we understand their meaning we can solve quite a few of our mysteries. When I reflect on *kanji*, I am convinced that ancient humans were able to solve the mysteries of the universe to a certain degree. This seems especially true when we consider that modern science has a history of approximately 150 years and that the ancient wisdom was developed over tens of thousands of years of human culture.

It may not be true of all ancient wisdom, of course, but the wisdom of Thales, Aristotle, and Plato, for example, is still highly respected today. They discovered the truth that underlies today's humanity more than two thousand years ago. Even the use of astrology to forecast a person's character and destiny has been common for more than five thousand years. Astrology does not show any sign of decline; rather, it seems to gain more popularity as it is taken up daily by TV programs and such. In general, the way of thinking and the customs that have lasted more than three thousand years are mostly dependable. Humans must not have been so shortsighted.

Five

THE
POWER
OF
PRAYER



PEOPLE'S THOUGHTS ARE
TRANSMITTED TO WATER

Our consciousness affects water. Our collective thoughts have an especially remarkable effect. They are like laser light that can reach even the surface of the moon. The following story is a miracle of water purification at Fujiwara Dam.

In late August 1997, I went to speak at the Kogakukan Hall of the Omi Jingu shrine at the invitation of the Lake Biwa Research Institute, a civic organization. The title of my talk was "Hado, Water, and Life."

There, I met Kato Hoki, an ascetic priest of Shingon Tantric Buddhism. He was the chief

priest at a temple in the city of Omiya. As if he had been waiting for me, he showed me two photographs. They looked like featureless scenic views of a lake, taken from the same place and from the same angle.

While showing me the pictures, Reverend Kato said to me, "These pictures were taken at the lakeside of Fujiwara Dam, Gunma Prefecture, on the same day. I have been practicing the religious asceticism of Shingon Tantric Buddhism for many years. As I was practicing, I noticed that my incantations and prayers seemed to result in purifying the water around me.

"So a few months ago, I went to the lake and performed the incantations and prayers for water purification for about one hour. There was a noticeable difference in water clarity before and after."

When I looked at the pictures more intently, I noticed an obvious difference. The lake water in the picture taken after the prayer looked much clearer.

"Wow! It's amazing! It's really amazing! But I can understand this, Reverend Kato. It is because of *hado* and the spirit of languages, isn't it?"

"Indeed, it is. My temple practices Shingon

Tantric Buddhism. 'Shingon' means exactly 'to convey the spirit of languages.' "

"Reverend, would you please take me to the site next time? By taking water crystal photographs before and after your ascetic practice, I believe we can confirm the difference more clearly."

"Of course! I will let you know when the date is set."

One and a half months later, Reverend Kato and I went to Fujiwara Dam accompanied by Mr. Sato and Mr. Mochizuki, who were in charge of water crystal pictures and videotaping. There was another person with us, K., who miraculously recovered from terminal cancer after Reverend Kato performed his incantations and prayers.

WORD ENERGIES

Fujiwara Dam seemed stagnant and gloomy. This man-made lake is not really a lake but a huge reservoir. The reservoir at Fujiwara Dam seemed to have the same problem as any other dam in Japan. Since there was almost no convection current, accelerated oxidation was adversely affecting the sur-

rounding natural environment. No beautiful autumn colors were reflected on the water's surface.

Reverend Kato chose a site and prepared for his ascetic practice. He put a branch of a *sakaki* plant at each of the four corners of the site and purified it with sake he had brought. Once the sacred space was created and purified, no one but the ascetic priest was allowed to be inside.

Slowly and solemnly, the priest started his practice. His rich and ringing voice gave no indication that he was seventy-two years old. With his fingers, he made various hand signs, and from time to time he shouted out briskly and loudly.

I noticed that his voice and the hand signs were directed not to the reservoir but to two glasses of water on a stand at his feet.

Immediately, I understood what he was doing. Perhaps he designated one glass of water as yang and the other as yin. By concentrating all his energy into the yin and yang waters, he was influencing the water in the reservoir through resonance. Thus the resonance effect started by the water in the glasses would give lively vibrations to the reservoir.

Reverend Kato's incantations and prayers lasted about one hour without a break, and his ascetic practice came to an end. I felt awed and deeply moved by watching the priest's solemn, wholehearted devotion. After a while, I said to him, "Reverend Kato, thank you very much. If you don't mind, I wish to ask you some questions about your practice." Like a professional interviewer, I held a microphone for our videotaping and asked many questions. Reverend Kato was not at all out of breath and humbly answered my questions. After about fifteen minutes of interviewing, Mr. Sato suddenly screamed, "Mr. Emoto, look at the lake! The water is clearing up rapidly. It is really amazing!"

Mr. Mochizuki also exclaimed, "Wow! Really great! It is so clear now that we can see the trees reflecting on the water. That reflection wasn't there before."

I turned my head toward the water, and I was stunned. A gentle breeze had now stopped; the ripples on the water were gone, too. The water surface was like a mirror reflecting the surrounding colorful scenery.

"Look, Reverend Kato. It's incredible, isn't it? When we came here, the lake surface had almost no reflection. It is so beautiful now. It's really great! I am awestruck."

Without showing any excitement, Reverend Kato smiled calmly and said, "Indeed. It is getting quite clear."

I thought to myself, "Well, I didn't expect it to be this great." Then I said to him, "Actually, I thought that if we took the samples of water before and after the prayer and took crystal photographs, we might be able to detect the difference, but it is so obvious to our own naked eyes that we do not need to do this to see what's changed. It is awesome. As I expected, the energy of the spirit of languages is verifiable. Thank you very much."

THE SECRET OF THE HEPTAGON WATER CRYSTAL

Three days later, my excitement grew even more, reaching a peak when Mr. Sato handed me the crystal pictures of the lake water samples taken before and after Reverend Kato's incantations and prayers. With trembling voice, he said, "President,

tremendous things have happened!" Normally he would have addressed me as "Chief," but then he excitedly used "President."

The photographs he handed me were indeed beyond my imagination. The water crystal picture before the prayer was horrible. Examined more closely, it looked like a woman struggling and suffering in despair. However, the other picture turned out to be beautiful. To my amazement, it was not a hexagon but a heptagon. We have never been able to take such a picture of a heptagonal crystal before. I wondered why this happened; soon I came to realize the reasons and developed a new hypothesis: Water is a pilot for all beings. When humans, who reside in the three-dimensional world, move to the otherworld, water alone can synchronize with the energy levels of their consciousness. Water is the only agent that does not interfere with humans and takes them to the other dimensions as they are. Therefore, in the three-dimensional world, water must change its physical properties variously; thus, it gives us hints for its functions. The ultimate aspiration of water in the solar system must be "light" itself.

In other words, we are originally the children

of light. Our goal for the moment is to go back to that status.

The heptagonal water crystal taught me this new hypothesis. This thought touched my heart and moved me almost to tears. It was a real honor and pleasure to meet with the Reverend Kato Hoki.

This experience led me to come up with a quixotic plan—purifying the water of Lake Biwa with the spirit of languages. This plan was carried out on July 25, 1999, and resulted in a wonderful phenomenon.

A month after the Fujiwara Dam experience, Mr. Sato called K., who had accompanied Reverend Kato and had subsequently heard dreadful news.

He communicated that a week after we went to Fujiwara Dam, the local TV station reported that a young woman's body had surfaced at the reservoir there. The next day, the murderer of the woman was arrested. I don't believe this is just a coincidence.

The water crystal picture before the prayer had indeed looked like the distorted face of a woman who was suffering. On the other hand, in the hep-

tagonal crystal picture, I saw a merciful face like that of Mahatma Gandhi.

This experience was very shocking. Since then, I have come to recognize the spiritual world and the spirit of languages. It feels uplifting and invigorating for me to think that the energy from the spirit of languages can influence all life-forms on earth. When it is based on true love and gratitude, the spirit generates unbelievably refined energy to affect all life on Gaia.

FROM ISRAEL TO TOKYO— BEYOND TIME AND SPACE

The first time I really prayed was more than thirty years ago, in front of a TV set. It was being reported that the *Apollo 13* spacecraft had had a serious explosion in one of its oxygen tanks while en route to the moon, and images of people all over the world praying for the three astronauts' safe return were being broadcast.

One of the scenes that stuck in my memory was

of Jewish people praying earnestly at the Wailing Wall. Following these people, I also prayed for the astronauts' safe return in my own way.

It might have been the first time that collective prayers had occurred worldwide, transcending races and religions. It must have been the power of these prayers that enabled the astronauts' miraculous return despite the one-in-three-million odds.

That experience of more than thirty years ago is one of the driving forces behind my promotion of international activities with prayer as the theme, although I had previously been indifferent to religions and religious education.

In July 2003, I visited Israel. Declaring July 25 as the day to offer our love and gratitude to all the water on earth, I visited the Jordan River to pray for world peace. There I decided to do a completely unexpected experiment.

My unscheduled experiment was to send love and gratitude from the seminar site near Lake Galilee to the tap water placed on my desk in my office in Asakusabashi, Tokyo. I truly wanted to see how water crystals would change before and after the participants offered spoken prayers. Having

had all the participants readily consent, I showed a slide picture of the glass of water on the desk in my office.

To the water, we recited and sent our words, "Water, I love you." "Water, I thank you." "Water, I respect you." We repeated these phrases three times. That's all the experiment involved.

I promised the audience I would show the result in five hours. Mr. Kizu, a researcher, was on standby in the laboratory in Tokyo; at midnight I sent him an e-mail to freeze the water. Shortly after, his e-mail response arrived: "I have just finished the preparation. I will be able to send you the result in three hours." It was 2:00 a.m. in Japan; 8:00 p.m. in Israel.

The time had come to show the participants the result. It was about 11:00 p.m. I said to the audience, "I have just received the picture that resulted from your cooperation. Let me show it to you."

Did the *hado* energy in the prayer and words of love and gratitude reach Tokyo more than twenty thousand kilometers away?

A beautiful water crystal appeared, although tap water in Tokyo had never formed crystals before. This is evidence of the power of prayer.

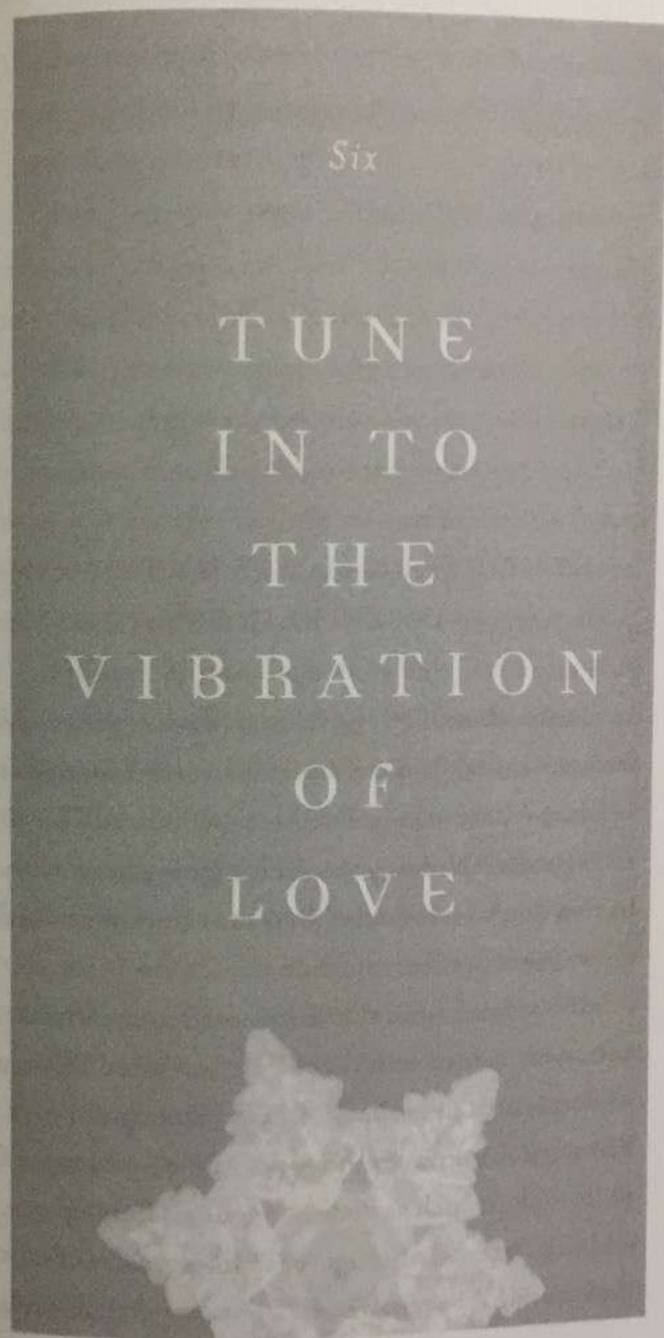
All things begin with consciousness. The world is made up of the consciousness of each and every one of us. If the earth is filled with the *hado* of ample love and gratitude, the world will manifest itself as love and gratitude.

A PRAYER

*When we were children,
No one taught us the importance of a prayer.
Not our mothers, fathers, grandmothers, grandfathers,
Nor schoolteachers.
During the war, they all must have prayed.
But they thought that the prayer was not heard,
Because they had atomic bombs, burned houses, loss of loved
ones.
So I, too, didn't pray until I was in my mid-fifties.
Well, when I was small, I did go to the Sunday school of the
occupying forces and I prayed, "Jesus, Jesus, please
make me a good child of yours,"
Since I knew I could get chocolate and sweets.
But after working with water for fifteen years,
I was taught.
"It was wrong. Prayers are really important."
What was wrong was how they prayed.*

*They prayed for winning the war.
They prayed for good fighting of their husbands, sons,
fathers, and brothers.
Prayers then were forced, too.*

*A prayer for destruction will never be heard,
Because water is a messenger.
Water carries only the prayers with love and gratitude.
This is proven by water crystals.
When we pray for our families' safety,
When we pray for our loved ones' health,
Our prayer is heard.
For us, all the people on the earth are important,
Because all of us are a family living on the earth.
So let's pray together for the peace of our family.
Let's pray for peace on earth.
Our prayer will surely be heard!*



THE ETERNAL THEMES OF HUMAN BEINGS

As discussed earlier, the most difficult questions that we need to find the answers to are: Where did we come from? Why are we here? Where will we go after we die? Nobody would disagree about that. In this book I have described my attempt to find the answers to these questions.

Has it been several million years since human beings came into existence? The recorded history of humanity goes back a few thousand years. Throughout human history, the teachings of philosophers such as Plato, Socrates, Chuang-tzu, and Lao-tzu and of religious beings such as Christ and Buddha have offered signposts for solving

these seemingly eternal mysteries. Although their teachings were expressed differently, they have all been respected as truth.

People today have difficulty believing unconditionally in the aspects of this world that exist only as mental or spiritual phenomena. People have a tendency to resist grasping the world in its entirety, and instead pick and choose the part of the teachings relevant to their own conditions and interpret that part according to their own needs. Contemporary tensions among religions, philosophies, and races seem to derive from these tendencies.

Fortunately or unfortunately (depending on how you look at it), I lacked a basic knowledge of religion and philosophy. On many occasions, I was faced with an important situation where I had to make a choice. Relying on my ethics and empathy, backed by the sense of justice that was growing inside me, I was able to make decisions and to live for more than sixty years without devoting myself to a specific religion or philosophy.

I am grateful for the happiness I feel in challenging myself to explore these questions at this stage of my life.

On the journey to reach this point, I had a fateful encounter with *hado* and water many years

ago and success in taking water crystal pictures starting a few years later, and I've accumulated many photographs since then. These experiences have taught me how to paint freely; the canvas was Masaru Emoto, myself, and it was white in terms of philosophical and religious background.

The painting style was representational, not abstract. Namely, it was a scientific method of taking photographs with microscope cameras. My work was immediately recognized by twenty-first-century leaders in healing and spirituality. It played a role in proving and endorsing what they had accomplished. These leaders then spread news of my work worldwide. In time my work was affirmed by those who had a faithful religious belief in the sincere pursuit of a life purpose.

Eventually, my work was supported by many women intuitively, rather than logically. They were the ones who gave birth to babies after carrying fetuses for 280 days, babies that began as tiny fertilized eggs of almost 100 percent water and became small humans with tens of trillions of cells. They were the ones who had DNA for such life bearing. After receiving great resonance worldwide, I am no longer just an ordinary man in his sixties. With this

realization, I ventured on a quest for answers to human beings' three eternal questions.

Let me summarize my working answers.

WHY DO WE HAVE THE ABILITY TO THINK?

Let me repeat: All life-forms cannot be born without water. Water was not intrinsic to this earth. It came from outer space, plunging through the earth's atmosphere in the form of ice in comets, which are still arriving. At this point, I am not going to discuss my views about what this phenomenon entails; I may be able to do so sometime in the future. Here it is sufficient to say:

1. Without water, no life has its birth.
2. Water came from the universe.
3. Therefore, all life, including humans, came from outer space.

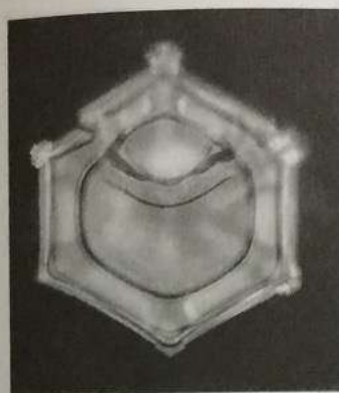
The question then is: From where in the universe did we come? As discussed, I believe it to be

the Big Dipper. Of course, this belief is just the result of my own reasoning. I hope readers will contemplate where our true home is by relying on their own sensibilities.

Honestly, I am not familiar with astrology, *bagua* divination, Chinese astrology, or numerology. Among old fortune-telling practices, I believe we can find the keys to discover where our true home is. Combining our knowledge and wisdom and generating ideas together, we will be able to hit upon key words for such a discovery.

Wherever our true home may be, I feel confident about how we were sent here because of what I have learned from photographs of water crystals. I have seen a great many of these pictures and eventually came to realize that water is the blueprint of reality.

Let's take a look at the pictures in Figures 16–18. The top photograph was taken after exposing water to a picture of the Izumo shrine, the middle to a view of cherry blossoms, and the bottom to an image of an elephant. Please take another, closer look; you will notice the similarity between the shapes of water crystals and the shapes of actual items. If water is shown the picture of a person's face, I am sure it will form a crystal by capturing his or her characteristic



Figures 16–18. After water was exposed to the picture of the Izumo shrine, the shrine's sacred straw rope appeared. There was a pink color in the center of the one exposed to the image of cherry blossoms, and a trunk in the crystal shown the picture of an elephant.



features. The foundation of my belief is derived from studying water crystals and conducting tuning-fork experiments. As I mentioned earlier, the most beautiful crystal was formed after water was exposed to "love and thanks."

A water crystal may be showing us a mandala of vibration or a design of life phenomena. If so, then the fundamental concept of this planet called Gaia is love and gratitude. In other words, the earth was originally designed with the concept of love and gratitude. Humans are entrusted to maintain that concept. The act of love gives every being vitality. Giving vitality is the same thing as giving vibration. As seen in tuning-fork experiments, in order for us to give off vibrations, we have to vibrate first. That is an ability given to us humans. Why? The reason is that only we humans can freely sing "do, re, mi, fa, sol, la, ti, do." No other being can sing songs in the same way we humans can.

In other words, only humans can freely modulate the source of energy—vibration—and then send it off. This ability at freely modulating vibration also explains our ability to think. Why can humans, unlike other animals, think? I believe it is because humans have the ability to freely modulate and transmit vibrational information. This abil-

ity has manifested itself as our wisdom, history, and civilization.

There are numerous and elaborate kinds of vibrations. Evidence can be seen in the fact that no two snowflakes are identical despite countless snowfalls since ancient times.

When we come up with grand ideas, they often arrive with what's described as a "flash" or "shock." These expressions also point out that humans have numerous and elaborate vibrations. I believe this is because of the variety of atoms that make up human beings. In other words, I believe that humans are made up using all of the atoms in the world. Let me cite my explanation for that from my book *Hado Jidai eno Jyomaku* (The Prelude to the Hado Age).

ALL THINGS HAVE MENTAL VIBRATIONS

I feel I have come to the place where I was supposed to come. Once, when I measured the *hado* of a cut flower, it indicated the emotion of sadness, which was previously thought to be something only humans could feel. From this experience, I developed the following hypothesis:

Be it negative mental *hado* such as frustration, anxiety, worry, and anger or positive *hado* such as sympathy, trust, kindness, and confidence, when humans have these mental vibrations (*hado*), they are expressed as such emotions.

These vibrations are actually common to all beings. Perhaps not only humans but also all things, including plants and minerals, share these emotions. To put it most generally: the *hado* energy that is the source of all phenomena is derived from the mental (conscious) *hado*.

Based on this hypothesis, I have conducted experiments on various materials, including diamonds, drugs, food, water, and ceramics. The results all support my hypothesis.

All the materials tested displayed the same emotions as humans do. This finding led me to another daring idea. However, before getting into it, I have one more finding to share.

THE
SHAPE
OF
LOVE

GRUDGE AND GRATITUDE HAVE THE SAME HADO

Once I was invited to speak at the Intuition Study Group (led by Mr. Yukio Funai of Funai

Consulting), and since Dr. Ronald Weinstock, the developer of MRA, happened to be in Japan at that time, I made arrangements for him also to speak at the seminar. He told me the following story during our preparation meeting for the seminar: "*Hado* has two aspects—positive and negative. Within one *hado* [vibration], there are positive and negative, and they are expressed in two extremes. For example, paired feelings such as grudge and gratitude, anger and kindness, and sadness and joy share their *hado*. Depending on a given person's positive or negative field, the same *hado* can be expressed quite oppositely."

I admired his explanation, because I had seen many cases that endorsed his point. You may want to think about your own personality in this context; you will probably find that you, too, have these contradictions and dualities.

ONE HUNDRED AND EIGHT WORLDLY DESIRES AND ELEMENTS

My idea grew and grew, and reached its climax when I referred to the *Japanese Dictionary of Physics and*

TUNE IN
TO THE
VIBRATION
OF
LOVE

Chemistry and read about elements. The following was what I found:

Proposed by Boyle in the late seventeenth century, Lavoisier in the latter half of the eighteenth century, and others, elements became recognized with experimental bases. The number of elements discovered was about thirty then. Subsequently, many more elements were discovered as new metals were found and spectroscopic analysis and X-ray spectroscopic analysis came into use.

Next, new elements were discovered through nuclear reaction. Currently, 103 elements have been confirmed, from hydrogen, atomic number 1, to lawrencium, atomic number 103. Furthermore, an additional 5 new elements, from atomic numbers 104 through 109, excluding 108, were found through nuclear reaction.

When I saw that the total number of elements is 108, something flashed into my mind; I thought of the "108 worldly desires" that humans are said to have.

A SIGNPOST FOR NEW SCIENCE

Through the process described above, I developed another hypothesis: Each and every element that makes up all substances—humans, animals, and plants—has both positive (yang) and negative (yin) *hado*. Humans are made up of combinations of all 108 elements—the 103 elements in the periodic table and the 5 new elements. Other animals, plants, and substances have fewer elements.

For example, roses may be made up of combinations of thirty atoms. A joke goes, "A monkey is a human with three fewer hairs." Well, it may not be a joke after all; it may be implying that monkeys are made up of 105 elements, three fewer than humans.

Each element must have its intrinsic meaning in terms of *hado*. By analyzing elements using *hado* measuring devices such as MRA, we may be able to uncover the mysteries of humans and ultimately the mysteries of the universe. My intuition tells me hydrogen has the role of "information," oxygen that of "energy," and carbon that of "intelligence." I believe that each of the 108 elements has its own intrinsic role.

The concept of two fields, yin and yang, or

negative and positive, is the basic physical phenomenon in the universe, where condensation occurs through repeated attraction and repellency. When opposite fields collapse, everything loses stability and also collapses.

I am a little concerned that the newest among the 108 elements were discovered through nuclear reaction. I am anxious about whether the additional elements will disturb the balance of the universe.

In any event, I believe it is correct to say that the atoms that constitute the human body give rise to negative mental *hado*. In this vein, it is very important to eat the right foods. Foods are the only means by which our bodies are supplied with the necessary nutrients.

WHAT FOODS ARE TRULY GOOD FOR US?

As you know, the human body consists of as many as sixty trillion cells. Each cell has minutely different vibrations. To vibrate, cells need to resonate with something else—foods.

Because the cells of both our bodies and foods

are made up of atoms, they share the same materials, and may therefore be said to be of the same sort. Naturally, the cells of our bodies want to live continuously according to the order of our DNA or our will. In other words, they want to continue vibrating. As discussed earlier, a cell cannot continue to vibrate by itself. So it gives off an SOS signal saying, "Give me vibration." It is the signal "I am hungry."

Attending to the signals of our cells, we relieve them by eating, sending them food. Since each cell is very small, the food is made into tiny, even microscopic parts through the digestive process. Water, of course, is always there to escort the foods so that they can move smoothly during the entire progression.

Ultimately, foods become the different frequencies that the various cells need. Through resonance phenomena, vibrational energies are distributed according to cells' needs, and they are revitalized again.

When we think about the relationship between foods and our cells, it becomes clear that the purer this symbiotic relationship is, the more efficiently energy exchange occurs. So foods that have fre-

quencies that are very close to those of our cells are good for us.

Since we have sixty trillion cells, with many different needs, the best solution is a balanced diet with a wide variety of foods. In terms of energy, problematic foods are the ones with frequencies that are altered artificially, such as foods grown using chemical fertilizers and pesticides, foods containing artificial preservatives, and foods made with MSG.

When these foods are ingested constantly, our cells' physical properties will be altered, and this may trigger the development of cancers, incurable diseases, and mental disturbances. Suppose a cell gives off a certain signal when it gets weak. Then that cell can pick up a vibration that is similar but not exactly the same. This would inevitably result in the cell's properties being altered.

If you agree with what I have discussed in this section, I encourage you, especially if you are in a medical field or the food industry, to start studying vibrational nutrition. In the near future, I anticipate that technology will be developed to accurately measure the frequencies of each organ and each food.

TUNING IN TO THE HADO OF LOVE

When I wrote *Hado Jidai eno Jyomaku* (The Prelude to the Hado Age), I had yet to think of everything in terms of vibration. Currently, I view us humans as being equipped with many varieties of vibrations—that is, information—from our birth. I believe this is true because, as discussed earlier, every element has its intrinsic frequency, and our being made up of many elements gives us the ability to tune in to many different things.

For example, we can talk to beautiful flowers in the garden and cheer them up. Among the wild plants, we can find herbs and some plants that are edible. We are also good at tuning in to the frequencies of dogs and cats. Wherever we go, we can see people using a similar tone of voice to amuse babies.

Instinctively, we humans have the ability to tune in to others' frequencies. I believe this is possible because we share the same elements with them; we have their frequencies within ourselves.

We can directly give off vibrational energy that resonates with others, thereby revitalizing them. That energy is *love*. The recipient of the energy

sends off a pleasure energy in return. That energy is *gratitude*. In this manner, love and gratitude complement each other and generate energy efficiently. This is exactly the source of free energy.

Science should have stayed focused on an extension of this concept of love and gratitude, yet something went wrong somewhere, and this principle was forgotten.

Worldly desires came into play: the ambition for fame, material greed, hunger for power, jealousy, fear of death, and so on. With these desires interfering, it was difficult to generate free energy. We can easily develop destructive energies in the short run, but we have a hard time developing love-and-gratitude energy or renewable energies in the long run.

How did this happen? I believe it resulted from having people in power at different times who wanted control over society. They successfully utilized the negative vibrations of people's worldly desires.

There is no value in denying our past. Perhaps we should accept it as the course that we had no choice but to take, because denying our past is tantamount to denying our existence. What we need

to do is learn from the past and create the present and the future in a more hopeful way.

Returning to that important question, "Why are we here?," I share the following:

The role of humans is simply to give the vibration of love. As a natural consequence, the energy of gratitude will be generated. Thus the world will be balanced beautifully with these complementary energies.

Such energy is free, and it can continue forever, without drying up. The source of energy is water, H_2O . *H* represents gratitude, and *O* love. With one portion of *love* vibration and two portions of *gratitude*, energy will be created. Water is forever.

SOMETHING THAT CONTINUES FOREVER

We are water. We are vibration protected in water. The vibration collects atoms that were sent to the earth in advance and makes temporary "clothing" for us to wear. That clothing is our body. How we wear this clothing—with or without care—makes a

difference in terms of how long it will last, and so life span differs from person to person.

Another factor that affects our life span is the *hado* inherited from our ancestors. When our ancestors left unfinished many things that they had wished to do, negative genes were created, and the size of our atomic clothing was disturbed to a degree determined by these unfinished desires. This disturbance may result in a shorter life span. But when we feel love and gratitude, our clothes will be easily mended. The clothes will also be repaired when we complete our ancestors' unfinished jobs.

When we take off our temporary clothes (death), what will happen? I believe there are two paths: one is to cross the river Styx and go to the otherworld; the other is to go through the cycle of reincarnation. Those who cross the Styx will become a part of water recirculation in the universe, and they will be sent to the next destination. Through the water circulation in the universe, the order of life in other stars will be maintained. Wherever we go, humans exist like the sun, giving the energy of love unstintingly.

Those who cannot cross the Styx are flunked students in this earthly school that trains humans to be peacekeepers in the cosmos. They must re-

peat the schooling until they can graduate. In our time there are so many repeaters that it is difficult to get back into school again.

To sum up: Passing or failing the earthly school depends on how much we can feel and exercise love and gratitude at the level of the body, not just in the head. We humans are supposed to vibrate. Our being is our soul in temporary clothing made up of atoms. In other words, we are vibrating souls. We cannot continue to vibrate alone. Unless we receive resonating vibrations from others, we stop vibrating—that is, we truly *die*.

Conversely, as long as we have resonating vibrations, our vibrations will not stop; thus there is no death. The absolute condition for receiving resonating vibrations from others is *gratitude*. In other words, as long as our bodies have feelings of love and gratitude, our life—vibration/soul—will never disappear and will be eternal.

EPILOGUE

This book is my attempt to explain plainly the true meanings of love and gratitude that I learned from my study of frozen water crystal pictures.

In the series of experiments in which words were shown to water to see the changes in crystal formation, the most beautiful crystal resulted from exposing water to the words "love and thanks." A label with the words "love and thanks" was pasted on a water bottle and left there for twenty-four hours. The picture was taken thirteen years ago, and I have not seen a more beautiful crystal since.

I have been pondering why such a beautiful water crystal was formed after showing the water "love and thanks." I finally found my answer. Once I had it, I felt that I needed to share my findings with my readers. Meanwhile, the Tokuma Shoten Publishing Company had asked me to write a book; so I took the opportunity to satisfy both goals. It was a struggle for me. With a title such as *The Shape of Love*, I needed a suitable structure and writing style. In the past, people tended to think of me as "Emoto, the Hard-Liner." Therefore, I had trouble changing my style. With Ms. Toyoshima's support and advice, I managed to work up my thoughts into a book. Having just finished reading the final galley proof that Ms. Toyoshima sent me, I realize once again how difficult it is to write this kind of book. What I have written is new science, with the added burden of trying to present *hado* in an easy-to-understand manner. Since *hado* is invisible, I needed a miracle.

The other tool I used to explain *hado* was the tuning fork and its sound. Sound clearly is also invisible, which is why I needed illustrations to explain tuning-fork experiments. It was virtually impossible to convey sound resonance or echo phenomena with enough presence that readers would feel as if they were listening.

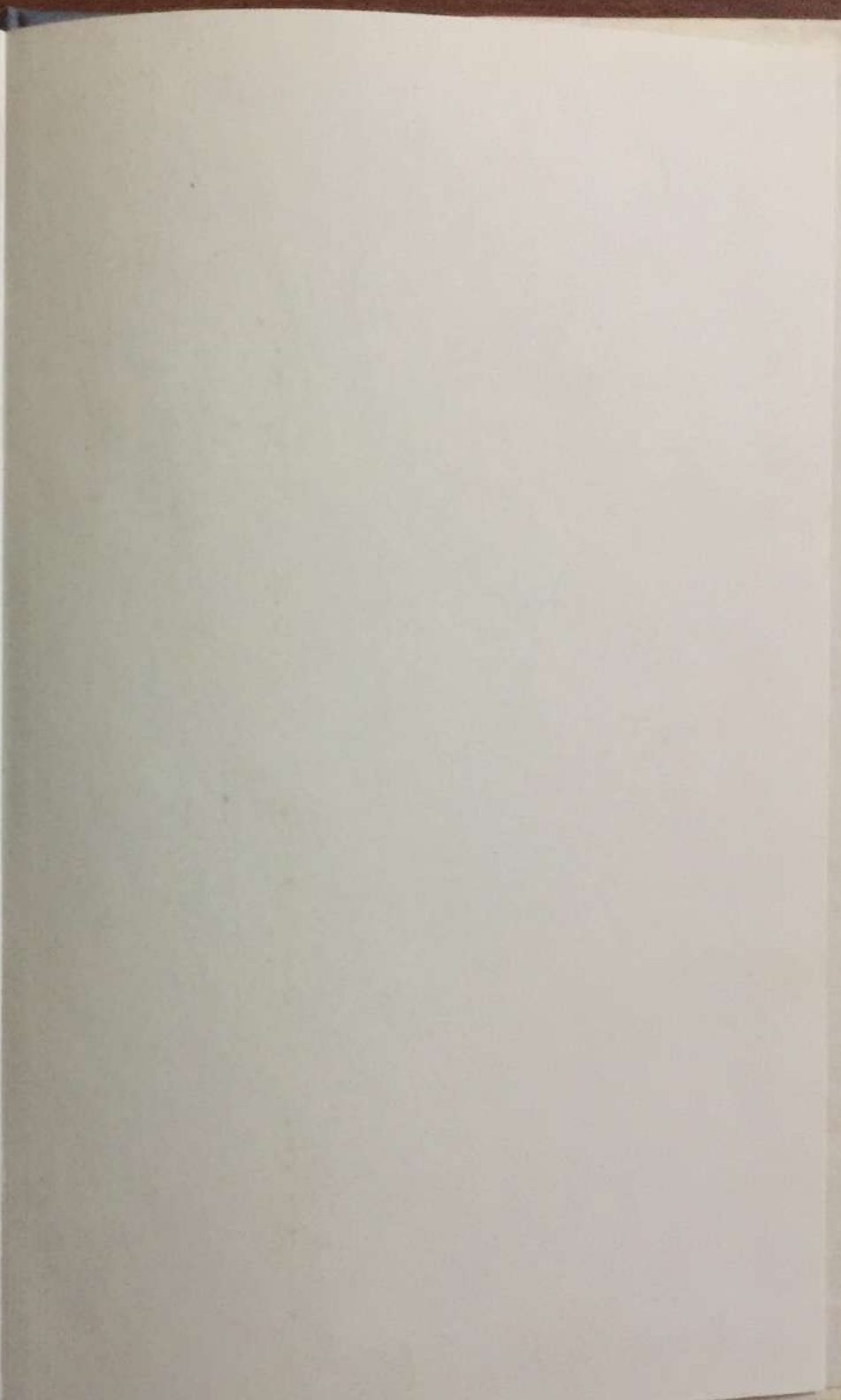
As a writer, I still have to keep training myself to write correctly, as I wish to tell the important truth to as many people as possible. It is hard work, but I intend to enjoy it at the same time.

Well, what did you think of the book? Was it easy to read? What else? Your honest feedback will be very much appreciated. Please send your comments to my Web site: www.hado.net.

In closing, I must confess one thing. While writing this book, I became very ill and was almost hospitalized. I still have a lingering cold. I often talk about the importance of love and gratitude and say that the best way to avoid illness is to feel love and gratitude, yet I myself became sick. Why? It is because my heart is not filled with love and gratitude. I understand the concept in my head, but my love and gratitude are not substantial enough to reach the core of my body. No wonder it took six years for me to understand the message of love and gratitude from water.

I pledge that I will put love and gratitude into practice, together with you. As my first step, I dedicate this book to my beloved wife with gratitude.

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(continued from front flap)

such important issues as how we treat others and the earth itself, Dr. Emoto's findings encourage the positive actions that spell a better future for all.

A magnificent follow-up to *The Hidden Messages in Water*, *The Shape of Love* is a fascinating investigation into the intersection of science and spirituality and its impact on our lives and our world.

DR. MASARU EMOTO is a graduate of the Yokohama Municipal University and the Open International University as a doctor of alternative medicine. His previous book, *The Hidden Messages in Water*, has sold more than 600,000 copies worldwide. He lives in Tokyo and frequently travels to the United States to speak about his work.

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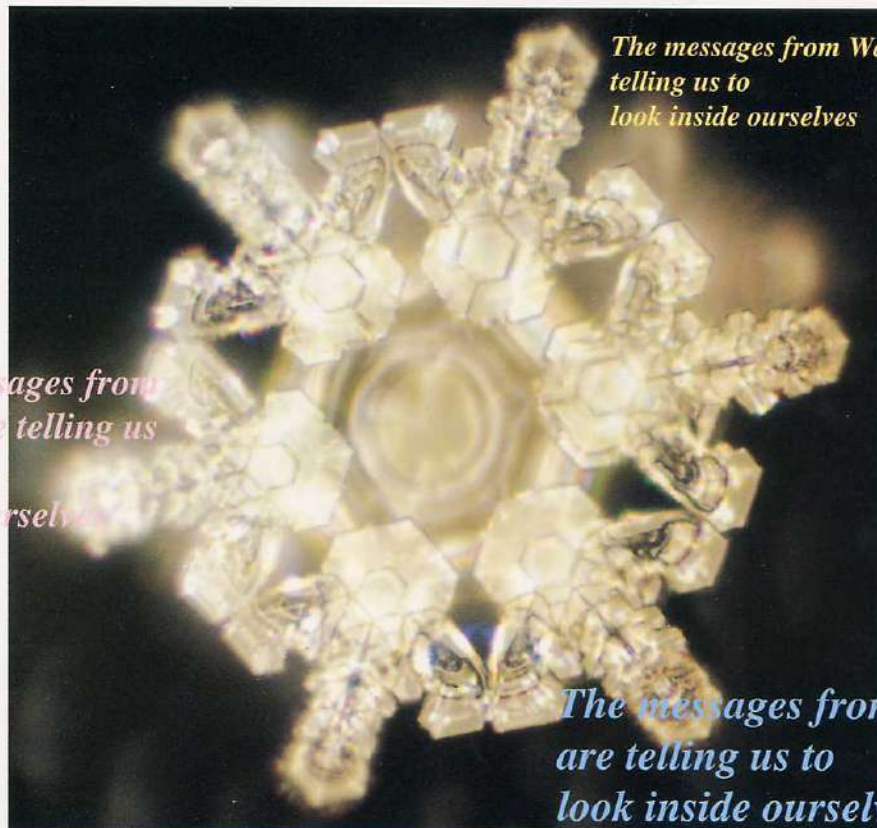


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World's first pictures of frozen water crystals

Messages from Water



*The messages from Water are
telling us to
look inside ourselves*

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water are telling us
to look
inside ourselves*

*The messages from water
are telling us to
look inside ourselves*

Masaru Emoto (Doctor of Medicine alternativa) / I.H.M. General Research Institute

HADO Kyoikusha Co., Ltd.

「マイクロクラスター水」とは	121
マイクロクラスター水・カルチャー200	123
マイクロクラスター水・アンデス400	124
埼玉県・ちちぶ湖 二瀬ダムの水に波動を転写	125
アロマオイルの情報を水に転写	127

人の意識で変わる水

水は人の意識を写す	129
阪神・淡路大震災と水道水	130
500人の「愛の気・言魂（言霊）」を受けた水	131
船井氏の愛の気を受けた水	133

水と言魂について

人の意識と結晶	135
七角形の結晶写真が撮れました！	138

水は宇宙から来た？

水の不思議は深まるばかり	139
1997年のマスコミ報道より「水は宇宙の果てから飛来した」	140

あとがき 江本勝	141
----------	-----

編集後記 なるかげつねこ	143
--------------	-----

Introduction 7

Masaru Emoto, Water and HADO	7
Water, Humans and Earth	8
Can You Make Evaluations of Water in a Glance?	8

Chapter 1

Story of Water in Daily Life	11
Water and Environmental Problems	11
Can the Water on Earth Survive?	11
The Chinese Character of Water	12
Water Crystal Is the Face of Water	13
Discovery of a New Water Evaluation Method	15
A Message from Water	18

Tap Water in Japan 20

Sapporo City, Hokkaido Prefecture	21
Sendai City, Miyagi Prefecture	21
Kanazawa City, Ishikawa Prefecture	21
Shinagawa-ku, Tokyo	22
Nagoya City, Aichi Prefecture	22
Kita-ku, Osaka City	23
Katano City, Osaka City	23
Hiroshima City, Hiroshima Prefecture	24
Fukuoka City, Fukuoka Prefecture	24
Naha City, Okinawa Prefecture	24

Tap Water, Overseas	25
London, UK	25
Paris, France	26
New York, USA	27
Vancouver, Canada	27
Buenos Aires, Argentina	28
Manaus, Brazil	28
Water in the Natural World	30

Spring Water	33
Ryusendo Cave, Iwate Prefecture	34
Sanbu-ichi Yusui Spring Water, Nagasaki-cho, Kita-Koma-gun, Yamanashi Prefecture	35
Clear Water of Kobo, Kanagawa Prefecture	36
Kobo Spring Water, Fukuyama City, Hiroshima Prefecture	36
Rumbling Water in Tankawa Village, Yoshino-gun, Nara Prefecture	37
Spring Water of Saijo, Hiroshima Prefecture	38
Ubuyama's Water, Kumamoto Prefecture	39
Fountain in Lourdes, France	40
Hogget Diamond Spring Water in Tasmania, Australia	41
Underground Water in Northern Island, New Zealand	42

Rivers, Lakes and Marshes	44
Horobetsu River, Hokkaido	45
Goshikinuma, Fukushima Prefecture	46
Shinano River, Niigata Prefecture	47
Sumida River, Tokyo	48
Fuji River, Shizuoka Prefecture	49
Ado River, Shiga Prefecture	50
Biwako Lake (South Area of the Lake), Shiga Prefecture	51
Yodo River, Osaka Prefecture	52
Shimanto River, Kochi Prefecture (Midstream)	53

Glaciers	55
Antarctic Ice	56
Colombian Glaciers, Canada	57

Mount Cook Glaciers, New Zealand	58	Showing Person's Name to Water	105
Rainwater	60	Deguchi Onisaburo	106
Biei-cho, Hokkaido	61	Amaterasu Omikami	107
Sendai City, Miyagi Prefecture	62	Adolph Hitler	109
Kanazawa City, Ishikawa Prefecture	62	Mother Teresa	110
Tokorozawa City, Saitama Prefecture	63	Placing Water to a Picture	111
Asakusa-bashi, Taito-ku, Tokyo	65		
Fujisawa City, Kanagawa Prefecture	66	Chapter 3	
Okazaki City, Aichi Prefecture	67	Masaru Emoto/The World of Water Spreads Afar	115
Nishi-ku, Osaka City	68	"What Is HADO/Ghi?"	115
Fukuyama City, Hiroshima Prefecture	69	Measuring Machine of "HADO"	116
Hakata-ku, Fukuoka City	70		
Kagoshima City, Kagoshima Prefecture	70		
		"Transcript Technology" that Changes Water Artificially	118
Chapter 2		Development of Technology of Transcribing HADO	118
A Story of Ever-changing Water	72	Transcribing Change and Immune Information on the Tap Water of shinagawa-ku	119
Water Listens to Sound?	72		
		The Micro-cluster Water of Dr. Lee H. Lorenzen	122
Playing Music to Water	73	All for His Wife	122
Similarity of Crystal Pictures	74	What Is Micro-cluster Water?	122
Pictures of the 100 Samples are Similar...	74	Micro-cluster Water/Culture 200	123
Beethoven's "Pastorale"	75	Micro-cluster Water/Andes 400	124
Mozart's "Symphony No. 40 in G Minor"	76	Transcription of HADO Information onto Futase Damo of Chichibu Lake, Saitama Prefecture	125
Bach's "Air for the G String"	77	Transcribing Aromatherapy Oil Information on Water, Camomile Water and Fennel Water	127
Bach's "Goldberg Variations"	78		
Chopin's "Farewell Song"	79	Water Changed by People's Consciousness	129
Healing Music, "Hado"	80	Water Reflects People's Consciousness	129
Tibet Sutra	81	The Great Hanshin-Awaji Earthquake and Tap Water	130
A Korean Folk Song, "Ariran"	82	Water with "Chi, Soul, and Spirit" of 500 People	131
Kawachi Folk Dance Song	83	Water with Mr. Funai's Chi of Love	133
"Just Like a Flowing River"	84		
From a Celtic Folk Song, UK	85	Water and Soul	135
Elvis Presley's "Heartbreak Hotel"	86	People's Consciousness and Crystals	135
A Heavy Metal Music	87	We Could Take a Heptagonal Crystal Picture	138
A Popular Music in Japan	88		
Saying "Thank you" and "You too!" to Rice Everyday	89	Water Came from the Space?	139
		The Wonders of Water Become Even Deeper	139
Showing Letters to Water	90	"Water Came Flying from the Ultimate Limits of Space," from a Press Report in 1997	140
Thank You	92		
You Fool	93	Postscript Masaru Emoto	142
You Make Me Sick/I Will Kill You	94	Editor's Notes Tsuneko Nanukage	143
Love/Appreciation	95		
Soul/Demon	98		
Angel and Devil	100		
Let's Do It/Do It	102		
Beautiful/Dirty	104		

われています。なんだか人間とよく似ていますね。

そして、その水の大部分は「海」にあり、雲や霧になって空中を漂っている「水」もあれば、雨水、地下水、湖や沼、河川、高い山の万年雪、南極などの「氷」も、もともとは「水」です。

でも大切な水が、良い水なのか、悪い水なのか、人間の身体にとってはどうかとなると、研究機関か専門家でない限り、はっきりしたことはわかりません。私たちからみれば、どの水も同じようにみえますから。

水に含まれる情報の違いとはなんだろうか。なんとかそれを見ることはできないだろうか。

そんなとき、ふと、「まだ科学が解けない疑問」(ジュリア・ライ／ダヴィッド・サヴォルド編 晶文社刊)という本を読みました。この本には50項目くらいの謎があり、その中に「同じ形の雪の結晶はあるのか」という項目があげてありました。数100万年前から降り続けている雪の結晶は、全部違う……ということでした。

Introduction

Masaru Emoto, Water and HADO, which signifies the world of subtle energy related to consciousness, synonymous with "Chi" in Japanese

My encounters with the study of water when I became acquainted with Dr. Lee H. Lorenzen. Dr. Lorenzen was at that time 34 while I was 41. Dr. Lorenzen studied biochemistry at the University of California at Berkley and later became a water researcher, developing "micro-cluster water" (or Magnetic Resonance Water).

Since the encounter with Dr. Lorenzen, I had become attracted to the study of water and had begun wanting to know more about the properties of water. I wondered if there were any machines that could measure and see water. It was at this time that through Dr. Lorenzen, I encountered a machine that could measure HADO, called an MRA, Magnetic Resonance Analyzer. It was after this discovery that my research started to advance with increasing speed.

ひと目でわかる水の評価方法はないか

それまでに私は、なんとか水の違いを表わす方法はないものかと、悩んでいましたから、「ああ、これだ!」と思いつきました。

誰もがパッとひと目で見てわかるような、水の評価方法はないか……。

そんなところから考え出したのが「水の氷結結晶(以下結晶という)写真」です。この方法なら、知りたい水を凍らせてできる結晶を、写真に撮影すればいいのです。

水を凍らせて、その結晶を撮影したら、その水の情報が得られるのではないかと考えたのです。

苦労を重ねた末に、結晶写真を撮影し、拡大してスライドにすることができました。そして講演などに持って行くと、その美しさと不思議さに、コピーを頼まれることも多くなったのです。結晶写真の美しさと醜さが人を引き付けてくれました。

そのようなことが重なって、結晶写真に対する喜びと、神秘さをわかちあいたいという切なる願いから、この本の出版を企画しました。

身近な水の話

The MRA was used at that time in the USA for homeopathy (a popular drug therapy in Germany). The minute that I saw this machine, an idea flashed through my mind that it could be used in the study of "micro-cluster water" (Magnetic Resonance Water), so I brought it back to Japan as an instrument that could hopefully contribute to my research.

As a result, "HADO water" that transcribes HADO information by MRAs in micro-cluster water, that Dr. Lorenzen produced at my request, demonstrated that the physical condition of people can be improved by water.

I have introduced the use of the MRA and HADO in my literary works as listed below. Please refer to them for specific details.

"The Prelude to the HADO Age" Sun Road publishing Co., Ltd.

"Human Science of HADO" Business Publishing Co., Ltd.

"Truth of 'HADO' Theory" PHP Institute, Inc.

"The Study of Water and Life from the Viewpoint of 'HADO' Science" PHP Institute, Inc.

"Food Science of HADO" Co-author, Akiko Sugahara. Takanawa Publishing Co., Ltd.

"Happiness in Hard Times" Co-author, Ravi Batra. PHP Institute, Inc.

"Saving Our World. The 'HADO' Theory Revolution" PHP Institute, Inc.

"HADO' Theory Gives New Meaning to Human Happiness" PHP Institute, Inc.

"HADO: Tuning into a New Reality" PHP Institute, Inc.

"What is HADO?" PHP Institute, Inc.

"Awakening Latent Memory - In Search of a New Self" PHP Institute, Inc.

As I began doing more research on water, I became interested in taking pictures of various frozen water crystals. Through these pictures, I have gained a great experience by seeing these faces of water. These pictures were so wonderful that I just had to show them, so I decided to edit them into this picture book, "The Message from Water".

Water, Humans and Earth

A human being appears on this earth physically for the first time when an ovum of the mother and sperm of the father meet each other and become a fertilized egg. At this time water accounts for about 95% of the fertilized egg, in other words, it is almost all water. The amount of water in a matured human body is 70%. No wonder it is said that the human body is made of water.

People live their lives surrounded by various kinds of water everyday until the day they die.

The earth is called the "Water Planet" and about 70% of its surface is covered with water. Isn't this somewhat similar to the human body? Most of the planet's water such as rainwater, underground water, lakes, marshes and rivers is in the sea. Some water floats in the air in the form of clouds or mist. Firm in high mountains and ice in Antarctic are also originally water.

As I went on with my research of water, I became unsure whether the precious water that I am working with was clean water or unclean water, or subsequently what it means to the human body. No one except for a water research institution or water research professionals really know the definite answer. Water, whatever it's makeup, appears the same to our eyes.

What is the difference in the information that each kind of water holds? Is there any possible way of seeing that?

While I was thinking about this, I came across a book titled, "THE DAY THAT LIGHTNING CHASED THE HOUSEWIFE" (Edited by Julia Leigh and David Savold, Shobun-sha Publisher). This book contains about 50 questions. Among them, there was a question that asked "Are there any snow crystals of the same shape?" The answer was that snow has been falling on earth for a few million years and each crystal has a different shape.

Can You Make Evaluations of Water in a Glance?

I had always wondered if there were methods of expressing the difference of water nature. And that was when it hit me that "This is it!"

That was what led me to make these "pictures of frozen crystals of water" (hereafter referred to as crystals). With this method, all I had to do was to take pictures of the crystals made by freezing water."

If I freeze water and take a picture of the crystals that form, I could obtain information about the water. That was the whole idea behind the experiment that I was about to start.

I enlarged my pictures of crystals into slides and brought them to my lectures. Since then, I started to get requests for copies of them because of their beauty and mysteriousness. The loveliness as well as ugliness of the crystal pictures attracted people. It was from these events and my earnest desire to share the joy and mysteriousness of crystals that I decided to publish this book.

Chapter 1 Story of Water in Daily Life

Water and Environmental Problems

We cannot think about the quantity of water that circulates this earth without thinking about environmental problems. To solve environmental problems we need the prevention of water contamination, resulting in higher purification levels of water. Water circulates in this world limitlessly and absorbs and dissolves all contaminants. Water is the source of life. If water is contaminated, all creatures would be denied of their existence. Considering these environmental situations, I continued to seek a way to clearly evaluate water.

Can the Water on the Earth Survive?

The tap water that we unconsciously use everyday, is one type of water that has many figures.

Most tap water is directly from rivers. River water is collected in a treatment plant to undergo sterilization and disinfection by chlorine. The water is then transported to each home through water pipes.

It has become common practice for home users in cities to attach a water purifier to the water faucet. Water in most cities is contaminated. How bad is the contamination and is it because the original river water is contaminated? Did it get contaminated on the way to the home water faucets?

How contaminated is natural spring water?

To go further back, how contaminated is the rain that falls from the sky contaminated? Does rainwater get contaminated impurities in the air although it is to be originally distilled on the earth?

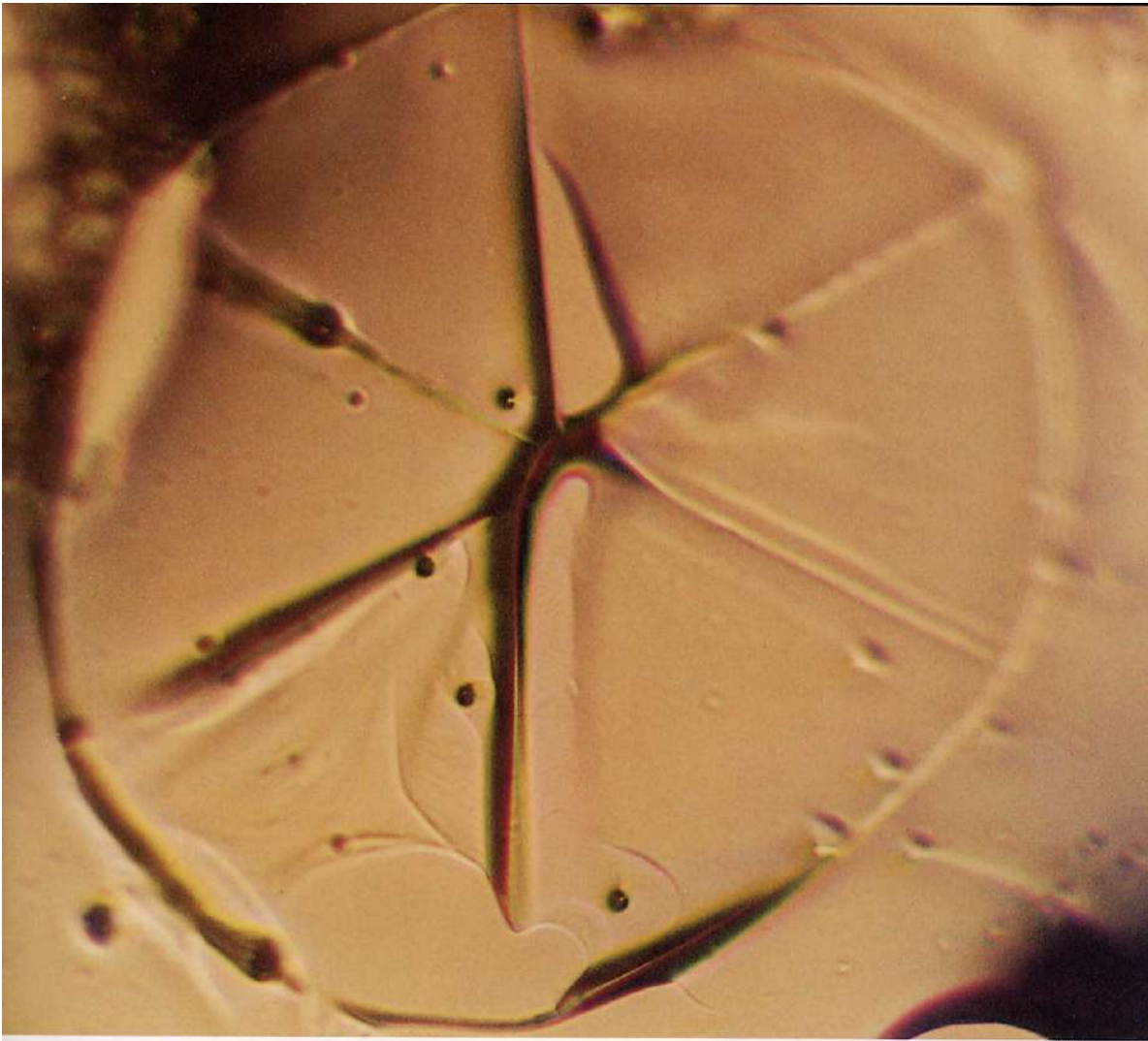
Even scientific experiments and analyses of impurities and contaminants contained in each water sample seem to be partially a numeric magic.

Water is essential to our life, but when we think of it, it contains a lot of problems.

Which tap water is more contaminated, Tokyo or Osaka?

How about local cities in Hokkaido and Kyushu?

Is water in the rural areas really more pure?



The Chinese Character of Water

水という文字は……

水の結晶写真を撮影中、どの氷も写真のような状態を通過して水に戻ります。

水が凍って結晶になり、温度が上がって水に戻る寸前の一瞬、 -5°C から 0°C の間で、「水」という漢字とそっくりの姿を見せてくれます。昔の人はこのことを知って「水」という文字をつくったのでしょうか。漢字以外の文字については、この推理は当てはまりませんが……。

While taking pictures of water crystals, whatever kind of ice melts to water through the state shown in the picture.

When water freezes, it becomes crystallized. At the moment right before it returns to its water form (with a rise in temperature, between -5°C and 0°C) it creates a shape that is identical to the Chinese character for water. Did people in the ancient times know this and make the Chinese character for "Water" based on this information?

Other letters except Chinese ones may not be applied to this reasoning.

『結晶』は「水の顔」

結晶とは、原子あるいは分子が規則正しく配列している状態の個体で、雪や水晶のほかに、ダイヤモンドなどの天然の鉱物、食塩、化学調味料などにも結晶が見られます。

とくに雪は諸条件の重なりによって生まれることから、同じ顔をした結晶はひとつもありません。これは2人として同じ人間がいないことと似ています。

そして雪ばかりではなく、地球上のいろいろな水にも、独自の結晶構造があるはずだと考えました。

水の分子が結晶したとき、きれいな水はきれいな結晶をみせる。しかし汚染された水は美しく結晶しないのでは…と、そう思いついたのです。

1994年、早速実験にかかりましたが、なにしろいろいろな水を凍らせ、小さな壊れやすい結晶を、それも溶けないように顕微鏡のステージに乗せて、超特急で撮影する必

要があります。

まず、凍らせる水の量、シャーレの素材や容量、ドライアイスやクーラーも総動員しました。冷凍庫の庫内温度、冷却時間、実験用の冷蔵室の温度、顕微鏡観察倍率、ライトの当て方、レンズの絞りなど、実にさまざまな条件をひとつずつクリアしてはじめて撮影できます。

この実験に取り組んでから、満足のいく結晶写真が撮影されるまでに、2ヵ月という時間を要しました。この間、何百、何千枚というフィルムを無駄にしたことでしょう。

でも、最初に結晶写真を得たときの感動はえもいわれないものがありました。(14ページの写真)

なんでも最初の1枚が大切な意味をもつものです。

これに勢いを得て、冷凍庫と、カメラをセットした顕微鏡が入るような大きさの冷蔵室をつくり、そして『結晶写真撮影班』を結成しました。少しずつ写真を増やし、データを蓄積していきました。

Water Crystal Is the Face of Water

Crystal is a solid substance with orderly configured atoms and molecules. In addition to being in snow and crystallized quartz, crystals are also seen in natural minerals such as diamonds, table salt, and chemical seasoning like MSG.

In particular, because snow is formed under a variety of conditions, there are no crystals that have the same face (as is true with people's faces.)

This is due to the fact that for snow flakes to have the same crystal structure, the various types of water on the earth have to start out having the same crystal structures.

I had a theory. When a water molecule crystallizes, pure water becomes pure crystal, but contaminated water may not crystallize as beautifully? Well, at least I thought so.

In 1994, I immediately started my experiment. I needed to get each sample of water frozen. Then before they melted I had to place these small fragile crystals on the microscope stage to be photographed at a super high speed.

First of all, I had to get a full set of equipment: the required quantity of water samples to freeze, Petri dishes which material and volume are considered, dry ice and a cooler. Photographing the crystals could only be possible after meeting various conditions, the exact freezer temperature, specific times to be cooled, exact refrigerator temperature, microscopic observation magnification, how to light the object, and lens iris.

It took about 2 months before I was able to take a picture that I was satisfied with. During this period, I must have wasted a few hundreds or a few thousands of rolls of film.

However, it was a very impressive moment when I succeeded in taking my first picture of a water crystal.(Picture in page 14)

After that initial photograph, my experiment gained momentum. I then made a refrigerated room in which a small freezer and a microscope set with a camera could fit. After organizing a "crystal photographing group" my colleagues and I took pictures one by one and stored the data.



はじめて撮影に成功した結晶写真/マイクロクラスター水
The first successful crystal picture we took/Micro-cluster Water

新しい水の評価法の発見

水は変化が激しく、不安定なものです。調べたいと思うひとつの試料水を100個のシャーレに滴下し、冷凍庫に2時間入れておきます。できあがってくる結晶を捕え、顕微鏡を通し、200~500倍の倍率で撮影をします。

しかも、いろいろな結晶の中から平均的なものを得るために、考えられる限りの努力が続きました。

マイナス5℃に設定した冷蔵庫での撮影は、スタッフの体力を考えると、1回の作業はどうしても30分以内に限られます。

結晶写真の撮影については、完全に同じ結果、つまり同じ結晶は得られないわけですから、再現性という点では100点満点の結果ではありません。でもたとえば、格子状の結晶が多いとか、板状の結晶が多いなどの、はっきりと

した傾向が見られ、傾向性という面では、識別ができていると思っています。74ページに1回に1種類の試料水を100のサンプル用意し、凍らせて撮影したときの、いろいろな結晶写真を掲載しました。美結晶、六角、不定型、結晶なし、などにわかれますが、ある一定の傾向性が見られることがわかります。

われわれは結晶写真から多くのことを学びました。今までに、企業や有志の方などの協力も得て、世界各地、また、日本中の湧き水、雨水、河川、湖沼の水を凍らせて撮影することができました。

4年半で約1万枚の写真撮影、所蔵しています。

とくにこの写真集にご紹介した海外の水のほとんどは元・ニチレイアイス社長の田口哲也さん（「水の文化史～人と水のふれあいの歴史」冷凍食品新聞社刊の著者）が、世界中をくまなく歩いて採水してこられたものです。

Discovery of a New Water Evaluation Method

Water changes rapidly and is unstable. We dropped one sample of water to be tested on 100 Petri dishes and placed them in a freezer for 2 hours. We took the crystals out and put them under the microscope to be photographed at magnifications of 200-500 times.

In order to obtain an example of an average crystal we had to photograph as many samples, under as many conditions as we could think of. It's only physically possible for most people to last about 30 minutes (at the longest) while taking pictures inside a refrigerator set at 5°C below zero.

It is impossible to obtain identical crystal pictures. In other words, it is impossible to perfectly reproduce the same crystal twice. However, crystals can show a certain distinctive tendency called a grid crystal or laminar crystal structure. Crystals can be identified by this structural tendency. On page 74, there are pictures of crystals taken by freezing 100 samples at a time for 1 type of water. Although there are many examples of crystals in these samples such as beautiful crystals, hexagonal crystals, variable crystals, or no crystal, we can see that there is a certain tendency in all of the samples to form a grid crystal structure.

We learned many things from these pictures of crystals.

Thanks to the cooperation of several companies and volunteers hitherto, we were able to take pictures of spring water, rainwater, river water, lakes and marshes all across the world and in Japan.

We have photographed and stored about 10,000 pictures in 4 and a half years.

Most of the water from overseas shown in this picture collection was collected by Mr. Tetsuya Taguchi, the former President of Nichirei Ice Co., Ltd. who traveled all over the world and wrote "The Cultural History of Ice: Links between Man and Ice," published by the Reitou Shokuhin Journal.



▲冷蔵室 / Refrigeration room



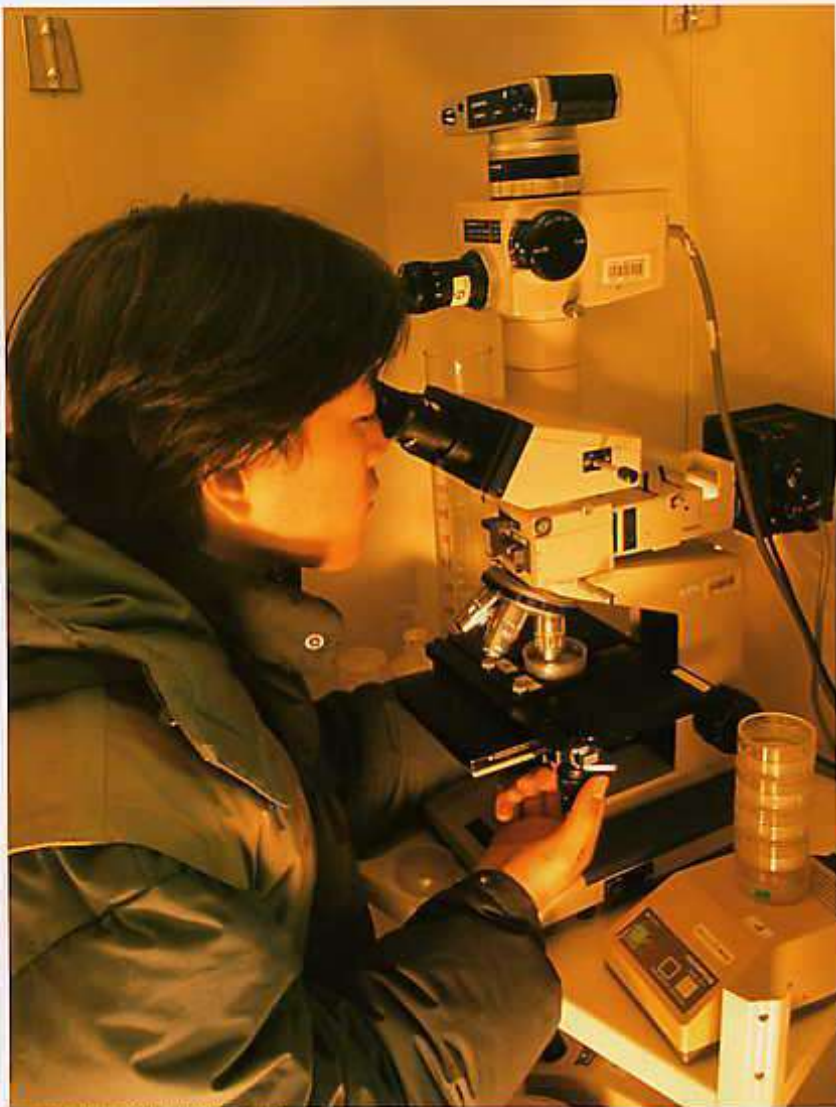
▲撮影カメラ / Camera



▲冷凍庫。1つの試料水を100個のシャーレに分けて、氷結させている様子
Freezer Water to be tested is divided into 100 Petri dishes for freezing.



▲試料水をスポイトで取り出し、シャーレに1滴落とし、凍らせている様子
Placing a drop of water to be tested into a Petri dish using a pipette.



▲ -5℃設定の冷蔵庫で撮影している
Photographing inside a refrigeration room set at -5℃

▶ 氷の先端部分を撮影している
Photographing the ice tip



水からの伝言

私たちスタッフが、実際に結晶写真を見るときは、最初の一枚の写真から教えられたように「六角形の整った結晶構造をしているかどうか」がもっとも重要です。経験から、結晶構造の欠けや崩れは、良い徴候ではないと思います。つまり、普通に眺めて、美しいと感じるかどうかが判断の基準です。

撮影のため、結晶のできる過程を何千回と見てきました。すると不思議なことに、水の「がんばる様子」を見たり感じたりするようになりました。

そして結晶写真は素晴らしい伝言を選んで、水が人間に何かを語りかけていると思いました。

これらの結晶写真はまさに「水の顔」でした。

水は基本的には「良い水になろう！ 良い水になりた

い！」と、けなげに努力していると思います。

そんな表情が伝わってきたのです。

水の結晶写真は、現代の科学的な水の分析方法とは少し離れるかもしれません。まったく違った角度からみた、水の評価方法です。

さらに、水の流れと人の行方と言われるように、水は決して定まることはありません。結晶として撮影されたものは、その日、その時の状態を表わしています。

従って、これを科学的レベルまで引き上げていくためには、毎日のように、いろいろな所で多くの人々の手によって、観測されなければなりません。

ともあれ、これはたぶん、世界ではじめての試みです。このような手法において、水にアプローチする方法もあるという提言として、水が見せてくれる「水の顔」に出会ってください。

A Message from Water

When our staff actually looks at the crystal picture, it is most important that they notice that it has a completed "hexagonal crystal structure", as we saw in the first picture. From our experience, we know that the chipping away and/or collapsing of crystal structures are not good signs. In other words, the judgment criteria is whether you can feel that it is beautiful or not by looking at it.

During the photographing, we observed the crystallization process a few thousand times. Then strangely, we came to feel and see the crystal trying to become "beautiful crystal figure" of water, and that crystal pictures carry wonderful messages. We felt that the water was trying to say something to us. We came to understand that these crystal pictures show different "faces of water".

Water, basically, is trying hard, bravely, to be a "Clear water! I want to be clear water!"

We felt such expression coming out from the crystals of water.

Pictures of crystallized water may deviate slightly from the information given by modern scientific water analysis. Our water evaluation method comes at the analysis from a completely different angle.

In addition, as is often quoted, "Flow of people as well as water is not stable." The pictures of the water crystals express the condition of that sample of water only in that very moment of that very day.

Therefore, in order to raise this analysis to a scientific level, the crystals must be observed on a daily basis at various locations and analyzed with many people's supports.

In any case, this is perhaps the first attempt of this kind in the world. We hope you will enjoy this introduction to a unique method of approaching the study of water, called the "Faces of water".

日本の水道水

水道水の結晶写真

現在の日本の上水道水に、塩素や塩素処理によるトリハロメタン、その他環境ホルモンの原因となる化学物質が含まれていることは、残念ながら周知の事実です。実際に大都市の水道水をそのまま飲むと、塩素臭が鼻につくこともあります。

水道水がまずい理由は、水道水となるダムや川などの元の水を、飲めるように殺菌するために消毒薬を加えたから……であることも、おそらく知られています。また「加えられた消毒薬は、人体に影響ありません」と説明されれば、黙ってうなづくしかありません。でも実際には多くの

人達が、浄水器を使って有害と思われる物質を取り除き、自分たちの身体を守っているのです。

地方や田舎へ行っても、日本の水道の普及率は、ほぼ100%。現在では地下水や井戸水を汲みあげて、直接飲用している人は本当にわずかです。

それに全国の水道水には、ある一定の基準があり、その基準をクリアしないと広く提供できないことが法律で定められています。

そこで各地の水道水を結晶にして撮影しました。一定の基準を満たしている水道水は、果たして全国どこでも同じような結晶になったのでしょうか。

Tap Water, in Japan.

Picture of Tap Water Crystals

Regretfully, it is a known fact that chlorine, chlorinated tri-halomethane and other chemical substances that are the causes of environmental hormones are found in the tap water of Japan. When we drink the tap water in major cities, we actually smell a chlorine odor.

We all know that this is one of the reasons why the tap water is not good. The water that comes from dams and rivers has disinfectants added to it to make it drinkable. And since it carries a sign saying, "Added disinfectants are not harmful to humans," we are supposed to believe that it is OK. Actually though, many people use water purifiers to remove the seemingly harmful substances that they instinctively know threaten their bodies.

The ratio of waterworks covering local and rural areas is nearly 100% in Japan. These days, only a small amount of people pump underground water or well water to use as drinking water.

There is a specific nationwide standard for tap water, and it is provided for by law that the water that doesn't satisfy these standards cannot be supplied to the public.

I decided to take pictures of tap water samples in their crystal forms. Do tap water samples that satisfy the national standards have the same kind of crystals no matter where the samples are found in Japan?



Sapporo City, Hokkaido

北海道・札幌市

札幌市は大都会ですが、郊外の環境は東京のそれと比べたら、まだまだ自然がそのままに残っています。この札幌市の水道水の水源は豊平川。それほど汚染されている川ではないのですが、水道水ではやはり、きれいな結晶を得ることはできませんでした。

でも、必死でまっとうな結晶になろうと努力しているようにも見えます。

Sapporo is a large city, but when comparing its suburban environment with the suburbs of Tokyo, the nature is more intact. The water source of the tap water in Sapporo comes from the Toyohira River. Although this river is not polluted as badly as some others, we could not obtain clear crystals from this tap water.

However, it seems that it is trying desperately hard to be a clean water.

Sendai City, Miyagi Prefecture

宮城県・仙台市

「杜の都」、水の美しい街として有名な仙台市ですが、水道水は……。これもまた、という感じです。

Sendai is famous as the "City of Forests", and it has beautiful water sources. But as for its tap water, it is the same as Sapporo's.



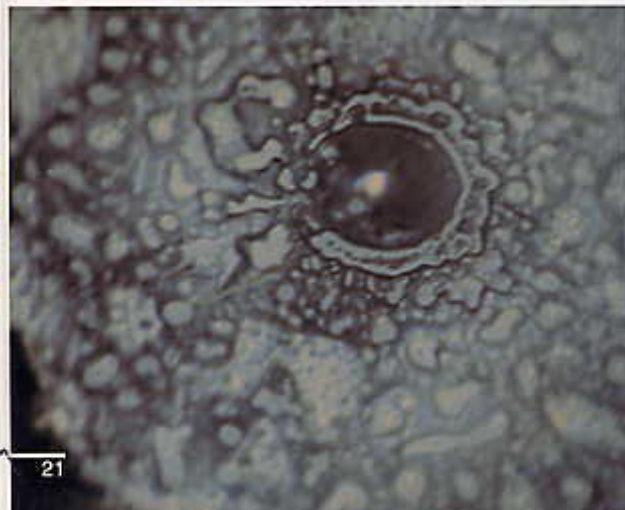
Kanazawa City, Ishikawa Prefecture

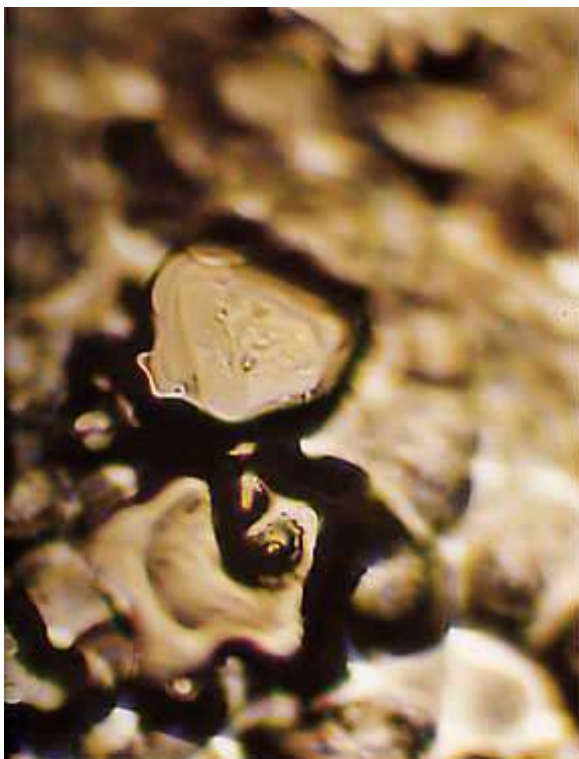
石川県・金沢市

北陸の都市で城下町。市内に浅野川、犀川が流れており、市内中央の兼六園は日本三銘庭園のひとつです。

しかし、水道水の結晶は……。

Kanazawa is the largest city in the Hokuriku district and is a castle town. The Asano River and the Sai River flow through the city, and Kenrokuen Park at the center of the city has one of the 3 famous gardens of Japan. However, the water is...





Shinagawa-ku, Tokyo

東京都・品川区

予想どおり東京の水は、良くないことを証明してしまったような写真です。

結晶化する予兆も見えません。大都会という環境のなかにある水の宿命なのでしょうか。

This picture seems to indicate that the water in Tokyo is not as good as we had expected.

This picture of Tokyo's tap water shows no sign of crystallization. Is this the fate of water in a metropolitan environment?

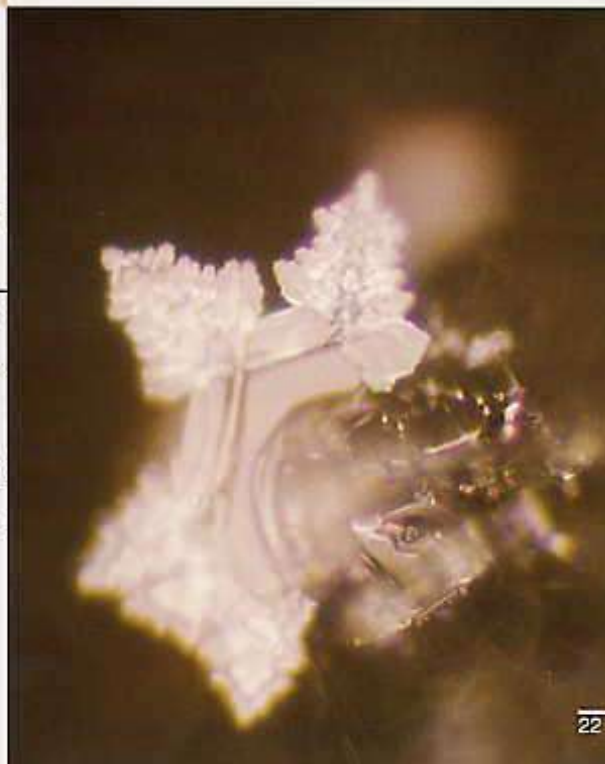
Nagoya City, Aichi Prefecture
愛知県・名古屋市

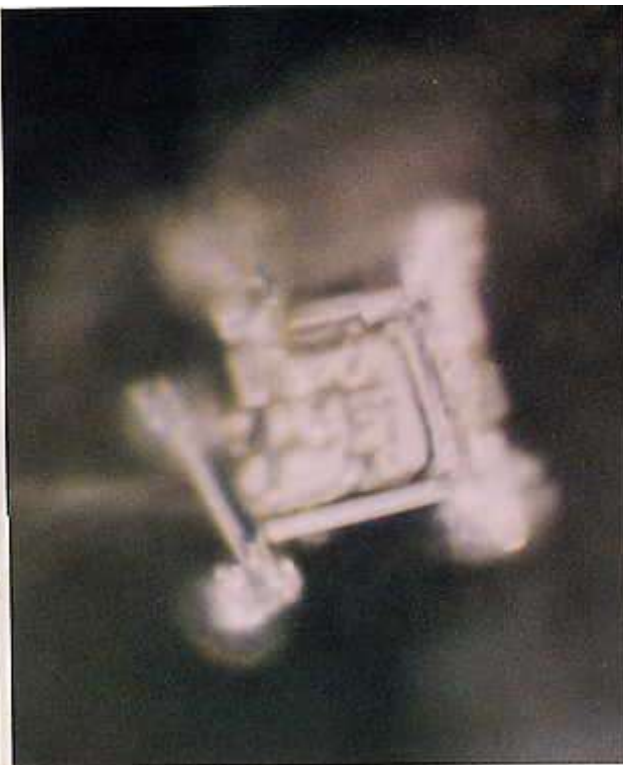
大都市の水道水としては珍しく、結晶になる一歩手前の姿がとらえられました（木曾川系水源）。

完全な六角形になるうとする水を阻害している要因は、いったいなんでしょうか。

Unexpectedly, we were able to capture its figure just before crystallization, rarely seen in tap water in large cities. The Water source is the Kiso River.

What is the factor that impedes a water crystal from forming a complete hexagon?





Kita-ku, Osaka City

大阪市・北区

大阪も「水の都」……でしたが、今では、水のまずさで定評のある都市に。

ただこの写真、かなりいびつですが結晶になろうとしています。しかも角には枝も見られ、発展願望が大。

Osaka used to be a "City of Water". But it has become a city famous for unpalatable water.

The sample of water from Osaka seems to be trying to crystallize, though it is significantly distorted. We can see branches at the corners which indicate that it is trying to becoming fully developed.

Katano City, Osaka Prefecture

かたの 大阪府・交野市

交野市は大阪市の北部、奈良と京都の県境にあります。

交野市の水道水は、6割を地下水を水源としているためか、とてもきれいな結晶がとれました。

そういえば、千利休がお茶をたてるときに、交野の水をわざわざ取り寄せて使ったとか……。

Katano city lies in the northern part of Osaka and on the prefectural border between Nara and Kyoto.

We were able to obtain a clear crystal from the tap water in Katano, since 60% of it comes from an underground water source. Come to think of it, Sen-no-Rikyu, a tea master and a founder of the Sen school of tea ceremony, used water from Katano to make tea.





Hiroshima City, Hiroshima Prefecture

広島県・広島市

川と橋の町、広島。原爆の洗礼を受けた町、広島。酒どころとして名高い西条もひかえていて、昔から水のおいしいところでした。必死で六角形になろうとしている結晶は、まるでやがて人の優しさと団結を表わしているようです。

Hiroshima, a city of rivers and bridges. Hiroshima, a city baptized by the atomic bomb.

Saijo is famous for its sake, and the water in this city has always been good since ancient times. The crystal that is trying hard to develop into a hexagon seems to be expressing the graceful kindness and solidarity of its people.

Fukuoka City, Fukuoka Prefecture

福岡県・福岡市

九州一の大都市・福岡。やはり都会の水道水で美しい結晶を得るのは無理なのでしょうか。結晶の半分ほどが何かに浸食されたような形ですが、結晶の名残りは見られます。

The largest city in Kyushu, Fukuoka. Is it an impossible task to try to obtain a clear crystal from a city tap water? About half of the crystals that we photographed seemed to have been eroded by something, but still there are traces.



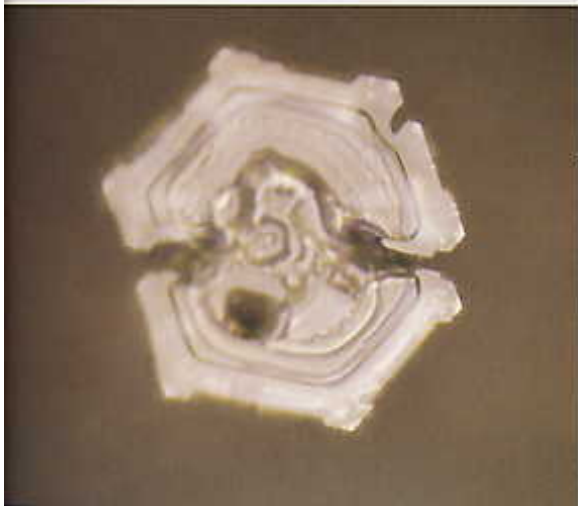
Naha City, Okinawa Prefecture

沖縄県・那覇市

観光商業都市沖縄は、本土より1~2ヵ月早く桜が咲き、早めに梅雨も。大きな川はなく、水道水の水源地、雨水を溜めたものを利用しています。水や海を大切にする人々の気持ちが表わされているようです。

Okinawa is mainly a tourist and commercial city. On the island, the cherry blossom season arrives about 1 to 2 months earlier than on the mainland and their rainy season also comes earlier. There are no large rivers so the water source for their tap water comes from rainwater reservoirs.

This water crystal seems to express the people's warm feelings toward water and the sea.



海外の水道水

世界の水事情

所変われば品変わる……のたとえにあるように、水ほどその環境（文明、文化を含む）や風土によって変わるものはないでしょう。

そのため、WHO（世界保健機構）では、1984年に水質指針（ガイドライン）を作成しましたが、そのなかで「飲料水の安全判定の目安や処理目標としての基準は、各国がその国内状況（水事情、社会全体の環境レベル、技術力、経済力など）を勘案して決めるべきであり、指針はそのための基礎資料を提供するにすぎない」と注釈しているほどです。

Tap Water, Overseas

The Water Circumstances of the World

Each country has its own customs. Nothing else is changed so much by the environment and the natural features of the land (including civilization and culture) as is the water.

For this reason, the WHO (World Health Organization) created water guidelines in 1984. In these guidelines it is stated that "The standard for safety judgment of drinking water and criteria for treatment should be determined by each country giving consideration to its own domestic conditions (water circumstances, environmental level of the entire society, technical as well as economical power) and these guidelines are only provided as a basic material for that purpose." Therefore, the water purification method for tap water differs according to each country. In our country, a treatment system using mainly chlorine has been provided by the ministerial ordinance of each prefecture.

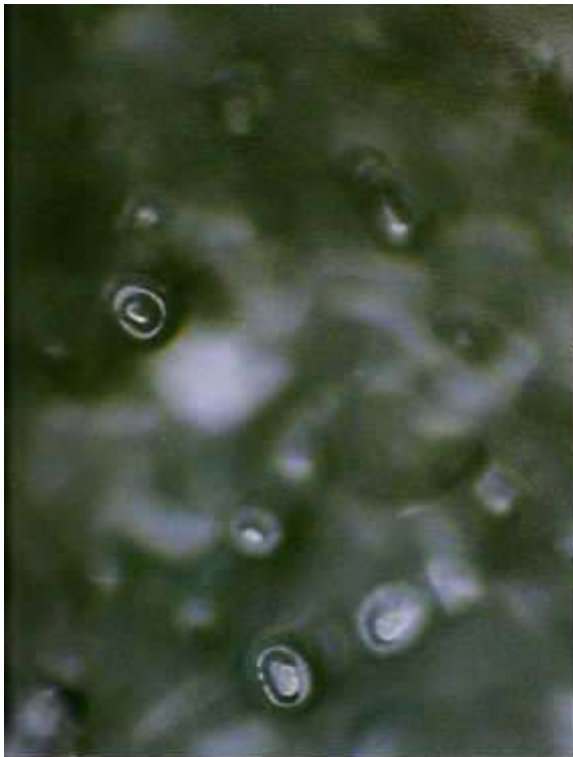
These pictures of tap water crystals from around the world were taken only from 6 large cities: London (UK), Paris (France), New York (USA), Vancouver (Canada), Buenos Aires (Argentina) and Manaus (Brazil). However, when compared with the pictures of Japanese tap water crystals, they were surprisingly more clear.

It seems that the reason is the difference in the degree of contamination of the water sources in each country, as well as the difference in the water treatment systems.

ですから、水道水の浄水処理方法は、各国によってまちまちなのですが、わが国では、主として塩素を中心とした処理システムが省令によって定められている、ということになります。

今回、ご紹介する外国の水道水の結晶写真は、紙面の都合で、ロンドン、パリ、ニューヨーク、カナダ、アルゼンチン、ブラジルの6都市だけです。しかし、日本の水道水の結晶写真と比較してみると、案外きれいなものが多いのです。

その理由は、それぞれの国の原水の汚染度の違い。そして、水の処理システムの違いにあるようです。



London, UK

イギリス・ロンドン

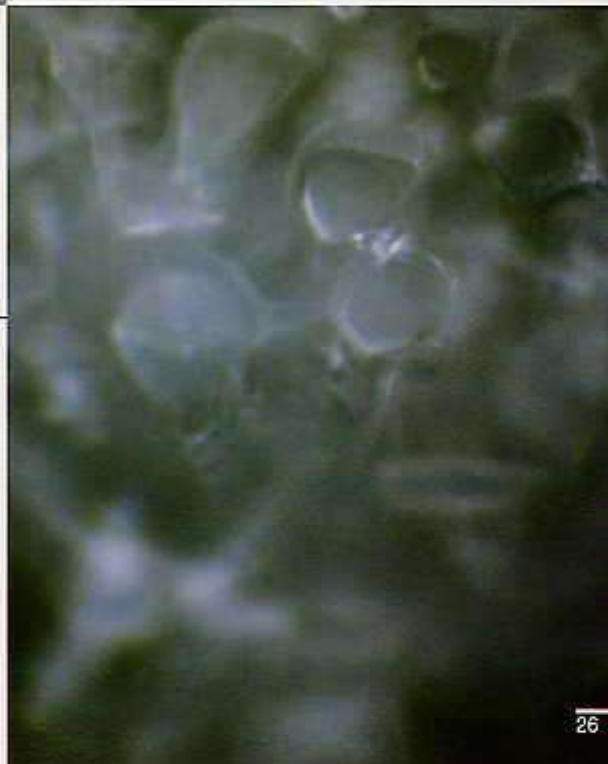
霧の都ロンドンの水道水です。
結晶というには程透い状態しか得ることはできませんでしたが、
日本の水道水と比べてみると、なんともいえません。

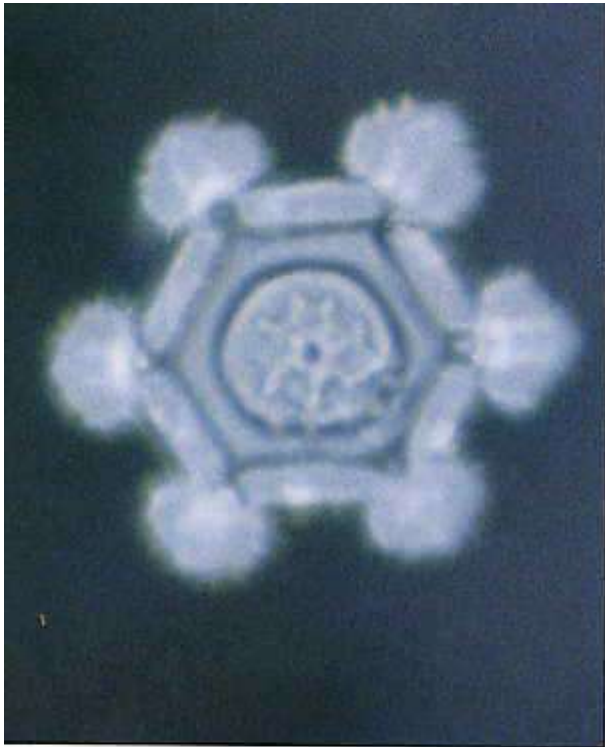
The tap water of London, a foggy city.
We could only obtain crystals that were not fully developed as was frequently the case in Japan.

Paris, France
フランス・パリ

セーヌ川の流れるパリの水道水です。
なかなか結晶するというにはいたりませんが、思っていたよりひどくはない……といったところでしょうか。

The tap water of Paris where the Seine River flows.
The sample did not crystallize easily but it was not as bad as we had expected.





New York, USA

アメリカ・ニューヨーク

アメリカ大陸の東海岸にあるニューヨークは、人種のつぼとされているとされていますが、水道水は日本の湧き水よりいい顔をしているものがあります。

ちなみに、ニューヨークの処理システムはフッ素、オゾン処理が中心ということです。

New York is located on the east coast of the North American Continent and is said to be the melting pot of races.

We can see that some of the tap water crystals have better faces than those of Japanese spring water.

In New York, tap water is usually fluorinated or ozonized.

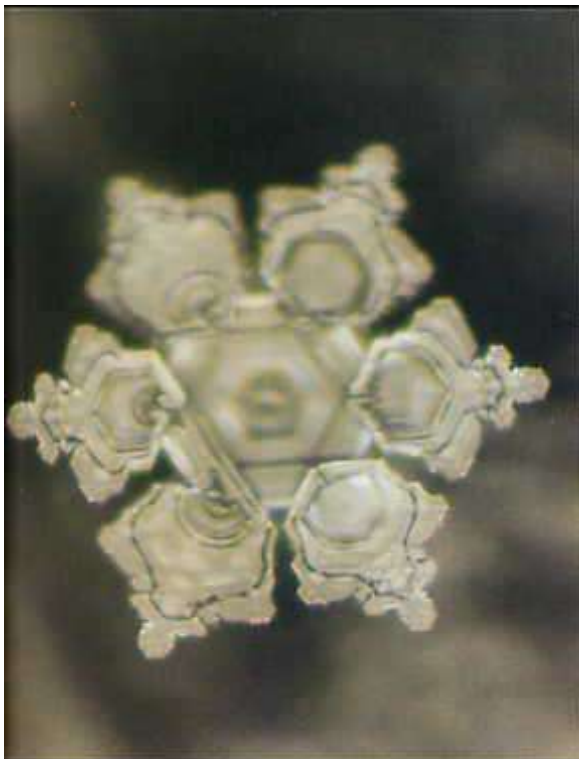
Vancouver, Canada

カナダ・バンクーバー

アメリカ大陸西海岸、すぐお隣りはアメリカのシアトル。比較的暖かく住みやすいことから、日本人も多く住んでいます。水道水にしては美しい結晶を保持しています。

Vancouver is located on the west coast of the North American Continent. Seattle, Washington in the USA is just a few miles south from there. Because the weather is relatively warm and subsequently affords it's population a comfortable living climate, many Japanese people live in Vancouver. The crystals of the water here retained a beautiful crystalline shape especially for those of tap water.





Buenos Aires, Argentina

アルゼンチン・ブエノスアイレス

美しい結晶をみせてくれました。

こんな結晶写真が撮れると、日本の水道水の質の悪さが思われなくなりません。

しかし、旅先で飲んで安全かどうかは、また別の問題です。

The water here shows a beautiful crystal shape.

Pictures of these beautiful crystals remind us of how bad the Japanese tap water is.

Beautiful crystals, however, are one thing and safe drinking water while traveling is another.

Manaus, Brazil

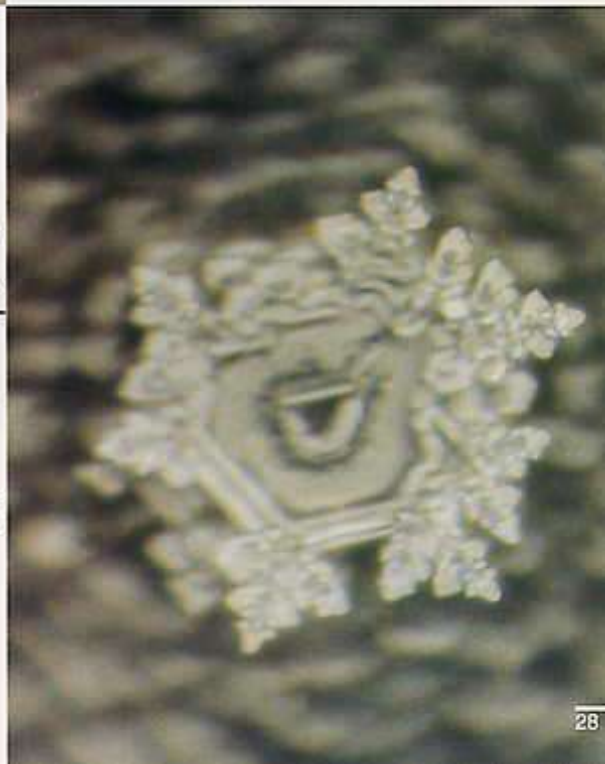
ブラジル・マナウス

とても美しい結晶です。

美しく結晶する、水道水が飲める国の人々がうらやましい気はしますが、しかし、消毒基準が日本に比べて、それほど厳しくはないということですので、何とも言えません。

Very beautiful crystals.

The water crystallized beautifully. The people who live in countries where the tap water is drinkable are really very fortunate, but the disinfection criteria are not so exacting as those in Japan.



自 然界の水

滔々と……が水の自然な姿

「自然水」といいますが、どこからどこまでが「自然」なのか、その境界線はあいまいです。

「人間の影響が及んでいない水」といいかえれば、もはや地球上には「自然水」など残っていないかもしれません。水は私たち人類が生まれるずっと以前から、地球上に存在していました。そして水は、自然に、滔々と、循環するというサイクルを繰り返していました。

私たちは、その循環していた「自然」の水をちょっと拝借しているだけではなかったのでしょうか。

ちょっとお借りしていたつもりが、生活が便利になり、文化が発展すると同時に、あまりにもたくさんの水を使うようになり、その水を汚し続けることになってしまったよ

うです。そして自分たちで汚した水を「浄化」と称して塩素を入れて消毒し、「不自然」な水をつくり出してしまったのではないのでしょうか。

循環する水の浄化力

水は本来、自然なものです。水自身には、自然に自分を浄化する自浄作用がありました。

たとえば雨水が地面に染み込んで、地下水となる過程でろ過されることや、川や湖から蒸発して雲になることも浄化の一種です。シジミ、ハゼ、ボラなどの川と海の間で生きる生き物は、川の上流から流れてきたものを食べて生きています。だから河川は中流とくらべて、河口近くの水がなんとなく美しい結晶を見せてくれることも、自然の浄化といえるのではないのでしょうか。

Water in the Natural World

Water Flows Swiftly... is a Natural Figure of Water

We say "natural water", but to what degree is the word "natural" applied? In other words, the boundaries of the word natural are very vague. If we say that water "not influenced by humans" is natural water, then there may be no water left on earth that can be called natural.

Water existed on the earth long before humans emerged. It has repeated its swift circulation cycle naturally.

We were only borrowing circulating "natural" water.

We were just borrowing it, but because it became so convenient, we started using too much water as our human culture developed. As a result, we started polluting water before we put it back in circulation. This polluted water is then "disinfected" with chlorine, which we call purification, whereby creating "unnatural" water.

Purifying Power of Circulating Water

Water is originally natural and has the power to purify itself. For instance, when rainwater penetrates the ground, it is filtered through the soil and becomes part of an underground water source. Water also is filtered when evaporating from rivers and lakes to become clouds in the sky. These are just some of its natural processes of purification.

Creatures that live between the river and the sea, such as corbicula, goby and striped mullet, eat their food that is carried from upstream. Therefore, it can be said that as a result of this natural purification, the water near the river mouth would show beautiful crystals as compared to the water found mid-stream.

自然水はどこに？

大自然の循環サイクルの中では、つねに大きく浄化作用が働いているようです。

しかし現代では人間の営みのために、大量の農薬や化学肥料、各種の化学物質が土壌に染み込んでおり、雨水はそこをろ過装置として通過しています。したがって地下水や湧き水も汚染されていることになります。

また下水施設や生活雑廃水、工場廃液などを引き受けている河川の汚染はいうまでもなく、自動車の排気ガスや工場が吐き出す煤煙、産業廃棄物などのゴミを焼却する煙も汚染源ですし、原子力発電所もたくさんできています。

あらゆる状況下で汚染された大気。その大気の中を落ちてくる雨水も「酸性雨」となって、人間の汚染を受けています。

また湖や沼も大きく人の手が加わって、せき止められたり、埋め立てられたり、フタをされたり、つぶされたり、引越しまでさせられることもあります。

やはり、今や本当の意味での「自然水」を探すことは少なからず努力を要します。

この項では、一般的に「できるだけ人の手が加わっていない状態の水」として、日本国内を中心に、代表的な自然の湧き水や河川・湖沼の水、雨水などをとりあげ、その結晶写真を集めました。

Where Can You Find Natural Water?

Amidst the great circulation cycle of nature, purification is always happening on a large scale. However, today, due to the work of humans, a large amount of chemical substances have penetrated the soil through which rainwater filters. This means that underground water sources and spring water also are contaminated.

Not to mention the contamination that occurs when rivers take in waste water from sewage treatment facilities and plants, gray water, exhaust gas from automobiles, soot and smoke from plants and smoke from incinerating daily industrial waste materials are also contamination sources as well as many nuclear power plants that are being built.

Air is polluted under all kinds of conditions. Rainwater as "acid rain" is also subject to pollution by humans.

Lakes and marshes have been artificially reformed by damming, reclamation, covering, dissipating and even being forced to move.

It indeed requires effort to find "natural" water in the true sense of the word.

In this chapter, we will show a collection of pictures of the water crystals found in typical springs, rivers, lakes, marshes and finally in rainwater. Most of the samples are mainly gathered in Japan as "water not polluted by human hands."

湧き水

湧き水の自然な顔

日本全国から寄せられる湧き水の撮影は、非常に楽しいものです。

いくら撮影を続けても、さんたんたる状況に陥ってしまう水道水の結晶写真の結果とは、比べものにならないほど、ワクワクドキドキさせられます。

日本は国土の8割が山々におおわれています。先進国としては希少なほど自然の山林も多く残っていて、雨量も豊富で、清浄な水に恵まれた国なのです。

おかげで全国の至るところに湧き水も多く、古くから庶民の暮らしと密接に結びついていました。

しかし戦後の急速な都市開発と山林の人工的整備などにより、汚染のため使えなくなったり、枯渇してしまった湧き水もたくさんあります。

ところが最近になって、水道水の危険性が叫ばれ出し「ミネラルウォーター」ブームなどともあいまって、自然の湧き水に再びスポットが当たっています。

雑誌などの特集で「名水百選」が取り上げられ、その名水を求めて、何時間もかけて水を汲みに行く人もいます。全国で自然に湧き出ている水や地下水の中から選んだ結晶写真です。

さて自然の湧水たちは、どんな顔をして、どんなメッセージを伝えてくれるのでしょうか。

Spring Water

The Natural Face of Spring Water

These Photographs of spring water collected from all across Japan are very interesting.

Photographing was thrilling especially when compared with the depression that we felt while taking the pictures of the tap water crystals.

Mountains cover about 80% of Japan. Because of this we have an abundance of the natural mountains and forests not commonly seen in industrialized countries. We have plenty of rain and are blessed with pure water.

Since ancient times, this environment and our many natural springs have been closely related with the long and healthy life span of our rural people.

However, with rapid urban development and artificial development of mountains and forests, increased water supply accesses and drainage systems were built after World War II. Because of this, many sources of spring water became unusable due to contamination or due to simply drying up.

But recently, the community was alerted to the dangers of tap water and this (triggering a "mineral water" boom) has caused natural spring water to again draw attention.

"Selected 100 Water of Japan" has been featured in magazines. To seek such water sources, some people travel hours to the identified locations. These are pictures of selected natural spring water crystals.

Now, what kind of faces do the natural spring water and ground water have and what message do they convey?



Ryusendo Cave, Iwate Prefecture

岩手県・竜泉洞

120メートルの深さをもつ地底湖もある、鍾乳洞の近くに湧き出す水。一部が欠けてはいるものの、大きな力強さを感じます。地底湖の水は浸食されつつも必死で自然を守るようとしているよう。手遅れにならないうちに、地球をきれいに……と思います。

Water comes springing out near a limestone cave that holds an underground lake as deep as 120 meters in some places.

Although the crystal that is formed from this water is partially chipped, we feel a dynamic strength coming from its structure. The water from the underground lake seems to try to desperately preserve it's uncontaminated nature even if eroded. We believe that we must make the earth beautiful again, before it is too late.



Sanbu-ichi Yusui Spring Water, Nagasaka-cho, Kita-Koma-gun, Yamanashi Prefecture

さんぶいちゆうすい
山梨県北巨摩郡長坂町・三分一湧水

八ヶ岳の雪解け水を源とする「三分一湧水」からは、美しい結晶を得ることができました。均整のとれた六角形構造をベースに、それぞれの角から三本の枝が別々に伸びている様子は、湧き水をめぐってみんなが仲良く手をつないでいるように見えます。

From a sample that was made up of Sanbu-ichi Yusui spring water we were able to obtain a beautiful crystal. It is made up of snow water from Mt. Yatsugatake. Based on a well-balanced hexagonal structure, 3 branches stretch out from each edge of the crystal. This gives the impression of people holding hands together around the spring water.



Clear Water of Kobo, Kanagawa Prefecture

神奈川県・弘法こうぼうの清水

弘法大師由来のこの湧き水は、どんな日照りの年にも、枯れることがないといわれています。

観光センターなどで売られている商品は、酒やソバをはじめ、どれも名水をうたってあります。

結晶写真は、地下から湧き上がってくるような力強さを感じます。素晴らしい宝物を後世に残したいですね。

Originating from Kobo Daishi, this spring is said to never dry up even during a severe draught year.

The products sold at the local tourist centers, including sake and soba, advertise that they are made using water from this spring.

In looking at the picture of the crystal we feel a strong power that seems to come springing out from underground.

We do wish to hand down wonderful treasures to our future generations.

Kobo Spring Water, Fukuyama City, Hiroshima Prefecture

広島県福山市・弘法こうぼうの湧水

1200年ほど前、中国地方を巡っていた弘法大師が、奇病に悩む民衆を救済しようと杖で岩盤を打って湧き出したという水。

弘法の水という名前は、大師の全国行脚中に湧き出したという言い伝えとともに、いろいろな場所に残っています。

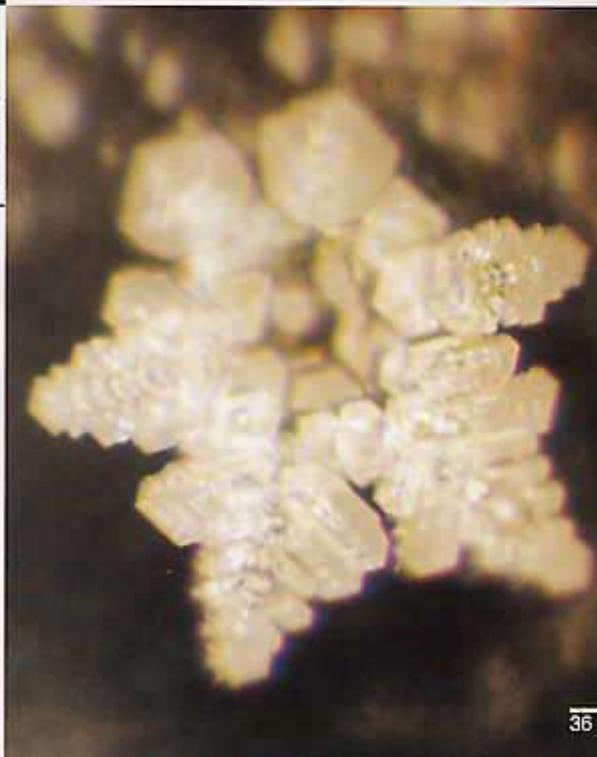
2種類の弘法の水はとてよく似ています。

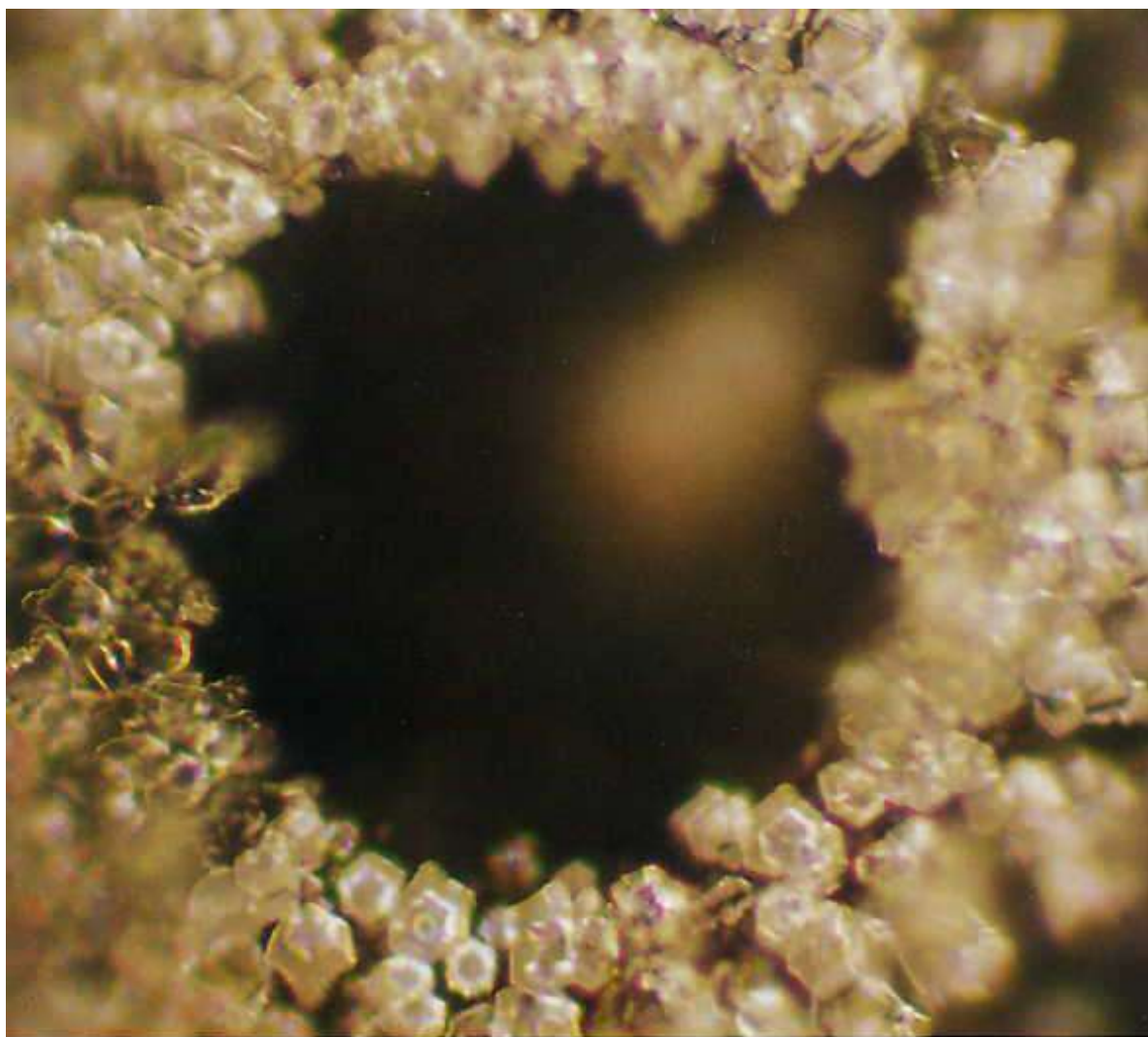
スタッフもときどき間違えるほどです。

About 1,200 years ago, the great Buddhist teacher Kobo was travelling in the Chugoku region of Japan. There were many people in the region afflicted by a strange illness and to help them, Kobo hammered away the base rock with his staff in order to get at the natural water flowing underneath. This water was named Kobo Spring Water.

The name "Kobo Spring Water" is found in various places throughout Japan, where-ever natural hot waters sprang forth during Kobo's travels.

There are two very similar types of Kobo Spring Water. They are so similar that even our staff sometimes have trouble telling them apart.





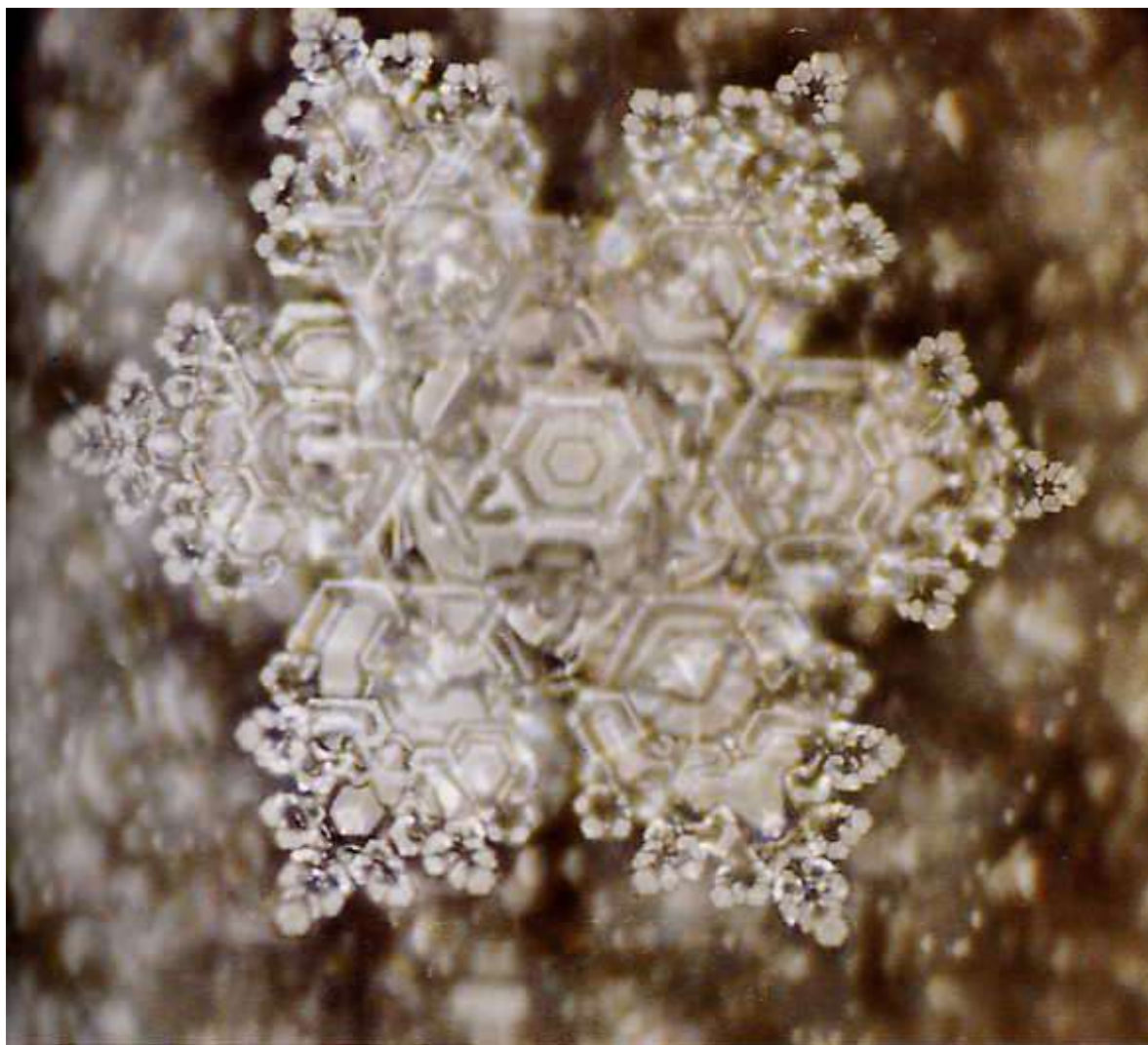
Rumbling Water in Tenkawa Village, Yoshino-gun, Nara Prefecture

奈良県吉野郡天川村・ゴロゴロの水

山岳信仰と厳しい修行で名高い大峯山の登山道入り口にあり、鍾乳洞に湧き出る水の音がゴロゴロという音をたてて、反響することからこの名前がついています。洞窟から湧き出る神秘の水といわれています。

This name comes from the rumbling echoing sound that this spring makes. The spring lies in a limestone cave at the entrance of a mountain path in the Omine Mountains. The people of these mountains are famous for their worshipping practices and strict ascetic beliefs.

The water that gushes from the mouth of this cave spring is called mystic water for this reason.

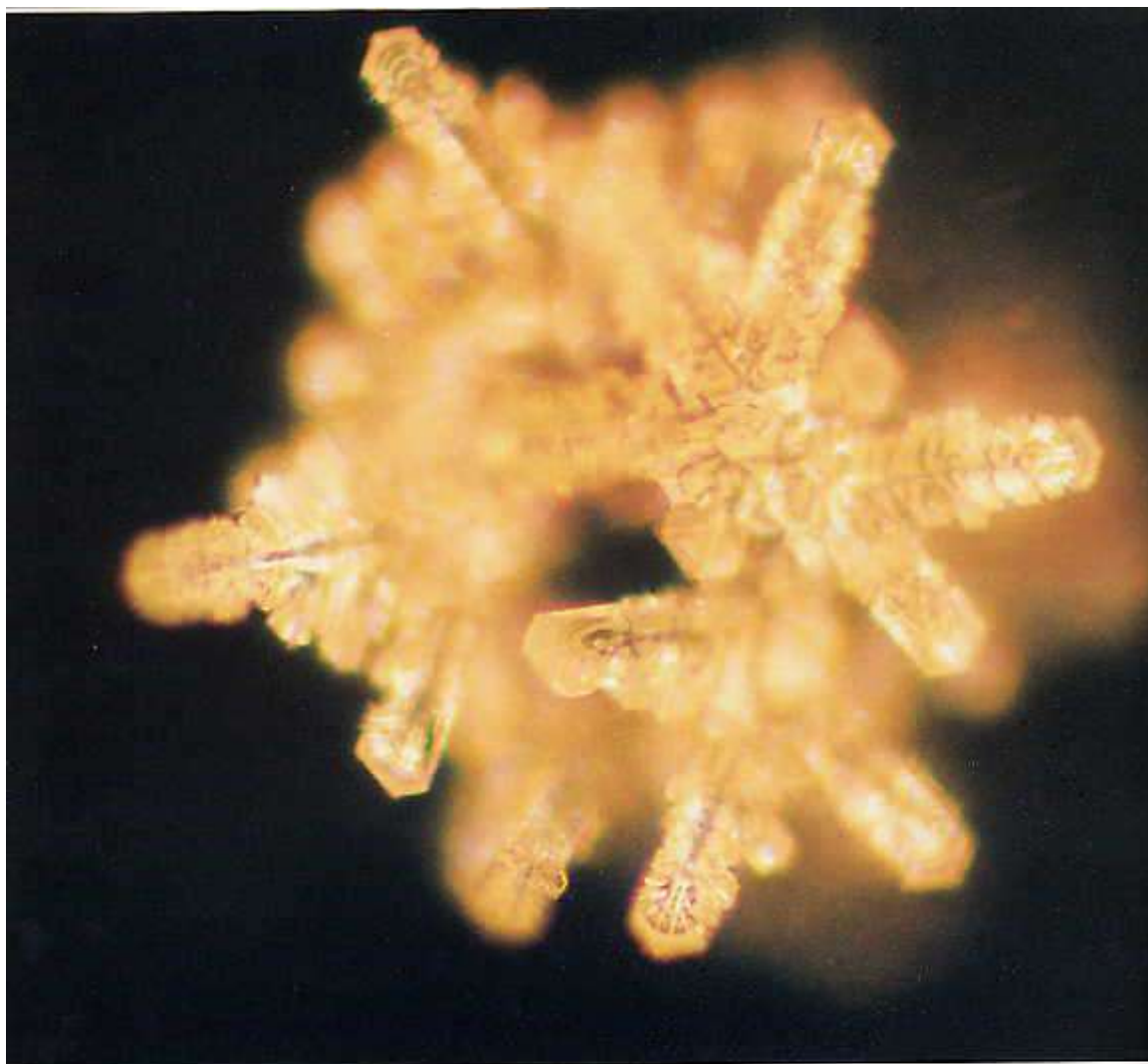


Spring Water of Saijo, Hiroshima Prefecture

広島県・西条の湧水
さいじょう

標高500～700メートルくらいの高地周辺に広がった町は、水が美味しいことから酒どころとしても名高く、兵庫の灘、京都の伏見と並ぶ酒どころです。中心部分までしっかりと結晶しており、周囲にすき間無く広がった枝は見事です。

This town that sprawls in the highlands mountains 500 to 700 meters above sea level is famous as a sake brewing area because of its good water. It is as famous for sake as Nada in Hyogo Prefecture and Fushimi in Kyoto are. The crystal that this spring water forms is firm through the center and branches magnificently. It then spreads out fully leaving no empty space.



Ubuyama's Water, Kumamoto Prefecture

熊本県・^{うぶやま}産山の水

熊本県の北の端、大分県に接している地で、阿蘇山の北のふもとにある湧水です。
牧畜の盛んな町で、大野川の源流あたりにある名水百選のひとつ。
美しい結晶はひっそりと咲いた、花のよう……。

Ubuyama's water is a spring located at the northern end of Kumamoto Prefecture, which borders Oita Prefecture and lies at the foot of the Aso Mountain where cattle breeding is prosperous. It is also the home of the source of the Ono River, one of the "Selected 100 Waters of Japan".
This beautiful crystal is just like a delicate flower blossom.

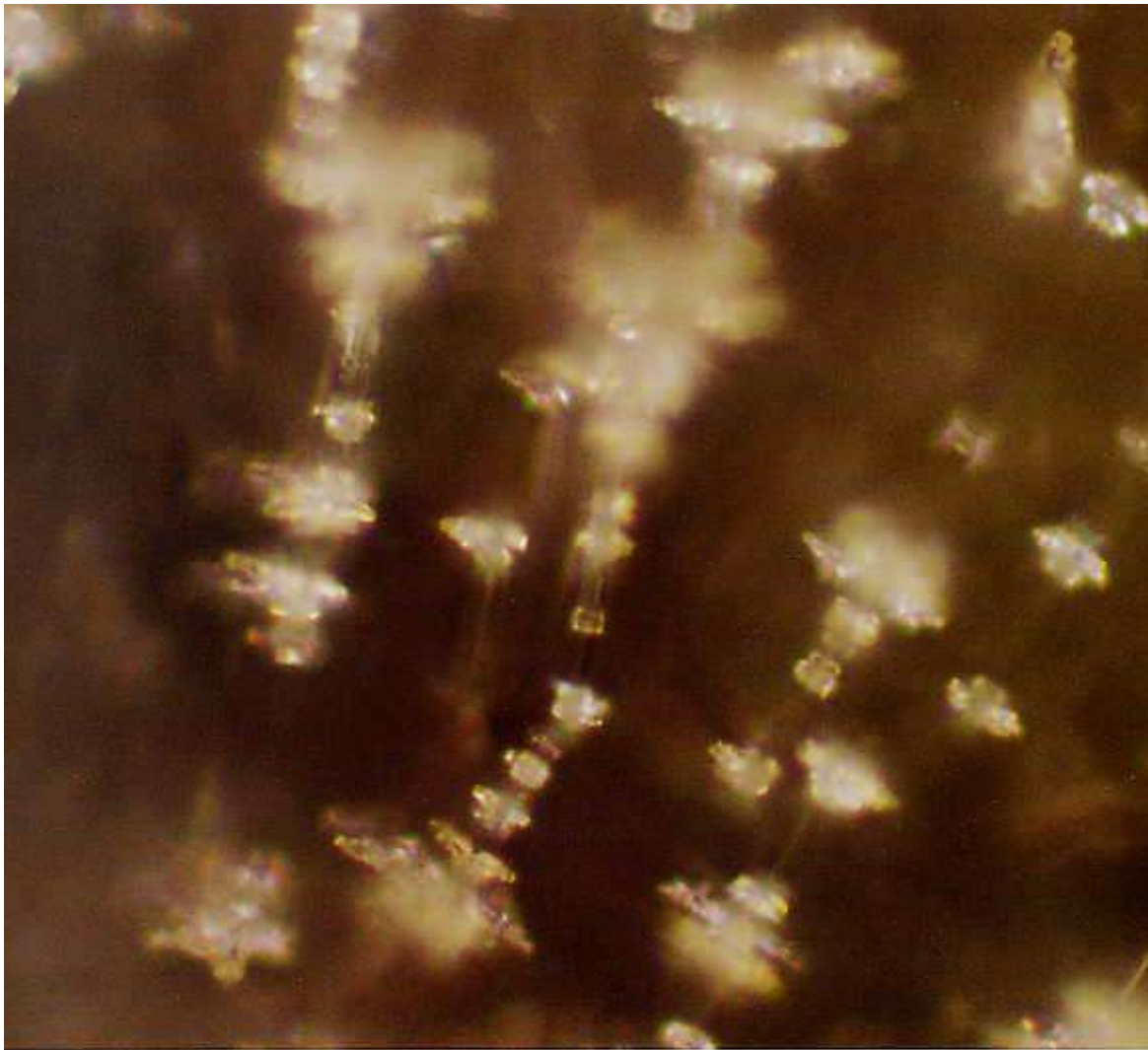


Fountain in Lourdes, France

フランス・ルルドの泉

「聖ルルドの泉」は奇跡の泉といわれ、世界中から毎年400万人以上の人が集まります。愛の波動をもつ水、恨みを逆転させる水として有名です。集団意識としての良さを表わす……神秘的な輝きが感じられる不思議な結晶です。

"St. Lourdes' Fountain" is said to be a fountain of miracles. The water has HADO from love and it reverses hatred to love. More than 4 million people from every corner of the earth come to visit each year. This crystal expresses the merits of the collective consciousness. A mysterious crystal that gives off the feeling of mystical glory.



Hogget Diamond Spring Water in Tasmania, Australia

オーストラリア
タスマニア **ホグト・ダイヤモンド湧水**

オーストラリアの南東部のタスマニア地方は、古生代岩石地帯に属していて、オパールや工業用ダイヤモンドの採取が盛んだった場所。
キラキラと光るダイヤモンドのような結晶がとれたのも不思議です。

The Tasmania region is located at the south eastern end of Australia. The spring is located in a Paloozoic era rock formation where opal and diamond mining (for industrial use) once prospered.
It is no wonder that glittering crystals of diamonds were there.



Underground Water in Northern Island, New Zealand
ニュージーランド北島・地下水

海岸では海水浴、山に登るとスキーができるという、日本人が大好きな旅行地のひとつです。人の数より羊の数の方が多い国の地下水は、伝統を大切にす人々に守られ、受け継がれているようです。

This is one of the most popular tourist attractions for Japanese people. The climate is such that while the sea-coast offers warmth enough for swimming, the mountain provide the temperatures needed for skiing. The underground water of the country where the number of sheep exceed the number of people, is preserved and taken over by people who cherish tradition.

河川・湖沼

生活を支える水

山々や森に降った雨は、木々の栄養分となったり、地面に吸い込まれたりしながら、少しずつ集まって小さなせせらぎをつくります。せせらぎが太く、強い流れになり、川ができます。川は少しずつ大きなエネルギーをもつようになり、急な山の間を抜けていきます。その間に、栄養分の多い山の土を下流に運びます。

途中の地形に応じて、水がめの役割を果たす池や湖や沼になったりしながら……。

川は水を下流に運ぶことで、植物のみならず生き物を育み、平野に入ると、上流から持ってきた栄養分の多い土を供給しながら、田畑をうるおして進みます。

毎日、食卓に登場する食物の多くは、川の水の恵みな

しには、生育しないものばかりです。

日本にはいわゆる大河と呼ばれるような大きな川はあまりありませんが、河川や湖、池や沼などの数は豊富です。中でも河川は古くから生活に密着した存在で、飲用水としてはもちろん、田畑の灌漑用水や交通手段としても重要な役割を担ってきました。

私たちの暮らしと直結している河川の汚れは、とても気になることです。

都市を流れる河川の汚れはどんな具合でしょうか。

地方はどうでしょうか。

清流と呼ばれる川の結晶はどんな姿をしているのでしょうか。

それらの河川の源であり、水がめの役割を果たしている湖沼の結晶は、どんな顔を見せてくれるのでしょうか。

Rivers, Lakes and Marshes

Water that Supports Life

The rain that falls on the mountains and forests can become nutrition for trees or penetrate through the soil collecting to form small streams underground. With enough water these streams become wide and strong, forming a river. These rivers then gradually accumulate energy and water enough to pass through steep mountains, carrying with it the nutritious mountain soil.

In accordance with the terrain along the way, the water may form pools, ponds, lakes or marshes.

By carrying water downstream, the river nurtures creatures as well as plants. When the river enters a plain it enriches the fields as it advances ahead by depositing the fertile soil that it carried from upstream.

Most of the food put on our tables everyday could not have grown without the blessings of the river water.

In Japan we have no large rivers but we do have an abundant number of small rivers, lakes, ponds and marshes. Even these small rivers have been important to our people's lives since ancient times and have contributed in supplying drinking water, as well as providing a means of transportation and field irrigation.

The flow of the rivers that are directly connected with our lives are very important to us.

How is the contamination condition of rivers that flow through cities?

How are the conditions in the local areas?

What is the appearance of the water crystals of the rivers that we describe as limpid streams?

What kinds of images does the water crystal of the lakes and marshes, the source of rivers show?



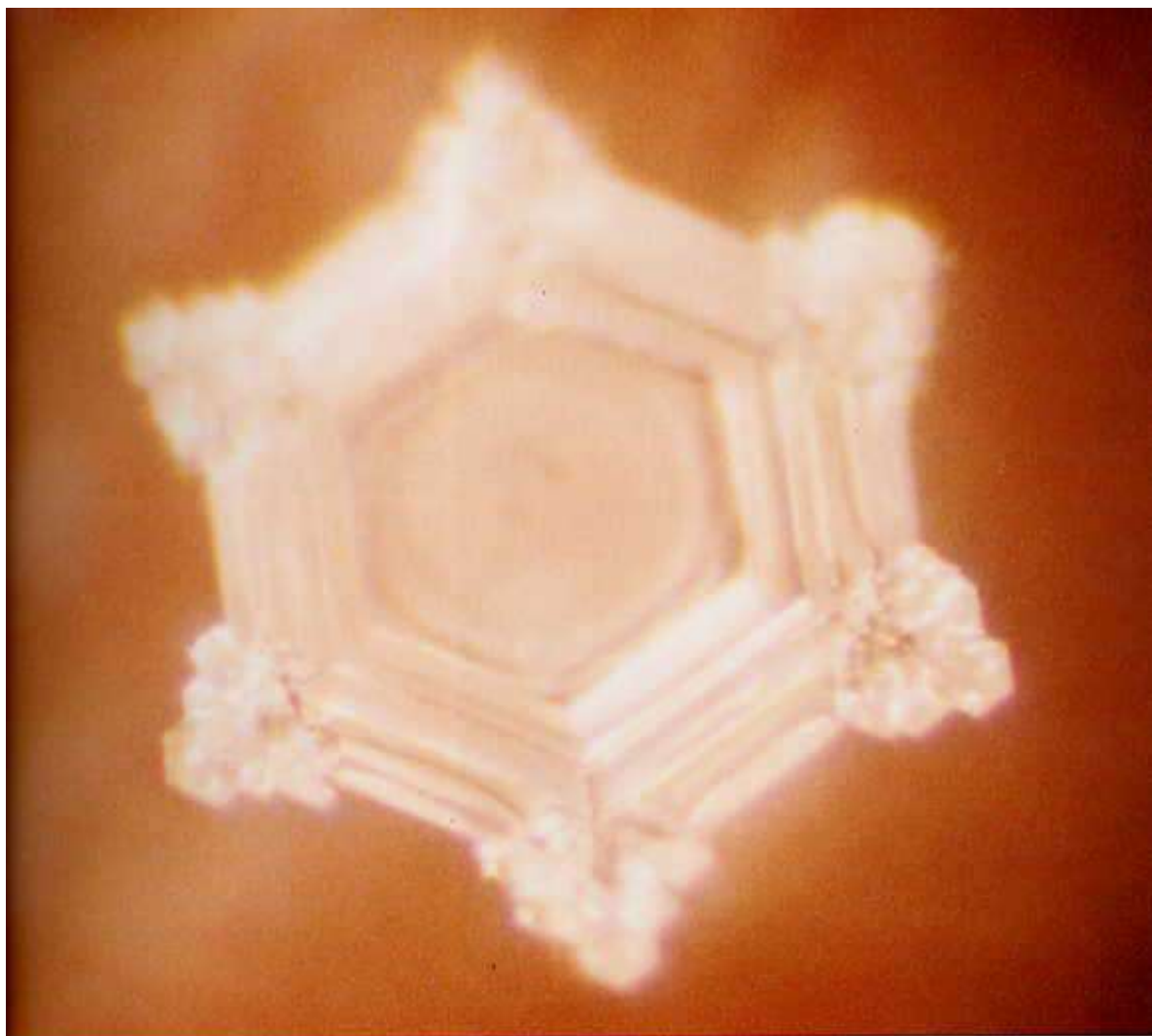
Horobetsu River, Hokkaido

北海道・幌別川

北海道の中央から南へ、日高山脈の山すそから、海にそそぐ幌別川。美しい結晶はまるで花びらのよう……。日本にも、まだまだこんなに美しい結晶を見せてくれる川が残っていることに、改めて感謝したい気持ちです。

This river flows from central Hokkaido southwardly, through the foothills of the Hidaka Mountain range, on to the Horobetsu River and eventually into the sea. These beautiful crystals look just like flower petals.

I am impressed that there is a river still remaining in Japan that has so beautiful crystals.



Goshikinuma, Fukushima Prefecture

福島県・五色沼

ばんたい
磐梯高原の入り口に点在する沼で、水面の色が朱、藍、緑など五色に変わることから、この名前がついています。水面の色の变化は、沼の底にたまった沈殿物と、太陽光線の作用によるものと思われ
れます。雪解けの季節の水の結晶は美しく輝くようです。

The name originated from the look of the water's surface in the dotted marshes at the entrance of the Bandai Plateau. The surface of the water there can be seen by changing into 5 colors ranging from red and blue to green.

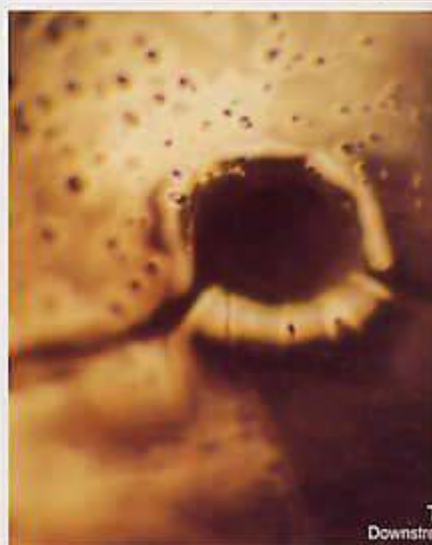
This change in color is thought to be affected by the deposits from the marsh bottom combined with the effects of solar rays. A water crystal glitters beautifully during the spring snow melting season.



上流 (十日町橋)
Upstream, Tekamachi-bashi



中流 (長岡)
Midstream, Nagaoka



下流
Downstream

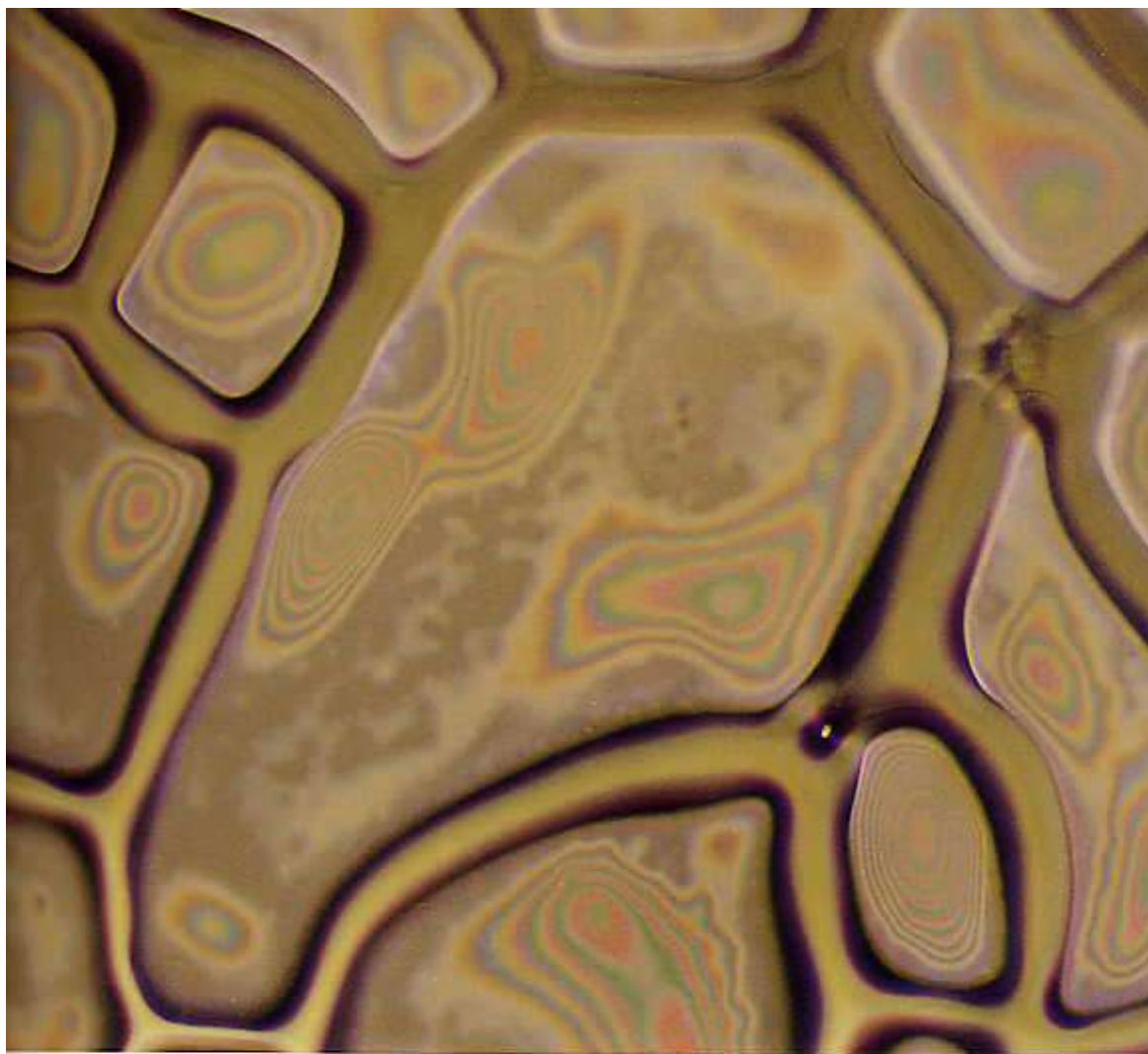
Shinano River, Niigata Prefecture

新潟県・信濃川

長野県や新潟県をまたいで流れる信濃川の、上流、中流、下流の結晶写真です。
都市部に入ると、少しずつ汚染されていることがよくわかります。

Pictures of the water crystals found upstream, midstream and downstream in the Shinano River as it flows
across Niigata prefecture and Nagano prefecture.

You can see by the crystals, that the river gradually gets contaminated as it flows into an urban area.



Sumida River, Tokyo

東京都・隅田川

隅田川のほとりにはたくさんの桜が咲いて、人々が集まります。その桜の下を流れる川の本当の顔が、こんなふうだったら……ちょっと悲しいですね。何とも……という感じですが、川そのものは20~30年前よりはきれいになっています。

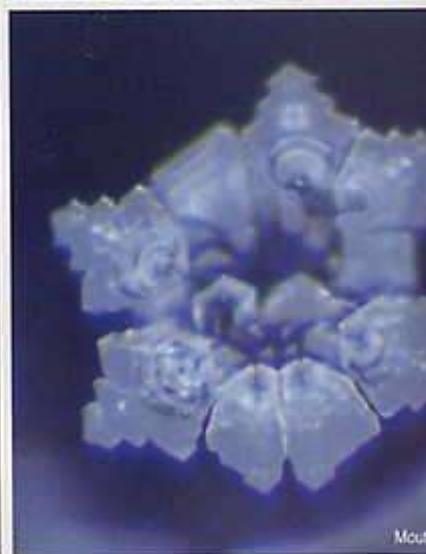
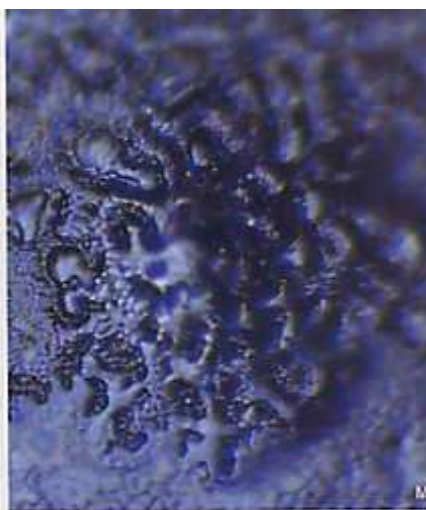
Cherry blossom trees bloom along the Sumida River attracting many people.

The actual crystallized face of the river water that flows beneath the cherry blossom trees, looks like this. Isn't it a little bit sad?

It is hard to say such a thing because it has actually become more beautiful now than 20 or 30 years ago.



上流源水/女取湧水
Upstream/Metori Yusu Spring Water



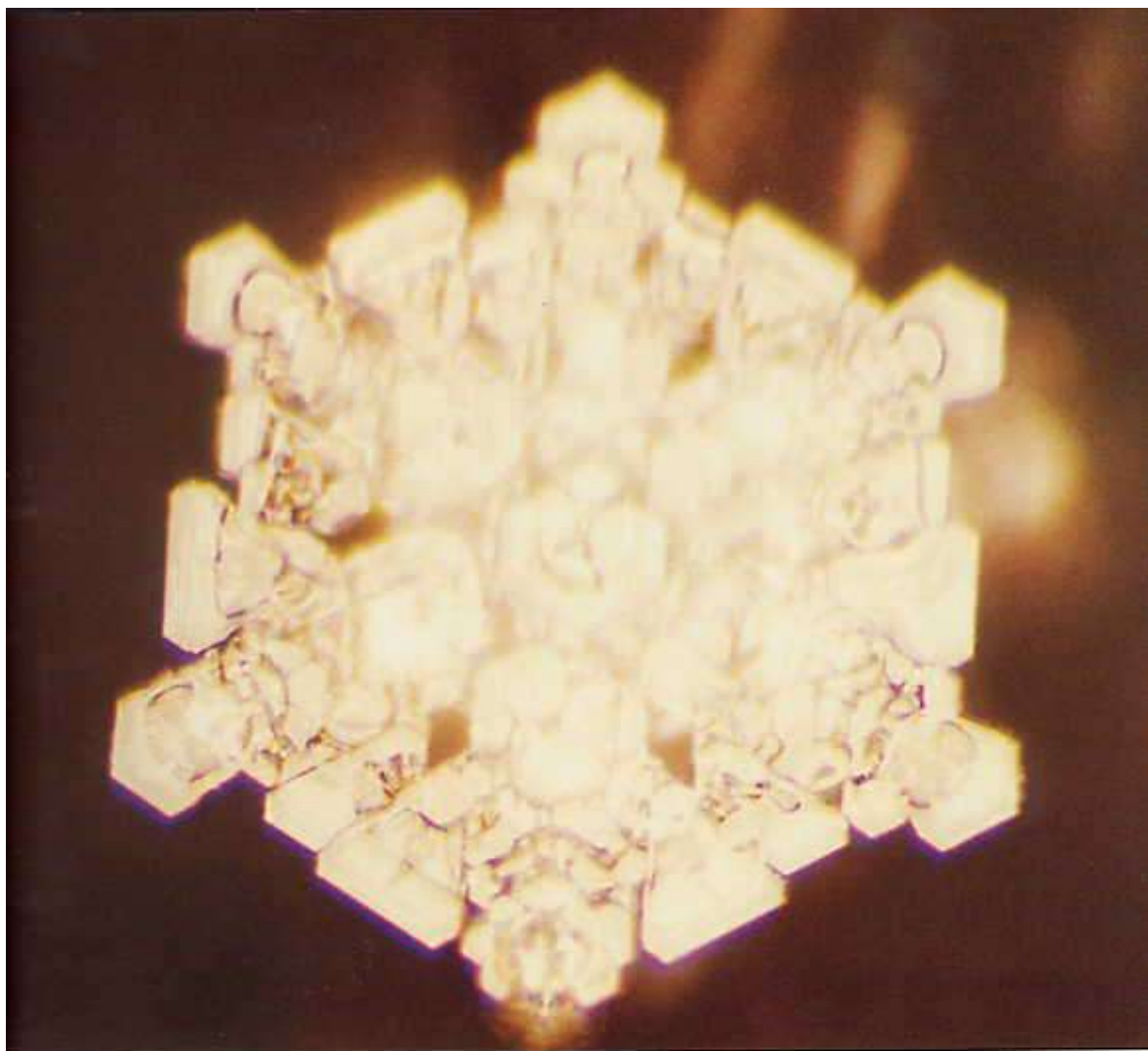
Fuji River, Shizuoka Prefecture

静岡県・富士川

富士川は中流域に大きな街があり、やはり汚染されているようです。ところが、河口付近ではおそらくその辺りに住む魚介類などの浄化作用によって、きれいな水の結晶になっています。水自身も、海に帰るときには美しい姿で……という意志があるようです。

There is a large city at the mid-stream points of the Fuji River, but that area also seems to be contaminated. But the water crystals found at the rivers mouth are clear because of the purifying affects of the fish and shells living in the vicinity.

This water crystal gives the appearance of having the intention of going back to the beautiful sea.

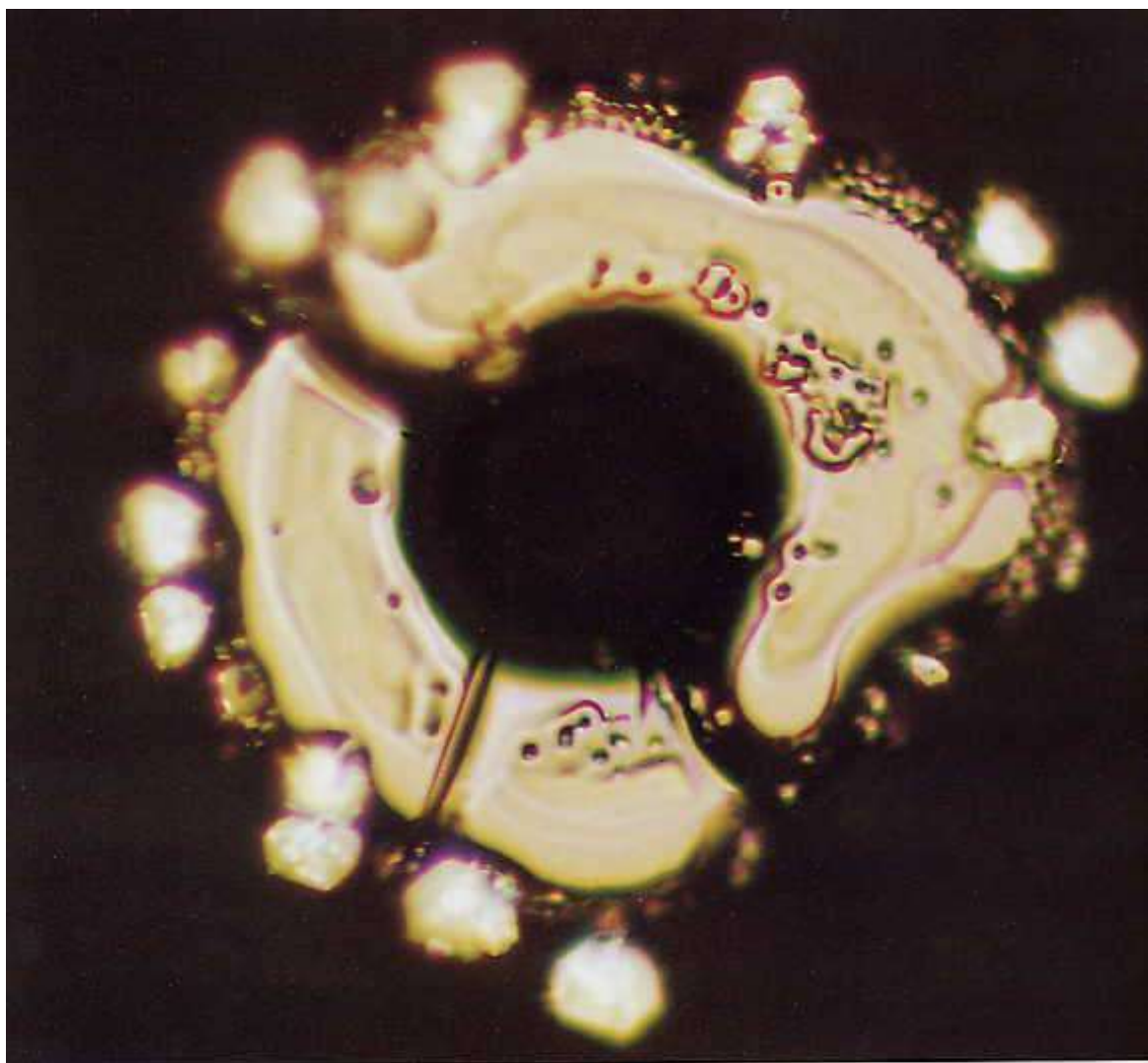


Ado River, Shiga Prefecture

あどがわ
滋賀県・安曇川

滋賀県の比良山から、北へ流れて、琵琶湖にそそぐ川。伝統民芸・京扇子の産地でもある高島の街を通過しています。美しい結晶は、日本古来の伝統工芸を守りながら……。でもこれが、琵琶湖に注いだ後には、どうなるのでしょうか。

The Ado river flows northward from Hira Mountain in Shiga Prefecture to the Biwako Lake. The river passes through the town of Takashima which is the production center of Kyosen, Japanese traditional fan of folk crafts. The beautiful crystal keeps the traditional work craft of Japan. How will this crystal's form change once it pours into the Biwako Lake?



Biwako Lake (South Area of the Lake), Shiga Prefecture

滋賀県・琵琶湖（湖南）

近畿の水がめ。日本の中心にある最大の湖、琵琶湖の水は残念ながら、このような状態です。滋賀県は早くから、限るみで合成洗剤の使用中止を呼びかけるなどの努力をしていますが、それでも琵琶湖の汚染は年々進んでいることを裏付ける、痛ましい姿の写真です。

The largest lake at the center of Japan and the water pool of the Kinki Region. Regrettably, the water of Biwako Lake seems to be like this. This crystal's structure supports the fact that the contamination of Biwako Lake is getting worse each year. This is the case, even though Shiga Prefecture has for many years been making efforts in its campaign against the usage of synthetic detergents. This is a picture of the water crystal's lamentable figure.



Yodo River, Osaka Prefecture

大阪府・淀川

近畿の平野全体を、杓ったりとうるおしながら南下し、大阪湾にそそぐ淀川。関西の主要な街々を通り、文字どおり生活全体を洗い流すような役目を負って流れてきた川。生活や人間関係の汚染をも抱えて、苦悶しているのかもしれない。

The Yodo River pours into the Bay of Osaka as it flows southward enriching the entire Kinki plain. The river passes through most of the major cities in Kansai and flows as if it literally has been given as the role of a general cleaning in its path. It must be suffering with the load of contamination accumulated from its daily life and all of the people that it touches.



Shimanto River, Kochi Prefecture (Midstream)

高知県・四万十川 (中流)

日本最後の清流と呼ばれる四万十川。美しい結晶で枝の部分に特徴があります。
ベースの六角構造の外側に六角形の枝が付き、その先からさらに小さな枝が伸びています。
中流でもこのような美しい結晶がとれますから、水を守ろうとする周辺住民の心意気を感じます。

The Shimanto River is referred to as the last clean stream in Japan. It creates a beautiful crystal which features in the branches.

At the outside of the basic hexagon structure, a hexagon branch is attached and from its edge another small branch stretches out.

This beautiful crystal was taken from the mid section of the river. Within its structure we can feel the spirit of citizens that lived along the river.

氷河

氷河・氷層の結晶にロマンを

地球上の氷は大きく分けて陸にある氷と、海にある氷の2種類があります。氷河とは、陸にある氷のうち、湖や河、凍った土の中にあるもの以外で、雪が降って長い間溜まって凍った氷のことをいいます。なかでも山の中腹にあって、とくに河のように見えるものを氷河と呼んでいます。

冬になって、雪が降り積もっては、また暖かくなって溶け出したところに、冬がくる……といったことを繰り返し、普通は数年以上、雪の量の少ない地方では100年以上もたって、万年雪の状態になっています。

Glacier

A Dream of Crystal of Glacier and Ice Stratum

Ice on the earth can be divided into roughly two types: ice on the land and ice on the sea. A glacier is located on land, located at places other than lakes, rivers, and frozen soil. A glacier forms from snow that has accumulated over a long period of time. Among glaciers in many places, one that locates at the middle slope of a mountain and that appears like a river is called glacier.

In the winter, snow accumulates rapidly into large piles that will become glaciers. Before the temperature becomes higher and starts to melt the snow, winter comes again. With the repetition of this cycle, normally, in more than a few years the glaciers turn to ice. For regions with little snow fall it takes more than 100 years for a glacier to form. Glaciers are labeled by where they occur geographically; such as, plateau glaciers, mountain glaciers, valley glaciers, suspension glaciers and mountain foot glaciers.

Glaciers have history. Glaciers have ice stratum in the same way that geological formations do. I have this big dream of taking a sample of these stratum some day so as to survey these ancient water crystals.

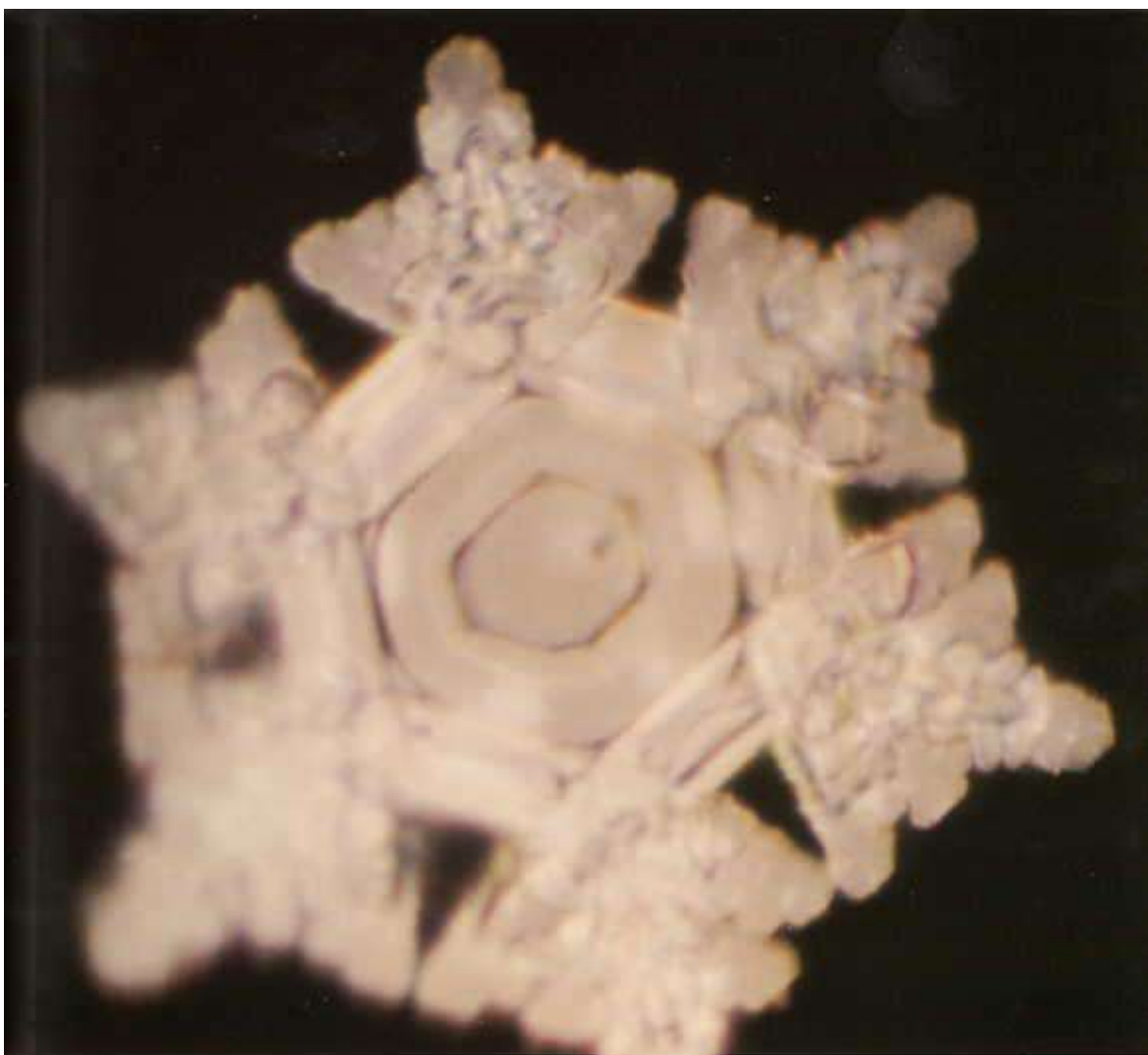
The pictures of glacial water crystals shown here are of those samples taken from the surface of the glaciers so are considered to be affected by the present global environment.

高原氷河、山地氷河、谷間氷河、懸垂氷河、山麓氷河などいろいろな姿形をしています。

氷河は歴史をもっています。

また氷河には「地層」と同じように「氷層」があります。いつかこれを取り出して、古代の地球の水の結晶を写真に撮って、調べてみたいという、大きなロマンを持っています。

ここに載せた氷河の水の結晶写真は表面から採取したもので、現在の地球環境の影響を受けているものと思います。

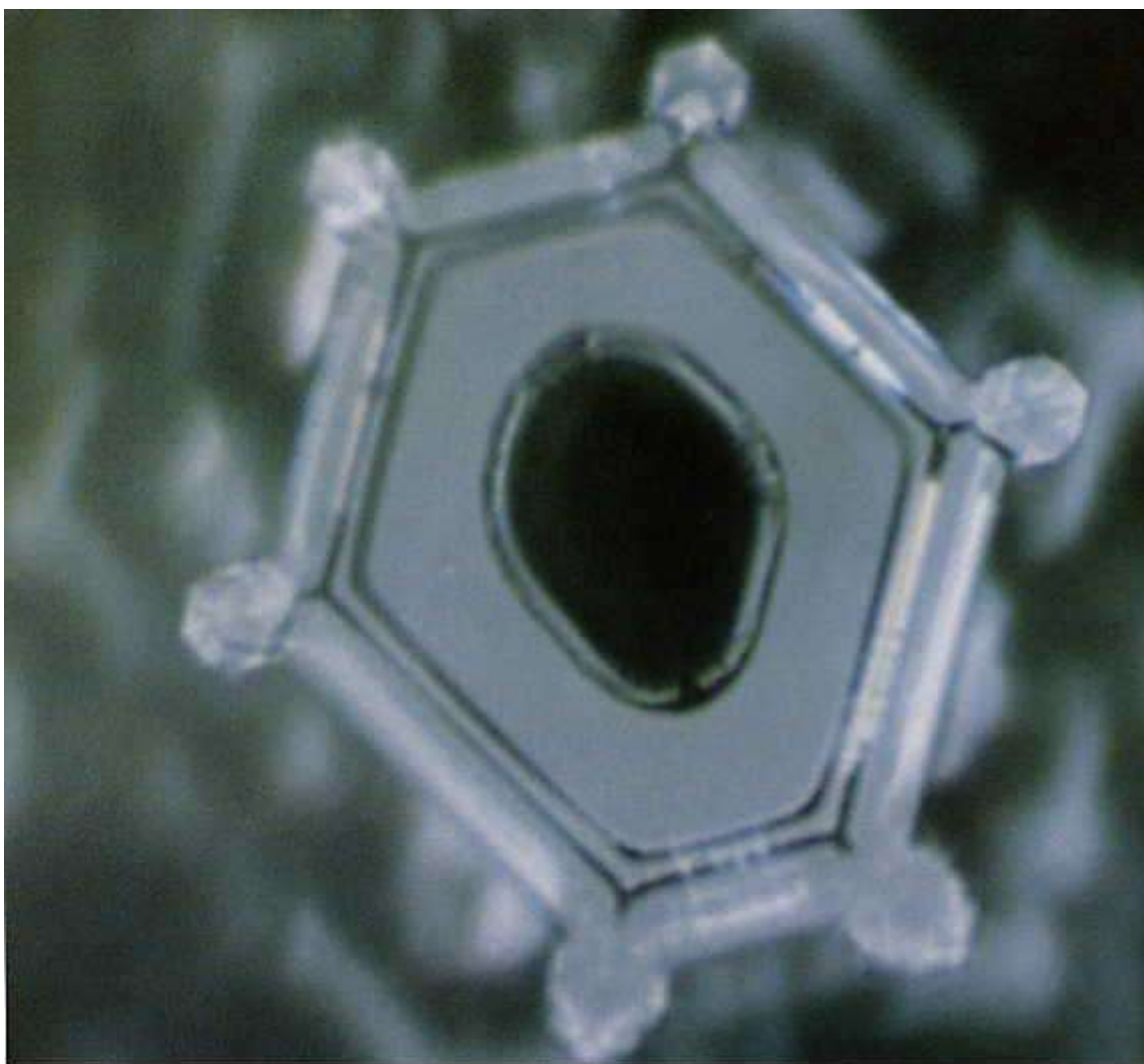


Antarctic Ice

南極の氷

南極探検隊の隊員の一人が持ち帰ってくれた、推定37万年前の氷の結晶です。きれいに整って、結晶の見本のような写真です。ただその他の自然水と比較してもとくに際立って美しいということもないので、当時と比べて今の自然水が極端に汚染されているわけではないことがわかり、ちょっとホッとしています。

This is a crystal of ice that one of the Antarctic expedition members brought back. It is estimated to be 370,000 years old. This crystal is very organized and is a perfect model of crystal formation. However, it is not as markedly beautiful as some other natural spring water crystals that we have seen. This means that today's natural water is not as contaminated as it was at one time in history. This is quite a relief.



Columbia Glacier, Canada

カナダ・コロンビア氷河

カナディアン・ロッキー山脈には、いくつもの氷河があります。
万年雪となった氷から取り出された水の結晶は、しっかり六角形は保っているのですが、大きく空いた中心からは、どんな伝言を受け取ればいいのでしょうか。

There are many glaciers in the Canadian Rocky Mountains.
This crystal of ice is extracted from firn, and maintains a firm hexagonal shape. What kind of message should be interpreted from the large void at the center of the crystal?



Mount Cook Glacier, New Zealand

ニュージーランド・マウントクック氷河

太平洋南西部、オーストラリアの南東部にある島国。北島と南島があって、北島の中央には活火山が連なり、南島には3,000メートルを超える山々が連なっています。その中に富士山とならぶ高さのマウントクックがあり、万年雪の氷河をもっています。その氷河の雪解け水の結晶写真です。

New Zealand is an island country located in the southwest Pacific Ocean, southeast of Australia. It is composed of North Island and South Island. In North Island's central area there is an active volcano that is still in good shape.

On the South Island, there are mountains that exceed 3,000 meters. Among them is Mount Cook which is as high as Mount Fuji and has glacier of firm. This is the picture of a crystal taken from the melting water of that glacier.

雨水

地球上を循環する雨水

雨は天から降ってきます。

1年中、ほぼ同じ土地に、ほぼ同じ量だけ、降っています。

この自然の約束にしたがって、人は作物をつくり、水を飲み、水を汲み、山の木々もうるおっています。

そして地球上の水は、空に昇って雨になり、地上に降ってくることで、まるで天然自然の浄水器を通ったように、浄化されているのです。

結晶写真を撮影してわかったことは、当然のことながら、どんなに立派な浄水器よりも、自然の循環による浄化の方が素晴らしいということ。

Rainwater

Rainwater that Circulates the Earth

Rain comes falling down from heaven.

All year round, the same amount of rain falls on the same land.

Because of this consistency, people can plan and grow crops, drink water, and pump water and trees in the mountains can have enough water.

The water of the earth becomes rain as it evaporates into the sky and then falls back to the ground. It is cleansed by passing through this natural water purification process.

What we learn from this crystal's picture is that of course, natural purification is much more effective than any mechanical water purifier, no matter how good.

Rain is the source of fresh water such as spring water, lakes, marshes and rivers.

We obtained this beautiful crystal from natural spring water.

The spring water that flows out onto the earth's surface passed through the natural filtering devices of soil and rocks when it fell as rain a few hundred years ago and penetrated into the ground.

The water then joins the spring water vein to flow out at a place that it feels is "the right place" and when it feels that it is "the right time".

What would the crystals look like for this rain which is the source of spring water?

We sampled rainwater and took a picture of the crystal.

Recently, there have been reports of damages due to environmental disruption. What is the water crystal difference between rain that falls on a densely populated urban area and rain that falls on a rural area?

Is there a difference between the rain that falls in the north or the south? Is there any difference between the rain that falls during different seasons at the same location?

湧き水や湖沼、河川などの真水のもとは、雨。

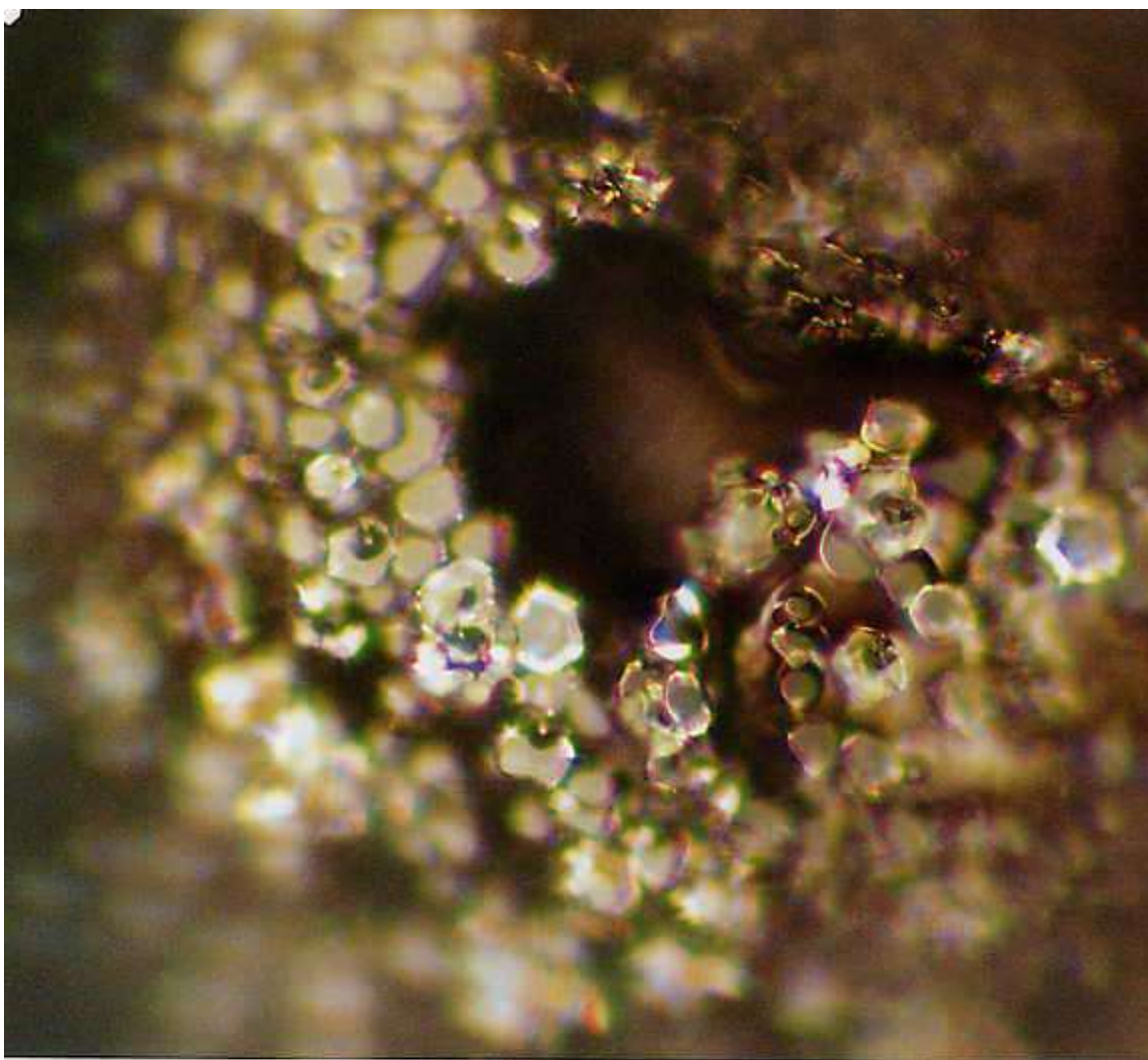
自然の湧き水からは美しい結晶が得られました。

今、地上に湧き出している湧き水は、おそらく何十、何百年以上も前に降った雨が、地中深く浸透する間に、多くの自然のろ過装置にあたる土や石の間をくぐり抜けてきたものです。そして水脈をつくり「ここぞ!」と思う位置に、また、「今だ!」という時期に湧き出ているのです。

そこで、湧き水のもとになる雨はどうでしょう。雨水を採取して結晶写真にしてみました。

環境破壊などの被害が指摘されています。人口の多い都市に降る雨と田舎に降る雨とでは、違うのでしょうか。

北と南、あるいは同じ土地でも季節によって違いはあるのでしょうか。



Biei-cho, Hokkaido

北海道・美瑛町

北海道のほぼ中央、美瑛町は「北の国から」のロケ地のひとつです。のどかな田園地帯に降る雨水は、悲しいかな……。北海道はとくにオゾン層破壊、酸性雨の被害が大きいとされていることを立証してしまったようです。

Located in the center of Hokkaido, Biei-cho was chosen as one of the locations for "Kita-no-Kuni Kara, From the Northern Country."

The crystals from the rainwater that falls on this quiet rural region are saddening.
Hokkaido seems to have had obvious damage caused by ozone layer depletion and acid rain.



Sendai City, Miyagi Prefecture

宮城県・仙台市

仙台の雨水からは、きれいな結晶が得られたかと思えば、形にもならない時があるなど、時期によって大きなバラツキが出ました。原因ははっきりしませんが、雨水はその時の大気の状態などによって、大きく影響されるデリケートなものようです。

The rainwater from the Sendai area sometimes showed beautiful crystals and sometimes showed those with an unshapely form. These were also great fluctuations in the crystals depending on the season.

This cause is not clear but rainwater seems to be very delicate and might have been affected by the condition of atmosphere at that time.

Kanazawa City, Ishikawa Prefecture

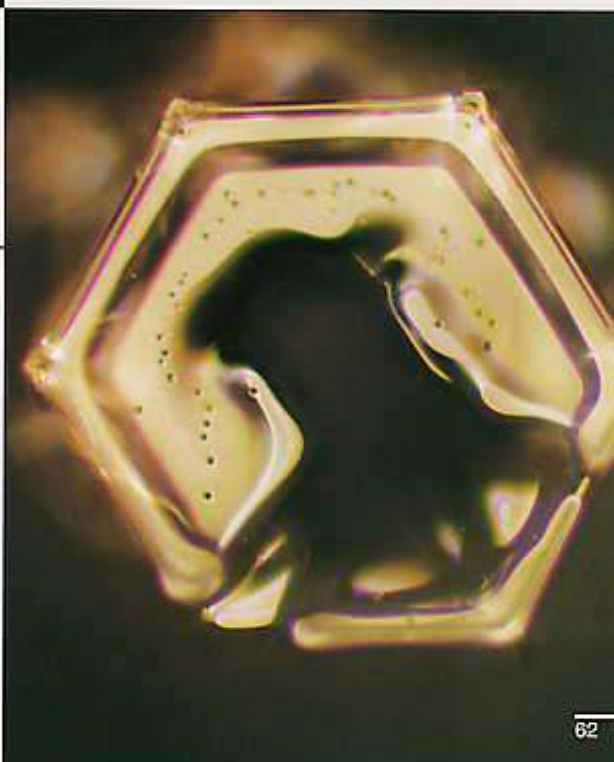
石川県・金沢市

古都金沢に降る雨からは、不思議な結晶が得られました。完全ではありませんが、六角形の結晶構造が見てとれます。

日本海側は太平洋側に比べて大きな工業地帯もなく、大気汚染の度合いが低いはずで、もう少し美しいものが撮れてもいいのに…と思ってしまいます。

From the rain that falls on the ancient city of Kanazawa, we obtained mysterious crystals. The crystal is not complete, but we can see a hexagonal crystal structure.

There aren't as many large industrial zones on the Japan Sea coast as there are on the Pacific Ocean coast, so it would follow that the air pollution level in this area would be lower. We feel that for this reason we should be able to obtain a beautiful water crystal from the Japan Sea coast than from the Pacific Ocean coast.





Tokorozawa City, Saitama Prefecture

埼玉県・所沢市

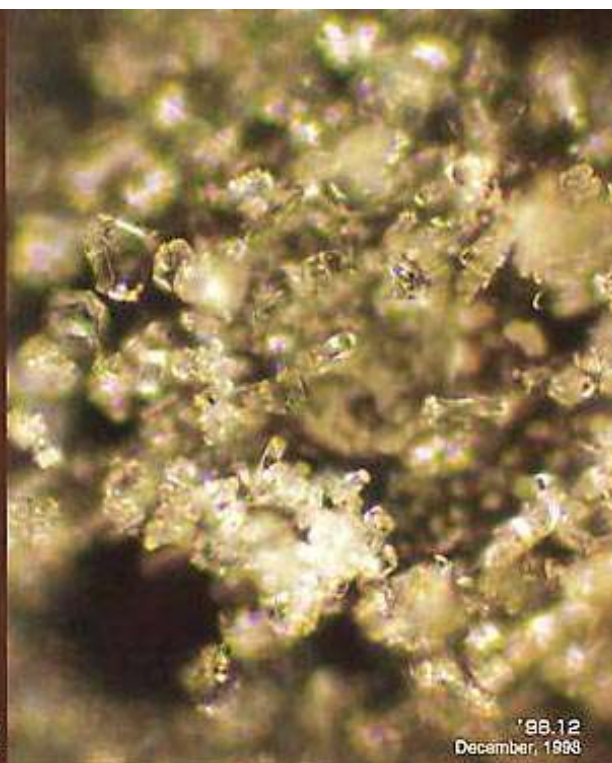
所沢の雨水を最初に撮影しはじめた（98年6月）頃は、公開をはばかれるくらいにおぞましい映像でした。ところが右の写真のように最近になってくればくるほど、結晶がきれいになってきています。所沢市民の環境問題に対する関心が深まるにしたがって、美しい結晶になっていると判断せざるをえません。がんばれ所沢！

When we first started taking pictures of the rainwater in Tokorozawa City (June, 1998), the crystal's structure was so miserable that we hesitated to make it public. However, as you can see in the right picture, the crystal has become clearer recently. We cannot help but believe that as the citizens of Tokorozawa became aware of their city's environmental problems, it has started showing very beautiful crystals.

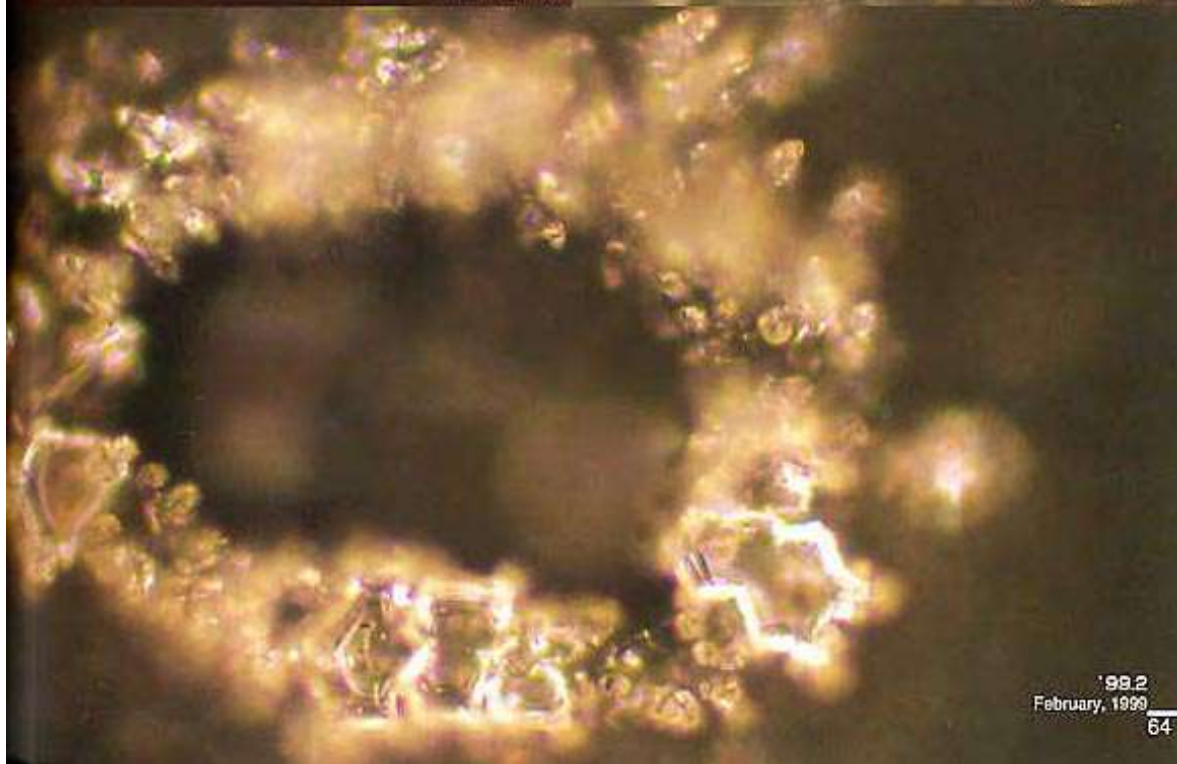
Slick to it, Tokorozawa!



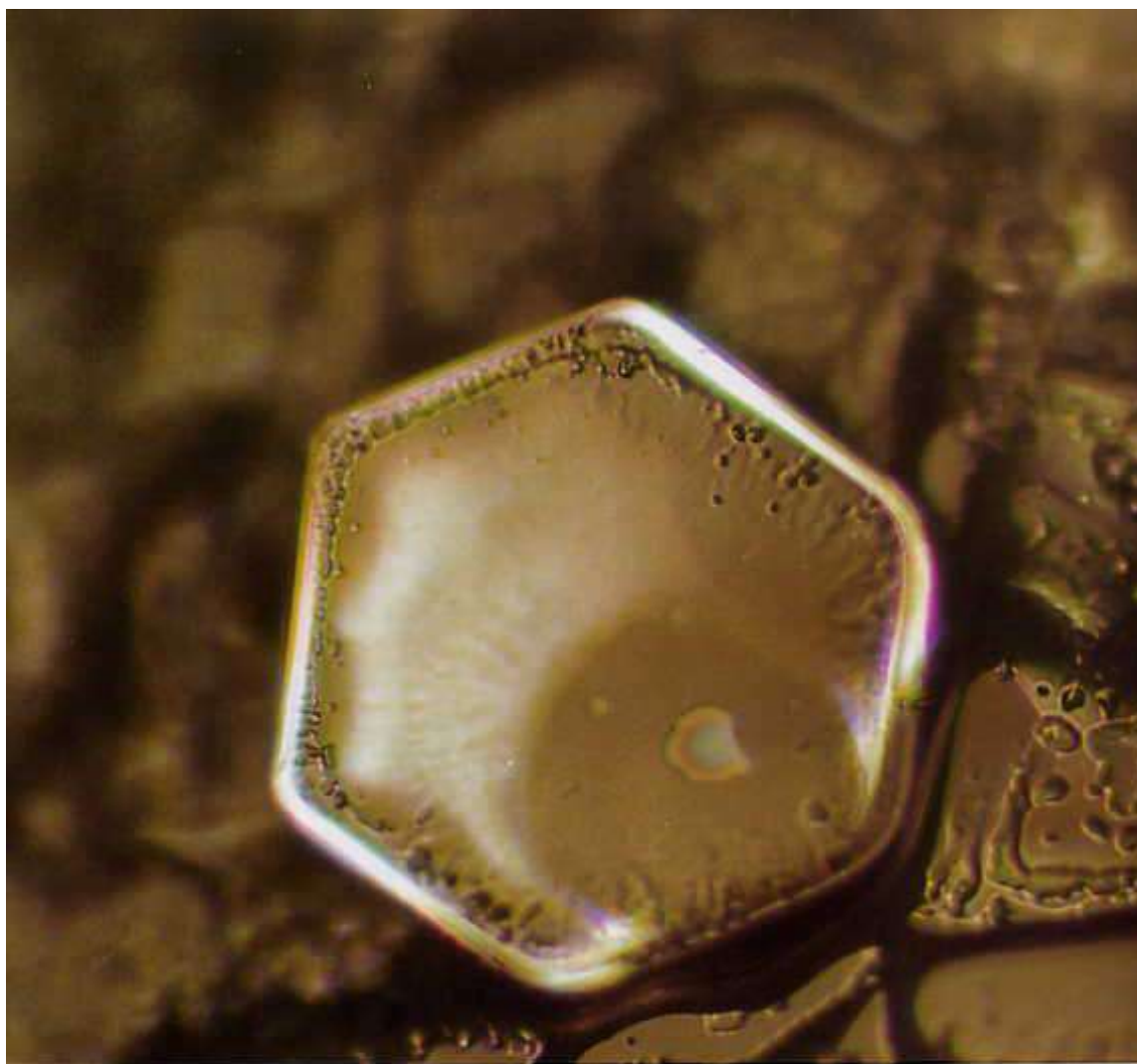
'99.10
October, 1998



'99.12
December, 1998



'99.2
February, 1999



Asakusa-bashi, Taiho-ku, Tokyo

東京都台東区・浅草橋

東京の真ん中にある浅草橋に降る雨でも、時には結晶を得られることがあります。
なかなか形の整ったきれいなものには出会えませんが、それでも水道水などと比べれば、自然の浄化作用の素晴らしさを感じます。

We were able to get crystals from the rain that fell on the Asakusa-bashi at the center of Tokyo.
It was hard to find shapely and beautiful crystals from this water, but even so, we can see the effects of the natural purifying power of rain water. This is especially evident as compared with the crystals found in tap water.



Fujisawa City, Kanagawa Prefecture

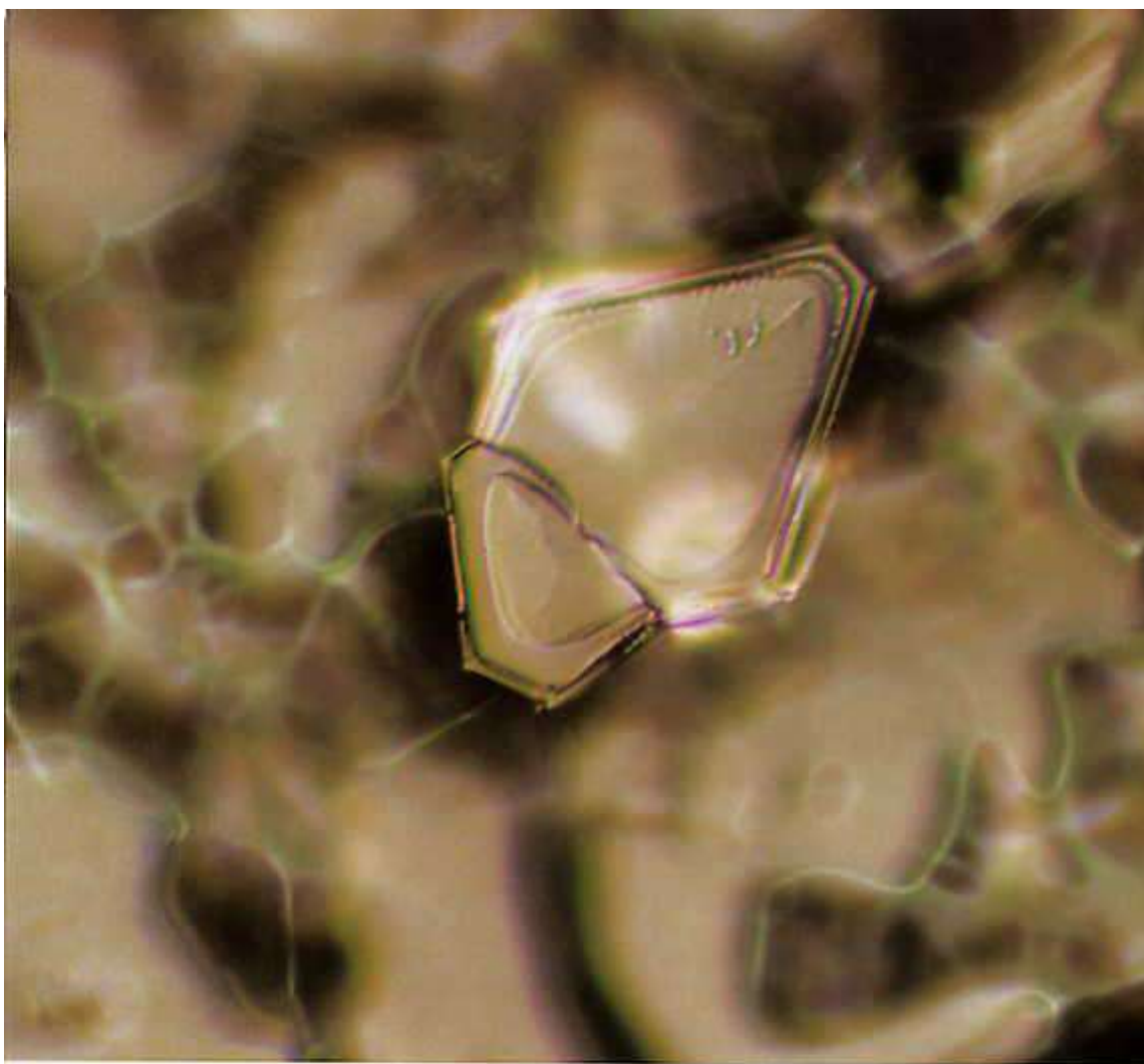
神奈川県・藤沢市

江の島を目の前に高級住宅地として歴史のある町。

ゆったりと、暮らしやすい土地柄で、風光明媚そのもの。しかし、この地の雨水は、まるで酸性雨によって六角形が溶けてメロメロになってしまったような気がしてしまいますが……。

Fujisawa is a historic city in front of Enoshima and a prestigious residential area.

The city has beautiful scenery, is comfortable and easy to live in. However because of acid rain, the rainwater crystal from this area melted away leaving no trace of a hexagonal shape.



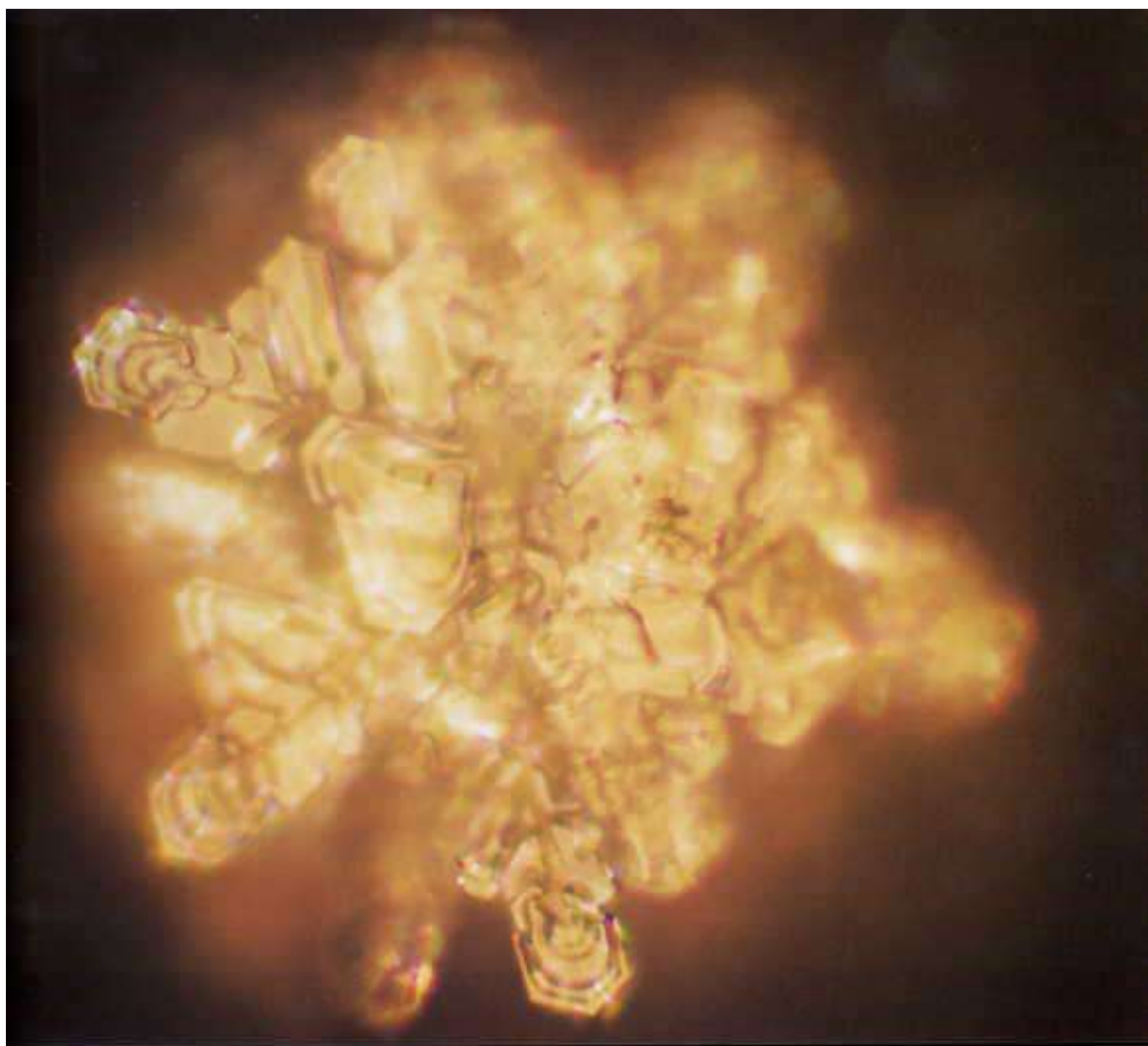
Okazaki City, Aichi Prefecture

愛知県・岡崎市

名古屋市の隣り、岡崎市でも整った結晶を見ることはできませんでした。ある時期には結晶化しそうなものも見られるのですが、それを妨げる要因の方が強いようです。これらの写真からは「混沌」としたイメージや、水自身のもどかしさが感じられます。

We could not see an organized shape in the crystal taken from the rainwater in Okazaki City where is adjacent to Nagoya City. At one point we could see crystals that were close to formulating, but the factors that impeded their formation seemed to be stronger.

While looking at these crystals we felt the sense of chaos in the images. It is as if the water itself is irritated.



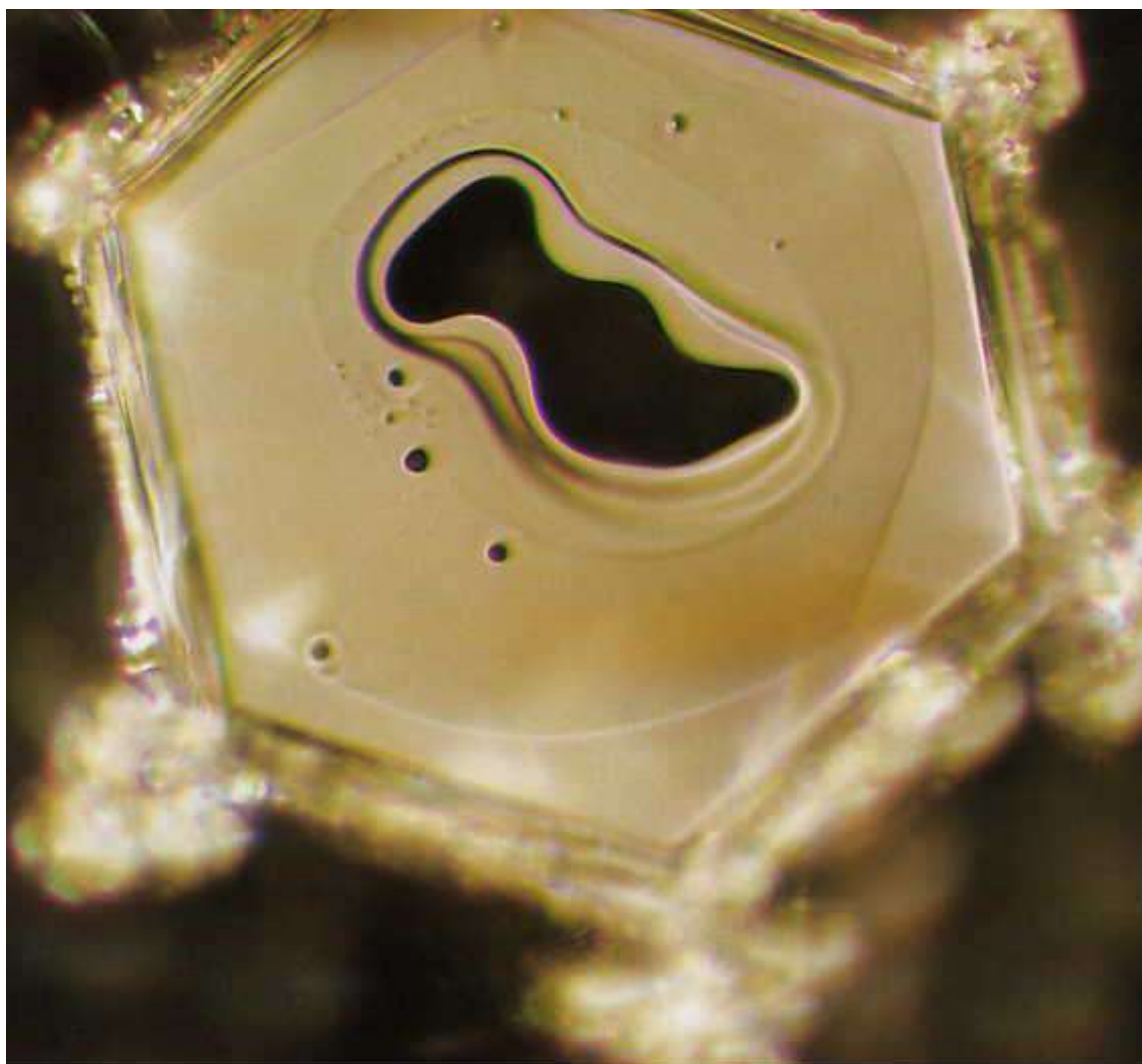
Nishi-ku, Osaka City

大阪市・西區

大阪市内のオフィス街で採取した雨水の中で、あえて一番きれいに撮れたものをご紹介します。やはり結晶に歪みはあります。きれいな結晶にはなっていませんが、結晶化しようとする意志は見えるようです。

From the rainwater that was sampled from the office quarters of Osaka City we find the most beautiful picture of a crystal.

There is a distortion in the crystal and it has not become fully developed but we can see its will to become crystallized.



Fukuyama City, Hiroshima Prefecture

広島県・福山市

瀬戸内海の海岸にある福山市は、空襲を受けたために戦後大開発をされた町です。六角構造の名残りは確認できるものの、どれも歪んでいたりと、亀裂が入っていたり。しかし、これらの写真からは、なんとなく「頑張っている」感じが伝わってきて、応援したくなるような結晶です。

Fukuyama City is located on the coast of the Seto Inland Sea. It was re-developed after the world war because it was destroyed by bombing.

We can identify remnants of a hexagonal structure, but most of the crystal structure is either distorted or cracked. From these pictures however, we can feel that it is "trying hard" to develop and we want to support its efforts.



Hakata-ku, Fukuoka City

福岡市・博多区

九州一の大都市・博多の雨水も、酸性雨の被害は免れられないようです。

結晶の形は少し歪んでいますが、六角形が見えるものもあれば、割った結晶が無残にも真っ二つに割れてしまったものも……。

水は市民に何を訴えているのでしょうか。

A crystal taken from a sample of the rain in Hakata, the largest city in Kyushu. Alas, this crystal could not seem to evade the damage done from acid rain.

The crystal shape is slightly distorted, but seems to be a hexagon and some of the clearer crystals have split in two. What is the water crystal trying to ask its city's citizens?

Kagoshima City, Kagoshima Prefecture
鹿児島県・鹿児島市

六角構造に枝が伸びている、不思議な姿のきれいな結晶が得られました。ほかの都市と比べても、希望がもてます。

桜島の火山灰は雨水の結晶にどのような影響があるのか、などと思います。

In this picture, we obtained the shape of a mystical figure imbedded in a clear crystal with branches stretching out from the hexagonal structure. As compared with the crystals from other cities, there is hope in this one. We could not help but wonder what affect the volcanic ashes of Sakurajima have on the surrounding rainwater?



第二章 変化する水の話

水が音を聴いているの!?

最近、百貨店の店頭などで「このピロシキは生地を発酵させる際、チャイコフスキーの名曲を聞かせて、美味しくまろやかに仕上げた音楽食品です」などという宣伝文句が掲げられ、行列ができています。また、もっとも科学的な分野といわれる医療の現場でも、最近、音楽療法の技術が取り入れられはじめています。

植物に意識があるという説もなかば公認されつつあります。植物を育てるとき「元気に育てね」とやさしく声をかけてあげると、「枯れてしまえ」などと嫌な言葉をかけるのとでは、生育状態に歴然とした差が出るそうです。

Chapter 2 A Story of Ever-changing Water

Water Listens to Sound?

Recently, we see advertisements such as "Our piroshki is now a 'musical food'." We tried to enhance its naturally mellow flavor by playing music composed by Tchaikovsky while it was fermenting." Out of curiosity, people lined up to buy this product. Also recently, music therapy technology is being introduced in medical institutions, which is said to be the most scientific field.

Additionally, theories saying that plants also have consciousness are becoming more public. When we grow plants by saying sweet things to them such as "Please grow up healthy" or alternately by saying mean things such as, "Go on and get withered", these theories say that the plants show a clear difference in their growing progressions.

These theories made us think,

The water contained in food and plants must be listening to music and words.

People can become joyous and encouraged when they listen to music, all because the water contained in their bodies goes through a change.

The vibrations of music and words transmitted through the air effects water more than any other element.

"The vibrations of music and words affect the water that is contained in plants and food." Furthermore, "good music and kind words must exert a positive effect on water."

Is there any way to demonstrate this theory? Pictures of crystals are wonderfully effective as a method to view the effect that music and words exert on water.

ここで考えました。

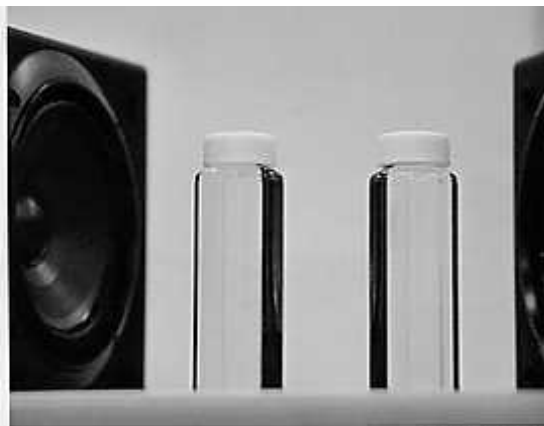
食物や植物の中に含まれている水が音楽や言葉を聴いているのではないかと。人が音楽を聴いて楽しんだり、元気づけられたりするということは、人の身体の中の水が変化したためではないかと考えたのです。

空気中を伝わってきた音楽や言葉の振動が、もっとも影響を与えるのは水なのではないでしょうか。

「音楽や言葉の振動が、植物や食品の水に影響を与えている」。さらに「良い音楽や良い言葉が、それらの水に良い影響を与えている」らしいと思いました。

これを何らかの形で実証することはできないか。音楽や言葉が水に与える影響を表現する方法としても、結晶写真は素晴らしい有効です。

水に音楽を聴かせてみる



▲音楽を聴かせて
Playing music to water

どうやって水に音楽を?!

ベースになる「基本の水」には、不純物がもっとも少なく、シンプルな結晶構造を持つ精製水を採用。ところが年を追って精製水そのものが、良い結晶をもたなくなってきました。お見せするのは、一部の良いものです。

まず基本の精製水の結晶写真をカメラに収め、その水に右上の写真の状態に音楽を聴かせた後、結晶にし撮影したものです。

「どのように音楽を聴かせるのがもっとも良いのか」「ジャンルは？ 時間は？ 音量は？ スピーカーとの距離は？」などなど。じつに細々とした実験方法が、さらに私たちを悩ませました。試行錯誤の結果、

★2つのスピーカーの間に精製水を置いて、通常程度の音量で、1曲完全に聴かせる

★精製水のビンの底を必ずよく叩き、一晩、置く

Playing Music to Water

How Do We Play Music to Water?

We selected distilled water as the base water to do our experiments on because it has a simple crystal structure with the least number of impurities. We did find that some distilled water tends to lose the ability to form well-structured crystals as recently. What you see here are only those samples started out having well formed crystals. First, we took pictures of basic distilled water then after playing music (under the conditions shown in the picture on the right) we crystallized them and took their picture again. "What is the best way to play music so that we get the optimum effects on the crystals?" "What should the genre of the music be? For how long? What is the volume? How long should the distance from the speaker to the crystals be?" We had to spend a lot of time planning our detailed experimentation methods. As a result of trial and error, we decided on the following procedures: Place the distilled water in between 2 speakers and play one piece of music at a normal volume. Tap the bottom of the distilled water bottle well overnight. Tap well again the next day before freezing the water to make crystals. Take pictures of the crystals.

We do not know if this is the best method or not, but we feel that it is the best method that we know at this present point in time. In particular, tapping the container well is a rather important component because when we neglected to do it the crystallization rate declined. By applying this tapping vibration, information seemed to be transmitted through the water causing the crystals to activate. Anyway, these are the pictures of the crystals that we saw as a result of such strenuous efforts. Because there is no crystal that is identical to another, we obtained different crystal forms each time we took a picture. The next page, confirms the similarities that can be found among pictures taken of 100 random samples. Following our music experiment we decided to see how water responds to words. We also challenged ourselves to conduct experiments to see how much water is affected by human consciousness. It felt like we were setting foot in a jungle that no one has ever explored before.

★翌日さらによく叩き、その水を凍らせて結晶を撮影……という手順を確立しました。

これがベストの方法かどうかはわかりませんが、現時点でのベターな方法と思われます。とくに「よく叩く」ということが結構重要で、これを怠ると結晶の出現率が低下するのです。振動を与えることによって、水に伝わってくる情報が活性化するらしいのです。とにかく、そうした試みの末に、撮影された結晶写真です。

また、結晶は2つと同じものがないということから、次に撮影するたびに違った結晶ができます。ですからサンプルは、100のサンプルの中からランダムに取り出したのです。類似性を確認してみてください。

音楽の次は「水に文字を見せる」ことを考えつきました。無謀を覚悟でチャレンジです。さらに人の意識で、どこまで水が変化するかという実験にも挑戦しました。

前人未踏のジャングルに行く気分です。

Similarity of Crystal Pictures

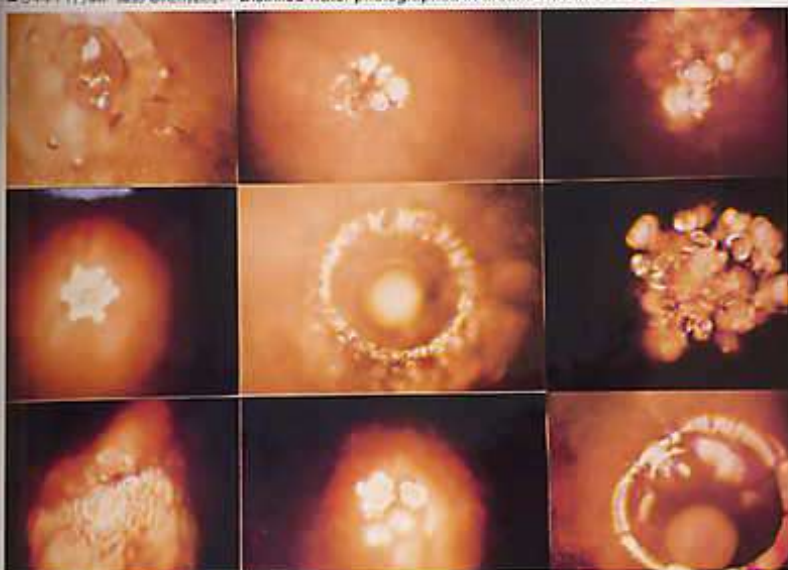
結晶写真の類似性

Pictures of the 100 Samples are Similar...

100のサンプルから撮影して得られる結晶写真は、よく似て……

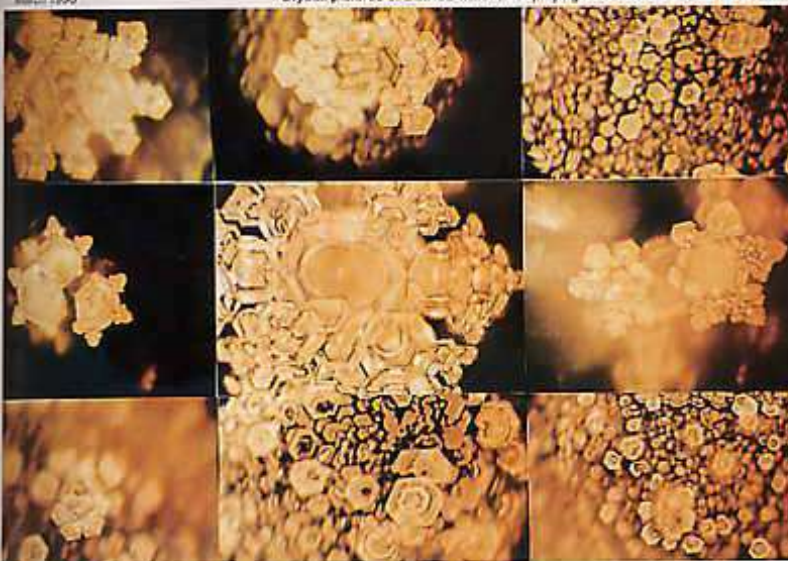


▲ 94年11月頃、撮影した精製水 Distilled water photographed in around November 1994



▲ 96年3月頃の精製水の結晶写真
Crystal pictures of distilled water in around March 1996

▼ 96年3月頃に精製水に波動ミュージックを聴かせて撮影した結晶写真
Crystal pictures of distilled water after playing Hado music around March 1996



73ページ、右上の写真のようにセッティングし、音楽を聴かせて撮影した写真は、これまた見事な姿を見せてくれました。

基本の精製水・100のサンプルの結晶をそれぞれ撮影し、ランダムに選び出したものです。

A sample of water that we placed as shown in upper right picture on page 73 and then exposed to music showed some wonderful shapes.

The left hand pictures are of the crystals from 100 basic distilled water to select them at random.

左の写真は、上の基本の精製水に音楽、それも身体に心地よいヒーリングミュージック「Hado」CDを聴かせた水の結晶のいろいろ。

ひとつひとつのシャーレによって、結晶の形は違いますが、ご覧のように類似性は認められると思います。

In the left hand pictures are crystals of water that have been exposed with a playing of a healing music called "Hado". This music is known for its ability to relax the body. In each container the shape of the crystals differed, but as you can see, we think that there are also some similarities.

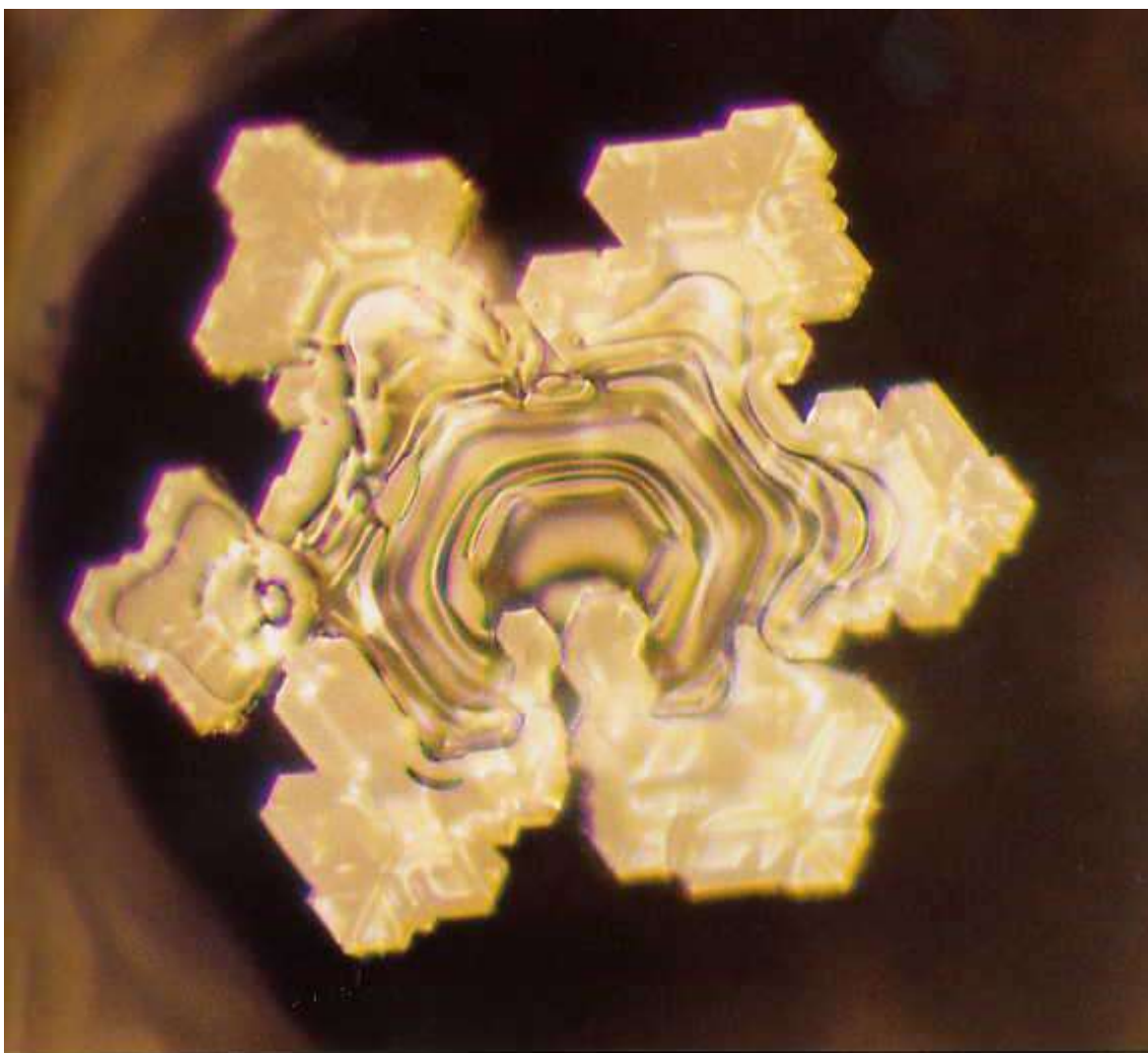


Beethoven's "Pastorale"

ベートーベン 「田園」

ベートーベンの作品を代表する交響曲のひとつで、明るく爽やかで楽しい曲です。
良い曲は水を活性化させ、成長を促進させることを裏付けるような美しい結晶です。

This is one of Beethoven's most famous symphonies and is a bright, fresh and joyous piece.
This beautiful crystal supports the fact that good music positively effects water.

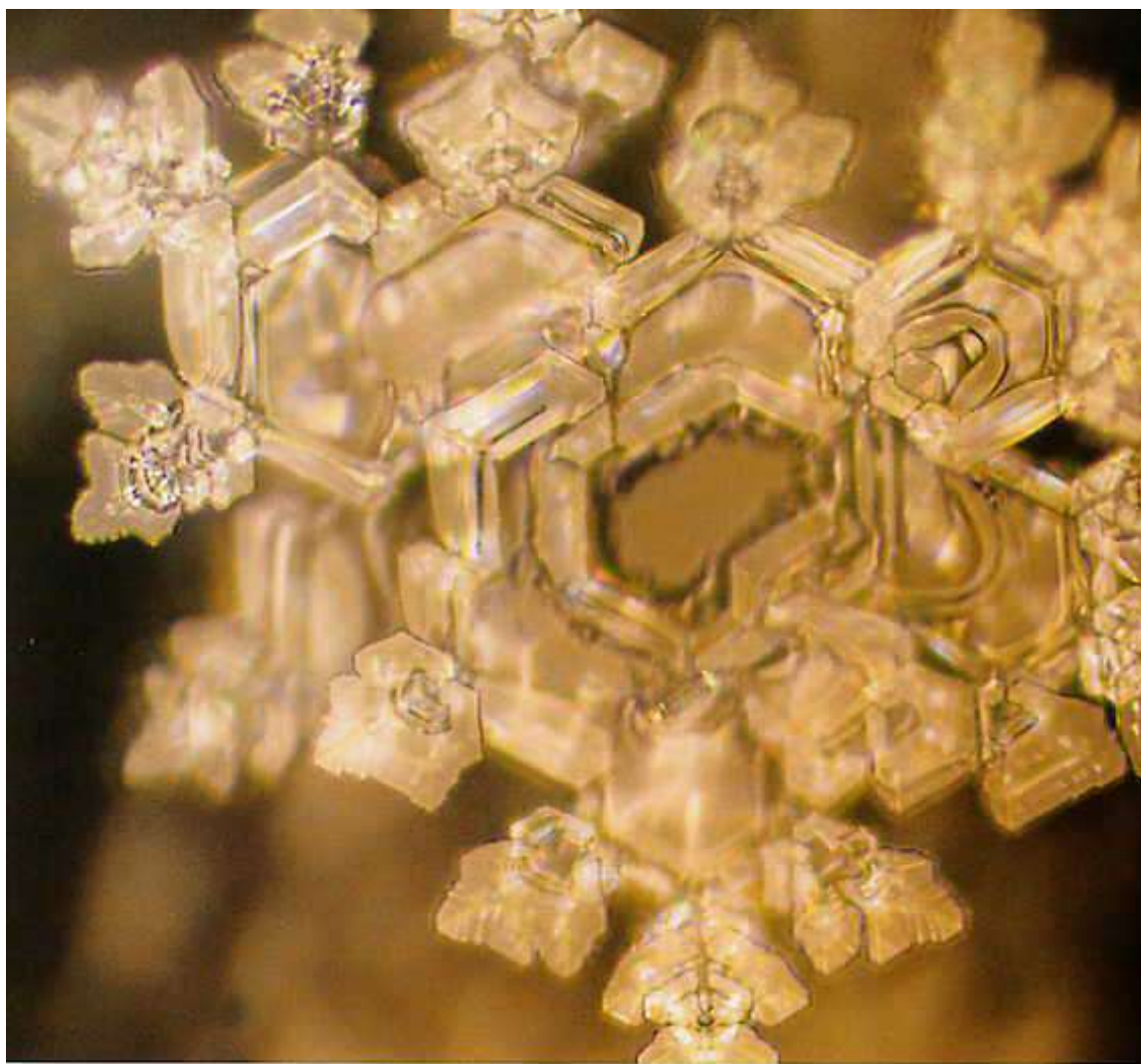


Mozart's "Symphony No. 40 in G Minor"

モーツァルト 「交響曲第40番ト短調」

モーツァルト全文器曲のなかでも、つねに美しいものを追及する魂の唄……美への折りとも思える深い思いが込められた曲。聴く人の心を静かに癒してくれます。結晶は作曲者の気持ちを代弁するように、美しく、たおやかにできあがっています。

This symphony is a soulful song that seems to pursue beauty the most of any of the works of Mozart. A piece of deep thought that seems almost like a prayer to beauty. This music quietly heals the heart of its listeners. This crystal is so beautiful and graceful that it's as if it's speaking on behalf of the composer's feelings.



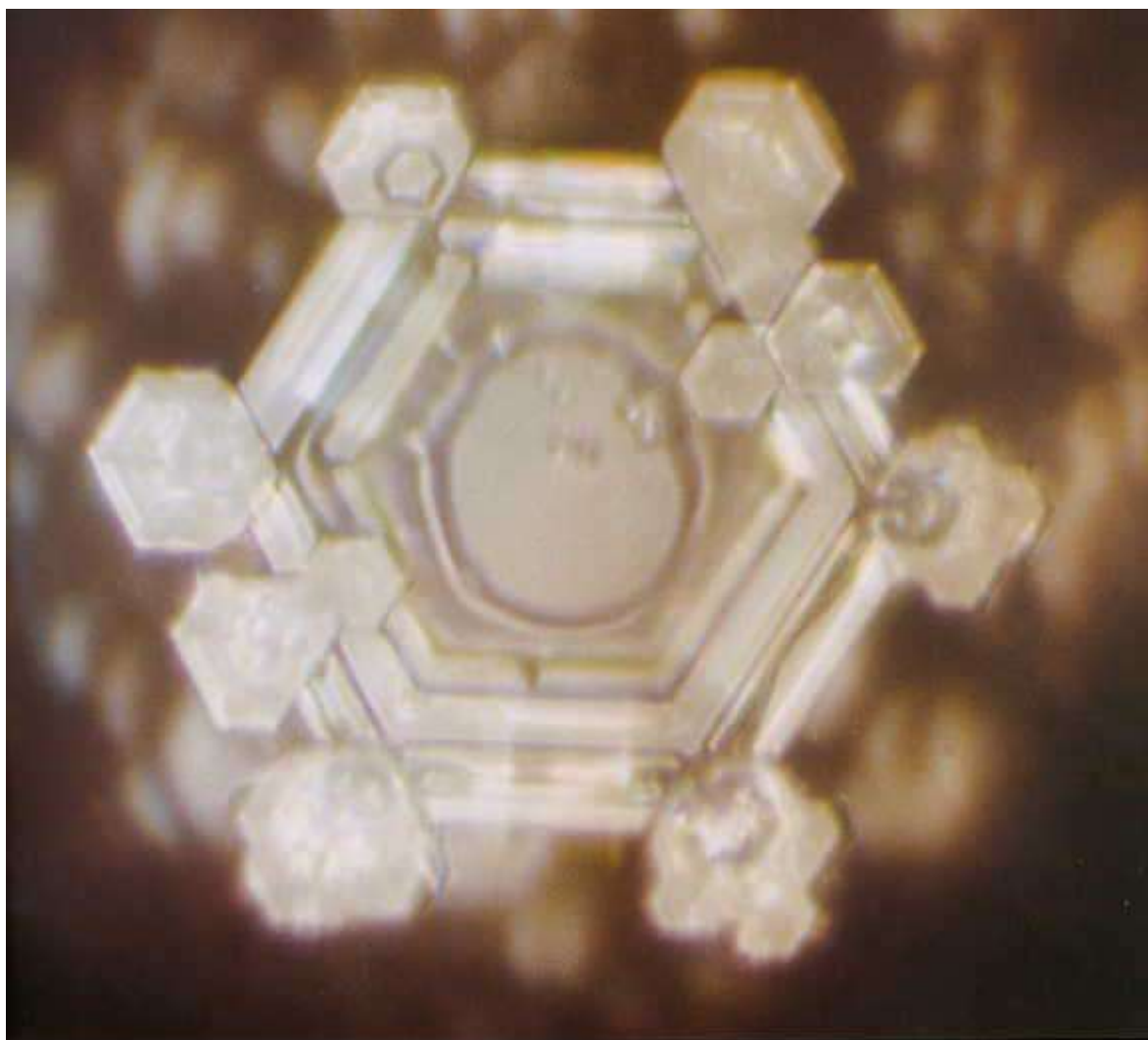
Bach's "Air for the G String"

バッハ 「G線上のアリア」

有名なヴァイオリン曲。ヴァイオリンの音色にうっとりして誘われるかのように、水の結晶も枝の部分が大きく伸びやかに成長しています。
結晶がなんとなく、楽しげに踊っているような印象さえ受ける写真です。

Through this famous violin piece, the crystal seems as if it has been enchanted by the sound of the music. The branches of the water crystal stretch out freely.

This picture gives the impression that the crystal is dancing merrily.



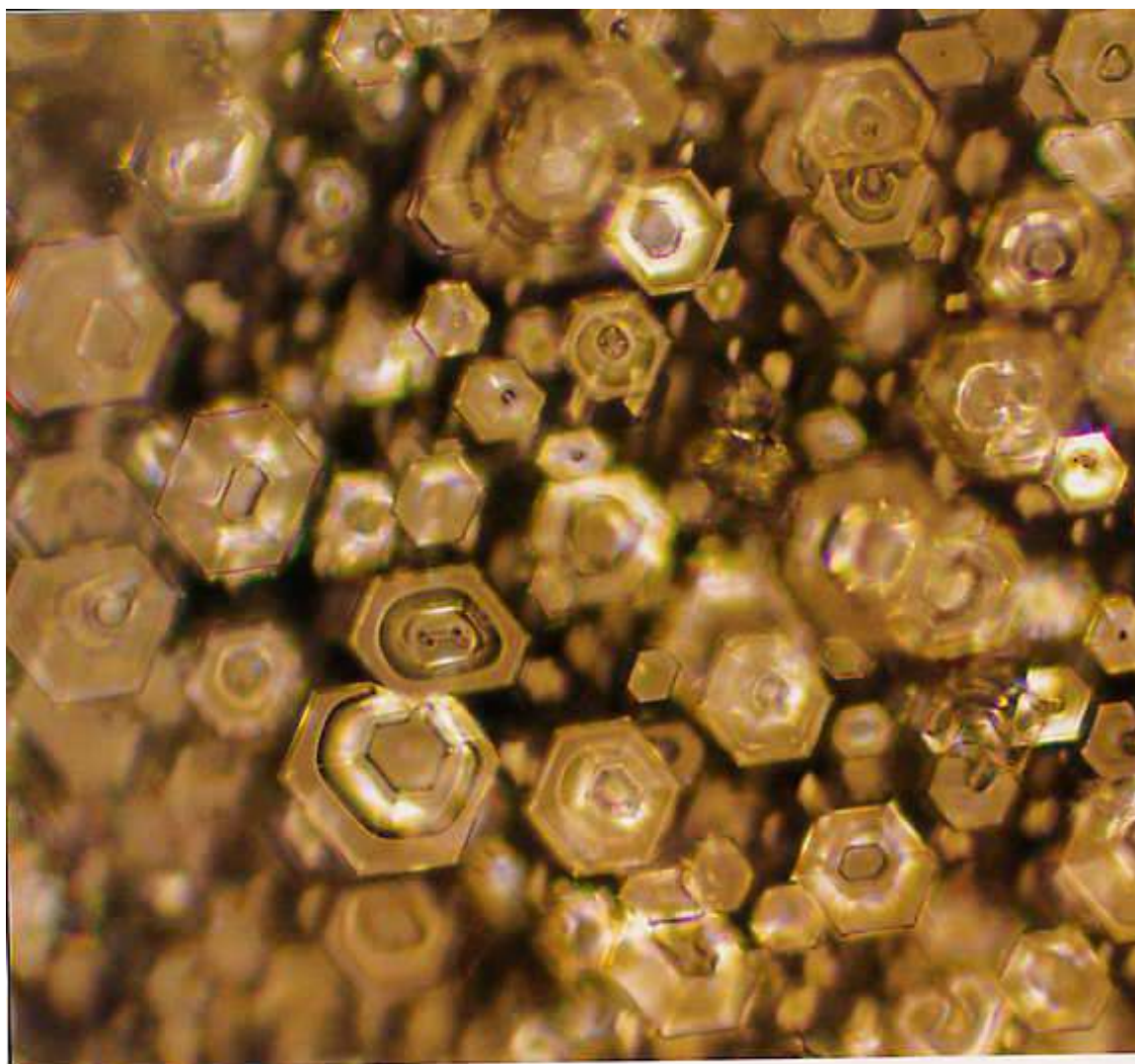
Bach's "Goldberg Variations"

バッハ 「ゴールドベルク変奏曲」

この曲はバッハがたいへんお世話になったゴールドベルク氏のために、感謝を込めて捧げた曲といわれています。基本の精製水と比べると、六角形の角からさらに別の六角形が成長している様子ははっきりとわかります。感謝の気持ちが成長を促進するとすれば、ちょっと哲学的ですね。

This music is said to have been dedicated to Mr. Goldberg, in appreciation for all that Bach owed him. As compared with the crystals formed from basic distilled water, here you can see that one hexagon is growing from the edge of another.

We could philosophize about the feelings of appreciation that are written into his piece and their ability to promote positive growth.

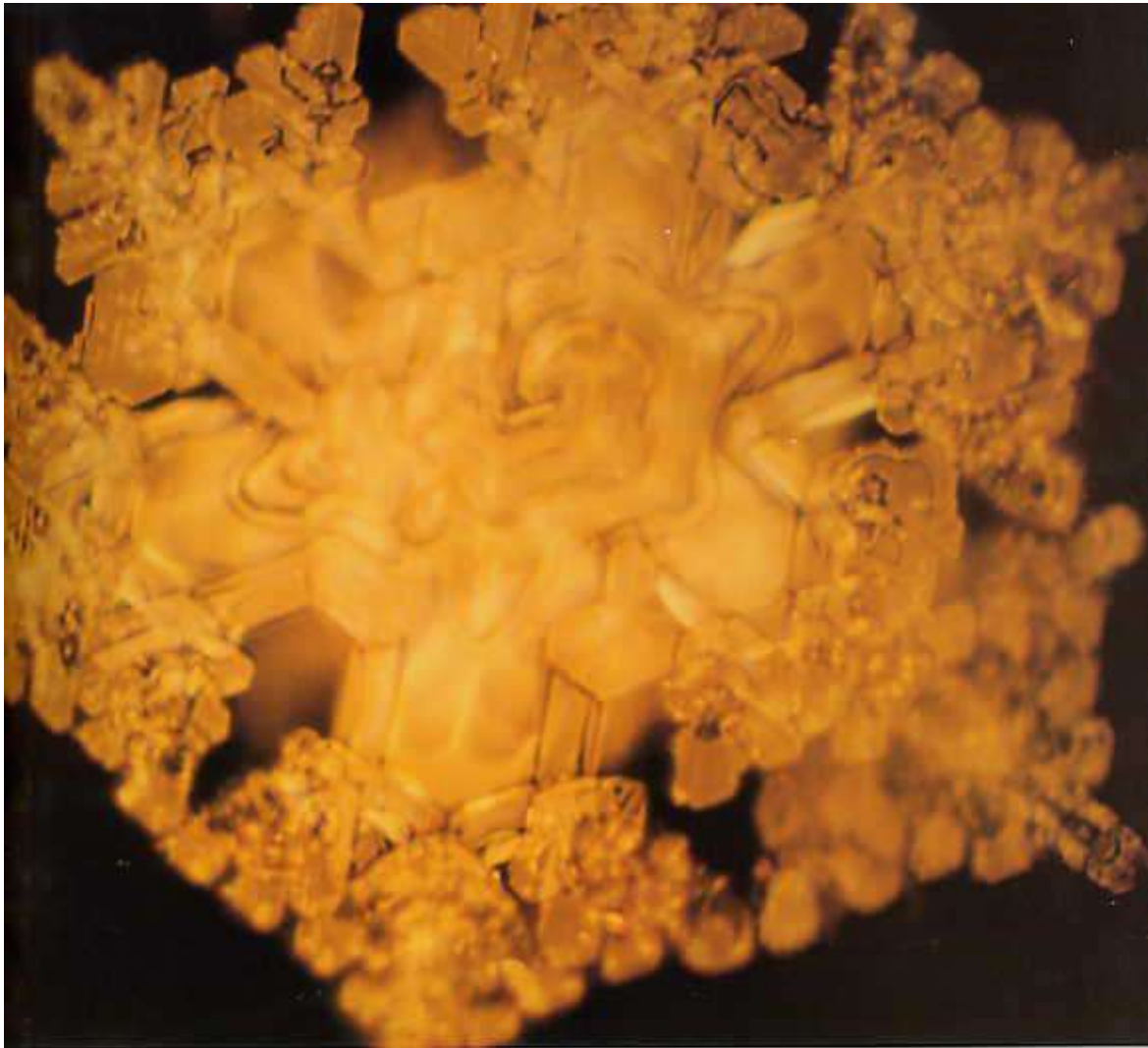


Chopin's "Farewell Song"

ショパン 「別れの曲」

ピアノ曲として有名で、メロディーを聴けば誰でも知っているお馴染みの曲です。そしてこの結晶を得たときほどびっくりしたことはありませんでした。「別れの曲」だからでしょうか、基本の結晶の形が見事に細分化され、まさしく「別れ別れ」になってしまいました。顕微鏡の倍率は同じなのに……です。

This is such a famous piano music piece that almost anyone can recall this music once they hear it. I have never been so astonished as I was when I obtained this crystal. Is it shaped the way that it is because it is effected by "Farewell Song"? The basic crystal shape is almost perfectly divided into small parts that have become "separated" from each other. This, despite the fact that the magnifying power of the microscope, is the same as it was in the other photos.



Healing Music, "Hado"

ヒーリングミュージック「Hado」

これは痛みをやわらげ、身体の免疫力を高めることを目的に、特別な技術を駆使してアメリカでつくられたヒーリングミュージックのCDを聴かせたものです。枝の部分が一ヨキニヨキと力強く伸びており、まるで栄養価の高いキノコのような美しい結晶写真になりました。実際にこの曲を聴いて、いろいろな生理的効果があったことが、多数報告されています。

This is a picture of a crystal of water that has been exposed to a CD (Composed by Alan Roobik) of healing music that was created in the USA. This music is said to make use of a special technology with the purpose of easing pain and enhancing physical immunity. The branch section of the crystal stretches out and becomes elongated. The resulting picture is beautiful, resembling a highly nutritious mushroom. We have received many reports from users that also felt various physiological effects by listening to this piece.



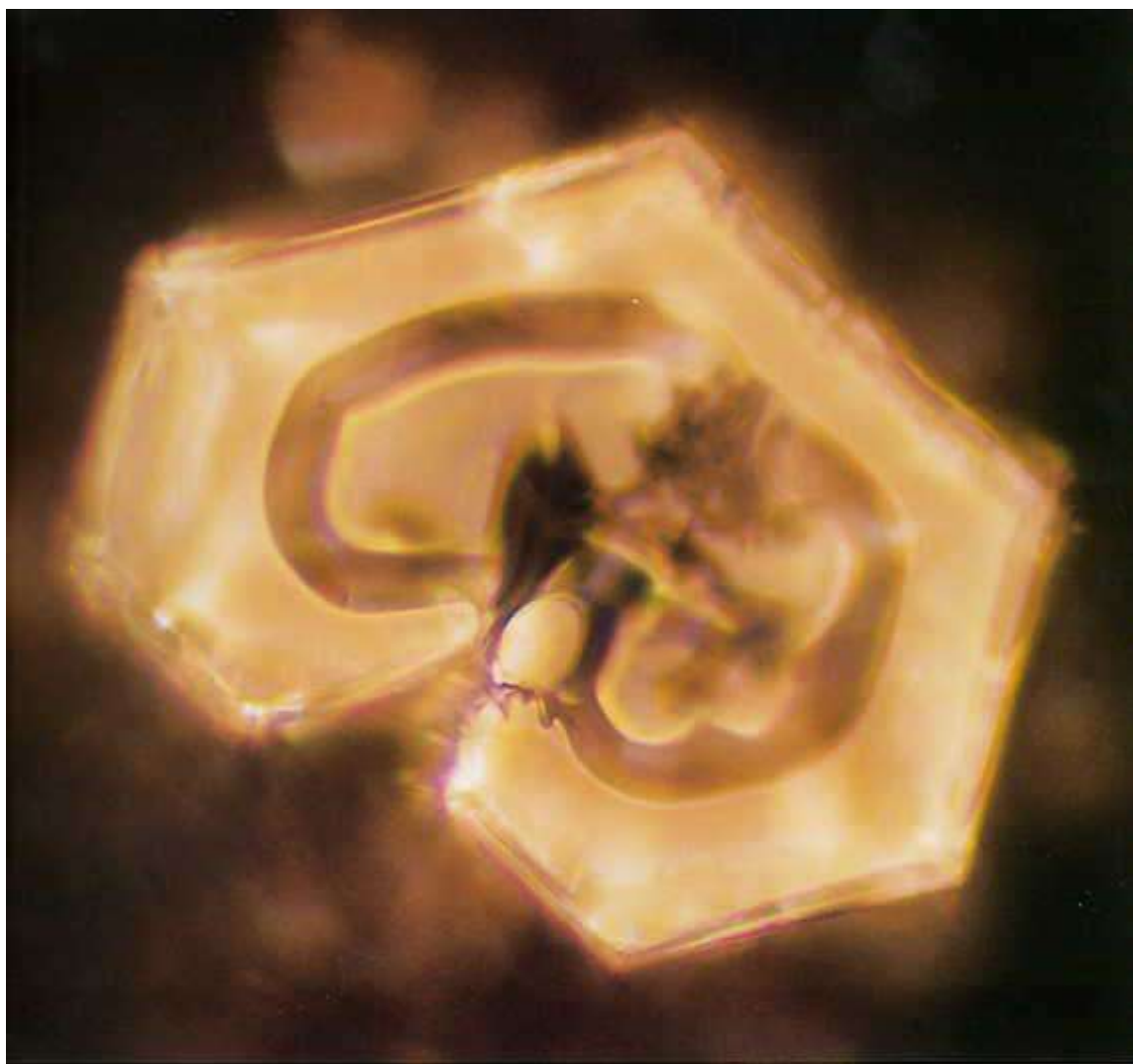
Tibet Sutra

チベットのお経

映画「セブン・イヤーズ・イン・チベット」の中でも流された、お経のCDを聞かせたもの。力強く、美しい結晶が撮れました。古くから伝えられているお経は、人々の魂に語りかけ、それを癒す強いエネルギーを持っているであろうことが確認できます。

This is a picture of crystal of water that formed after being exposed to a CD of the music from the sound track of the movie, "Seven Years in Tibet."

We were able to take a picture of a powerful and beautiful crystal. We can reaffirm the ancient knowledge that the Sutra talks to people's souls and has a strong positive energy that can heal people's feelings.



A Korean Folk Song, "Arian"

韓国民謡 「アリラン」

ご存じ、朝鮮の民謡。アリラン峠を越えて別れていく、恋人同士の別離の歌。
旅立つ男性を、残る女性が見送る……菅原都々子さんの歌を聴かせました。
なにか、つらく、切ない、胸の痛くなるような結晶ではありませんか。

This is a famous Korean folk song about two lovers who are forced to be separated as they cross the Arian mountain pass.

The girl sends off her departing lover with a song sung by Sugawara Tsuzuko.

Doesn't this crystal have a somewhat painful, sad and heartbreaking look?



Kawachi Folk Dance Song

「河内音頭」

河内地方で800年も伝承されている音頭。

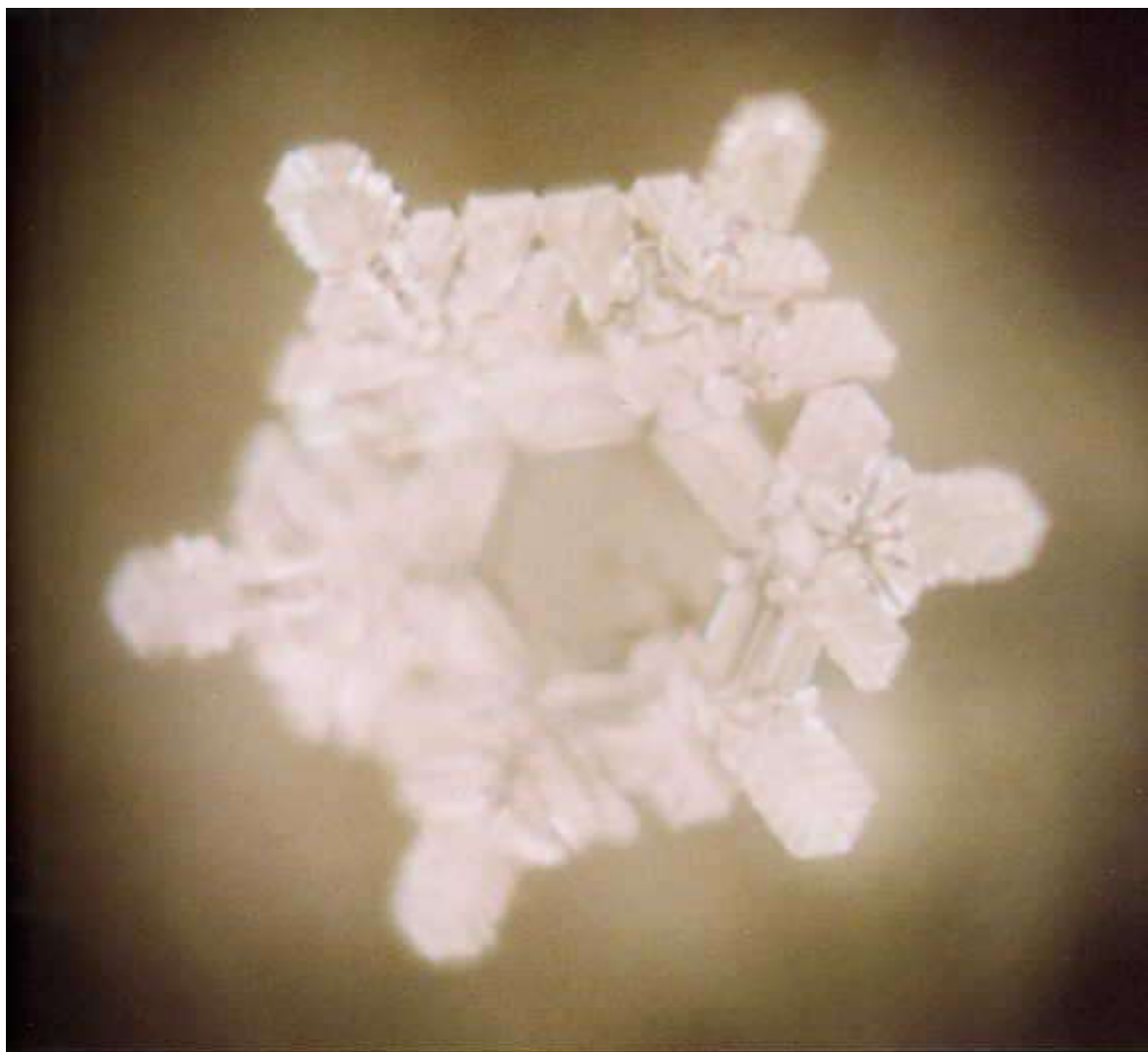
現在活躍中の河内家菊水丸さんの提案で、彼の歌う河内音頭を聴かせた水の結晶です。

長い間、多くの人々によって歌い継がれている曲には、人を癒す力があるのではないのでしょうか。

A folk dance song handed down in the Kawachi region for more than 800 years.

This is a crystal of water that we exposed to Kawachi Folk Dance Song. This idea was suggested by Mr. Kawachiya Kikusumaru and was sung by himself.

For hundreds of years this music has been cherished and sung by many people and because of this it may have some healing power.



Just Like a Flowing River

「川の流れるように」

クラシックやヒーリングミュージックと比べて歌謡曲はどうでしょう。

昭和を代表する歌手、美空ひばりさんの「川の流れるように」。時を越えて歌い継がれる良い曲は、やはり良い気・波動をもっています。聴く人の心をほっとさせるような、均整のとれた美しい結晶です。でも、ぽっかりと空いた空洞は何を物語るのでしょうか。

How about trying popular music as compared with classical music and healing music? "Just Like a Flowing River" was sung by Misora Hibari, a famous singer of the Showa Era. When this timeless and wonderful piece is sung, there can be no doubts as to its positive energy and HADO. The crystal that formed is well balanced in a way that reflects the nostalgic feelings of the listeners.

But what is the meaning of the gaping hole?



Folk Song of Celtic Region, UK

イギリス・ケルト地方の民謡から

日本でも馴染みの歌手エンヤさんの曲は、「ガイア・シンフォニー第一番」にも使われていて、リラクゼーションなどのヒーリング効果があるとか。

どの曲も不思議な、独特の世界をもっています。

この写真はそれを証明するかのように、優しく繊細で美しい結晶をみせてくれました。

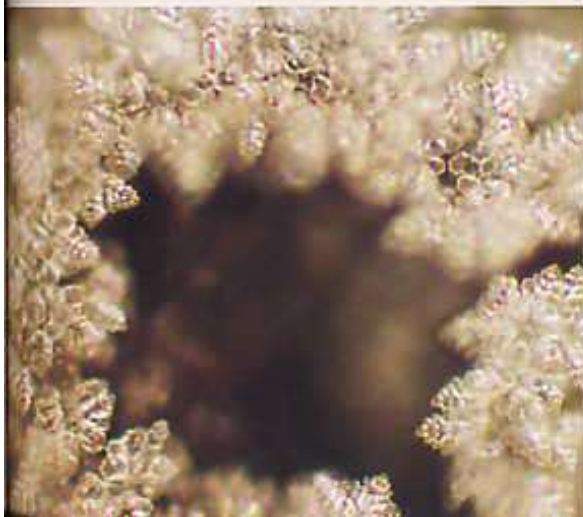
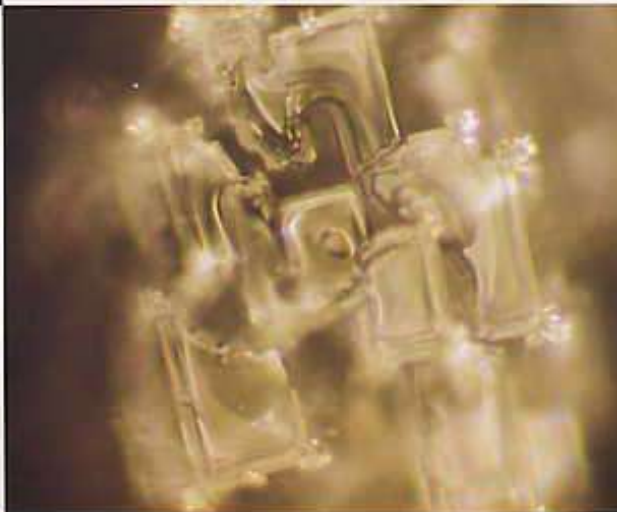
This music is sung by Enya who is well-known in Japan and elsewhere. We used the piece, "Gaia Symphony No.1," which is said to have the healing effects of relaxation. Each piece of her music has its own mystical unique world.

This picture shows a tender and delicately beautiful crystal.



Elvis Presley's "Heartbreak Hotel"
エルビス・プレスリー
「HEARTBREAK
HOTEL」

エルビス・プレスリーさんの「HEARTBREAK HOTEL」を聴かせたところ、3種類の結晶が撮れました。
上の写真は、まさしくハートが2つにわかれてしまったハートブレイクな写真。
右の写真は、それが融合しようとしている写真。
下の写真は、試練に絶えて、新たなハートの形成をしていると考えるのは、ちょっとセンチに過ぎるでしょうか？



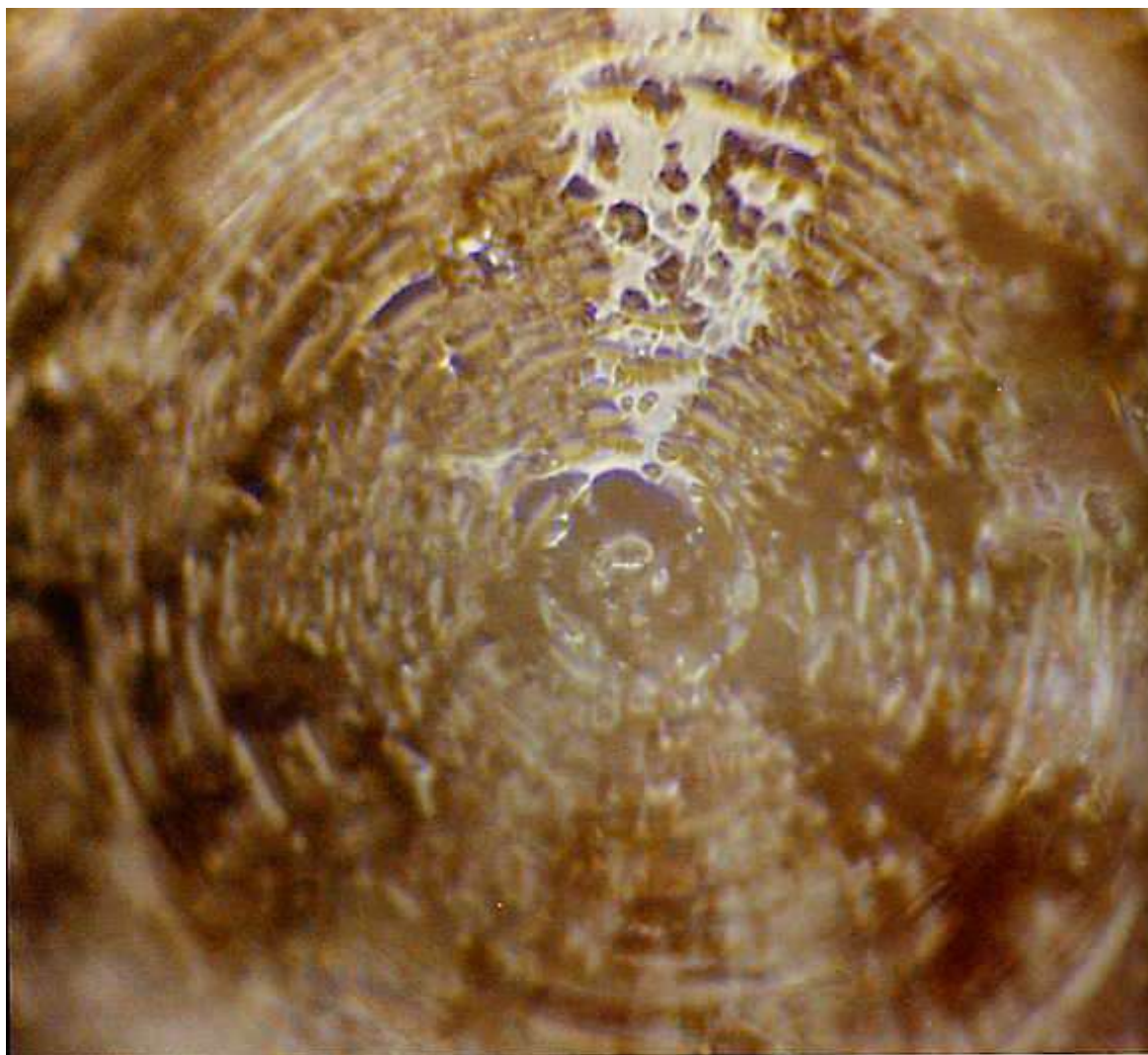
Heartbreak Hotel by Elvis Presley

When we exposed the water to "Heartbreak Hotel" sung by Elvis Presley, we were able to obtain three types of crystals.

The picture, above, is a picture of a heart broken into two.

The picture, right, shows the two parts trying to fuse together.

The picture, below, shows a newly formed heart that overcame the difficult period. Do you think that this idea is too sentimental?

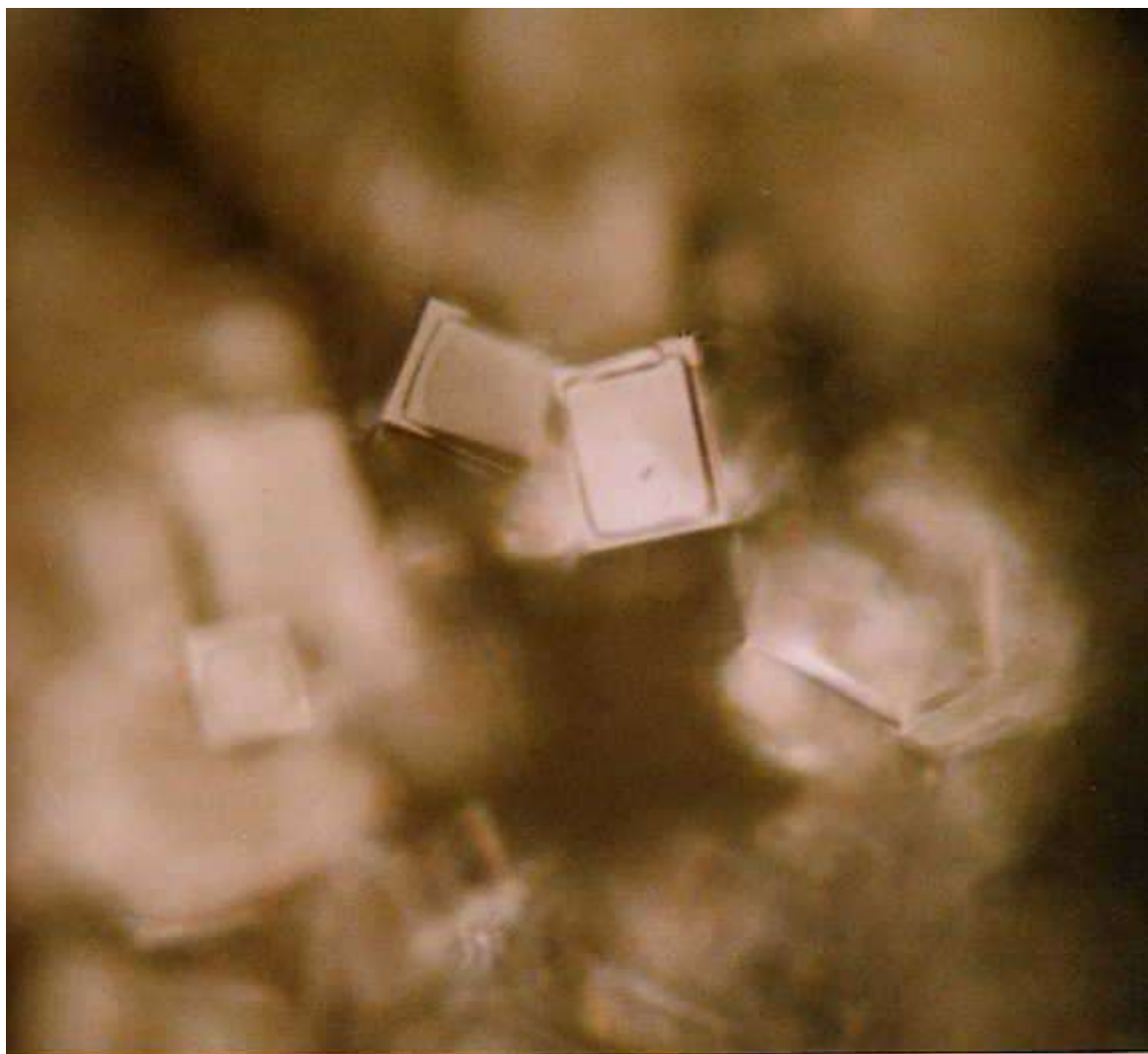


A Heavy Metal Music

あるヘヴィーメタルの曲

歌詞の内容は怒りがいっぱい。世の中を罵倒しているような曲です。基本の整った六角形の結晶構造が、見事にバラバラに壊れてしまっています。この曲に対して水は、はっきりとネガティブな反応を示したようです。ただしヘヴィーメタルが悪いというわけではなく、歌詞に問題があったと考えられますが、あくまでも一つの例です。

This music is filled with anger and seems to be denouncing the world. Subsequently, this crystal's basic well-formed hexagonal structure has broken into perfect pieces. The water seems to have reacted negatively to this music. We are not saying that heavy metal music is bad, only that there must have been a problem with the lyrics. This is merely an example.



A Popular Music in Japan

日本のあるヒット曲

若者に絶大な人気を誇るグループの曲で、ヒットチャートではいつも上位にありました。しかし結晶になると、六角構造が崩れてしまい、四角い無味乾燥の結晶になっています。ヒット曲が必ずしも良い結晶になる、というわけではない例としてご紹介します。

This is a song that is sung by a group who is very popular in Japan, and it is always at the top of the hit chart. However, when we look at the crystal, we can see its broken hexagonal structure and its subsequent square unattractive shape.

We are introducing this example only to show that hit music does not always contribute to the production of well-formed crystals.

ごはんを毎日 『ありがとう!』 『ばかやろう!』と声をかけた!

講演の席で、水に文字を見せる(90ページ参照)実験内容を発表しました。するとそれに呼応しておもしろい実験をしてくれた方がいます。

その実験とは、「普通に炊いたお米を2つの同じガラス容器に入れ、一方には『ありがとう』、もう一方には『ばかやろう』と言葉に出して毎日声をかけ、それを1ヵ月間観察する」というものでした。

小学生の子どもが2人、学校から帰ると毎日、ランドセルを放り出しては、瓶に貼った文字のとおり声をかけるという日課を1ヵ月続けました。そしてその結果、『ありがとう』と声をかけ続けたごはんは、半ば発酵状態となり、匂いを嗅ぐと芳醇な麹のような良い香りに。一方『ばかやろう』のごはんは真っ黒に変色して腐り、その臭いたるや……ひどいものでした。

Speaking "Thank you" and "You fool" to Rice Everyday

While presenting a speech on the experiment that we did with the effects of language on water (see page 90), one of the audience members told me that they were very impressed. At that time, this person also told me about an interesting experiment. This experiment involved placing cooked rice in two identical glass containers. Afterwards he/she talked to the rice everyday saying "Thank you" to one and "You fool" to the other. He/She did this for one month to see the results. Two elementary school children talked to the rice everyday for one month as soon as they came home from school. As a result, the rice that the children had said "Thank you" to, was nearly fermented and had a nice mellow malted rice aroma. The other bowl of rice that the children had said "You fool" to, had turned black and had rotted.

They said that its smell was disgusting beyond description.

Of course this is not an experiment that an official research institute did, so the result could have been just a coincidence. However, many people have done the same experiment and they showed the same results. Here, not only water but microbes seem to be involved. Microbes are just like us, they work hard if they are praised and become idle if they are abused.

It seems that by saying "Thank you" and "You fool", the microbes must have grouped into beneficial bacteria and disadvantageous bacteria.



もちろんこれはキチンとした研究機関が行った実験ではありませんから、たまたまそうなったと言われれば、それまでですが。その後、同じような実験をやってくれた人が何人も現われて、同じ結果となっています。

ここでは「水」だけでなく、微生物さんが深く関わっているようです。微生物さんも、われわれと同じでほめられれば良く働くし、けなされればふて寝をしようのでしょうか。

「ありがとう」「ばかやろう」と声をかけ続けたことで微生物は善玉菌と悪玉菌に分かれてしまったのではないかと思います。

水に文字を見せる

水が文字によって変化する？

水に音楽を聴かせるという私たちの試みに対して、水は想像以上の変化を見せてくれました。

そこで次に「言葉に対して水はどういう変化を見せるのか？」と考えました。ところが、言葉には響きがあります。たとえば「ばか！」と怒鳴るのと、「ばかねえ〜」と優しく言うのでは違うのではないかと思います。

それならということで「水に言葉 (= 文字) を見せる」という方法を考えました。それも、人の手書き文字ではなく、ワープロで打った一定の文字を瓶に貼りました。あとから考えても「水に文字を見せる」なんて、世間一般の常



識からは、はずれた発想だったかもしれませんが、撮影実験班は実行あるのみです。

ベースになる水は、音楽の時と同じ「基本の精製水」を使用。この水を2つに分けてガラス瓶に入れました。一方に「ありがとう」、もう一方には「ばかやろう」という文字をワープロで打った紙を貼りつけて、一晩放置。これを凍らせて写真撮影しました。

ところが水は言葉、文字によって、明らかな違いをみせてくれました。実験者には何も知らせず実験したり、実験者を変えてみても、同じような傾向が得られました。

Showing Letters to Water

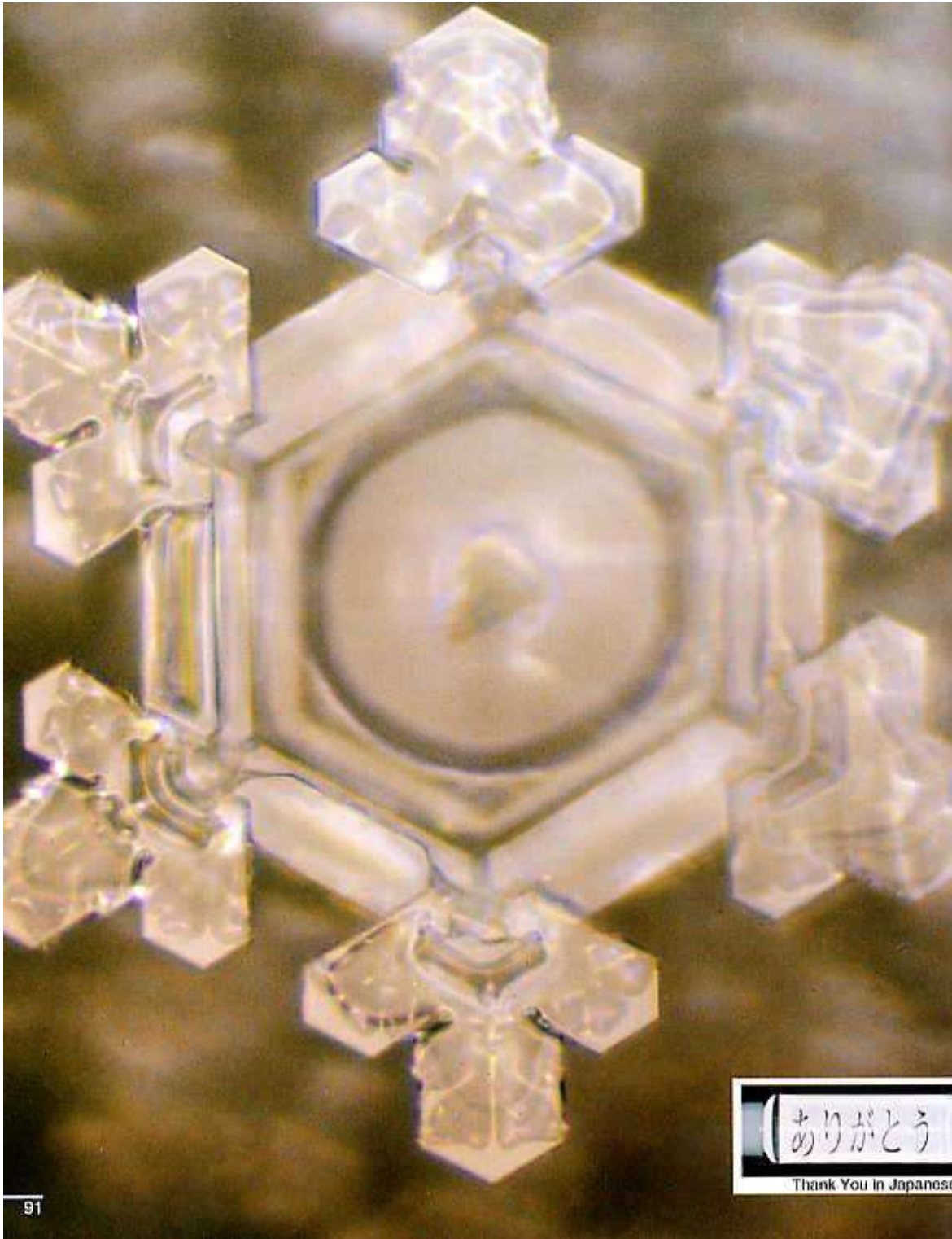
Does Water Change after Showing Words to Water?

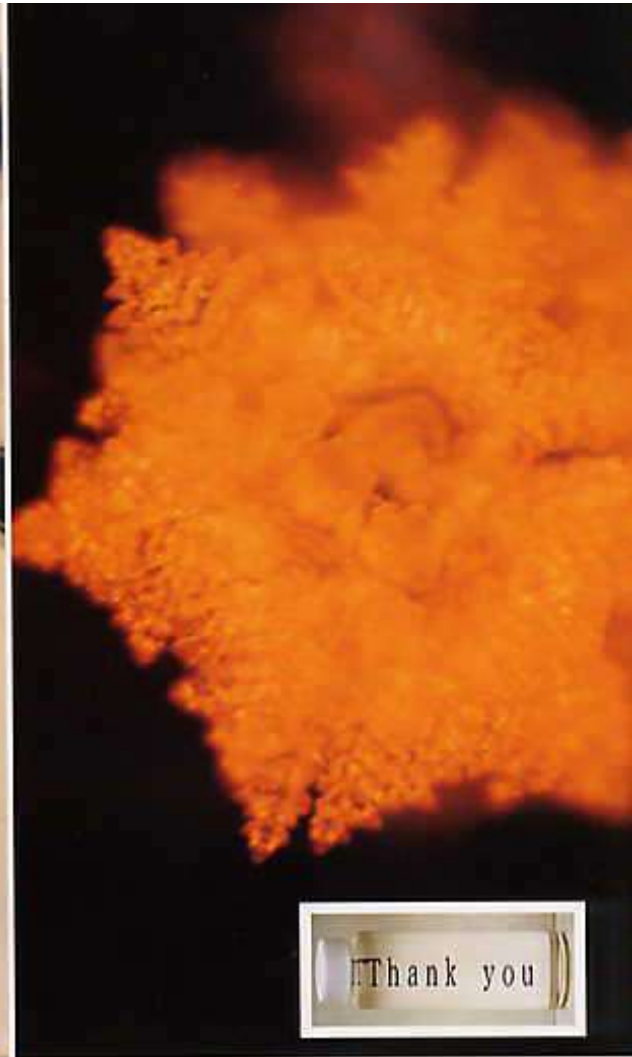
The water crystals showed various reactions to our attempts to expose them to music. So much so that we could not even have imagined the effects. Our next question lead us to ask, what kind of reaction does water show to words or to the sounds that words make? For instance, there is a great difference between angrily yelling "You fool!" and saying "You are a fool" in a gentle way.

So we decided to use language with our water samples. In other words, to "speak" to our water. We decided not to use handwritten words but rather words that were typed by a word processor. Looking back, our idea of speaking to water may have deviated from general common sense, but the photography team simply went on with the idea.

For the base water on which to experiment, we used basic distilled water. This was the same water that we used for experimenting with music. We divided this water sample into two parts and placed them into glass bottles. We then pasted a paper on one bottle that had "Thank you" typed on it. On the other bottle we put "You fool". We then left them both that way for one night. The next day we froze this water and took pictures of the crystals that formed.

What we found was that the two water samples showed conspicuous differences from each other. We did the experiments without giving any information to the experimenting team. We also changed the experiment staff and ran the tests again, but we obtained the same results both times.

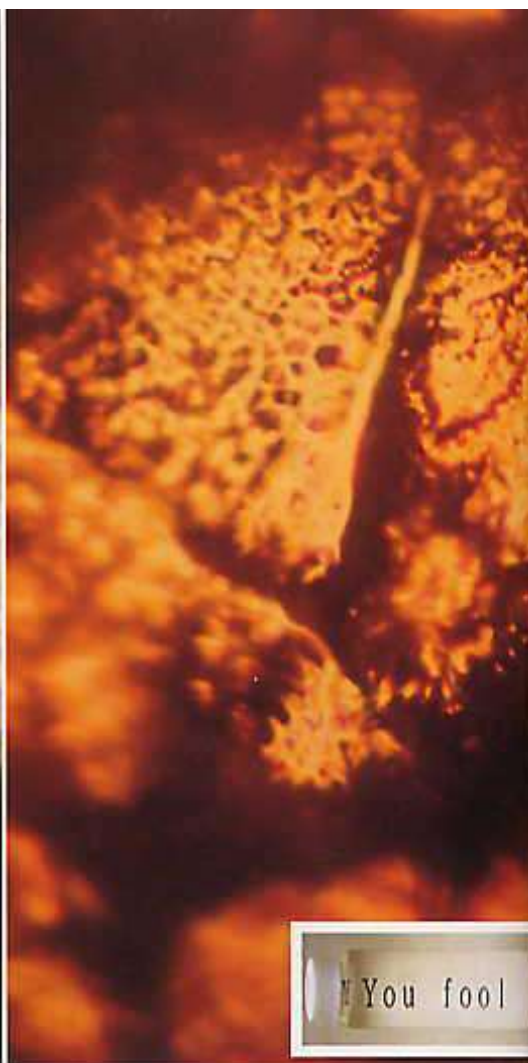
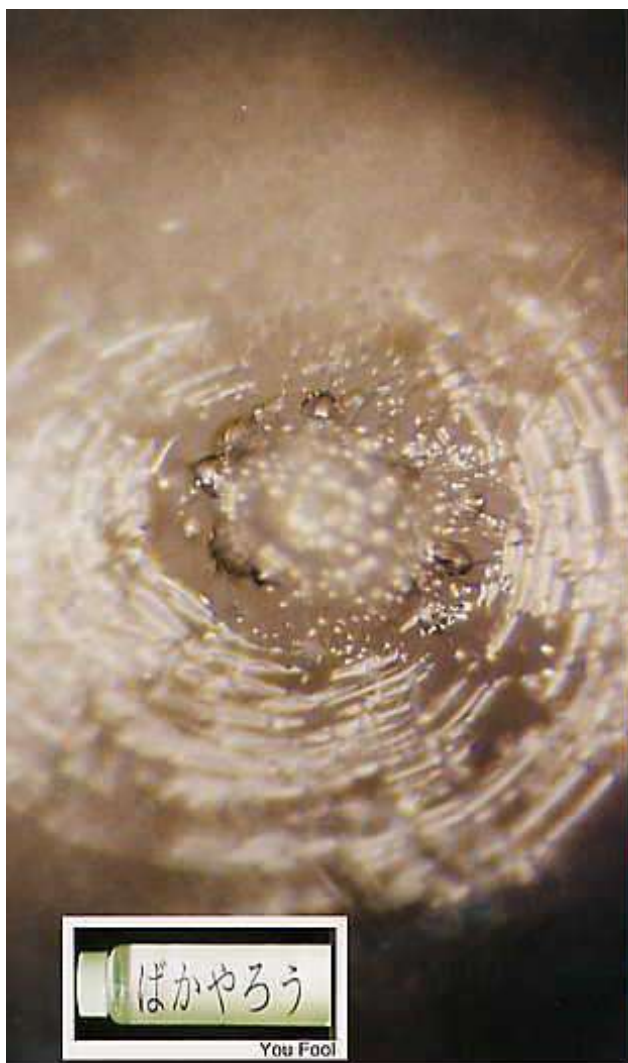




Thank You
ありがとう

基本の精製水は「ばかやろう」と同じ水です。とても美しく均整のとれた形です。78ページの「ゴールドベルク変奏曲」を聞かせた結晶と見比べると、なんとなく形が似ています。「ゴールドベルク変奏曲」はバッハが感謝の意を表わすためにつくった曲でした。日本語のありがとうの語源は、有り難く存在している……というような意味をもっています。韓国語も英語もまた違った語源からきているのでしょう。

In this experiment we used basic distilled water and the words "Thank you" in the same way as we did in the "You fool" experiment. The crystal has a very beautiful, well-balanced shape. It has a similar shape as the crystal that was exposed to "Goldberg Variations" on page 78. "Goldberg Variations" was composed by Bach to express his gratitude. The word, "Thank you" in Japanese exists to help us express gratitude. Korean and English must have derived differently.

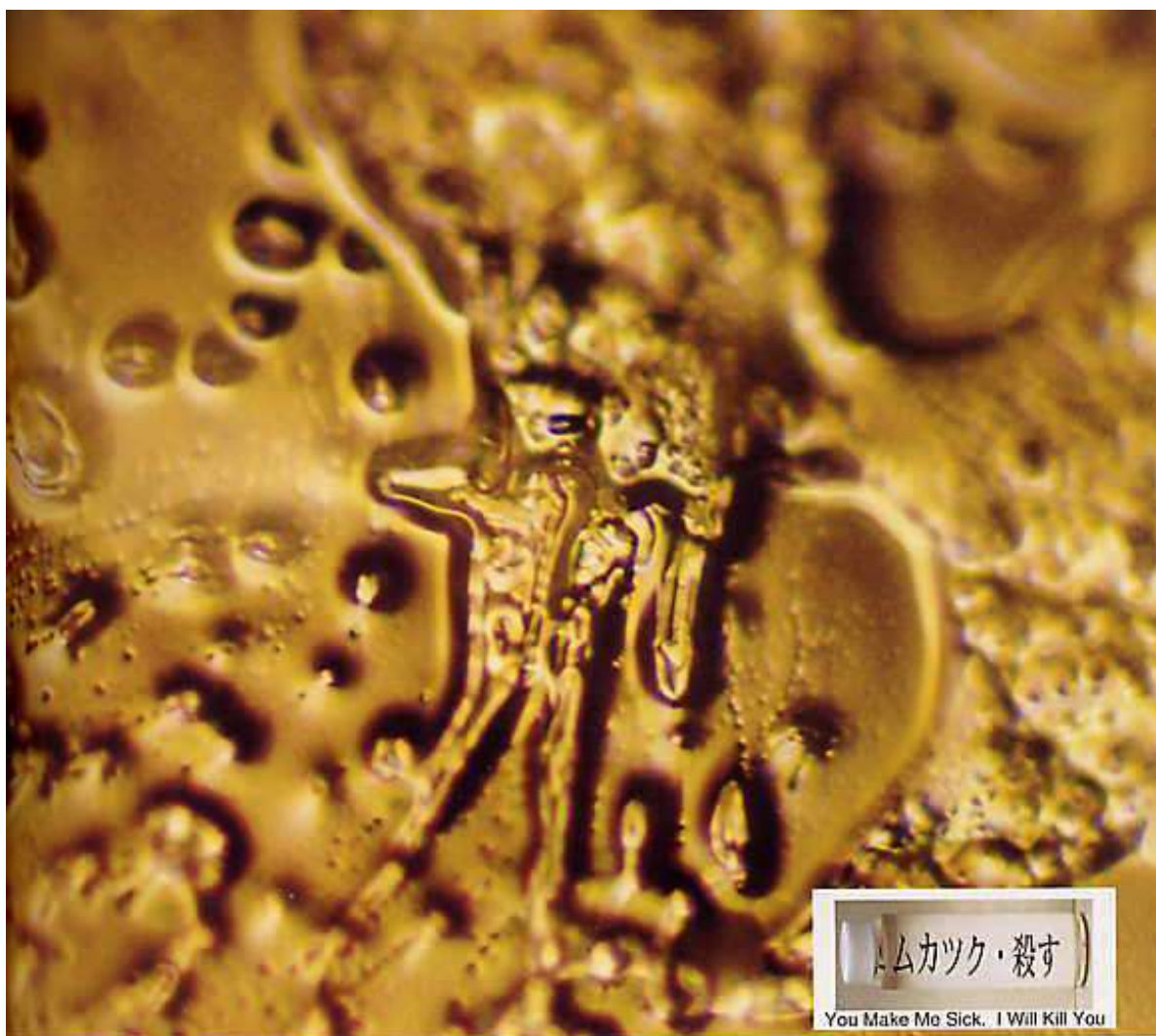


You Fool

ばかやろう

一晩中、瓶に貼りつけられた「ばかやろう」という文字を見ていた水です。87ページにあるヘヴィメタルの曲を聴かせた水の写真とたいへん似通っています。その曲は社会に対して「ばかやろう」と叫んでいるような歌詞でしたから、そうなるのかもしれませんが……。また同じ意味をもつ、英語の「You Fool」も貼ってみました。言葉の持つ語源によっても差がでてくるようです。

This is the water that had the word "You fool" on its bottle overnight. This is crystal is similar to the one from the water that was exposed to heavy metal music on page 87. The lyrics from the music were similar to saying "you fool" to society, so the consequence may have been the same. We also pasted the words, "You fool" in English to another bottle. It seems that there is difference in the etymology of words because we did not obtain the same results.



You Make Me Sick. I Will Kill You

You Make Me Sick. I Will Kill You
ムカツク・殺す

最近、若者がよく口にする言葉ですが、予想通り水の姿は醜態なものでした。結晶が融く歪み、潰れ、飛び散っている様子は、まさしく「ムカツク・殺す」そのもの。こういう言葉が横行する世の中は不気味です。なんとか……みんなの手で！

These are words that young people often use these days. Subsequently the shape of the water was as ugly as we had expected after we exposed the sample to these words. The crystal was distorted, imploded and dispersed. It really was a visual image of the words, "you make me sick" and "I will kill you." That we exist in a world where words like this are used rampantly is awe inspiring. We have to do something ourselves.

Love/Appreciation

愛・感謝

愛と感謝に含まれる人の意識

数多くの結晶写真を撮影してきましたが、当時ではこれほど美しい結晶は見たことがありませんでした。

やはり、この世の中で「愛と感謝」の気持ちに響くものはないということ。

「愛と感謝」を表現するだけで、身の回りの水、また身体の中の水がこんなに美しく変化してくれるのだったら…
””。

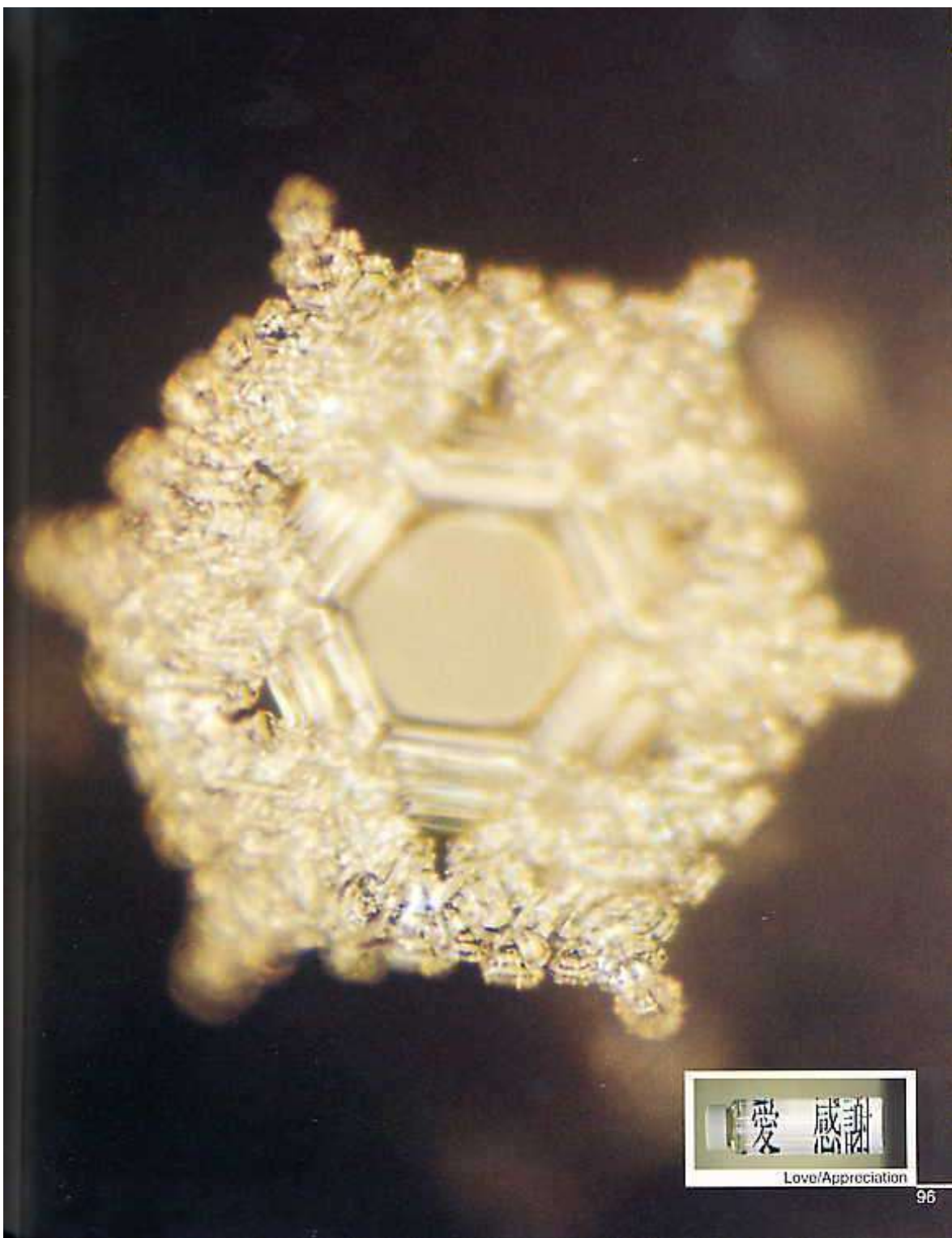
なんとか、日常の生活に生かされるといいですね。

また92ページの「Thank you」の結晶ともよく似ているのがうれしくなってしまいます。

People's consciousness contained in love and appreciation. We took pictures of numerous crystals from this sample but this was the very first beautiful crystal that we saw.

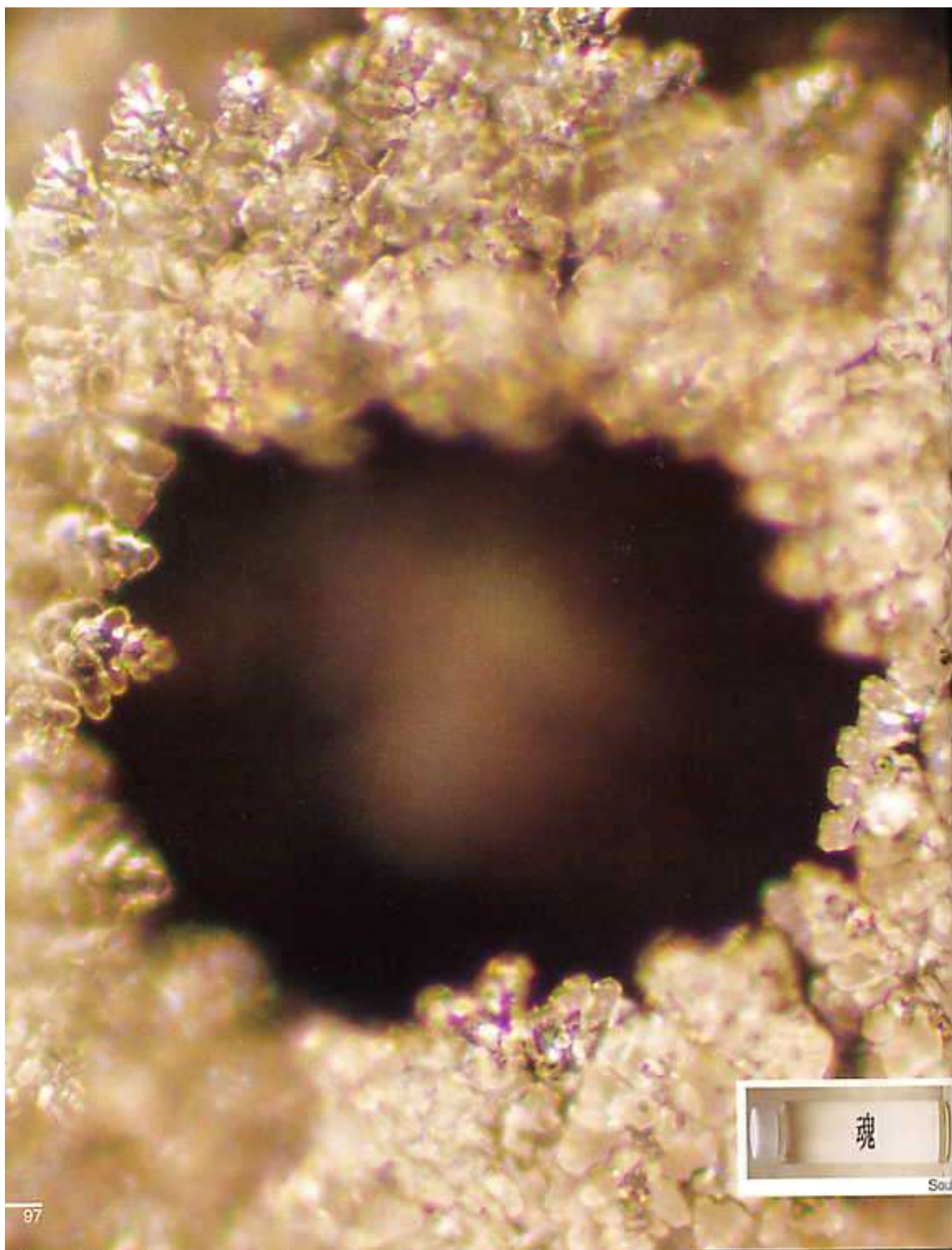
Indeed, there is nothing more important than love and gratitude in this world. Just by expressing love and gratitude, the water around us and in our bodies changes so beautifully. We want to apply this in our daily lives, don't we?

Strong resemblance to the crystal with the words, "Thank you" on page 92 was a happy coincidence.

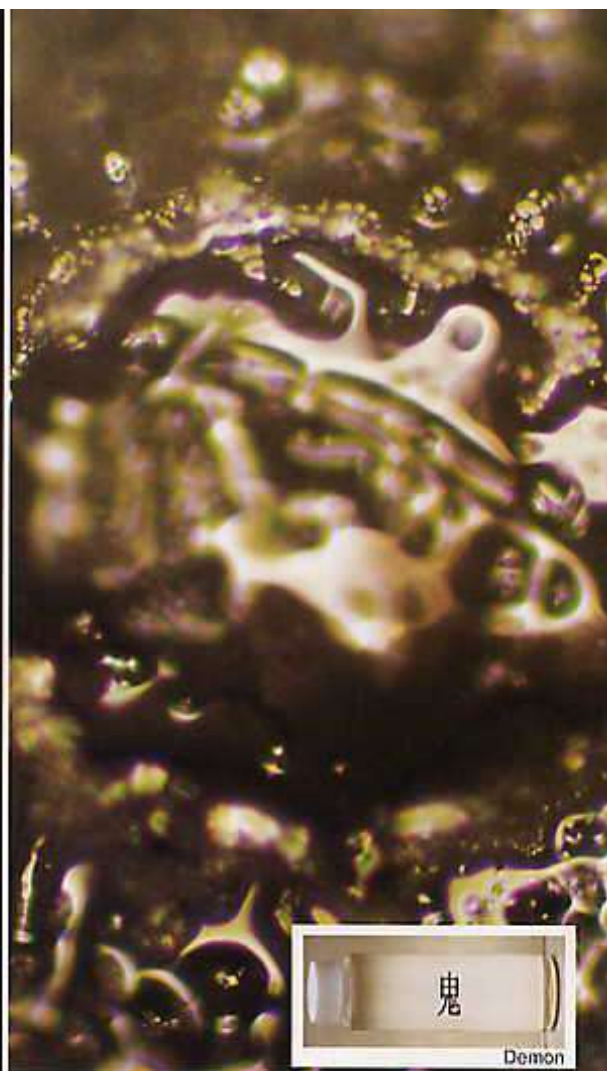
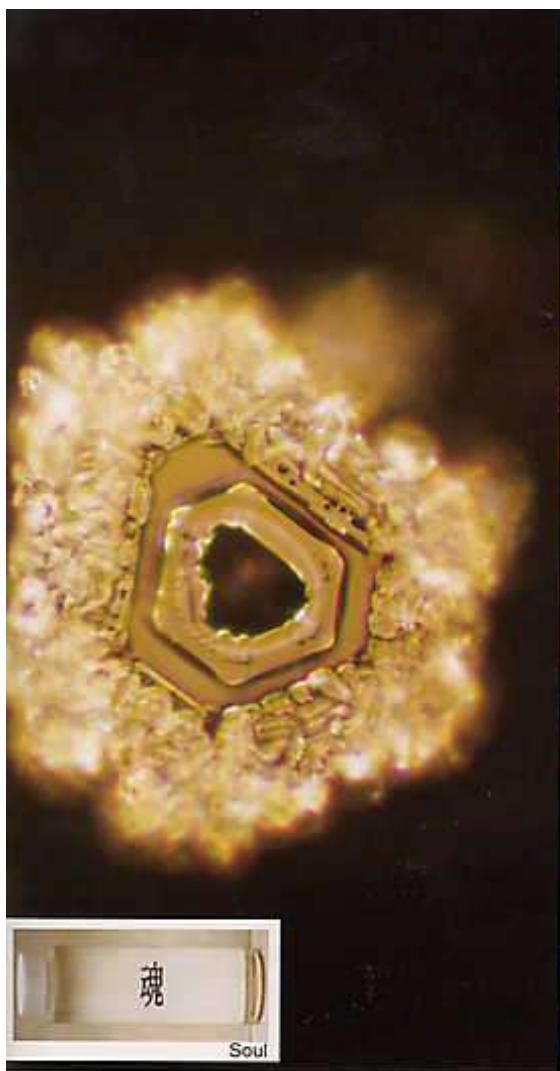


愛 感謝

Love/Appreciation



魂
Sol

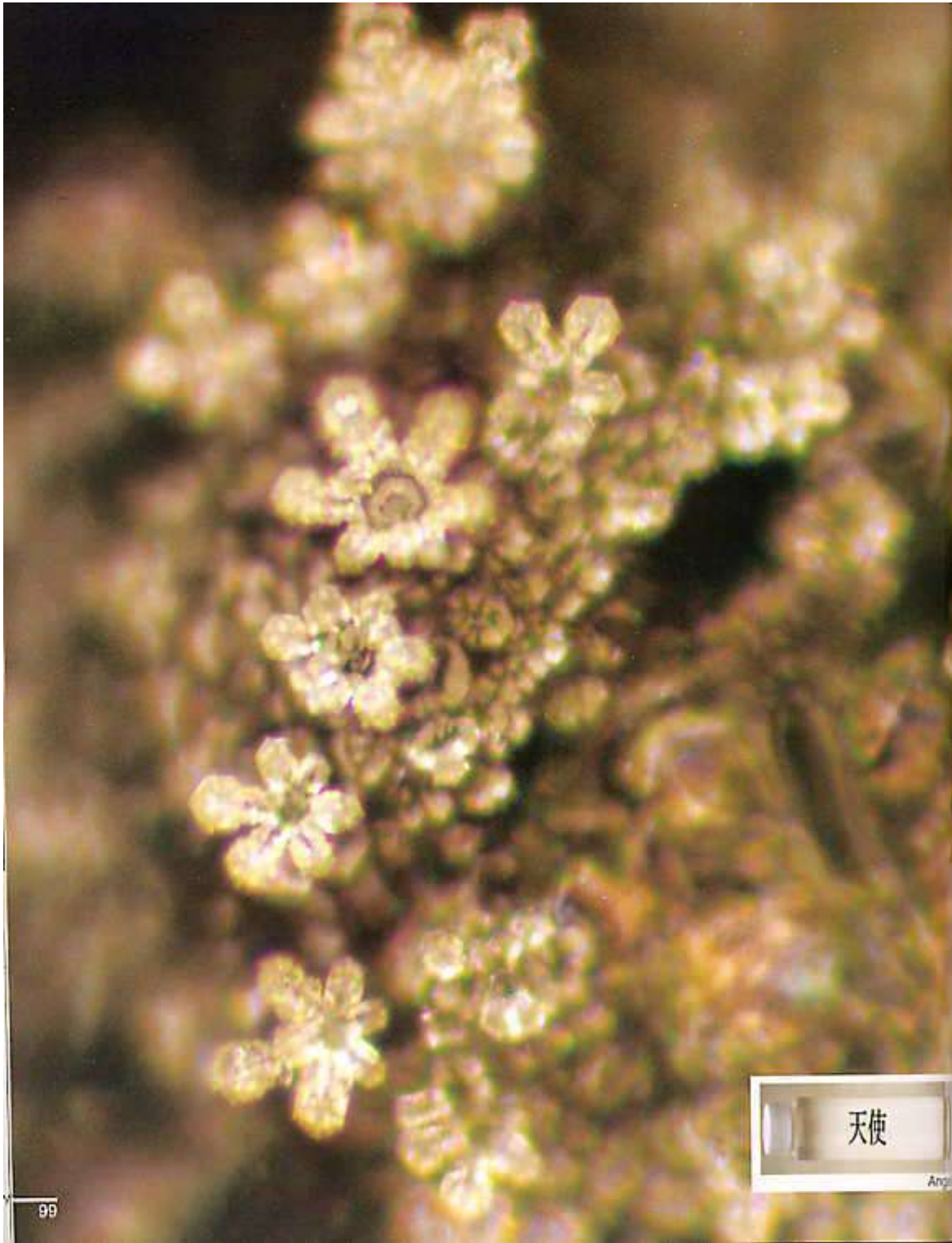


Soul/Demon

魂・鬼

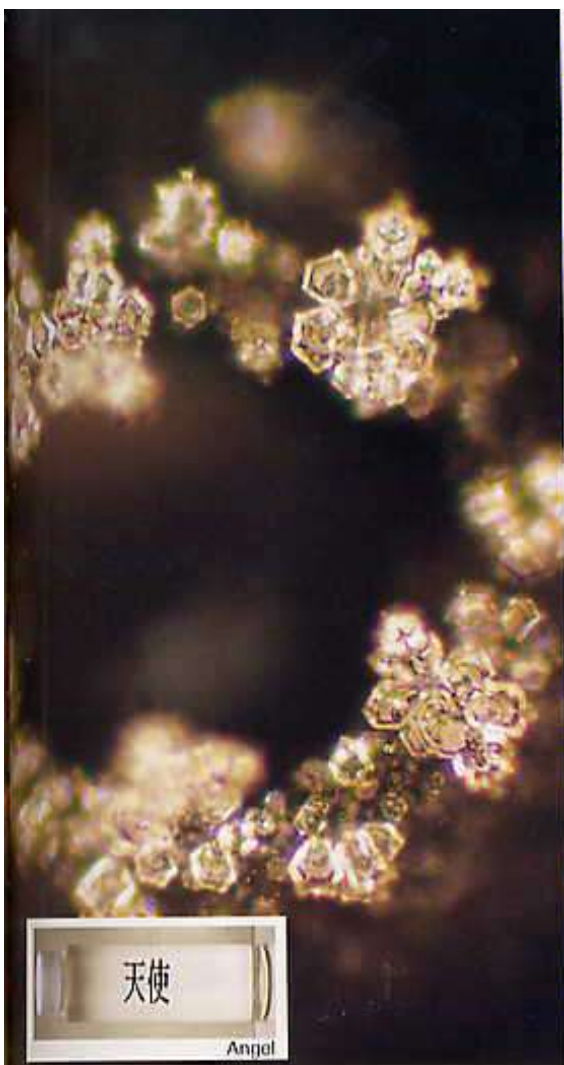
魂という文字の「云」の部分を取ると鬼という字になります。人は言いたいことを言わないと鬼になってしまうということでしょうか。水は魂を認識し、形にして、われわれ人間に伝言してきました……。2枚の写真から、どんな印象を受け取ればいいのでしょうか。中心にハート型が見えると思うのは、考えすぎでしょうか。そして鬼は……。

We have the letter, soul by removing the left part of the letter (which means "telling"), demon. People become demons if they do not express their opinions. In this picture, the water crystal recognizes the word soul and give us humans this message. What kind of impression should we make from the two pictures? Is it exaggerating to see a heart shape in the center?

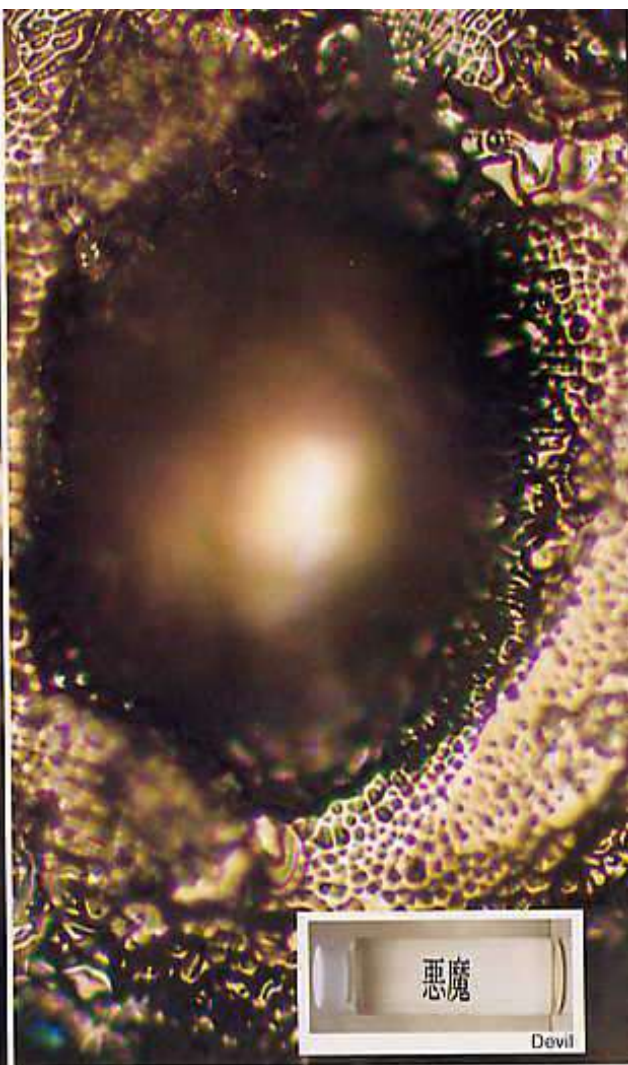


天使

Angel



天使
Angel



悪魔
Devil

Angel/Devil
天使と悪魔

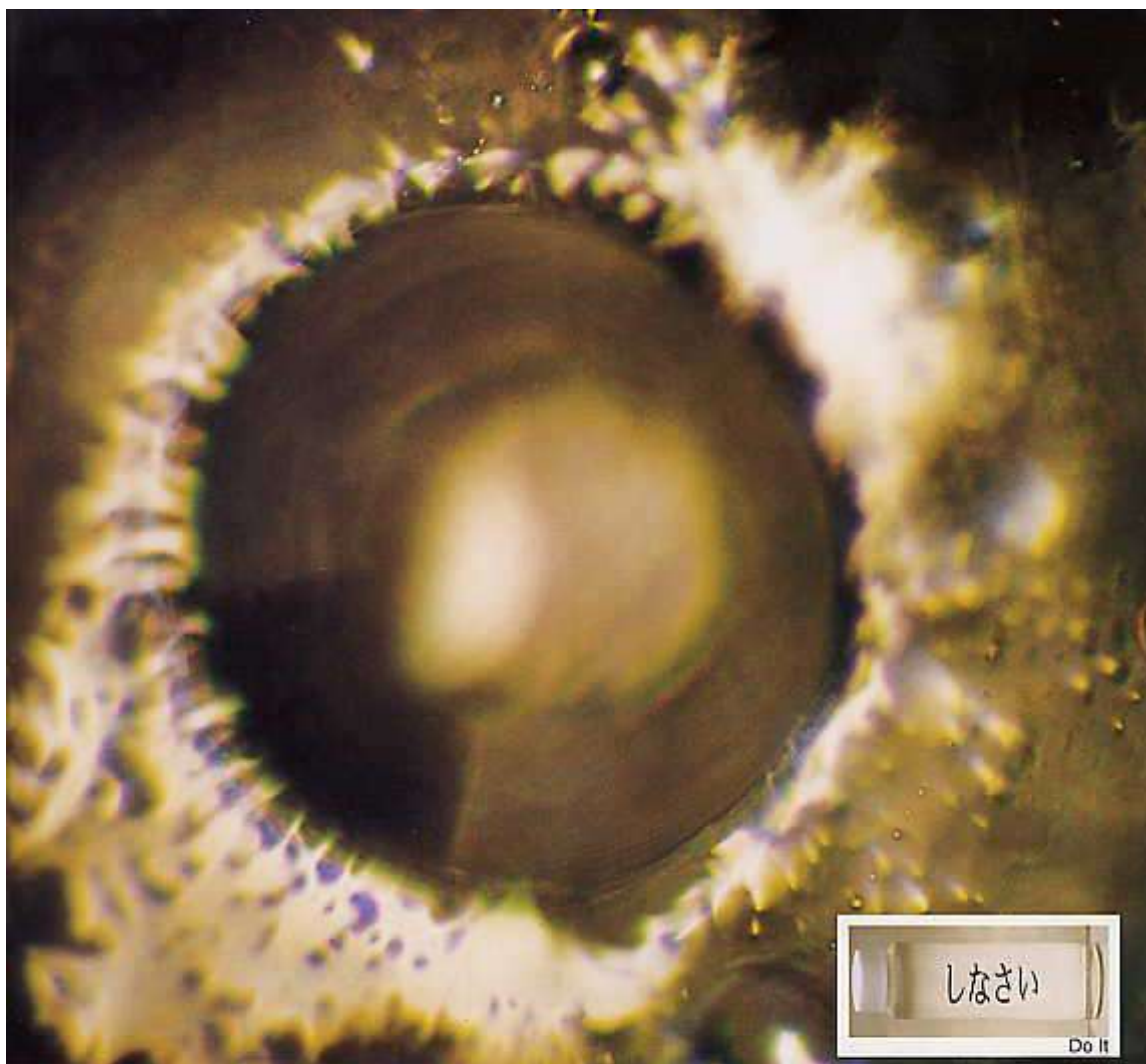
いかがでしょうか……。

What do you think?



しょうね

Let's Do It



Let's Do It/Do It

しょうね・しなさい

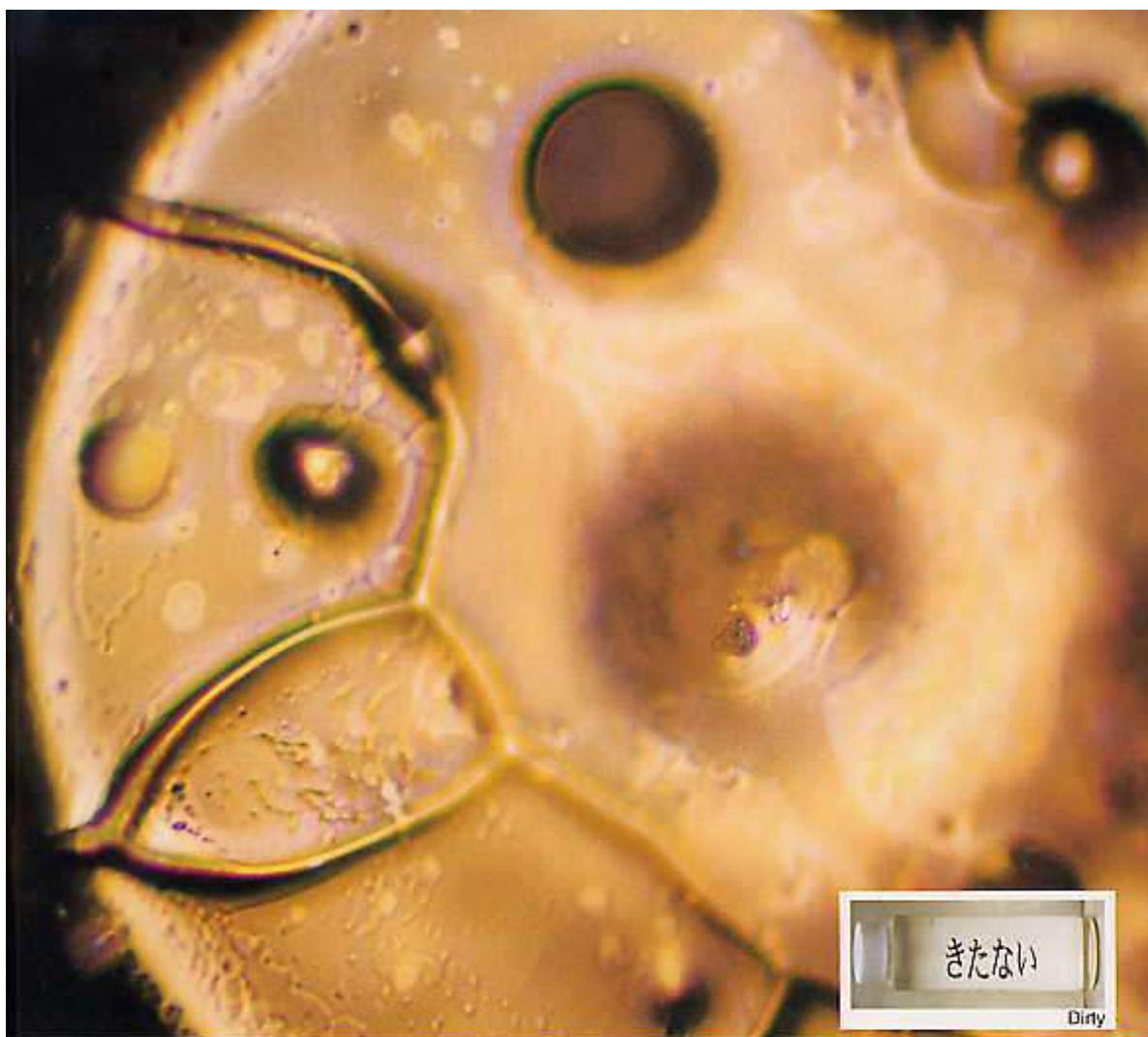
「しなさい」という命令口調の言葉と、「しょうね」という呼びかけの言葉の持つ意味の差が出ました。ついなんとなく毎日使っている言葉ですが、気軽に乱用することはできませんね。話す相手に悪印象を与える意味が、こんなところにあったとは驚きです。

We wanted to see if a word that was commanding (such as, "Do it") and a word that was encouraging (such as, "Let's do it"), showed different results. These are words that we use everyday without thinking about it, but we should not abuse these words by using them too easily.

It is surprising to learn that meaning that give bad impression on the person you talk to existed in places like this.



きれい
Beautiful



Beautiful/Dirty

きれい・きたない

基本の水に「きれい」という文字を見せた水は美しい結晶に、「きたない」という文字を見せた水は、きたない結晶になってしまいました。私たちが考えている以上に、文字や言葉が水に対して、大きな影響力を持っていることを知らされる写真です。

The water that we exposed to the letters of "beautiful" developed a beautiful crystal and the water that we exposed to the word "Ugly" had ugly crystals. These pictures show, in more ways than we had imagined, that letters and words have a big influence on water crystals.



人の名前を水に見せたら……

感謝の気持ちを込めて

また、とんでもないことを思いついた……と、撮影スタッフはびっくりしたようでした。なぜ、人の名前を水に見せたかという点、こないさきつがありました。

ある会社の経営者だったM氏が、波動を知ってから、2人の子供たちと、社員が3人くらい波動を勉強するインストラクターになりました。そしてなんとなくギクシャクしていた家族の関係がとてうまくいくようになった……ということで、私の研究に対して、大きなご協力をいただきました。

このご好意に対して、どんなふうにお礼をしたらいいかと、ずっと考えていました。そんなとき、ふっと「M氏の愛」という文字のラベルをつくって貼り、結晶写真を撮ってみました。すると予想以上に、100枚そろって、とてもきれいな結晶写真が撮れました。

Showing Person's Name to Water

With Feeling of Gratitude

The photography staff was astonished when hearing of this idea. The reason why I decided to expose water to people's names is due to the following sequence of events.

When Mr. M, who was an executive of a company, learned about the properties of HADO two of his children and 3 employees became instructors in teaching the properties of HADO. Then their family relation, which was not going too well, improved. Because of this experience he was eager to cooperate in my research.

I had been wondering for sometime how I should thank him for his kindness. So, as a gift, I decided to paste a label on some samples of water that said, "Mr. M's love" and take a picture of the crystal that developed. Then, more than I had expected, all the 100 water samples developed into beautiful crystal pictures. I was so impressed that I put them in a frame and gave it to him as a present. Needless to say, it made him very happy. After that, I pasted the names of deceased people, the names of people who invited me to give lectures and names people who were on my mind.

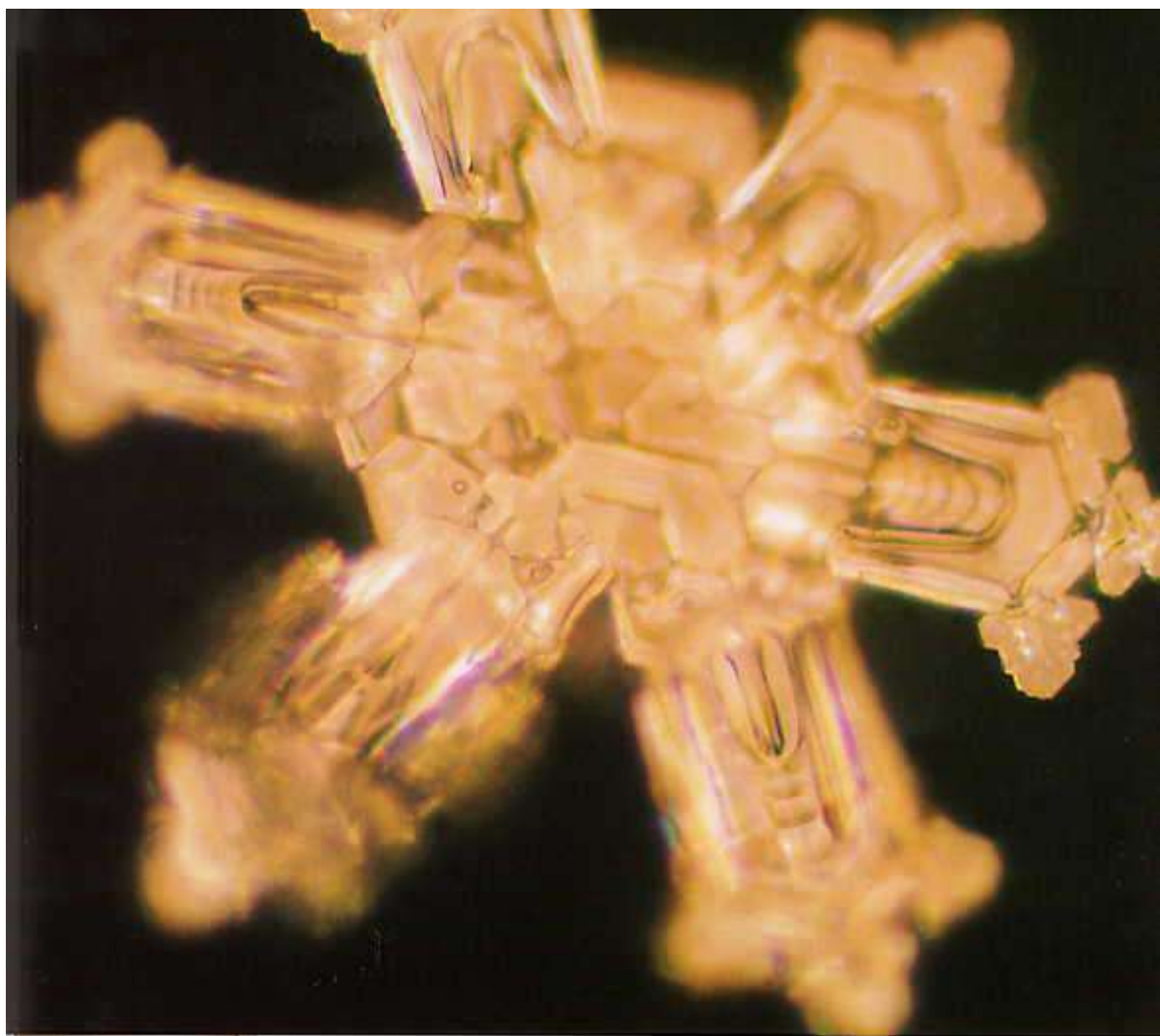
I, myself am not devoted to any religion and some people cannot be distinguished whether they actually existed or their existence was just a myth.



もう、うれしくて、額に入れてプレゼントしましたら、とても喜んでいただきました。

それで今度は、お亡くなりになった人だったらいいかな……とか、たまたま講演に呼んでいただいて縁のある方や、気になる方を次々に試させていただきました。

私自身、宗教にはまったくこだわっていませんし、実在の人なのか、神話の人なのかわからないような人もいます……。



出口王仁三郎

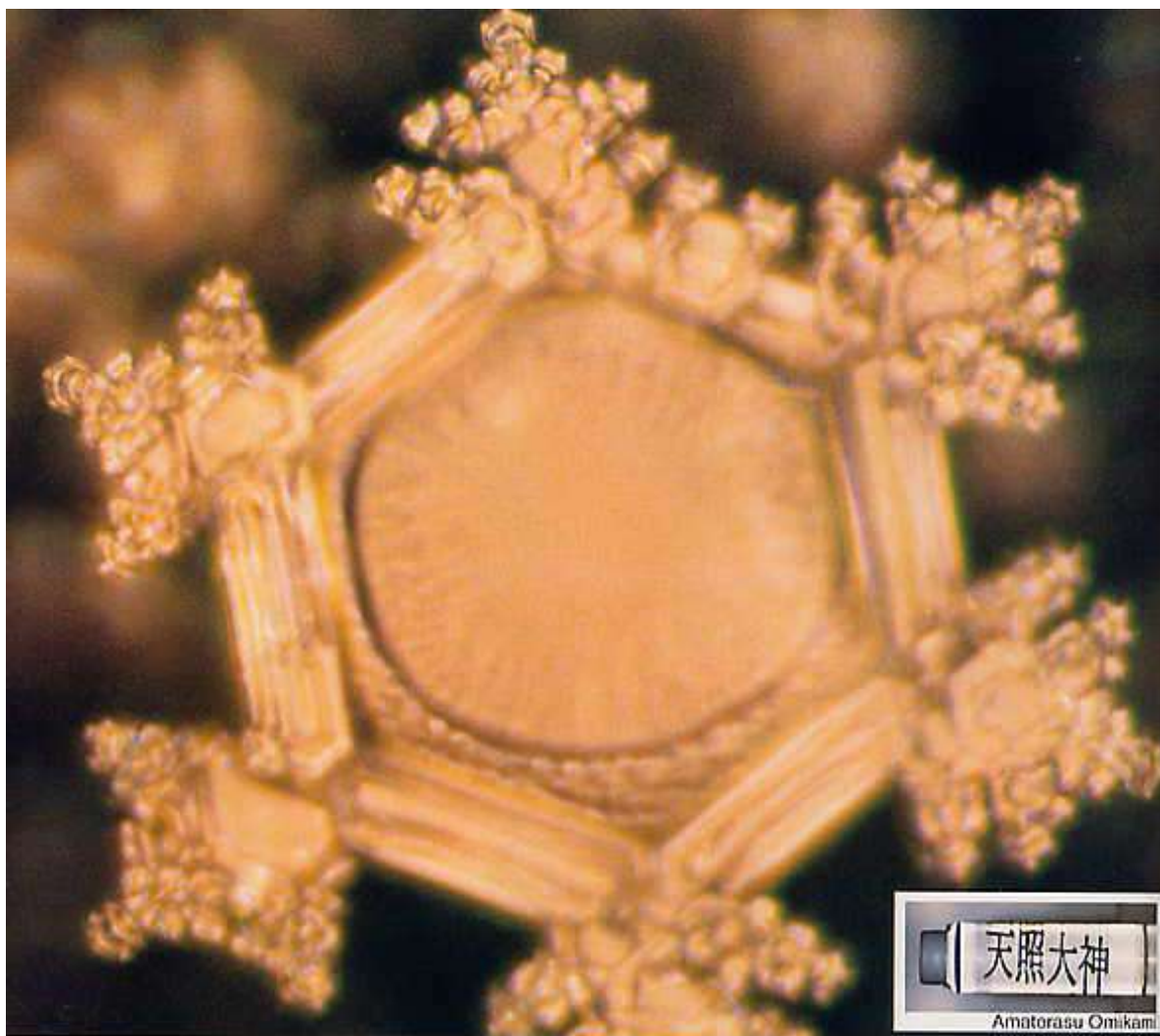
Deguchi Onisaburo

Deguchi Onisaburo

でぐちおにさぶろう
出口王仁三郎

京都生まれで、出口ナオさんの娘さんとお結婚。新しい宗教の新しいかたちを考え、大本教を育てた方。力強い、独特のパワーを感じる結晶になりました。

Born in Kyoto, he married Deguchi Nao's daughter and created a religious association to try to raise the study of modern forms of religion.



Amatorasu Omikami
あまてらすおみかみ
天照大神

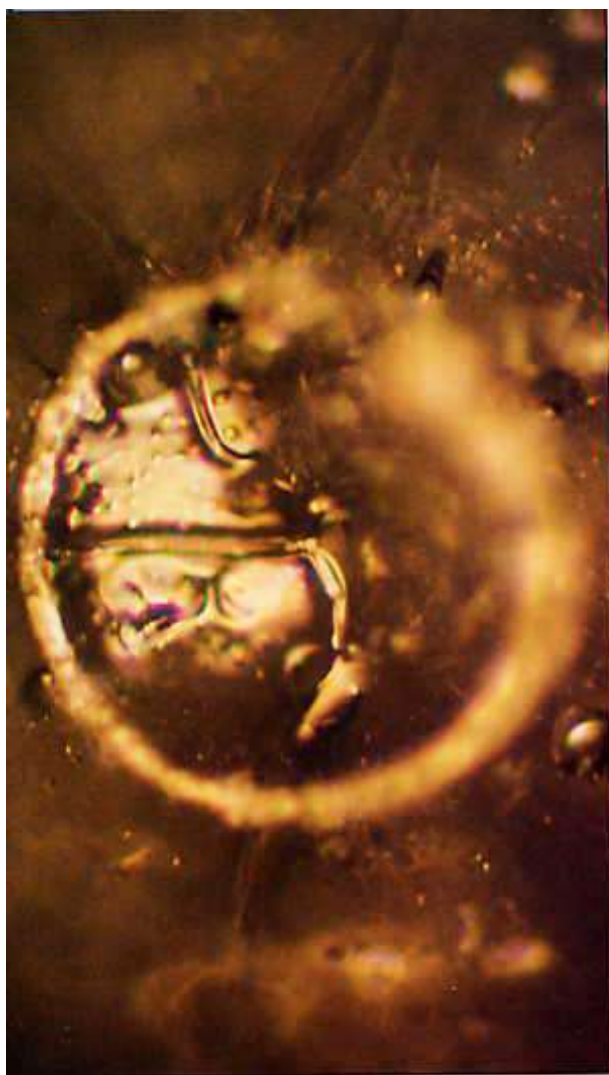
日本の神様の中心的存在「天照大神」。予想にたがわず素晴らしい結晶でした。それぞれの枝の部分が神事に使う「御幣（ごへい）」のようにも見え、結晶の中は神の霊として祭られる「神鏡」のよう。中心から、うっすらと光が差してくるようにも感じられます。また最初の撮影から10秒後の写真を見ると、中心に日輪とも思える形が現われ、神鏡があるように結晶が成長していったのです。

Amatorasu Omikami is the most important Japanese God. A beautiful crystal developed as we imagined that it would.

Each branch of the crystal looks like the pendant paper strips that a Shinto shrine uses in its divine services. The center of crystal looks like the Divine Mirror as the Shinto religion calls God's spirit. I can feel light slightly shining out from the center. The shape like the sun appeared in the center of the crystal taken after 10 seconds from the first one. The crystal was developing and it had the shape that looked like Divine Mirror.



撮影10秒後、成長する結晶
Developing crystal 10 seconds after photographing

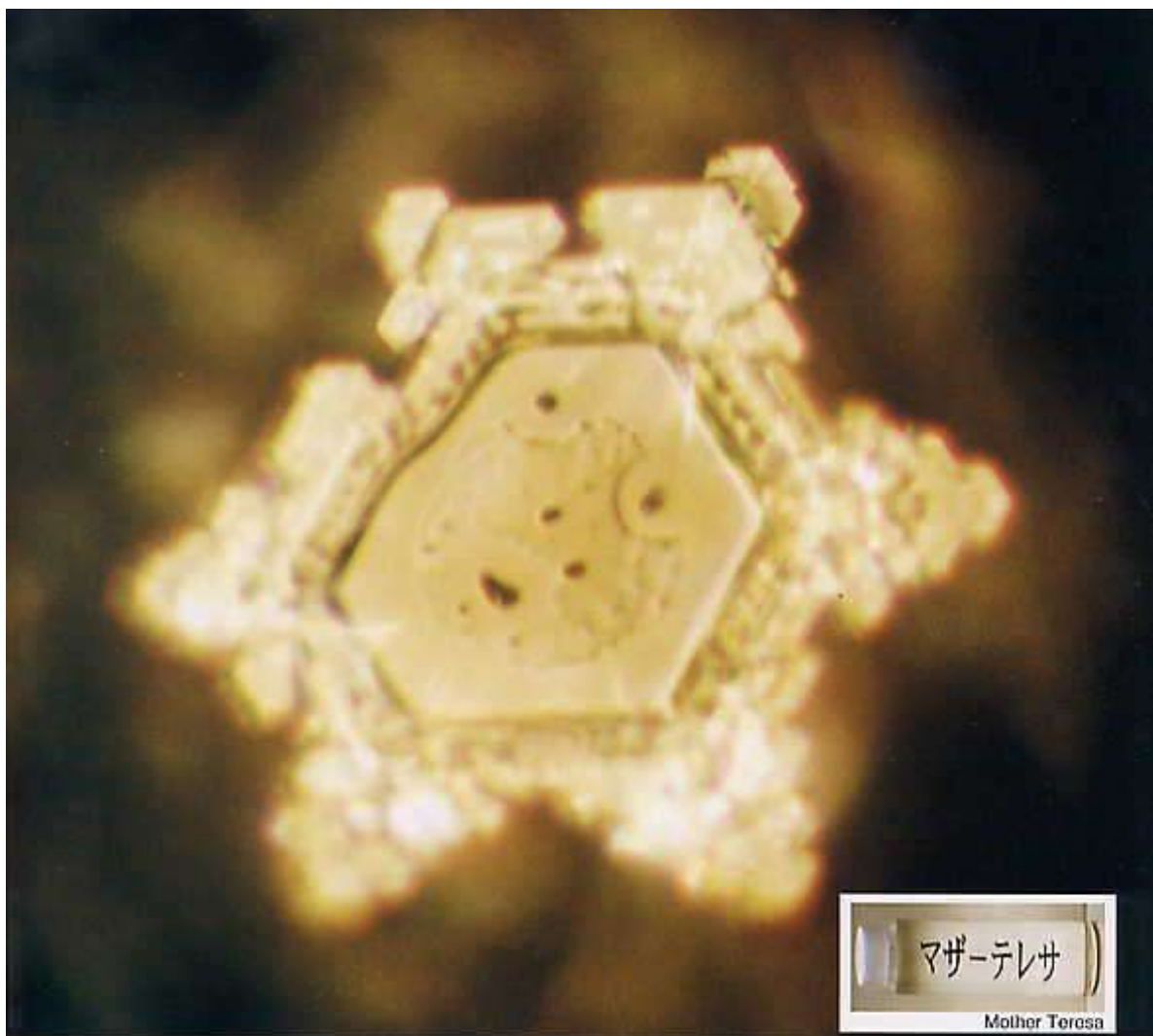


Adolph Hitler

アドルフ・ヒトラー

大量殺戮を繰り返した「ヒトラー」の文字を見せた結晶は「ムカツク・殺す」の場合と似ています。しかしほんの数枚ですが、右のような写真も撮れました。結晶にはなっていませんが、結晶化しようとしている様子が感じられます。これを見ると世の中には根っからの悪人など存在せず、誰もが良心を持っている存在でないかと思え、希望が持てます。

The crystal of water to which we exposed to the name "Hitler," looks like that of the water that we exposed to the words "You make me sick" and "I will kill you" too. However, we also had a few pictures like those shown right (though the number was small). The sample did not form a complete crystal, but it seems like it is trying to crystallize. When we look at this, we can infer that there are no truly wicked persons in humans because everyone has conscience.



Molhor Teresa
マザーテレサ

世界中の人の応援を受けて、インドで一部の恵まれない人々のために、真誠の一生を送った方。ノーベル平和賞をうける栄誉を博しました。テレサさん、若いころにはこんなお顔だったかも……。

She is a person who devoted her life to the underprivileged people in India and has received support from all over the world for her efforts. She was also honored to be awarded The Nobel Peace Prize. Mother Teresa may have looked like this when she was young.



基本の水(精製水)
The basic (distilled) water

Placing Water on a Picture

水を写真の上に置いたら……

文字ではなく、水に写真を見せたらどうなるのかという実験です。
幼い子どもの笑顔の写真の上に、基本の水を置いて変化をみました。
結晶の枝の部分が大きく元気に伸びている様子は、見る人をホッとさせてくれます。

This is an experiment in which we exposed water to pictures instead of to words. We placed a picture of a toddler's smiling face on a sample of our basic distilled water. The branch part of the crystal stretches out energetically. People have commented that it gives them the impression of being relaxed.



写真の上に水を置いて
Place water on the picture



基本の水(精製水)に無邪気な子どもの写真を見せたら
Water crystal after exposing the picture of the innocent child to the basic (disabled) water

Chapter 3 Masaru Emoto/The World of Water Spreads Afar

What Is HADO/Chi?

All substances are composed of combinations of atoms. Atoms are composed of electrons and an atomic nucleus. Because electrons are negative and the atomic nucleus is positive, electrons orbit around the atomic nucleus at an ultra high speed and emit unique, faint vibration waves. This is what we call HADO.

The HADO moves around at an intense speed by electrons electrically pulling against each other. This motion forms a pattern (Magnetic Resonance Field), of which there are not two alike. This is what is called "Chaos" in modern science.

There is regularity in the atomic nucleus level, but the elementary particle that is found in atoms has no regularity in modern science. The reason is that it changes according to the consciousness of observers, by the way they see things. The world of the neutrino is at the same consciousness level as that of human beings.

That is why the root level of matter depends on people's consciousness.

Despite the fact that HADO is a very important phenomenon, it has been neglected in the development of general science, simply because it is invisible. I am an outsider. I am not in a professional position. So I am actually at an advantage, and I could obtain the idea to try to put HADO energy into "a visible form by using water crystals as material and canvas."

When we apply the principle of the intensity of wave motion for instance, the health and stability of a creature's mind (good or bad) as well as the condition of the water can affect the process.

HADO is the minimum unit of invisible energy. Sound and electricity also have HADO.

Try to remember back to the tuning fork experiment that you did in your science class in junior high. You placed two tuning forks of the same frequency in line and then sounded one tuning fork. The sound was transmitted to the other tuning fork and resonated without making contact. This is called resonance.

This method of energy transmission through resonance is used in televisions, radios and cellular phones.

There are many things around us that actually make use of HADO technology.

「波動」を測定する機械「MRA」

それぞれの物質がもつ、固有のエネルギーパターンをコード化し、共鳴するかしないかを調べることによって、さまざまな波動の状態を測定することができる機械が、12年ほど前にアメリカで開発されました。波動の測定を可能にしたその機械の名前は、「MRA = Magnetic Resonance Analyzer (共鳴磁場分析器)」といます。

そしてそれを日本にはじめて持ち込んだのが、私こと江本壽です。

ここで「水が情報を記憶する」という技術と、私たちが研究してきた「波動」技術がドッキングしました。そして「波動と水」の研究をはじめて、すでに11年の歳月が過ぎ、11冊の本を出版し (6ページ参照)、なかにはベストセラーになるなどの経験もさせていただきました。

Measuring Machine of "HADO"

A machine, "MRA (Magnetic Resonance Analyzer)," which measures various states of HADO, encodes the unique energy pattern of each substance and checks whether it resonates or not, has been developed in the USA for the first time in the world 12 years ago.

This machine that makes the measurement of HADO possible is called the Magnetic Resonance Analyzer (MRA).

The saving/storing information and the wave motion technology that I had been doing research on united.

In the 11 years since I started my research on "HADO and Water," I have published 11 books, some of which have become best-sellers.

(Please refer to page 6.)

'Transcript Technology' that Changes Water Artificially

Development of Technology of Transcribing HADO

Mr. Yukio Funai, mentioned on page 133, added the spirit of love to water in his own way for transcription. I didn't think another layman like I could do such a thing.

HADO measuring instruments, including the MRA (currently, there are many types of HADO measuring instruments, including some domestic models), have HADO transcribing functions. The measurement first starts when the MRA puts out a faint resonance magnetic field, which is then transmitted to the subject and substances to be measured. Then the existence of resonance is checked. By amplifying the output of the measuring instrument HADO information can be transcribed.

The information is transcribed on to water because water has the highest retention capacity of information.

We also tried transcribing and photographing an immunity code (HADO information of normal immune strength) on to tap water and dam water with the MRA. After taking many crystal pictures we confirmed that crystals of water that have a high immune strength always have a firm tortoiseshell form.

It was made clear that when we transcribed the same information on to the same type of water, we obtained crystal pictures that had the same tendencies.

We were able to prove that a big change could be seen in pictures of water crystals that we had taken when no change was evident after the same crystals were studied through conventional scientific analysis methods.

We hear that trees at the upper reaches of the Amazon River are being logged for their potential cure-all effects as drugs. This transcription technology is approved by people. However, if those same people were to understand the effects of transcribing this kind of information, I know that it would help them to affect environmental protection laws. I wish such day will come soon.

品川区の水道水に 免疫情報を転写

東京の品川の水道水に、MRAで免疫のコード・波動情報を転写して、水の変化を撮影しました。左の基本の水は東京の水道水ですが、結晶にはほど遠いグロテスクな状態です。それが同じ水とは思えないほど明らかに変化しています。

このような変化が見られる理由としては、何らかのエネルギーが水に加わったと考えるのが自然です。それが私たちがいう「波動」。しかもMRAという波動測定器から発せられるエネルギーパターンには類似性があり、ある程度同じような形の結晶が得られるということも付け加えておきます。

たとえば免疫波動を転写して、何種類もの水で調べましたが、123ページのカルチャー200に見られるように、典型的な免疫の形である、素晴らしい亀の甲型の結晶が得られています。



免疫情報を入れる前の品川の水結晶
Tap water in Shinagawa before giving immune information

Transcribing Change and Immune Information on the Tap Water of Shinagawa-ku

We took a picture of change occurring in water by transcribing the HADO information of an immune code with the MRA on to a tap water sample from Shinagawa, Tokyo. The unaltered water on the left is the tap water of Tokyo. Its crystal formation is so grotesque. This second picture shows change to such an extent that it cannot be believed that it is the same water as was used for the first crystal.

It is natural to think that some kind of energy was applied to the water for such change to take place. This is what we call HADO. I would like to add that there is a similarity in the energy patterns emitted from a HADO measuring instrument, the MRA, as shown by the fact that the 2 crystals are of the same shape to a certain degree.

For instance, we transcribed an immune HADO, and did a survey using many types of water. As can be seen in culture 200 on page 123, we were able to obtain a wonderful tortoise-shell shaped crystal.



免疫情報を入れた後の品川の水
Tap water of Shinagawa after giving immune information

The Micro-cluster Water of Dr. Lee H. Lorenzen

All for His Wife

The person who first introduced me to the idea of doing research on water (and who I still receive guidance from) was Dr. Lee H. Lorenzen. He is a recognized authority who has directed his attention to the study of micro-clustered water's information retaining and storing capacities and has proven much of his research scientifically.

Dr. Lee H. Lorenzen is a son of an obstetrician and gynecologist. He was among the students who participated in the Marine College which is a college that provides courses to its students while they travel around the world for a few months. During the voyage, he fell deeply in love with another student (the daughter of Attorney General in the Reagan administration). They had their very first date in Kobe, Japan. They got married but his wife had been weak.

He tried to do everything that he could including visiting many hospitals in search a good doctor to treat her. She would not recover from her illness despite his efforts. One day his attention was directed to the fact that water accounts for 60 to 70% of the human weight.

How about changing the water in the body?

He started developing water for his beloved wife.

What is Micro-cluster Water?

Water normally is not composed of independent molecules, but rather they are hydrogen bonded to form small water particles called clusters.

When you align these water molecules and make them smaller it is called clustering.

Clustered water can easily make sharp turns and subsequently can reach far into the corners of the body. Its absorption power in the cells is very high.

Water that can be used in biology, science and agriculture is generally called "Functional water/HADO water."

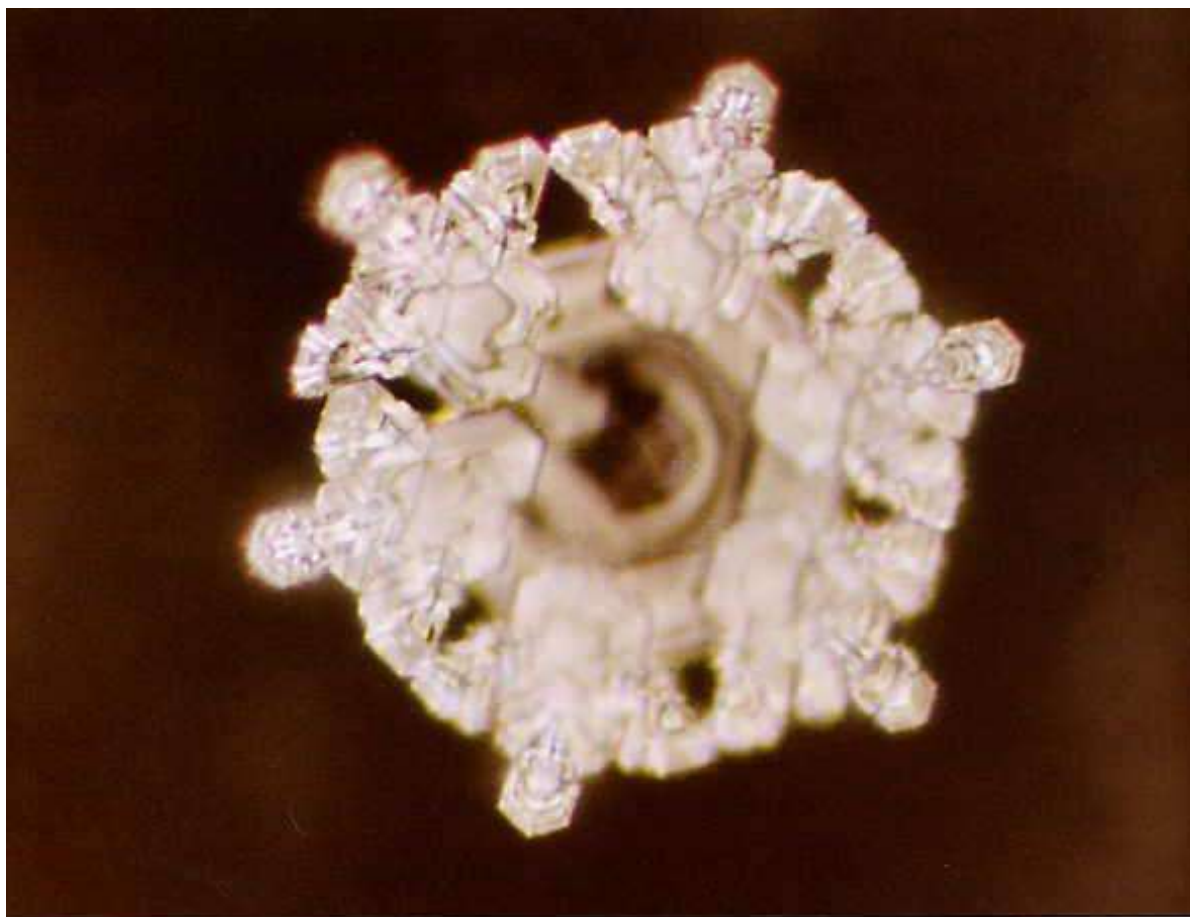
As a result of our research, he has succeeded in making water more powerful circulating distilled water through a laser beam while adding a special magnetic field. He also established a method of printing and transcribing the information that a certain substance has.

In January, 1998 in the USA, a patent was obtained for water to which this information is transcribed, and it is called Micro-cluster water.

Water carries information and at the same time has a transporting role. So good water means "Micro-clustered water that can retain information is good for the body and transport the information to the necessary places." This is what we mean when we say, "Good water pervades in five viscera and six entrails".

With the development of this water by Dr. Lorenzen, his wife recovered her health.

"Micro-cluster water", developed by Dr. Lee H. Lorenzen, has undergone various clinical experiments with the cooperation of doctors in Mexico and USA, and is achieving many good results. If research in this field progresses, the 21st century will be an age where "Water lives in symbiosis with medicine."

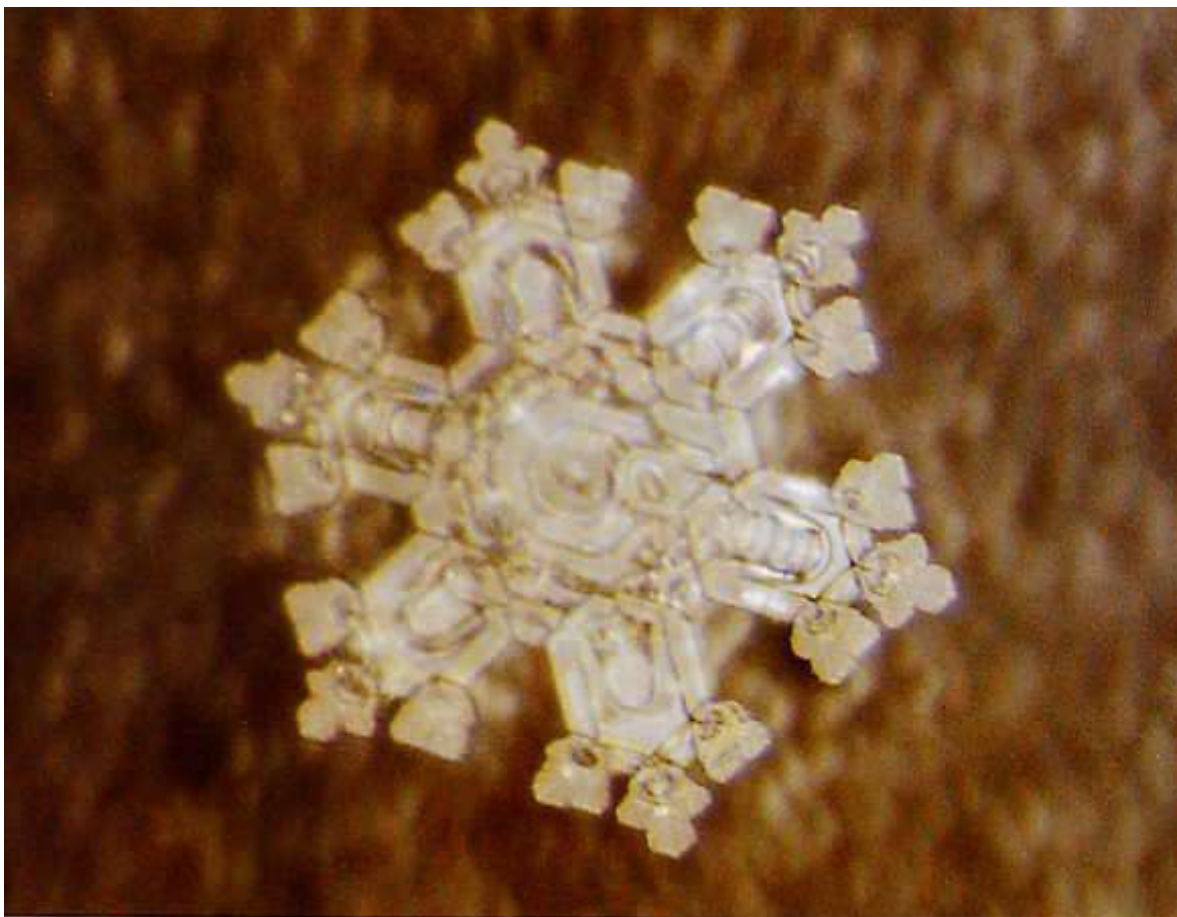


Micro-cluster Water/Culture 200

マイクロクラスター水・カルチャー200

リー・H・ロレンツェン博士が開発した水のひとつ。コーカサス（ロシア南部）地方は世界的に長寿村として有名で、100歳を超える人々が多く住んでいます。長寿の要因のひとつと言われ、彼等が受飲している山羊の乳からつくった乳酸菌飲料の情報を転写したもの。この乳酸菌（ケフィア菌）は移動させると菌の性質が変わってしまうのですが、その情報だけを取り出して転写すれば、同じ効果が得られます。この情報を転写した水の結晶写真は、非常に形の整った基本的な亀の甲の形をしています。つまり免疫の形である六角構造で、情報をしっかり保持していることを現わしています。200倍に希釈して飲みます。

This is one of the kinds of water developed by Dr. Lee H Lorenzen. The Caucasus region of southern Russia is world famous as a region where many people live to an advanced age. There are many people there who are over 100 years old. This is a picture of water crystals transcribed with the information from a lactic acid drink made from goat milk that they habitually drink. This lactic acid (Kefia bacteria) changes its property when it is transferred, but if we take out only its information and transcribe it, we can obtain the same effect. A crystal picture of water transcribed with this information has a very organized and basic tortoise-shell shape. In other words, it is of a hexagonal structure, an immunized shape, and shows that it retains information well. For drinking, it is diluted by 200-fold.



Micro-cluster Water/Andes 400

マイクロクラスター水・アンデス400

アンデス（南米）地方に自生し、万病に効くという「キャッツクロー（=クラクラ）」という樹の樹液エキスの情報を、レーザー処理して転写した水の結晶写真です。

基本の水は蒸留水ですが、見事に整った美しい形に変化しています。

ちなみに400の意味は、400倍に希釈して飲む飲み方を示しています。

This is a picture of water to which the information of a resin extract called Cat's claw (Kurakura) is laser treated and transcribed. Cat's claw naturally grows in the Andes region of South America and is an effective treatment or panacea.

The initial water sample was a distilled water but its crystal has changed into an organized beautiful shape.

The word 400 means that for drinking it is diluted 400-fold.

埼玉県・ちちぶ湖 二瀬ダムの水に 波動情報を転写

現在のダムは、どこもよんだ水にアオコが多く、酸性化が進んでいます。ダムは、本来滔々と流れているはずの水を溜めているという不自然な状態にあります。

ここでは、ダムの周辺の生体系を壊し、酸性化したまま下流に流れていく水によって、周辺の汚染がすすみ、自然破壊に向かっていくしかありません。

とにかくダムの水を良くしたい……と思い、ダムの水に必要な波動情報を転写すると、美しい結晶がとれました。

大きな転写装置をつくり、発展させれば、ダムの水も良くなるはずだと確信しています。

ところで、ダムの結晶写真を撮影中に、思いがけない写真が撮れました。

次ページの写真は5秒ごとにシャッターを切ったものですが、連写をはじめたときの写真と、5秒後の写真で、緑の部分と赤い部分が、反転しています。

これがどういう意味をもっているのか、今のところよくわかりません。

将来への課題としたいと思っています。



ダムの源水
Source water in dam



転写後
After transcription

Transcription of HADO Information onto Futase Dam of Chichibu Lake, Saitama Prefecture

Most of the present dams are stagnant where many Aoko (blue green algae) live and acidification at these dams is progressing. The dam stops water from flowing swiftly, thus keeping the water in an unnatural state. This disrupts the ecosystem on the periphery of the dam. The water then flows down river in an acidified form, contaminating the vicinity and destroying nature.

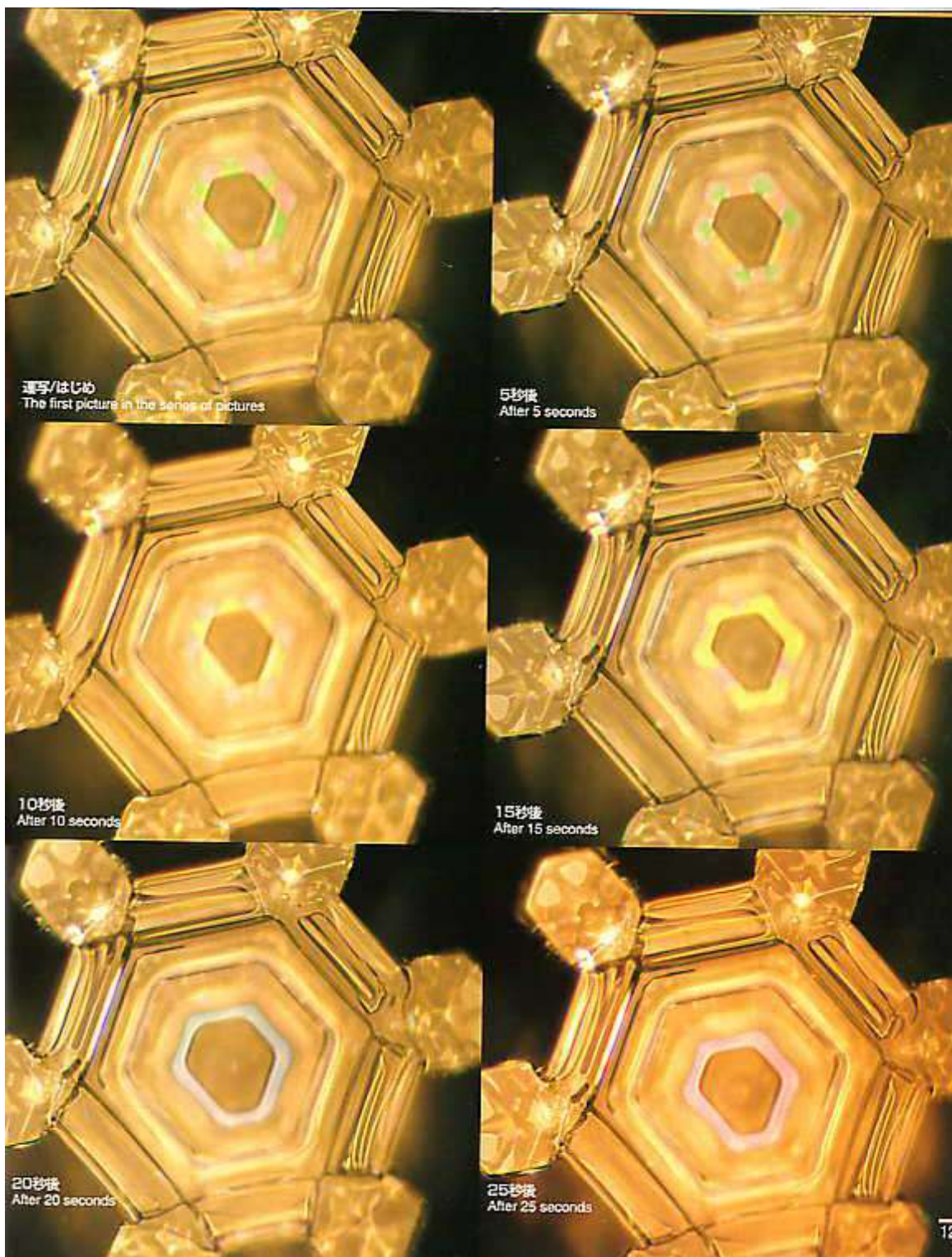
While harboring earnest feelings for its improvement, we transcribed the necessary wave motion to the dam water. As a result we came out with a picture of a beautiful crystal.

We are confident that if we make and develop a large transcribing device we can improve dam water.

By the way, during the photographing of the dam crystal pictures we also came out with an unexpected picture.

The pictures on the next page were taken every 5 seconds and you can see that the first picture and the picture taken 5 seconds later have reversed red and green areas.

We do not know what this means but this will be a future topic of study for us.





カモミール
Camomile

Transcribing Aromatherapy Oil Information on Water
Camomile Water and Fennel Water

アロマオイルの情報を 水に転写

～カモミール水、フェンネル水～



アロマオイルを水に転写中
Transcribing aroma oil to water



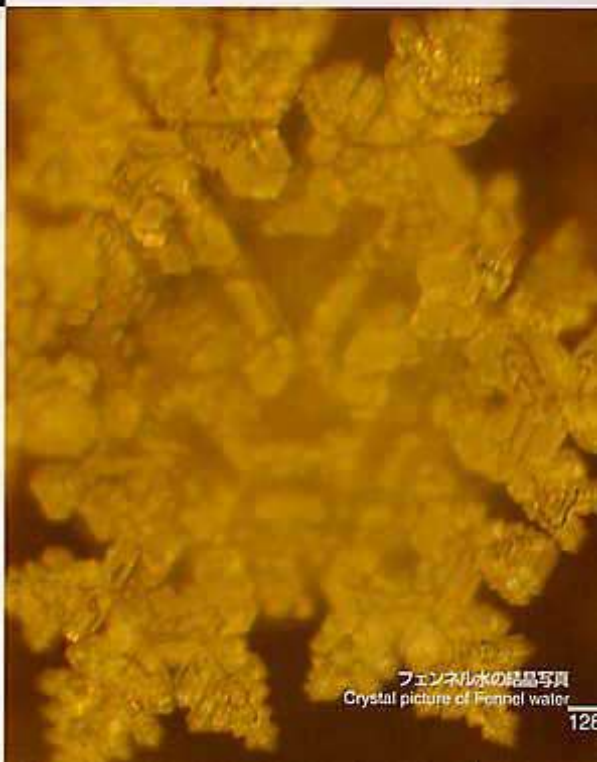
カモミール水の結晶写真
Crystal picture of camomile water



フェンネル
Fennel

アロマオイルのもっている波動情報を、水に転写して凍らせ、結晶写真にしたものです。
アロマオイルになる前の、もともとの花によく似た結晶が得られ、とてもびっくりしました。
結晶というものは、その物質がもつ形の相似性といえるのかもしれない。

HADO information that aromatherapy oil contains was transcribed to a water sample and was frozen before taking the crystal's picture.
We were surprised to obtain a picture of a crystal that is similar to the look of the flowers that the different aroma oils were made from.
These crystals may resemble the shape of the substance.



フェンネル水の結晶写真
Crystal picture of Fennel water



人の意識で変わる水

水は人の意識を写す

「水に文字を見せる」という試みは、私たちの予想を超える成果をもたらしてくれました。ここまで、水に音楽を聴かせたり、文字を見せたり、名前を見せたりしてきて、非常に楽しい体験をすることができました。

この実験の成果によって、文字や写真という「形」によっても情報が伝えられるという仮説が得られたように思います。

結晶がここまで大きな、はっきりとした変化を見せてくれるとは予想できませんでした。水が情報を記憶し、伝えることができるということがわかってきたのです。

このような結果を得ると、どうしても人の意識が水にと

のような変化を与えるのだろうか……という領域に踏み込みたくなってきました。

それは、じつは4年前の悲しい、つらい出来事からスタートしました。あの阪神・淡路大震災の直後、私の手元に送られてきた神戸の水の結晶写真は、大いに人の意識を内在するようなものであったからです。その証拠に3ヵ月後には、同じ神戸の水が劇的に変わってしまったからです。

人の意識によって、変化した水の結晶写真をご紹介します。

Water Changed by People's Consciousness

Water Reflects People's Consciousness

Our attempt at exposing water to language had greater results than we had expected. So far, we had very interesting experiences with exposing water to music, to language and to names. With the results of this experiment, we were able to formulate a hypothesis that information can be transmitted through "Shapes" such as words and pictures.

We did not expect though, that the crystals would show such dramatic and clear changes. We have become aware that water stores and transmits information.

After obtaining results like this, we could not resist stepping into the territory of human consciousness? We wanted to find out what kind of change thought could cause.

The idea started after a sad and painful experience that we had four years ago. Immediately after the Great Hanshin-Awaji Earthquake, the crystal pictures of the water from Kobe had something greatly inherent in human consciousness. To prove this, 3 months afterwards, the water in Kobe changes greatly.

We would like to show the crystal picture changed by people's consciousness.



震災直後
Immediately after the Great Hanshin-Awaji Earthquake



震災3ヵ月後
3 months after the Earthquake

The Great Hanshin-Awaji Earthquake and Tap Water 阪神・淡路大震災と水道水

1995年1月17日、阪神・淡路地方を襲った大震災の3日後、神戸で採取した、たまたま出ていた水道水の結晶写真です。

震災直後の人々の「恐怖やパニック、深い悲しみ」を水がキャッチしたかのよう……。結晶はメチャクチャに壊れ、見る人の気持ちまでゾッとさせるような写真になりました。あまりの悲惨さに、公開はできないと思いました。

ところが3ヵ月後……。打ちのめされた神戸の人々に、世界中から援助の手が差し伸べられ、世界中の人が思いを寄せました。暴動が起きなかったことで、思いもかけず、日本人はすばらしいとさえいわれました。

山のように積み上げられたガレキのなかで、人々は人間のやさしさ、温かさを取り戻すことができた……。そんな思いや願いが重なる結晶です。

On January 17, 1995, the Great Hanshin-Awaji Earthquake occurred in Kobe. Three days afterwards we took pictures of the crystals found in the tap water in Kobe (that was available at that time). It is as if the water captured the fear, panic and deep sorrow of the people immediately after the earthquake. The crystals were completely destroyed. It was a picture that made people shudder.

We felt that we could not make this public because of the horror of its extreme misery.

However, 3 months after that... Helping hands and sympathy from all over the world were given to the people of Kobe. Also since no riots occurred the people of Kobe were praised by many people.

Although the rubble piled up high, people were able to restore their environment due the kindness and warmth of others. This crystal seems to have collected these feelings also.

500人の『愛の気・言魂(言霊)』 を受けた水

日本全国にいる500人の波動インストラクター（私が主催する波動学の卒業生たち）に手紙を出しました。

1997年2月2日午後2時、オフィスの私の机の上に、東京品川の水道水を入れたコップを置いておきます。それに対して、みなさんの想いを発信してください。

もちろん、この水が良い水になるように。「水がきれいになりました。ありがとうございました」という願いを込めて、各地から、同時刻に、愛の「気・言魂」を送ってください。

こうして、全国から愛の「気・言魂」を送ってもらった結果の結晶写真（右ページ参照）です。もちろん、物理的な変化は何ひとつ加えていません。

予想はしていたものの、これほど見事な変化を得られたことに対して、撮影班一同、感動を通り越して涙がこぼれそうになってしまいました。



▲元の水 東京品川の水道水 前日撮影
Original water

The picture of tap water in Shinagawa, Tokyo taken the day before

改めて協力していただいた全国の皆さんに感謝します。そして、人の想いのパワーは、距離に関係なく届くと思えるようになったのです。

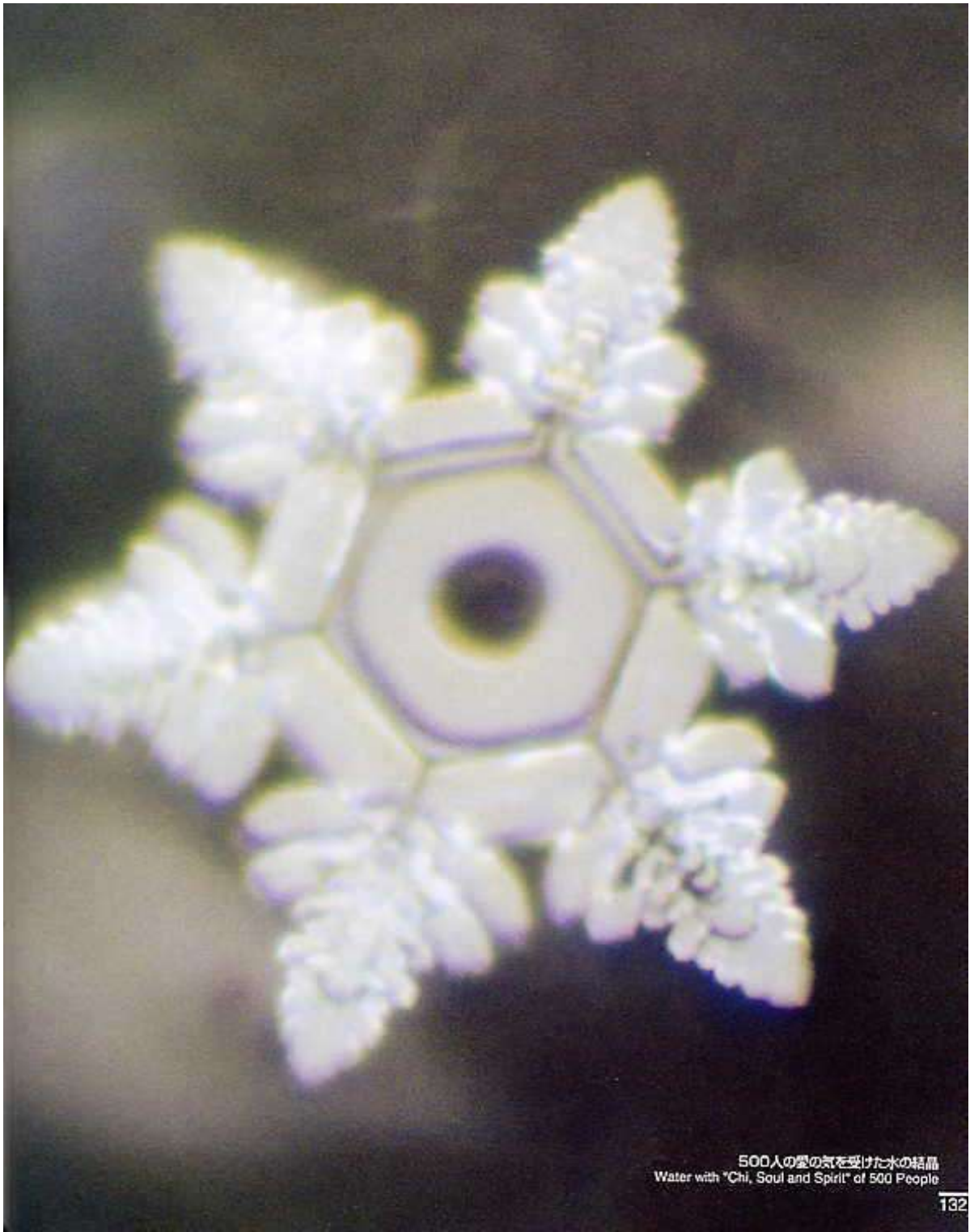
Water with "Chi, Soul and Spirit" of 500 people

I sent letters to 500 HADO instructors across Japan (graduates of my HADO study). "At 2:00 on February 2, 1997, I will leave a cup containing the tap water of Shinagawa-ku on the table in my office. Please transmit your feelings to that water at the same time from all over Japan. Of course, for the water to become a clean water, please send "Chi and Soul" of love and the wish that the water should become clean. Thank you very much."

In this way, water received "Chi and Soul" from all over Japan. And this is the picture of crystal we obtained. (Please refer to the right page.)

Of course, no physical change was made.

We had not expected it but were able to obtain a clear change in the condition of the water. All of the staff were so impressed that they were almost ready to cry. We feel deeply appreciative of all those who cooperated with us from all over Japan. We started to feel that people's thoughts could be gathered regardless of how far apart they are.



500人の愛の気を受けた水の結晶
Water with "Chi, Soul and Spirit" of 500 People

船井氏の愛の気を受けた水

東京品川の水道水に、日頃からご理解をいただいている船井総合研究所の船井幸雄先生に、「愛の気」を加えていただいた水の結晶写真です。当然良い結晶がとれるという想いはありましたが、正直、もともと水道水だから……これほどきれいな結晶が得られるとは思っていませんでした。

この結晶は、それまでのどの映像よりも美しいものでした。人間の意識が、浄水器などの機械を使うより、はるかに素晴らしく、緻密で美しい結晶をつくる水に変化させることができたのです。

Water with Mr. Funai's "Chi of Love"

This is a picture of a crystal of a tap water sample from Shinagawa-ku, Tokyo, that Mr. Yukio Funai of Funai Consulting Co., Ltd., (a supporter of our research) applied "Chi of Love" to. I felt without doubt that we could obtain well-formed crystals. However, because it was originally only ordinary tap water, we did not really expect that we could obtain such a beautiful crystal.

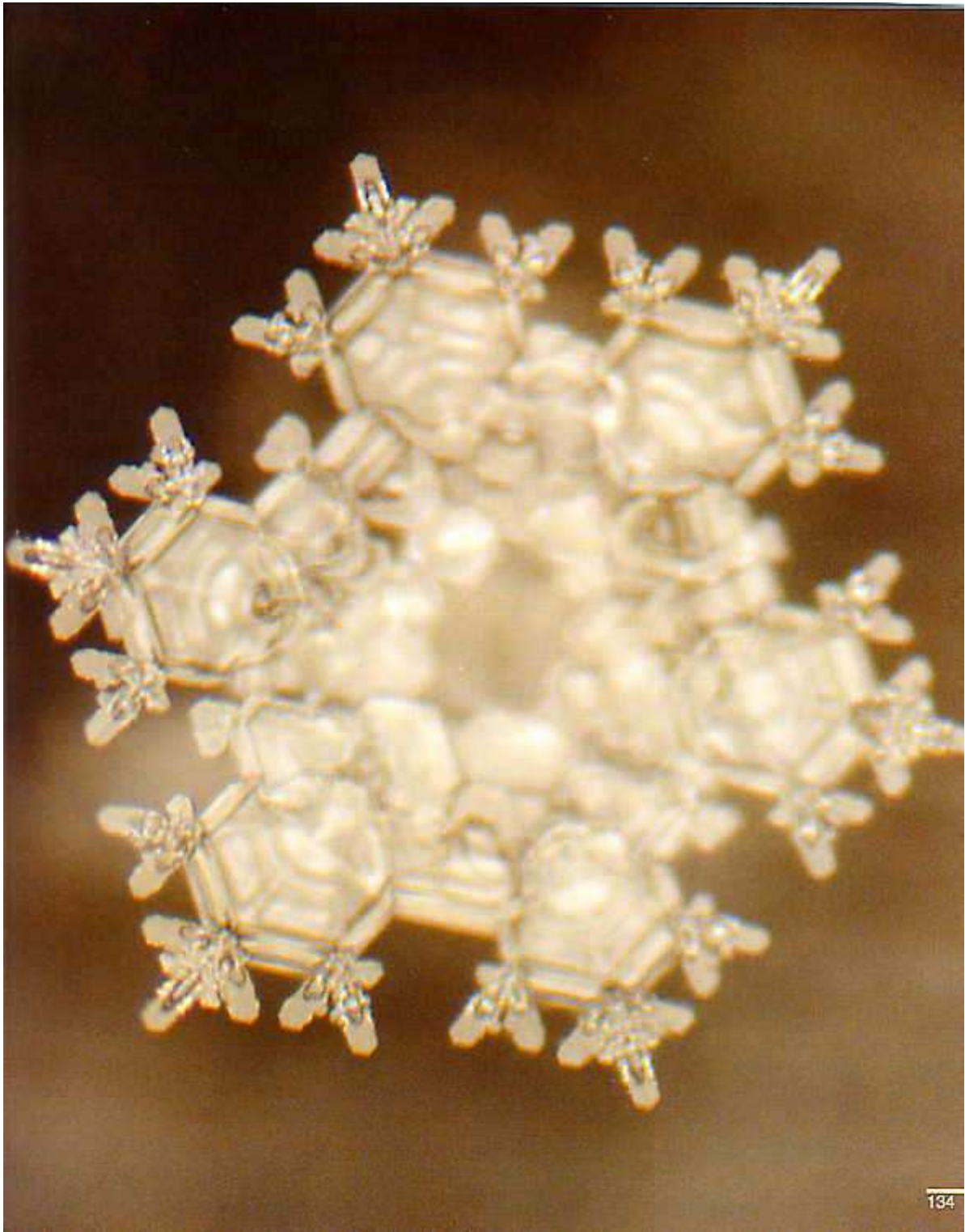
This is called, "Water is the mirror of mind."

If this is possible, then it could also be possible to change controversial tap water to a beautiful crystal through the conscious thought of human beings. And this fact seems to indicate that our actions and words make water more beautiful and cleaner.

水は心を反映させる……「水は心の鏡」という昔からある言葉を証明する結晶写真になったと思います。

これが可能だとすれば、心配されている水道水を、それを扱う人の意識によって、ここまで美しい結晶ができる水に変えることも不可能ではありません。

そしてこのことは、人間がちょっとした行為や言葉で、水を美しく良い水にすることができるに違いないということも教えてくれているような気がします。



水と言魂について

人の意識と結晶

最後にひとつ。これは群馬県の上野原町にある藤原ダムで行われた、大宮市寿宝院の加藤宝喜住職の「言魂による水の浄化実験」の結果得られた結晶写真です。

日本では古くから、言葉に魂が宿るといわれ、言魂（ことだま）の考え方は広く浸透しています。

実験前のダムの水の結晶写真は、なんともおぞましい限りで、もたえくるしむ人の顔のようにも見えます。この日、加藤住職は、ダムのほとり、約1時間にわたって、加持祈祷の業を行われました。業が終了して、しばらくした後、その場に立ち合った私たちが肉眼でもわかるほど、ダムの水が見る見るキレイになりました。これを目のあたりにして、非常にびっくりし、たいへん感動しました。

さらに結晶写真ではどうだろうと、期待を込めて持ち返



祈禱前の藤原ダムの結晶写真
Water crystal of Fujiwara Dam before offering a prayer

って撮影したものが、表紙でもご紹介している結晶写真です。

今までにこれほど美しく、本当に光り輝くエネルギーを発している写真は見たことがありません。六角構造の中に、さらに小さな六角形があり、その回りを取り巻く光のオブジェは、オーラでもあり、中央の三日月型の部分は、まるで後光が差しているかのようでもあります。

人の意識に基づく言魂のエネルギーの計り知れないパワーを感じさせる写真であり、人間の愛や感謝に基づくエネルギーと水とが調和したとき、とてつもなく素晴らしいことが起こるのではないのでしょうか。

Water and Soul

People's Consciousness and Crystals

Lastly, this is a picture of a crystal of water obtained as a result of a water purification experiment "through soul" by Reverend Kato Hoki, the chief priest of Jyuhakuin Temple, Omiya City. The experiment was conducted at the Fujiwara Dam in Minakami-cho, Gunma Prefecture. In Japan, it is widely believed that the soul dwells in the spirit which is present in words.

The picture of the crystal of water before the experiment, is indeed horrifying and in fact has the appearance of the face of a person who is suffering great agony. The day of the experiment, Reverend Kato, performed a prayer practice for 1 hour beside the dam. Moments after the practice ended, the dam water became visibly beautiful. We observed this with our own eyes and were very astonished as well as very impressed. How does the crystal picture look? We took pictures of the crystals with great expectations and we obtained crystal pictures as beautiful as the one on the cover.

We have never seen a beautiful picture that emits brilliant energy as much as this one does. Amidst the basic hexagonal structure, there is also a small hexagon. This hexagon is an object d'art of light that is surrounded by an aura. The crescent portion at the center also seems to have a halo around it.

People say that this picture makes them feel an immeasurable amount of power and energy in their soul based on people's consciousness. When energy based on people's love and appreciation harmonizes with water, why should such a wonderful thing seem so unreasonable?



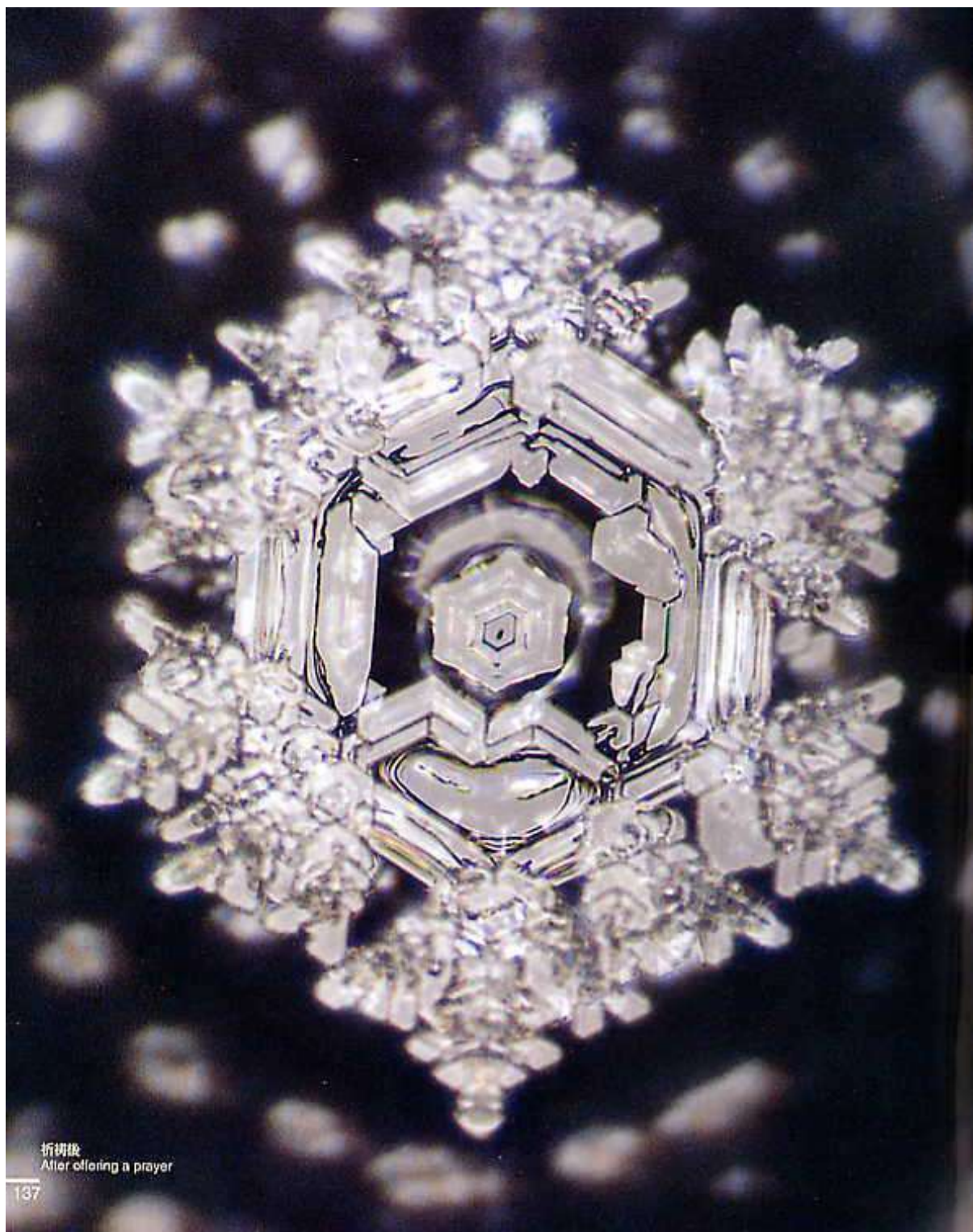
祈禱前ダムに波かえる
Waving water in dam before praying



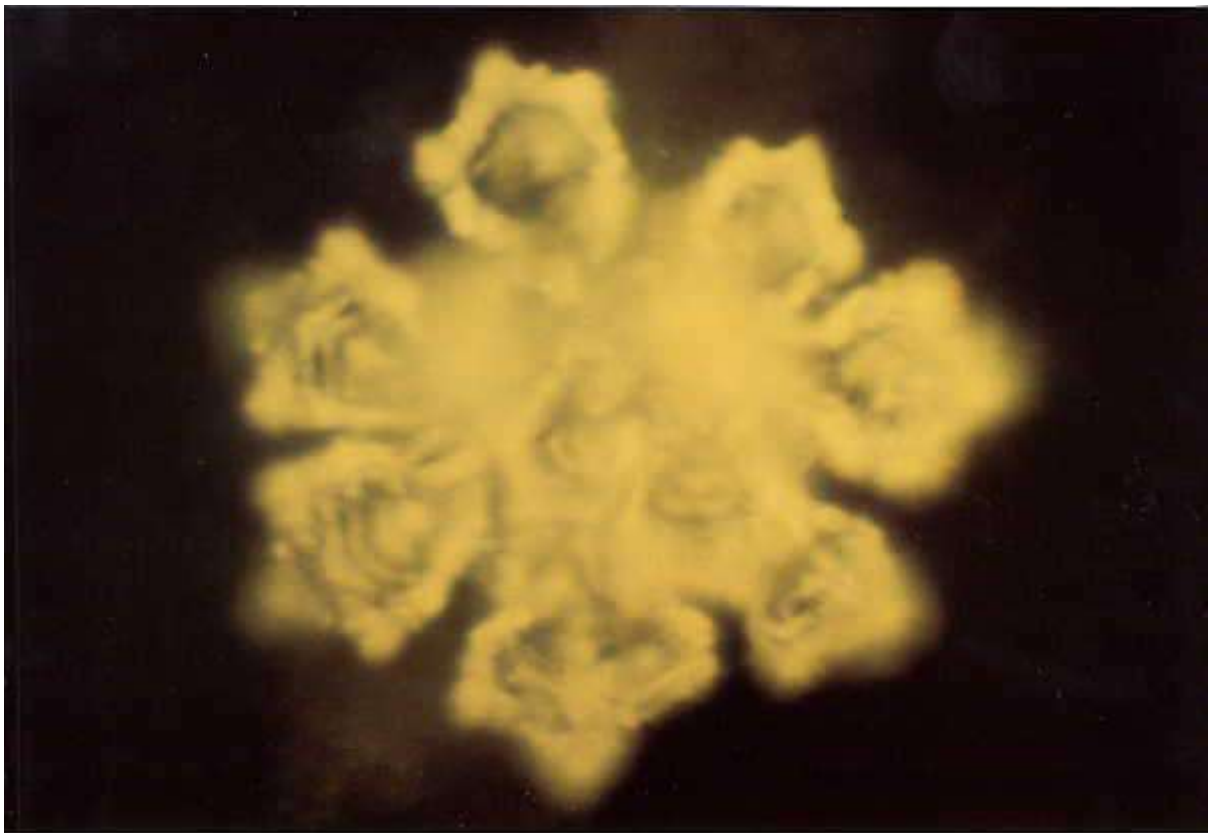
祈禱後に波が静止した
Still water in dam after praying



祈禱後湖水がきれいになり
Water of the lake became clear after praying



折镜般
After offering a prayer



We Could Take a Heptagonal Crystal Picture

七角形の結晶写真が撮れました！

加藤住職の祈祷のときの藤原ダム水を滴下して撮影すると、ほとんどが表紙と前ページのような素晴らしい写真になりました。

さらにその中に数枚、不思議な写真が撮れました。その1つをご紹介します。

美しさの点では、表紙の写真にまさるものではありませんが、よく見ると、なんと六角形ではなく、七角形になっ

ているのです。今までに七角形の結晶は一度も撮れたことがありません。加藤住職は七弁財天さんをお願いをされたのだとか。

水はいろいろの伝言をもたらしてくれていますが、伝言を聴くわれわれ人間の方が、大いに勉強する必要があるようです。

We were taking pictures of the dripping water of Fujiwara Dam while Reverend Kato was giving prayers. During that shoot we obtained pictures of crystals as wonderful as those on the cover page.

Among them, we were able to obtain a few mysterious pictures of which this is one.

In terms of beauty, there is nothing that compares to the one on the cover. Take a close look and you will be astonished to find that it is not a hexagon but a heptagon. We had never been able to obtain a picture of a heptagonal crystal before this experience. Reverend Kato said he prayed to the Seven Benzaiten (Goddesses of Fortune).

Water has a variety of messages, but it seems that we have a lot to learn from messages we receive.

水は宇宙から来た？

水の不思議は深まるばかり

結晶写真による水の評価方法は、従来の科学的な分析評価法とはまったく違う視点からの新しいアプローチです。

そして実験を続けてわかったことは、「水」に関しては私たちはやはり、まだほとんど何もわかっていないということ。

疑問や課題がどんどん拡がっています。

まず地球上に存在する水。

この水はなぜあるのでしょうか。水の起源については、今まで謎に包まれていました。しかし宇宙探査が進んでくるに従って、かつて火星にも水があったらしいことも確認されています。水は少なくとも地球固有のものではなく、宇宙にくまなく存在することがわかってきたようです。

Water Came from the Space?

The Wonders of Water Become Even Deeper

Evaluating water by taking pictures of water crystals is a new approach that comes from a completely different viewpoint than that of the usual conventional scientific analysis and evaluation methods.

What we learned from these experiments is that we do not know anything about water.

More questions and issues pile up one after another.

Let's start with the questions about the water that exists on earth.

Why does water exist? The origin of water used to be wrapped in mystery.

As the space probe advances, it has already confirmed that water exists on Mars. We are starting to understand that water is not unique to earth but exists all over space.



▲1997年6月2日(月) 朝日新聞記事より
Article from the Asahi Shimbun, Monday, June 2, 1997

海の源は「星」だった

米のイェール大学研究所は、自ら採集した「ヘル・ボップ」と呼ばれる隕石から、水の起源は地球に落ちた隕石から来たという発見を明らかにした。隕石中の水素の同位体比率が、地球上のものと一致していることが、この発見の鍵となった。同研究所は、この発見が、地球の水の起源を明らかにする上で重要な一歩を踏み出したと見做している。

ハワイ大が発表
「重水素の率近い」

地球に落下、海水の源に

この発表については、地球に落ちてきた隕石が、地球の水の源であるという説が有力だと見られてきた。しかし、この説は、隕石中の重水素の比率が、地球上のものと一致していることが、この発見の鍵となった。同研究所は、この発見が、地球の水の起源を明らかにする上で重要な一歩を踏み出したと見做している。

▲1997年8月24日(日) 毎日新聞記事より
Article of the Mainichi Shimbun, Sunday, August 24, 1997

1997年のマスコミ報道より
「水は宇宙の果てから飛来した」

アメリカ航空宇宙局・NASAは1997年の5月「宇宙から、地球の大気に向けて雪の玉のような微小天体が無数に飛来しているとみられる現象を、はじめて観測した」と発表しました(139ページの右上の記事写真参照)。この発表はNHKのニュースや全国紙でも取り上げられました。

「この雪玉は直径10数メートルの小さい彗星のような天体とみられ、毎日数千も飛来するが、地表に近づくにつれて分解し、やがて雲の一部になる」……とあります。

つまり「宇宙から毎日、雨が降っている」ということです。この「宇宙からの雨」の量は年間にしても極くわずかな量ですが、地球の誕生から46億年間降り続いたとすれば、海の水の源になり得る量です。

さらに、この「宇宙からの雨」は有機物も含んでいて、これこそが地球上での生命誕生の源ではないか……とのこ

とです。同じような研究は同年8月にハワイ大学の天文台からも発表されています(右の記事写真参照)。

だとすれば、水の特異で不思議な性質の謎も解けてきます。水の起源が宇宙にあるとすると、現代の地球

の科学力だけでは解明できないのも無理はありません。人類にとって宇宙は、あまりにも大きく、私たちの想像を絶する世界ですから。裏を返せば、水をもっと深く研究することで、宇宙のこともわかるかもしれないのです。

なんだかワクワクしてきます。

Water Came Flying from the Ultimate Limits of Space* from a Press Report in 1997

"Water Came Flying from the Ultimate Limits of Space." From a Press Report in 1997 the National Aeronautics and Space Administration (NASA) announced in May, 1997, that "We observed for the first time a snowball-shaped microscopic heavenly body flying in numerous numbers toward the stratosphere of earth from space." (Refer to the picture of the upper right article on page 139.) This announcement was reported in the NHK news and in national newspapers.

"This snowball is deemed to be a heavenly body similar to a small comet with a diameter of about dozen meters. About few thousands of them come flying daily but as they come near the earth surface, they decompose and become a part of cloud". In other words, "Rain comes falling from space everyday." This yearly quantity of "Rain from space" may only be a small quantity, but if this has been going on for 4.6 billion years (since the origin of earth) it is large enough to be the source of the oceans.

Furthermore, this "Rain from space" contains an organic substance and this indeed must be the origin of the birth of life. Similar research has been announced by an astronomical observatory at the University of Hawaii on August in the same year. (Refer to the right picture.)

If this is true, the question of the unique and mysterious nature of water can be understood. If the origin of water is space, it is no wonder that its questions cannot be solved by the scientific powers that we have on earth. Space is too big for humans and it is an unimaginable entity. The truth of the matter is that, by researching water more deeply, we may be able to understand more about space. Just the thought is so exciting.

Postscript

What kind of impression did you get from the pictures of crystals?

I am sure that you were astonished to find out that water shows such a variety of crystals due to its environment. Some of you may have asked the question, "Is it true?" And some of you may have believed this without a doubt.

I published this picture book with an earnest intention to propose new ideas. Things that are attempted for the first time always elicit criticism and I published this book well aware of that fact. I think my work started from love for people and for the Earth.

All I ask for is for you to understand the great and secretive aspects of water.

If water originally did not exist on earth and came from far away in space, it means that our existence also have started in outer space.

No one could have any objections to our attempts to study water. In these experiments we have clung to water in an attempt to get more familiar with it, to harmonize with it and understand it. These are all very important things for humans to do.

Therefore, before I started my work I already had possessed one technique. Through practicing health consultation in the past, with a total of more than 10,000 people, I experienced the maintenance of health through water. For this reason, I developed a unique approach toward water. I had many deeply impressive feelings while systematizing and organizing this book.

What is the destination of this chaotic world. What is the origin and history of humans. And how will it be in future? These are issues which everyone must think about very seriously.

I feel that this picture book will serve as a concise text and valuable teaching tool in helping people to keep taking a closer look at water.

I hope that this book creates an opportunity for discussions about water to be raised all over the world and that other countries will join me in trying to do the same thing. To achieve this purpose, this book has been written in English as well.

We will continue publishing, 2nd edition and 3rd editions. I hope to receive opinions and responses from my readers so as to enable the lifting of this research to a higher scientific and philosophical level, and not let it end in mere self-satisfaction.

Lastly, I would like to express my deepest appreciation to Dr. Leo H. Lorenzen who helped to carve my way in my research.

To Mr. Kazunari Ishibashi, Mr. Seiya Sato, Mr. Jun Fumamura and all the old and new staff members of IHM who engaged in this research. To Mr. Tokujiro Kawasaki, a landscape photographer, who takes beautiful pictures of Mother Nature.

To Mr. Shinya Taguchi, the former president of Nichirei Ico Co. Ltd., whose lifework is the positive adjustment of overseas water. Thank you for sending me ice from all over the world.

And to the members of the International HADO Friendship and their HADO instructors, who always supported us in my research. To the staffs of Sun Create, headed by Ms. Tsuneko Narukage, who organized the crystal pictures, so wonderfully.

Masaru Emoto

編集後記

本書には1994年9月からスタートして、1999年4月までに撮影された結晶写真を掲載しました。

編集を引き受けてから、はじめて結晶写真を撮影する冷蔵庫を見せてもらいました。畳1枚分くらいの大きさの頑丈そうな冷蔵庫の片側に机、反対側に冷凍庫があり、その机の上に顕微鏡とくっついた状態のカメラがありました。

冷凍庫の中にはぎっしりとシャーレが詰まっています。

なにより印象的だったのは、冷蔵庫の前につり下げられた厚めの上下のダウンジャケット。もう桜も散って、春たけなわというのに、結晶写真班は年中「寒い、寒い」の連続で越冬が続く、とか……。

ものすごい数の結晶写真は、きちんとデータとして保管され、世の中のため、人類のために役に立つ日を待っています。

とはいえ、世界中で、水を入れたビンに「ありがとう」だとか、「天照大神」なんて、ワープロで打った紙を貼り付け

ようと発想する人は、江本勝氏ひとりだけでしょうね……などと言いつつ、この写真集の第2弾の企画をすすめる編集スタッフたちです。

はじめはふと思いついた……とのことですが、根底に積年の、水に対する深い思いがあつての研究は、素晴らしい仕事で、少しずつ実を結びつつあります。

これまでの「今は、誰にも理解されない……」という思いにさいなまれながらの実験は、並々ならぬ苦勞の連続だったと思います。が、案外、実際に撮影に携わるスタッフたちは、毎日、大きな驚きと感動をもって、誰も知らない世界に踏み込み続け、叫び声をあげて楽しんでいたのかもしれない。

多くの方々のご支援と協力によって、今では膨大な資料が蓄積されている様子には、大きく頭が下がります。楽しい仕事をさせていただいたことに深く感謝します。

なるかげつねこ

Editor's Notes

This book contains pictures of crystals taken from September, 1994 to April, 1999.

After I had accepted the editing work, I first took my first look at the refrigerating room used for photographing the crystals. I saw a solid refrigerating room (about the size of 1 tatami mat), a desk, a freezer, and a camera with a microscope attached on top. The refrigerator was filled with Petri dishes. What was most impressive was the heavy down jackets and pants that were hung in front of the refrigerating room. The season had already turned to spring since it was night after the full blooming of cherry blossoms. The crystal photography staff kept on saying "It's cold, it's cold" all through the year. It was like spending winter in the Antarctic.

A numerous amount of crystal pictures were stored as data and are waiting for their turn to serve the world and mankind.

Who in the world, except for Emoto Masaru, would think of pasting papers typed with "Thank you", or "Amaterasu Omikami" on a bottle containing water. We all kept saying that. But now, it is us the staff, that are encouraging him to plan a second edition of this book.

He said it just came across his mind. Since his research was rooted on the deep feelings to water that he had accumulated over the years, he was very serious. Now it is gradually bearing fruit.

Up until now, the experiment that we carried out tormented us with feelings that we would never be understood by anyone. It was a hard effort for us. But I suppose the staff who were actually engaged in the photography were having the most fun. They screamed out astonishment and enthusiasm everyday as we stepped in to a world that no one else has ever explored.

I admire him for organizing and storing a tremendous amount of data with the support and cooperation of many people. I would like to express my gratitude to him for giving me this chance to do interesting work.

Tsuneko Narukage

参考にさせていただきました。ありがとうございました。
Many thanks for these references.

本の参考資料

■BP「まだ科学が解けない疑問」
ジュリア・ライノクウィッド・サヴォルド編 晶文社刊

CDの参考資料

■ベートーベン「田園」
「スーパーベスト101」 ベートーベン交響曲第6番 田園 ベルリン フィルハーモニーより

■モーツァルト「交響曲第40番ト短調」
「VERY BEST CLASSICS」交響曲第40番ト短調
K550 フリデン/イギリス室内管弦楽団より

■バッハ「G線上のアリア」
「ONCE UPON TIME CLASSICS-LOVE」G線上のアリア 管弦楽組曲第3番ニ長調
BWV1088より

■バッハ「ゴルトベルク」
「ゴルトベルク変奏曲/4つのデュエット」ゴルトベルク変奏曲 BWV988より

■ショパン「別れの曲」
「ショパンピアノ名曲集/別れの曲」エチュード<別れの曲>ホ長調 作品10の3より

■ヒーリングミュージック「HADO」
Hado Music "Blending of Science and Music" Immune System Pain Relief
Series1より

■チベットの祈禱
「決定版 ワールドミュージック」チベット密教の聲明 ギョルトゥ・ゴンパの僧侶たちより

■韓国民謡「アヒラン」
「管原都々子全曲集」より

■河内音頭
「河内音頭 河内家莫水丸」ボブ・マーリー物語97より

■川の流れのように
「美空ひばり オリジナルベスト50」より

■イギリス・ケルト地方の民謡
「エンヤ ペイント・ザ・スカイ ーザ・ベスト・オブ・エンヤ」より

■「HEARTBREAK HOTEL」
「MEGA ELVIS THE ESSENTIAL COLLECTION」より

ありがとうございました。

Book
BP "THE DAY THAT LIGHTNING CHASED THE HOUSEWIFE"
Julia Leigh and David Savold, Shobun-sha Publisher.

CD
Beethoven "Pastorale"
"Super Best 101"
Beethoven's symphony No. 6, "Pastorale" Berliner Philharmonisches Orchester

Mozart's "Symphony No. 40 in G Minor"
"VERY BEST CLASSICS" Symphony No. 40 in G Minor K550
BritanUK Chamber Orchestra

Bach's "Air for the G String"
"ONCE UPON TIME CLASSICS-LOVE"
Air for the G String Orchestral Suite No. 3 in d Major BWV 1068

Bach's "Goldberg Variations"
"Goldberg Variations/4 Duets"
Goldberg Variations BWV988

Chopin's "Farewell Song"
Chopin Famous Pieces for Piano-Farewell Song (Etude in E Major, Op. 10, No. 3
Healing music (HADO)
Hado Music "Blending of Science and Music" Immune system Pain Relief Series 1

Tibet Sutra
"World Music"
Chanting holy invocation of esoteric Buddhism "Sound track"

Korean Folk Song, "Ariwan"
Sugawara Tazuko Collection

"Kawachi Chorus song"
"Kawachi Chorus Song/Kawachi Kikusimaru Bobi Marley Story '97

Just Like A Flowing River
"Misora Hibari/Original Best Hit 50"

Folk Song of Celtic Region, England
"Enya Paint the Sky - The Best of Enya"

"HEARTBREAK HOTEL"
"Mega Elvis the essential collection"

Thank you very much.

水からの伝言

今日も水にありがとう

著者略歴……江本 勝 (えもと まさる)

1943年7月横浜市に生まれる。
横浜市立大学文学部国際関係論学科を卒業。
(株)地産、中部読売新聞社(現、読売新聞中部本社)などを経て、1986年、(株)I.H.M.を設立。
1992年10月に「オープン・インターナショナル・ユニバーシティー」より、代替医療学博士の認定を受け、ライセンスを交付される。アメリカで共振磁場分析器やマイクロクラスター水に出会い、水の奥に挑む。
科学の目というよりも、人間としてのオリジナルな視点で、身体の中の水、身の回りの水、地球上の水の研究にとり組んでいる。ついに、水のもつ本来の自然な姿が、その結晶から判明することに気づき、ユニークな実験を続けている。
現在、I.H.M.総合研究所所長、(株)I.H.M.代表取締役、(株)I.H.M.国際波動友の会代表。
著書「波動時代への序幕」(サンロード出版)など多数。

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The Message from Water

Water, thank you today as well.

Written by Masaru Emoto

Born in Yokohama in July 1943.

Graduated from International Relationships Course, Department of Humanities and Sciences, Yokohama City University.

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水は心の鏡 人の心を写してみせる



Water is a mirror reflecting our mind.



HIDDEN PLAIN SIGHT

The simple link between
relativity and quantum mechanics

ANDREW THOMAS

HIDDEN IN PLAIN SIGHT

Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

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HIDDEN IN PLAIN SIGHT

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DEDICATION

To Mum and Dad

CONTENTS

PREFACE

1) UNIFICATION

What unifies unifications?
Relativity and quantum mechanics
String theory and loop quantum gravity
The problem with structure
The principle of principles

2) UNIVERSE

Connectedness
The one and only
Absolutely no absolutes
Side effects
Parallel universes

3) SPACE IS NOT A BOX

Symmetry
The gravitational field
Newton's bucket
The reciprocal nature of gravity

4) TIME IS NOT A CLOCK

What time is now?
Time is not a clock
Spacetime
Invariants
The invariant speed of light

5) THE BLOCK UNIVERSE

How fast does time flow?
Are we *The Sims*?
Eternal life
Free will
The arrow of time
Ex nihilo solutions

6) QUANTUM REALITY

[The logic of quantum mechanics](#)

[The quantum casino](#)

[Schrödinger's fridge](#)

[The Copenhagen interpretation](#)

[The Many Worlds interpretation](#)

7) OBSERVING THE OBSERVER

[Lost in space](#)

[Fundamental observation](#)

[Environmental decoherence](#)

[Irreversibility](#)

8) THE QUANTUM RATIONALE

[Reality is relative](#)

[Particle types](#)

[The quantum rationale](#)

[Quantum magic](#)

[Symmetry and quantum mechanics](#)

9) HIDDEN IN PLAIN SIGHT

10) CONCLUSION

[Certainties and absolutes](#)

[Too Many Worlds](#)

[Reductionism and emergence](#)

[The laws of Nature](#)

PREFACE

For seven years, I maintained one of the most popular physics websites. Those seven years working on the site provided me with the opportunity to consider some of the most challenging questions about fundamental reality. Some avenues which initially appeared promising turned out to be blind alleys, while other seemingly innocuous principles turned out to be surprisingly fruitful. This book presents some of the most important insights I gained over those seven years.

I am pleased to say the website gained high praise from some of the most famous names in physics, but I was always more heartened by some of the comments left by casual visitors to my site, especially those who felt I managed to make physics exciting, entertaining, and easy to understand. Hopefully this book can continue that trend.

The remarkable success of this book has led to a series of *Hidden In Plain Sight* books. If you enjoy this book, I am sure you will enjoy the other books in the series. The common theme which links all the books is that — at the fundamental level — we should expect our theories of Nature to become simpler, not more complicated. Hence, the explanations we seek are deceptively simple, and have been overlooked. They are truly hidden in plain sight.

Andrew Thomas
(hiddeninplainsightbook@gmail.com)
Swansea, UK
2012

I now have a Twitter account on which I will post updates: twitter.com/andrewthomas101

u·ni·verse (yoo'ne-vûrs')

n.

1. The universe is one thing,
the only thing that exists.

1

UNIFICATION

In our modern world, we have grown used to ever-increasing complexity. We perpetually have to upgrade our mobile phones to the latest version 5.0 with new features we never knew we wanted. We have to buy the latest television with hard-disk recording built-in, and a baffling remote control to match. It feels like it is just a matter of time before the internet becomes so complicated that it develops self-awareness, calls itself "SkyNet", and launches a thermonuclear war against humanity.

Complexity is seen as a virtue, a selling-point. Extra features are seen as a good thing. Are you not confused enough yet?

I want to strip my life back to simplicity. I have cancelled my Facebook account. I have organised my apartment, stripped it down to the basics and discarded all unwanted junk. By removing distractions, I hope it is going to allow me to concentrate. When you feel the complexities of life are getting you down, you have to strip your life back to simplicity.

We tend to think of simple things as more beautiful. They are more economical, with less waste, less superfluous clutter. If we clear our heads, we can see things more clearly. If we clear our heads, we can see the truth.

Nature also likes simplicity. Nature abhors waste, both in materials and in energy. Everything in Nature is done for a good reason. We see beauty in simplicity because we can see its underlying efficiency. We might recoil from seeing an ostentatious sofa because so much of its covering serves no purpose, the inefficiency of its design being antithetical to the beauty of Nature. However, when we see a sleek, lean, minimally designed chair we are instantly attracted to its spartan beauty (perhaps until we have to sit on it for a couple of hours).

Due to Nature's close affinity with simplicity, the advance of fundamental physics over the centuries could be seen very much as the pursuit of simplicity. As physics has progressed it has been found that more elegant, simpler theories have been found to be the best match for reality. It is very important to remember this when we do physics: ask yourself, are you making things simpler? If not, then think again. As Albert Einstein said: "Any intelligent fool can make things bigger and more complex. It takes a touch of genius — and a lot of courage — to move in the opposite direction."

In physics, one of the most successful ways of simplifying our explanations has been by reducing redundancy in those explanations. If we find we have two theories which explain two apparently different behaviours of Nature, we might find it possible to replace both those theories with a single theory which still manages to explain both of those behaviours. When this happens, the process is called *unification*. The resultant unified theory will be simpler than either of the two previous theories, as it reveals a deeper, underlying truth.

This process of unification always represents a landmark in physics. It is like drawing a line in the sand. It shows we have reached a new level of understanding — we will never have to go back to our previous level of ignorance. Unification is, in many ways, the ultimate goal of physics. If physics is ever to provide a complete understanding of the universe, then the last act which will be performed by the very final physicist will be an act of unification.

This book has a single goal, though it is highly ambitious. The aim of this book is to reveal a link — possibly a unification — between relativity and quantum mechanics at the deepest possible level: the fundamental level. This link is based on an extremely simple principle, a simple idea.

Simplicity is good. I like simplicity.

What unifies unifications?

As we start out on our quest, a good starting point might be to examine some of the major unifications in the history of physics. Maybe we can detect trends or similarities in their approach. Maybe we could adopt aspects of their approaches to aid our quest. With this in mind, what follows is an historical review of some of the major unifications in physics. Don't worry too much about following the details — any principles which are important for our discussion will be described in detail later in the book. For the time being, just get a feel for the history of unification.

We start in 1638 when Galileo, the man described as the father of modern science, published his *Discourse on*

Two New Sciences. Galileo realised that if you are travelling at a constant speed in a constant direction (for example, being a passenger on a steady train), you feel as if you are stationary. Galileo had the insight that it was fundamentally impossible to distinguish the two situations of moving and being stationary. To be precise, Galileo stated that there was no experiment you could possibly perform which could detect if you were stationary or moving at a constant velocity. This unification of "being stationary" and "moving at constant velocity" stands as the first of the great unifications in physics.

In 1665, a 22-year-old Isaac Newton wondered if the force which pulled apples from a tree was the same force which held planets in orbit. Again, we see a simple, brilliant insight, an imaginative leap. From Newton's clear vision, a description of the force of gravity emerged as the unifying theory for two behaviours which were previously considered to be unrelated.

Another unification occurred in the nineteenth century by the man widely acknowledged to have been the greatest experimental physicist of all time. In 1831, at London's Royal Institution, Michael Faraday demonstrated that if you push a magnet through a coil of wire, an electric current flows. Conversely, if you pass an electric current through a wire it can deflect a nearby magnetic compass. From this, Faraday deduced that electric currents create magnetic fields, and moving magnetic fields create electric currents. Thus was *electromagnetism* discovered, unifying electricity and magnetism. However, Faraday was no mathematician, and he lacked the mathematical language to describe his discovery.

The next unification was revealed by the Scottish physicist James Clerk Maxwell who — unlike Faraday — **was** a mathematician. Maxwell took Faraday's results and constructed four equations which described the connection between electric and magnetic fields. Maxwell showed that an electric field would generate a magnetic field, and, conversely, a magnetic field would generate an electric field in an oscillatory fashion. The result was a self-sustaining electromagnetic wave which travelled through space. After calculating the speed of this wave, Maxwell found it to be the same as the speed of light, and thus had a brilliant insight: light is a form of electromagnetic wave! Hence, here was another unification, this time linking the field of optics with electromagnetism.

The next series of unifications happened in the twentieth century and was supplied by Albert Einstein, whose work we will be considering in detail later in this book. From a young age, Einstein had wondered what would happen if you moved so fast that you caught up with a light beam. It would seem that you would view a stationary wave of light. However, Maxwell's equations seemed to indicate a constant speed of light — regardless of the motion of the observer. Hence, Maxwell's result for the motion of light did not agree with Newton's laws of motion. Einstein managed to combine Maxwell's result with Newton's laws — but only by radically altering our concept of space and time. His resultant *special theory of relativity* unified not only electromagnetism with mechanics, but also space with time. Also, through his famous formula which arose from special relativity, $E=mc^2$, Einstein launched us into the atomic age by unifying mass with energy.

Einstein was on a roll at that point, and, ten years later, after a great deal of extremely hard work, Einstein struck again. Einstein had the brilliant insight — which he called the happiest thought of his life — that the force experienced by an observer undergoing constant acceleration was indistinguishable from the force of gravity. This represented another unification, this time between gravity and accelerated motion. Conversely, if an object was in free-fall it would not feel any force of gravity — it would be as if it was floating freely in space. This meant that gravity did not exist as an entity in its own right: gravity was the curvature of space. Objects travelling in a straight line in curved space appear to be drawn towards the centre of curvature, and this is interpreted as the force of gravity. The resultant theory — the *general theory of relativity* — unified gravity with the geometry of space.

The next unification occurred shortly after the discovery of relativity. The newly-developed theory of *quantum mechanics* was not consistent with special relativity as it only considered particles which moved very slowly compared with the speed of light. In 1927, Paul Dirac combined special relativity and quantum mechanics to create the first quantum field theory. This theory was further refined throughout the twentieth century to become the greatest triumph of physics in recent years as the foundation of the standard model of particle physics. The shy Dirac was awarded the Nobel Prize in 1933, and his first instinct was to turn it down as it would generate unwanted publicity for himself — until he was persuaded that turning down the prize would generate a lot more publicity.

The last unification to date occurred in the 1960s when physicists started to consider the symmetry between a particle associated with the electromagnetic force (the *photon*) and the *weak nuclear force* (called the W^+ , W^- , and Z particles). Unification was achieved by importing an idea which was first used in studying the physics of metals and other solids: *symmetry breaking*. Physicists realised that all four particles would be massless (i.e., they were all symmetrical) at high energies (for example, the unimaginably high temperatures reached in the first moments after the big bang). However, as the energy decreased and the universe cooled, this symmetry would be broken and the particles would be free to take different values. The photon was left with no mass, but the W^+ , W^- , and Z particles all collected mass. For this reason, the weak nuclear force can only operate at short ranges and is weak, whereas

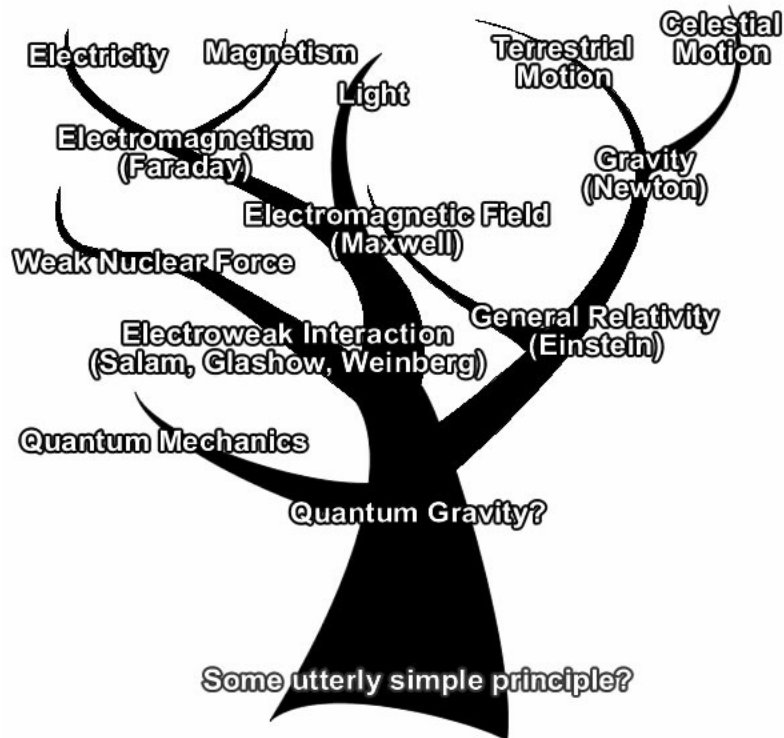
massless photons can bring us light from the stars. Hence, the two forces of electromagnetism and the weak nuclear force were, in fact, the same force behaving in two different ways at our everyday low energies. If it is sufficiently hot enough then the electromagnetic force and the weak force would merge into a single force. This was confirmed in the 1980s in CERN, the European laboratory for particle physics, when they recreated the temperature of the early universe and demonstrated the existence of the so-called *electroweak* force.

Considering general themes in all these approaches, one thing our historical study has revealed is that, in general, unification in physics is achieved by a single, imaginative idea. This might come from Newton pondering on an apple, or Einstein deciding that you could never catch up with a light beam: unification always requires one single, brilliant insight. Even in the case of the electroweak unification, with many physicists involved, it still required the inspired introduction of the symmetry breaking concept before unification could be achieved. It does not matter how much money or how many researchers you throw at the problem, unification is only ever achieved by a moment of inspiration. Unification is definitely not achieved by design-by-committee.

Also, the ideas by which unification is achieved are generally extremely simple ideas — anyone could understand these ideas. In fact, we could say that any unifying idea **has** to be simple. The idea of experiencing no gravity in a lift in free-fall, or catching up with a light beam, are simple ideas which anyone could understand. Similarly, Newton's idea connecting a falling apple with a planet held in orbit is a simple concept. It was as if these great unifiers picked-up on something which was under our noses all the time, something which was missed perhaps because it was too simple. Something hidden in plain sight. As Walter Isaacson said in his book *Einstein: His Life and Universe*, Einstein's approach was typical of his ingenuity: "He examined a phenomenon that was so very well-known that scientists rarely puzzled about it." Or as Nobel Prize-winning chemist Albert Szent-Györgyi said: "Scientific discovery consists of seeing what everyone else has seen, but thinking what no one else has thought."

The process of unification could be equated to a tree, with each theory being a leaf on the end of a twig. As we move back down the twig we eventually get to a junction point between two twigs: a point of unification. As we move further down, twigs merge into branches, and the branches merge into the trunk. As we continue to move further and further down the tree we find the number of branches gradually reduces as the process of unification reduces the number of redundant branches (theories). With each step, with each unification, our model of Nature becomes simpler.

The following diagram shows this tree of unification. The junction points of the branches represent points of unification. At each of those junction points, not only is the name of the unified theory shown, but also — in brackets — the name of the person(s) responsible for the unification.



But what will we find at the base of the tree? What is holding up the entire structure? As our progress down the tree has seen our model and our theories getting simpler, you would expect that at the ultimate base of Nature, we will surely find a principle which is simple, beautiful, and elegant. As the great physicist John Wheeler said: "To my mind there must be, at the bottom of it all, not an equation, but an utterly simple idea. And to me that idea, when we finally discover it, will be so compelling, so inevitable, that we will say to one another: 'Oh, how beautiful. How could it have been otherwise?'"

Relativity and quantum mechanics

The quest for one particular unification is dominating current research. As we enter the twenty-first century, we find the same two theories have dominated physics for a hundred years: the theories of general relativity and quantum mechanics. Both theories have been astonishingly successful and have been tested to remarkable accuracy. General relativity is our best theory of gravity, accurately describing the motions of planets, stars, and galaxies, and has correctly predicted the existence of black holes. Quantum mechanics is the force behind the laser and the transistor, and is therefore the force behind the computer revolution. Quantum mechanics is generally regarded as the most successful theory in the history of science. Nobody argues with either theory — they are both undoubtedly correct

The only problem is, they have absolutely nothing in common.

General relativity is the theory of "big stuff", describing the motion of planets and galaxies. Quantum mechanics is the theory of "little stuff", describing the behaviour of subatomic particles. For the most part, physicists only have

to use one or other of these theories, depending on the scale of their subject. For example, in order to study the motion of galaxies, they would use general relativity, in order to study the behaviour of particles, they would use quantum mechanics. So, because of the differences in the domain of application, this method of switching between the two theories — though not ideal — works perfectly well for most purposes.

However, we are interested in the quest to uncover the fundamental truth of Nature, and Nature surely does not use one theory for small objects and another theory for big objects. As far as Nature is concerned, objects are objects — the laws of physics apply equally to all objects. So at a deeper level, there must be a more elegant theory which applies to all objects, regardless of their size. It is the unearthing of this deeper theory — combining general relativity with quantum mechanics — which is the focus of much current research.

Einstein's theory of general relativity revealed that the very fabric of space itself can be curved in the presence of mass or energy. In the absence of mass or energy, space is "flat", it is uniform and without features. However, in the presence of mass or energy, the fabric of space is curved. This is a wonderful sweeping theory. One can imagine vast tracts of space being bent in a beautiful, smooth curve by a planet or star, like an interstellar ocean wave. And, just like an ocean wave, this glorious curve of space keeps moving and curving as the planets and stars are constantly in motion.

But what, exactly, is happening at the microscopic level during this curvature of space? What does space look like when we zoom in to examine this curvature in detail?

In the microscopic world, quantum mechanics takes over. Quantum mechanics predicts seething randomness at such small levels, with particles flashing into existence before their rapid annihilation. The resultant effervescent substance resembles foam rather than smooth space, and was given the name *spacetime foam* by John Wheeler. Theories which attempt to unify general relativity with quantum mechanics at this microscopic scale are called theories of *quantum gravity*.

String theory and loop quantum gravity

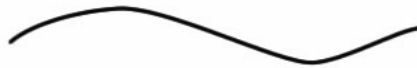
The two main approaches to finding a model of quantum gravity are string theory and loop quantum gravity. These two approaches are opposites in many ways (loop quantum gravity emerges from general relativity, string theory has a closer connection to quantum mechanics), but very similar in one important way. Both string theory and loop quantum gravity are based on the principle that the best way to analyse Nature is to discover the **structure** of the smallest components of reality.

String theory was first proposed by Yoichiro Nambu in 1970 while at the University of Chicago. When first introduced, the theory had more modest goals than it has now. The theory has been considerably expanded over the years, but the fundamental principles have been retained.

String theory considers particles as being composed of microscopic strings:

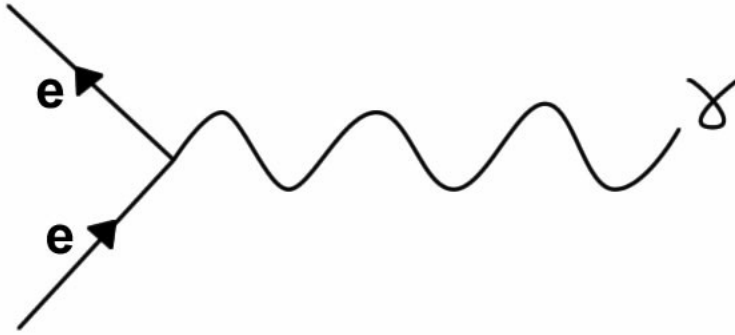


Closed string

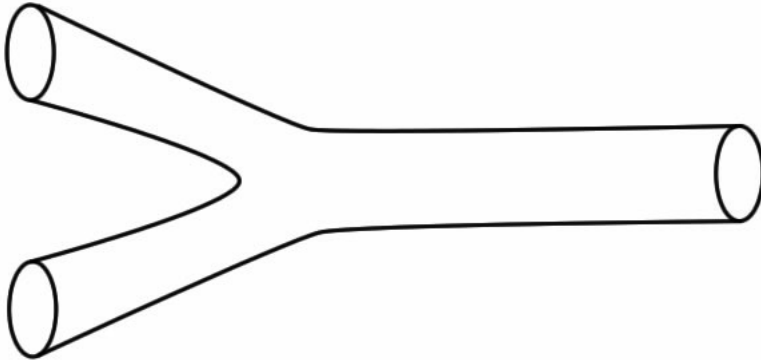


Open string

As a closed string moves through space and time, it sweeps out the shape of a cylinder. These cylindrical shapes can simplify our understanding of the interactions between particles. As an example, the following diagram shows the interaction between an electron and a photon:

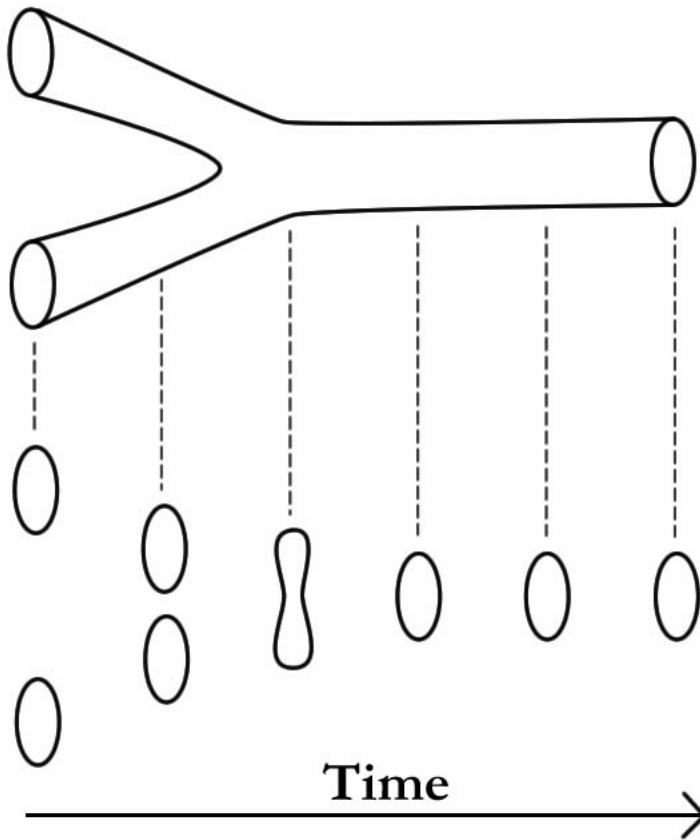


The shape of this interaction between elementary particles can then be viewed as a single string cylinder pinching itself and separating into two string cylinders:



The great attraction for theorists is that this stringy cylinder eliminates the infinities associated in dealing with the interactions of point particles. As can be seen in the two diagrams above, the particle interaction can be replaced by the much smoother string cylinder representation.

As we take successive snapshots in time, cross-sections through the string cylinder appear as microscopic loops which join and split in a smooth manner:



If these microscopic loops are sufficiently small, they can appear just like point particles. So the apparent interaction of point particles could actually be the splitting and joining of microscopic string loops.

Just as a guitar string can vibrate in many different ways to produce different notes, so can a loop of string have different modes of vibration to produce different types of particles. For a loop, a whole number of vibrations must fit around the string. Higher notes require more energy, so the particles would have greater mass. In this way, different particles — such as electrons and quarks — are just different vibrations of one of these tiny loops of string.

Much is made of the fact that string theory predicts a particle which appears to have the characteristics of the particle which is expected to carry the gravitational field. Even though such a particle has never been detected experimentally, it has already been given a name: the *graviton*. Such a particle would have to treat all objects in the same way — just as gravity is an attractive force for all objects. The fact that such a particle emerges naturally from string theory is often taken to mean that in string theory "gravity comes free". String theory's prediction of gravitons is one of the main selling-points of the approach.

This all sounds well and good, until you realise that string theory makes another prediction which is not so welcome, the prediction that space should have 10 or 11 dimensions. This is a blow, as we only see three spatial dimensions and one time dimension. This has forced the ingenuity of string theorists to come to the fore, as ways of tucking-up the extra dimensions into exotic structures have been suggested. However, having to resort to these kind of techniques is not really what you want in your simple, fundamental theory.

String theory is almost the only game in town when it comes to current theories of quantum gravity. However, there is one more proposal being worked on by a smaller community of researchers. *Loop quantum gravity* attempts to unify quantum mechanics and general relativity by applying the standard technique of "quantization" to Einstein's equations for general relativity. The key figures in this field are Lee Smolin of the Perimeter Institute near Toronto,

Carlo Rovelli of the University of the Mediterranean in Marseille, and Abhay Ashketar of Pennsylvania State University. We will be hearing some of these names throughout this book.

Loop quantum gravity's initial aims were less ambitious than those of string theory, being purely a theory of quantum gravity, with no attempt being made to predict the properties of elementary particles. However, this has changed in the latest version of the theory, which now does, indeed, predict the elementary particles. So the latest version of the theory is, like string theory, presented as a fully-fledged *theory of everything*. The main prediction of the theory is that space is not continuous but is instead quantized into discrete chunks: "atoms" of space. These chunks are the smallest possible units of volume, each approximately 10^{-99} cubic centimetres.

Neither of the approaches of string theory nor loop quantum gravity seems to be enjoying unqualified success at the moment, with progress being slow on all fronts. String theory has been getting a bad press as the theory which makes no testable predictions. Loop quantum gravity, however, boldly proposed a testable prediction that high-energy photons should travel slightly slower than low-energy photons, and this difference becomes measurable over long distances. However, in 2009, a gamma ray burst from deep space was analyzed and no speed difference could be detected.

There is a certain competitiveness/animosity between researchers in these two distinct fields, both groups being convinced of the correctness of their approach and the failings of the other approach. Such competitiveness should be healthy in theory, but it has not appeared to work out that way. This is not a golden age for physics.

A personal criticism of mine — which applies to both string theory and loop quantum gravity — is that neither theory has anything to say about the foundational problems of quantum mechanics. The foundational problems raise questions about the nature of reality at a very low level — before it is even observed. It is hard to even imagine what form reality takes before it is observed, so this might be considered more of a philosophical question by most scientists, and is sadly ignored by researchers, but it is still a problem at the very heart of reality which urgently requires a solution. We will be considering the foundational problems in Chapter Six which is dedicated to the question of quantum reality. No matter how long they are ignored, the foundational problems will not go away and will have to be tackled at some point. One of the proposals of this book is that a true linkage of quantum mechanics and relativity can only be properly achieved by obtaining a greater understanding of the foundational level.

The problem with structure

It was the Greek philosopher Democritus who first suggested that matter might be composed of indivisible "atoms" (meaning "uncuttable" in Greek). Democritus believed the properties of the atoms were determined by their shape, so water atoms were smooth and slippery, whereas iron atoms had hooks to bond closely together. His views might sound misguided, but, on the basis of what we now know about chemical bonding, it is actually a remarkably good analogy to reality.

Throughout the nineteenth century, successive experiments appeared to confirm the atomic nature of matter, until it became an accepted fact. But were the particles truly indivisible? In 1897, the physicist J.J. Thomson discovered the electron, revealing that there were smaller particles within the atom. In 1909, Ernest Rutherford directed alpha radiation at some thin gold foil, and found it was deflected. Rutherford interpreted this result as showing that there was a solid, positively-charged nucleus at the centre of every atom, surrounded by negatively-charged electrons.

The continuing subdivision of particles continued through the twentieth century with the discovery that protons and neutrons were each composed of three particles called *quarks*. Even though quarks are considered to be elementary particles, if history teaches us anything it is that particles which were once considered indivisible later reveal themselves to be composed of even more fundamental particles.

In answer to the question "What is a particle?", researchers in string theory would say elementary particles are actually composed of incredibly tiny strings, with average size of about a millionth of a billionth of a billionth of a billionth of a centimetre (called the *Planck length*). But this has just pushed the question of "What is a particle?" further back. We are now left with the question "What is a string?". We seem no nearer our goal in determining the ultimate bedrock foundation of reality.

In fact, this raises a potential weakness in all theories which believe Nature's secrets can be fully unlocked simply by examining the structure of the universe at increasingly smaller scales. The problem is: surely this "drilling" could just go on to infinity? How could it ever end? How would we ever know when we had reached the bedrock foundation of reality? As string theorist Brian Greene says in *The Elegant Universe*: "Another possibility, should strings fail to be the final theory, is that they are one more layer in the cosmic onion." Whatever structure we end up with, surely we will always be able to ask the question: "What is it made of?"

There is a famous (undoubtedly apocryphal) story which circulates in physics circles. A lecturer was presenting a

lecture on astronomy. At the end of the lecture, a little old lady got up and said: "What you have told us is rubbish. The world is really supported on the back of a giant turtle." The lecturer gave a superior smile before replying, "What is the turtle standing on?" "You're very clever, young man" said the old lady, "but it's turtles all the way down."

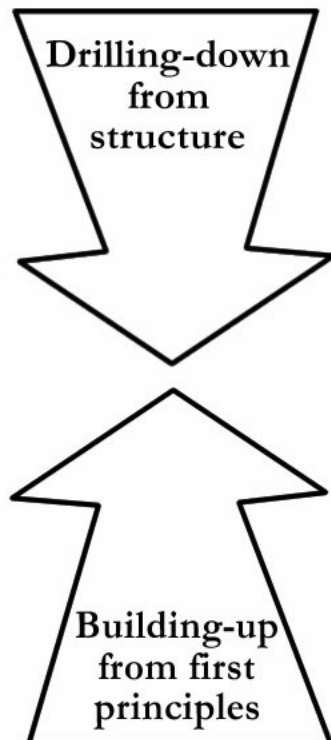
We are supposed to laugh at the little old lady, but actually the lady might well be correct: reality might well be composed of successive layers of structural "turtles". In which case, approaches based on analysing structure at ever-smaller scales have got serious problems.

String theory and loop quantum gravity are potential candidates for a so-called theory of everything. However, it is hard to see how a theory based on structure can ever be a theory of everything — there will always be the question "Why this structure rather than another structure?" String theory attempts to get round this problem by proposing a multitude of parallel universes (called a *multiverse*) with different string configurations dominating in each universe. But, at the end of the day, the question would always still arise: "Why strings?" Why should the string structure (or loops if you subscribe to the loop quantum gravity approach) be favoured over any other possible structure of the universe? I am not suggesting that either string theory or loop quantum gravity is wrong, I just do not see how either theory could ever represent the fundamental theory of reality.

The Nobel laureate Steven Weinberg has continued this rather pessimistic tone: "I have to admit that, even when physicists will have gone as far as they can go, when we have a final theory, we will not have a completely satisfying picture of the world, because we will still be left with the question 'why?' Why this theory, rather than some other theory?"

I do not share Weinberg's pessimism. Surely there must be an alternative to the inexorable "drilling"? In his book *Three Roads to Quantum Gravity*, Lee Smolin suggests a third approach to quantum gravity research. He describes how a handful of researchers are starting with general **principles** and are starting to build-up from those principles in order to logically deduce the laws of Nature. It is this third approach which is followed in this book.

In contrast to the "drilling down from structure" approach, we will be "building-up" from fundamental principles. In this way, we will be certain that we will encounter the fundamental bedrock of Nature — because we will be building-up from it. After all, you wouldn't build a skyscraper — or any edifice — from the top down: you would always start with bedrock and build up.



The principle of principles

The great advantage of theories based on principles is that they are not arbitrary (as opposed to theories based on structure). A fundamental principle (or *first principle*) appears obviously true. A fundamental principle contains the reason for its obvious correctness stated **within itself**. It is **axiomatic**. It is a self-contained entity, requiring no further explanation, validation, or support. A fundamental principle should appear so obvious that it would be impossible to conceive of a universe in which that principle is false. In this way, a principle is not arbitrary; instead it appears to represent a fundamental, unchanging truth which would have to be true in all conceivable universes. For this reason, a principle can form the very bedrock of the foundation of any true theory of everything.

This idea — that physics could be built up from deductive reasoning — has been considered for many centuries. In the seventeenth century, the philosopher Descartes proposed a system of physics based on reason. However, this methodology of logical deduction never gained a following, which I feel is a shame, as I believe the time is now right for it to play an important role in a physics in which experimental confirmation of theories is becoming ever-harder to achieve.

Our current particle accelerators can generate only a tiny fraction of the energy required to test theories of quantum gravity. The electroweak unification occurs with energies over 100 GeV (1 GeV is 1 followed by nine zeroes). The W and Z particles associated with electroweak unification have therefore been detected with our current accelerators which can reach energies of up to 14 TeV (1 TeV is 1 followed by 12 zeroes). However, the energies required to test quantum gravity will require energies of the order of the Planck scale of 1.22×10^{19} GeV (1 $\times 10^{19}$ is 1 followed by 19 zeroes). It might be many centuries before such an accelerator could be constructed, if ever. In the meantime, an alternative is the approach described in this book: an attempt to try to unify relativity and quantum mechanics by logical deduction from fundamental principles.

One of the great strengths of the approach of using general principles to derive theories is that there is no mention in principles of any particular structure or scale. Principles have such generality that they must apply to all physical processes in the universe, no matter if the underlying microscopic structure is strings or loops or any other arrangement. Also, as principles are completely invariant to scale, principles apply to the very small as much as the very large — they must apply to the realms of both quantum mechanics **and** relativity. For this reason, the method of building-up from principles is clearly ideally suited to the task of discovering a unification of relativity and quantum mechanics.

It must be admitted that there are pros and cons in the "building-up from principles" approach rather than the "drilling-down from structure" approach. The building-up approach means we have a solid bedrock in fundamentals, so we avoid the apparent arbitrariness of the drilling-down approach. However, it is that arbitrariness of the drilling-down approach that makes it so hard to duplicate. There are, for example, 19 numerical constants in the standard model of particle physics (known as *free parameters*), the values of which seem completely arbitrary. It is even conceivable that the universe could have been created with more or less than the three dimensions of physical space. It is hard to imagine how any approach which builds-up from obvious first principles is ever going to be able to capture that arbitrariness of structure. However, the "drilling-down" approaches seem to be having little success in this respect, either.

The question arises as to how much of the universe could have been created differently ("contingent"), and how much is a logical necessity. Our eventual goal is expressed clearly by Einstein: "What I am really interested in is whether God could have made the world in a different way; that is, whether the necessity of logical simplicity leaves any freedom at all." If a fundamental principle is true in every conceivable universe, then it would indeed possess a "logical simplicity" which would limit any freedom of design choices. By building-up from those fundamental principles we will make progress in discovering how many of the laws of Nature emerge as a result of logical necessity, and how many appear to require the assignment of arbitrary values.

Another reason to prefer theories based on principles is simply ... simplicity. At the ultimate base of Nature, we will surely find a principle which is beautiful and simple and obvious. The base of the tree would not only have to be simple, it would have to be "strong", for it would have to support the whole of the laws of Nature. The principle would have to be "strong" in the sense that it could clearly never be refuted (proved false). At the base, we would no longer expect to find a theory which could be derived from a more fundamental theory — because there could be no more fundamental theory. We would expect to find a principle, or, as John Wheeler suggested, an idea. But in order to reside at the base of the tree, it would also have to represent the end-of-the-line: a principle which was self-contained, a principle which required no further explanation, a principle which contained within itself the reason why it would be obviously true.

For our solution, we should be looking for something which is ultimately simple, and ultimately unified.

2

UNIVERSE

The universe.

The clue is in the title: "uni"-verse.

Uni-verse. Uni-fication.

The clue to unification is the universe itself.

"Uni" means "one". The universe is the one thing that exists. It is everything that exists.

In the time I have been working in physics, two themes have emerged to dominate my lines of thinking, two themes which appear to represent the underlying truth of our reality. Both of those themes appear to describe an aspect of the universe, revealing the structure of the universe to lie at the core of reality, and the properties of the universe being the key to obtaining ultimate unification.

Those two themes are both closely related to each other. The two themes provide two different ways of looking at the universe, but, together, they tell us the same thing. One theme is provided by quantum mechanics, and the other comes from relativity.

Connectedness

The first theme is "connectedness". Quantum mechanics tells us that there is no such thing as a completely isolated object: objects are connected. The impression of separateness is just an illusion.

It is possible for a particle to interact with another particle in such a way that the two particles form a single *entangled* quantum state. What this means is that the state of one particle is dependent on the state of the other particle in some way. Because of this dependency, it is a mistake to consider either particle in isolation from the other. Rather, we should combine the states and treat the result — both particles — as a single, entangled system.

For example, a light beam is composed of a stream of particles called photons. The direction of light's electric field is its direction of polarization. The polarization direction of a photon can be at any particular angle, for example vertical or horizontal. It is possible to generate a pair of entangled photons if, for example, a laser is shone at a crystal. In that case, a single photon can split to become two photons. Each photon produced in this way will always have a polarization orthogonal to the other photon. For example, if one photon has vertical polarization then the other photon must have horizontal polarization (this is due to the law of the conservation of angular momentum: angular momentum of the system before the split must equal the angular momentum of the system after the split).

So if two people each receive one of the entangled photons and each performs a measurement, they will find that the other person's photon has orthogonal polarization. This is not a big deal, you might think: there are two photons, and they have different polarizations. Whether they are separated by a great distance or not is irrelevant.

Well, in normal circumstances, you would be correct. But when we are dealing with quantum mechanics, objects can behave in quite counter-intuitive ways. As we shall see in Chapter Six, quantum mechanics tells us that before we take the polarization measurement of our photon, we have to consider the photon as having **both** polarizations, vertical **and** horizontal. Only after we measure the photon does it take a definitive value — either vertical **or** horizontal. So, if we are dealing with entangled photons, this means that the other entangled photon's polarization is only defined immediately after the measurement of its entangled partner. Bizarrely, this seems to indicate some instantaneous signalling through space, from one entangled photon to the other, saying "I've been measured — this is my value".

Einstein, in particular, was deeply unsatisfied with this result as *super-luminal* (i.e., faster-than-light) transmission of information is incompatible with the theory of special relativity. Special relativity states that the speed of light is a cosmic speed limit for transmission of information. However, it turned out that — in this case — Einstein appears to have been wrong, and the bizarre, counter-intuitive nature of quantum mechanics was correct. Einstein never accepted the implications of quantum mechanics. [\[1\]](#)

What this discussion of quantum entanglement really reveals, though, is that our human perception of objects being separated is not a match with the physical reality of the situation. Just because we can see no visual link between a pair of particles does not mean those particles are wholly separated. Indeed, quantum entanglement says

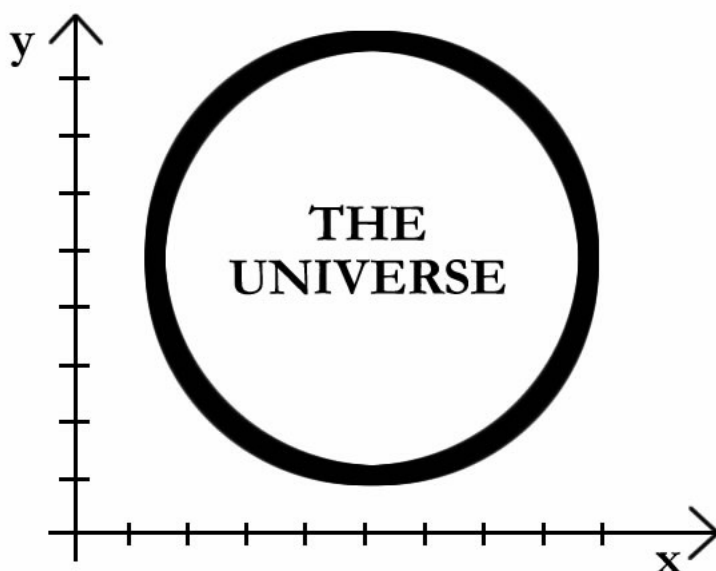
we should not consider objects as being separated at all: we should treat all objects as one object. The message from quantum mechanics is that we should treat the universe as one connected, entangled object.

The one and only

The second theme is that the universe is the only thing that exists. There is nothing apart from the universe. If the last theme — connectedness — was associated with quantum mechanics, then this theme is associated with relativity.

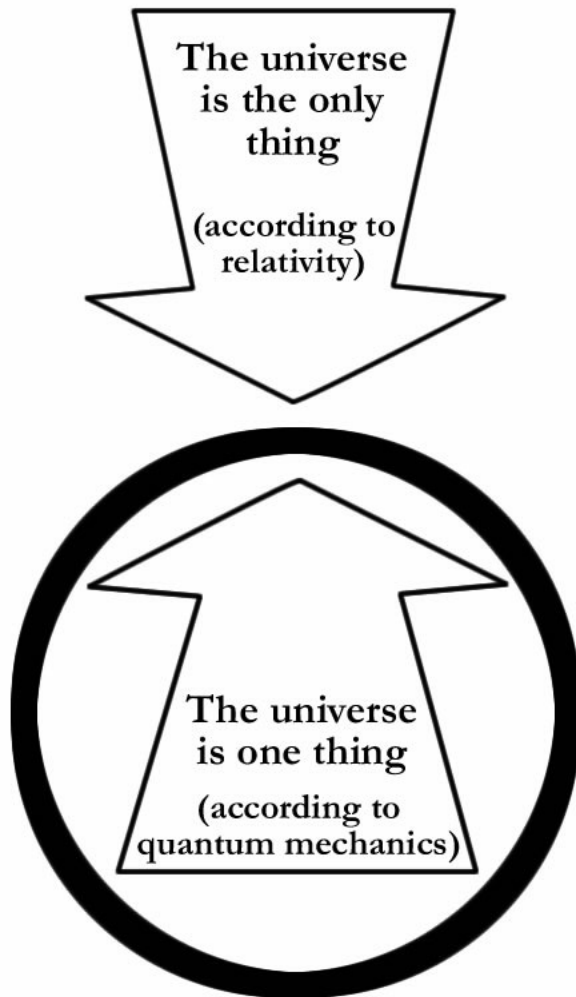
As the theory of loop quantum gravity has its basis in relativity, we might expect the loop quantum gravity team to provide us with insight into the implications of the universe being the only thing that exists — and this is what we find.

In his excellent book *Three Roads to Quantum Gravity*, Lee Smolin introduced a simple principle: **there is nothing outside the universe**. If we define the universe to be the sum total of absolutely everything that exists, then there can clearly be nothing "outside" the universe. This implies that there can be no absolute axes of space or time outside the universe.



This, in turn, means that the position of all objects in the universe can only be defined **relatively** in terms of all other objects in the universe. Because of this relative definition, we would expect to see the laws of Nature behaving in a relativistic manner. And this is, of course, what we do see in the theory of relativity. So relativity is telling us that there is nothing outside the universe: the universe is the only thing that exists.

It is as if quantum mechanics and relativity are both telling us the same thing in different ways. Quantum mechanics tells us that everything is connected as one object: the universe. And relativity tells us that the universe is the only thing that exists. Two ways of saying the same thing. It is as if quantum mechanics is on the inside of the universe, looking out, telling us the universe is connected. Whereas relativity is outside the universe, looking in, telling us the universe is the only thing that exists:



When the two great fundamental theories in physics are both telling you the same thing, albeit from different viewpoints, I think you should listen.

From these two different viewpoints of the structure of the universe, we obtain our definition of the universe:

u·ni·verse (yoo' nə-vûrs')

n.

1. The universe is one thing,
the only thing that exists.

That single definition of the universe combines part of the behaviour of both quantum mechanics and relativity. In this respect, it represents a very basic form of unification in itself.

There are two parts to this definition: "The universe is one thing" stresses the message of quantum mechanics, whereas "The only thing that exists" stresses the message of relativity. The two parts essentially mean the same thing, but together we get the first hints of possible unification to come. The theme of the universe is one of unity.

From this definition of the universe we can derive Lee Smolin's principle "There is nothing outside the universe". Obviously, if the universe is the only thing that exists, then there can be nothing outside it. For this reason, this

principle is obviously true. Moreover, this principle would have to be true in all conceivable universes — because there could be nothing outside **any** conceivable universe.

Hence we have at last found our fundamental principle, a principle which contains the reason for its obvious correctness stated **within itself**, a principle which is obviously true in all conceivable universes. So perhaps we have at last found John Wheeler's "utterly simple idea" which lies at the base of the tree. As John Wheeler said: "Oh, how beautiful. How could it have been otherwise?"

Lee Smolin referred to his principle as the "first principle of cosmology". We will see it is far, far more than that. Taking the role of our fundamental principle, we will discover that a remarkable proportion of the laws of Nature can be derived from this principle. The very fact that we can derive so many of the laws of nature by building-up from this principle will give us confidence that this is, indeed, the fundamental principle.

Absolutely no absolutes

Who, or what, is responsible for keeping the trains running on time? Fairly sensibly, you might suggest the train company is responsible, and this is surely the case. The train company has to maintain the tracks and the trains. It has to ensure the trains have enough fuel. It has to ensure the trains leave the station on time. Perhaps more fundamentally, it has to ensure the railway track extends the full distance between destinations!

But the train company is not the only entity which has responsibility for keeping the trains running on time: Nature has just as much responsibility. Nature has to ensure that its laws apply consistently to all objects. Nature has to ensure its laws do not drift over time. It is all well and good if the train company ensures its trains have enough fuel, but if Nature fails to ensure that the chemical reaction in the train engine produces enough energy, the train will not be going anywhere. Similarly, the train company can ensure its trains depart from the station at the correct time according to the station clock, but if Nature makes the clock run at a faster or slower rate then everyone will miss the train. Also, while it is essential that the train company ensures it has laid enough track to connect two destinations, if Nature allows any deviation in the length of the rails — such as a length contraction — the passengers are going to be stranded in the middle of nowhere.

Just as it is vital that Nature ensures the smooth-running of the railway, it is essential that Nature applies its laws in a consistent and unchanging manner to ensure the smooth-running of the entire universe. In this respect, Nature has a very responsible job, and it takes its responsibilities very seriously.

Now let us imagine Nature is expanding and diversifying its range of operations. It is going to use its profits from its highly-successful railway franchise and is going to move into the construction industry. Nature has bought a factory, and is going to supply a range of off-the-shelf, timber-framed "kit" houses which the customer puts together using only a screwdriver and some screws. [2]

In order to keep production costs down, the design is very simple: all the pieces of timber are one metre long. The construction of each house requires 1000 of these metre-long planks. So the job of Nature in this case, as factory boss, is to ensure that all the planks of wood produced by its factory are all precisely one metre long.

This raises some fundamental questions about the principle of measurement. For a start, it is vital to supply the *units* in which any measurement is made, e.g., metres, or kilograms. It is units which give our measurements meaning because units relate our measurements to some previously agreed-upon standard for some physical quantity.

For example, when we measure a plank of wood we are finding the relation between the wood and the marks on a measuring tape. Units provide the essential relational link between the unknown object being measured and the rest of the known world. And this will be a key theme in the later chapters of this book: giving property values to isolated objects is meaningless — property values arise through the interaction of an object with the rest of the universe. The length property of a plank of wood arises from its relationship with the measuring tape.

If we forget to give our measurements in units, or if we are not in agreement over which units we have both used to make our measurements, it is a recipe for disaster. For example, in 1999, the Mars Climate Orbiter space probe was intended to orbit Mars at a low altitude while mapping its surface. It was known that the probe could not get closer than 80 kilometres from the Martian surface or atmospheric stresses would rip it apart. However, the probe actually came within 57 kilometres of the surface and did, indeed, disintegrate. The crash investigators found that the cause of the error was due to the flight system software calculating thrust in metric units, while the ground crew were entering thruster data using imperial measures.

But probably the most notorious misuse (or absence) of units is from the 1984 rockumentary *This Is Spinal Tap*. In a famous sequence, lead guitarist Nigel Tufnel attempts to explain to a bemused reporter why his amplifier is louder than anyone else's because "Everyone else's amp only goes up to 10. This is 1 louder. This goes up to 11."



Let us return to consider the kit house company. If you remember, Nature — as company boss — has the task of producing 1,000 metre-long planks of wood. In order to do this, Nature has to measure the wood using a metre rule. Essentially, it is relating the wood to the known length of a single physical object (which, in the case of the metre, used to be the length of a platinum bar stored safely in a vault in France). This then becomes a standard of length on which everyone can agree. Everyone can relate their own measurements to this one physical standard stored in Paris.

The length of the platinum bar acts as an **absolute** standard: it has an independent existence, an independent reality. It is not dependent in any way on the people taking the measurement, or the objects being measured. It is as if the absolute standard has to exist entirely **outside** of the system which contains the object being measured, and the object performing the measurement. The platinum bar sealed in the vault in Paris is a good example of an absolute standard because it exists independently, entirely outside of the kit house factory.

Now try to imagine that the kit house factory is the entire universe, and it is completely under the control of Nature. You will be able to see why the seemingly innocuous statement "there is nothing outside the universe" has such tremendous implications. Nature can no longer access anything outside the universe — anything outside the factory. That means it can no longer access the absolute standard of the platinum bar in Paris. So the principle that "there is nothing outside the universe" reveals that all fundamental behaviour must take place in the absence of any absolute reference.

But, if you remember back to when Nature was in charge of running the railways, Nature takes its job very seriously and always does the best it can to keep the universe running smoothly. Even though Nature has lost access to its metre rule, **Nature always does the best it can with the tools available**. If Nature cannot use an absolute standard external to the universe, it can still use a standard of length which has to be defined in terms of objects **inside** the universe. This means if it wants to measure objects inside the universe, it can only make **relative** measurements, relative to other objects in the universe — the option of taking absolute measurements is not open to Nature.

What does this mean for Nature running its kit house factory? Remember, Nature has the job of producing 1,000 metre-long planks of wood, and its job has just got considerably harder because it has lost access to its metre rule. But Nature is going to do the best with the tools available: it is going to take relative measurements, relative to other objects in the "universe". To achieve this, Nature picks one plank at random and declares this to be its new standard length (perhaps humorously called the *plank length*?), and it then compares the other planks to this standard plank and proceeds to cut 999 planks to exactly the same size as this standard length. Of course, this means that the planks are no longer guaranteed to be one metre long, but at least all the planks will be the same size.

But, here is the really strange thing: even though the planks are not necessarily one metre long ... it doesn't matter! As long as all the planks are the same size, it is perfectly possible to construct the house. All the floors and walls and ceilings will fit together perfectly. The door will fit in the doorway, and the roof will fit with no problem.

Though, of course, there will be a side effect ...

Side effects

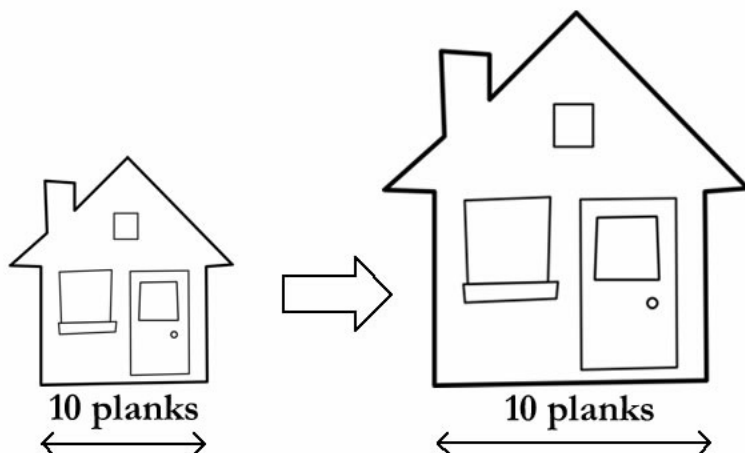
So we have just seen that Nature — even though it has been denied access to an absolute standard — has managed to produce its kit house by cutting 1,000 planks to the same standard length. This has necessarily been a relative measurement: each plank has been measured relative to another randomly-selected standard plank to ensure all 1,000 planks are the same size.

However, when the customer buys the kit, and constructs it using a screwdriver, he gets something of a shock.

While it is true that his house fits together perfectly — all the floors and walls and ceilings come together perfectly — he finds his finished house is twice the size of his neighbour's house — even though they bought the same type of kit house!

The reason for this discrepancy is fairly obvious: Nature was forced to use relative measurements — it was the only option open to Nature. While this resulted in a house which fitted together perfectly well, the size of the house could turn out to be any random size relative to other houses, depending on the random plank length which Nature picked as its standard length.

The final house is effectively selected at random from a virtually infinite range of sizes!



So being forced to use a relative system of measurement rather than having access to absolute standards is not a serious problem for the laws of Nature — systems can function perfectly well on that basis. But using a relative system of measurement can introduce unexpected, counter-intuitive behaviour which can appear weird.

So what kind of counter-intuitive behaviour do we experience in Nature due to this lack of absolutes?

In Chapter Six, which is dedicated to quantum mechanics, we will consider the counter-intuitive behaviour of quantum mechanics in detail, including the description of a famous experiment in which particles can apparently be in more than one place at once. But all the weird manifestations of quantum mechanical measurements can be described as being variations of a particular characteristic quantum behaviour: before measurement of a quantum property, we find the property appears multi-valued, and when we perform the measurement of the property we find we get a random value from a potentially infinite list of possibilities. **But this is exactly what we found with our kit house when we sold it to a customer!** When the customer has constructed his house, he finds his final house could be any size from a potentially infinite range of sizes, and the selection of the type of house he receives is random (depending on the length of the randomly-selected plank in the factory). **This has clear parallels with quantum mechanical behaviour!**

But there's more ...

Every customer, when he constructs his kit house will measure each plank of wood in his kit to be the same length. This length is therefore an invariant length for each customer. As we shall see later in this book, there is a parallel with the invariant speed of light: every observer in the universe measures the same speed of light — regardless of the motion of that observer. But, because we are forced to use a relative system of measurement, there will be a side effect in both cases. In the case of the kit house, the only way the customer will measure each plank of wood to be precisely one metre long (the standard invariant length) is if the customer's tape measure is also modified in size: the measurement units on the tape have to be modified. Similarly, each observer can only measure the same invariant speed of light if the observers' clocks are modified: **the observers' clocks must run at different rates — in fact, time itself must run at different rates for each observer!** This is Einstein's principle of special relativity. As we shall see later in the book, time itself moves at different rates for observers moving relative to each other.

So we have found a simple potential link between quantum mechanical behaviour, and the behaviour due to relativity. It is this link which will be explored in this book.

The reason why this relative behaviour appears weird to us is because we generally only deal with absolute measurements in our daily lives. When we go to buy clothes, we already know our own measurements according to a system of absolute units, and we know the clothes in the shop will also conform to that absolute system of units.

Hence, it is quite easy to find clothes which fit. This is only possible because the shop, the customers, and the clothes could be considered as forming a *closed system*, and the absolute standard measure (that metre of platinum in Paris) resides outside of that closed system.

At human scales, we have access to absolute measurements. We can access measuring tapes which provide us with absolute measurements of length, and speedometers which provide us with absolute measurements of speed. However, when we get to the extremes, when we get down to the most fundamental levels, Nature is pushed to the limit and all of the absolutes get progressively stripped away. That is when we start to see the inevitable side effects which are caused by the switch to relative measures.

Parallel universes

If we return to consider our principle that there is "nothing outside the universe", the question might be arising in the minds of some readers: "What about parallel universes? Surely, if such a thing existed, it would be outside our universe? In which case our presumed principle — that there is nothing outside the universe — would be wrong." This requires investigation.

Parallel universes are very much flavour-of-the-month in physics at the moment. The concept appears to offer an easy solution to some of the greatest current challenges in physics. It could be argued that this is not necessarily a good thing, and I would tend to agree.

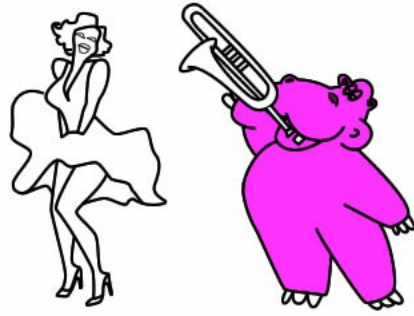
At the current moment in time, fundamental physics has found itself in something of an impasse. Progress is slow, and there are several deep and troubling mysteries — with no obvious solution — on the horizon. These questions include the unknown composition of dark energy which is apparently responsible for the observed acceleration of the expansion of the universe. Another mystery concerns the apparent fine-tuning of some of the fundamental constants. It has recently been realised that if some of the fundamental physical constants of the universe were only slightly different then the existence of life in such a universe would have been impossible. The most notable example of this is the apparent fine-tuning of the *cosmological constant* which governs the expansion of the universe. It appears the cosmological constant has a tiny value, but is not zero. If the constant was much larger, the additional acceleration of the universe would have prevented stars and galaxies from forming. And if the value was much smaller, the universe would have collapsed back in on itself before life could have developed.

The principle of parallel universes offers a simple way out of this conundrum: just postulate the existence of a range of different universes, and a random mechanism by which the fundamental constants vary from universe-to-universe. Then it is possible to present a simple explanation as to why the constants are set to such fortuitous values in our universe: there is nothing special about our universe, we just happen to reside in a random universe in which the constants are set correctly.

However, the weakness of this so-called *anthropic reasoning* is that it can be used to predict anything, and a theory which predicts anything predicts nothing. It seems as though we are giving up finding a theory which unambiguously predicts the nature of the universe. As Brian Greene says in his book *The Elegant Universe*, this method has the capacity "to lessen our insistence on explaining why our universe appears as it does."

I am definitely not a fan of parallel universes, but we must consider the potential implications of them representing something "outside the universe". To answer this question, we will refer to a comprehensive review of parallel universes conducted by Max Tegmark. [\[3\]](#)

Theoretical parallel universes actually come in a variety of different flavours. The first type of parallel universe considered by Max Tegmark arises from the theory that space is infinite (this is by no means certain — space might be *closed* in which case it has a finite volume instead of being infinite). The theory states that if space truly is infinite, and uniformly filled with matter, then somewhere out there in the dark depths of space there is going to exist every possible structure. Hence, somewhere far, far away, beyond the limits of our visible universe, there exists a pink hippopotamus playing the trombone to Marilyn Monroe. It sounds like a joke, but this is actually a prediction of the theory. As Max Tegmark says: "Even the most unlikely events must take place somewhere."



As you can see, this theory makes some rather bold assumptions about the rather dubious physical quantity of "infinity". But, more importantly for this discussion, does this represent a separate "parallel universe" in any sense? This type of parallel universe is identified purely on the basis of its distance from our visible horizon. Basically, it is a long, long way away — that is the only distinguishing feature of this region of space. But Antarctica is a fairly long way away as well. Does this mean Antarctica is in a parallel universe? If not, then where do we draw the line? How far away has the region of space got to be before it is denoted as being a parallel universe?

Surely, this type of "parallel universe" has as much claim to being a parallel universe as Antarctica does: in other words, none whatsoever. A distant region of space is still part of our universe.

The next type of parallel universe we will consider is perhaps more in tune with the general conception of what a parallel universe should resemble — mainly through their rather clichéd use in popular science fiction. This concept of a parallel universe is of a completely separate realm of existence, distinguished by having its own completely distinct spacetime structure to that of our universe. This is the type of parallel universe much beloved of many a Star Trek episode, for example, the episode in which a transporter mishap swaps Captain Kirk and his companions for their evil counterparts from a parallel universe — the episode entitled *Mirror, Mirror* (I'm giving my age away, here).

Such a universe could theoretically exist on the other side of a black hole, the black hole providing a *wormhole* to another universe. Another possible source of this type of separate realm of existence is provided by the *Many Worlds* interpretation of quantum mechanics (which we will consider in detail in Chapter Six).

But, a universe which exists as a separate realm of existence, which can have no effect on the objects in our universe, and which itself can never be observed, surely does not exist — by definition. As Paul Davies says in his book *The Mind of God*: "There is something philosophically unsatisfactory about all those universes that go unobserved. To paraphrase Penrose, what does it mean to say that something exists that can never in principle be observed?"

However, to be honest, these distinctions are all irrelevant for our current discussion in this book. This is because we are completely at liberty to define the term "universe" as we wish, and we are choosing to define the term in the loosest possible manner as "the sum total of absolutely everything that exists". So if we decide that parallel universes exist — even though we can never observe or interact with them — then they are, by definition, part of the "universe".

The universe is defined as everything that exists. Whether or not this means the universe is composed of a subset of so-called "parallel universes" is irrelevant.

The universe is everything that exists. Therefore, there is nothing outside the universe. [\[4\]](#)

Hypotheses about the nature of reality which invoke parallel universes are very popular at the moment. These hypotheses certainly seem to infest popular science books. However, I would consider such hypotheses — which can, by definition, never be falsified — to be borderline unscientific. Not only that, but I would consider these hypotheses to be positively dangerous for science, for two reasons.

Firstly, as Brian Greene explained, invoking parallel universes makes the job of physics too easy. Instead of seeking theories which explain how the universe works, theories which make testable predictions, we end up with hypotheses which explain nothing. Absolutely anything can be explained by invoking anthropic reasoning: just say the laws of physics are different in each parallel universe, and we just happen to inhabit a universe in which the laws are set to those which we observe.

But, secondly, I feel parallel universe theories are dangerous because they are a distraction, a diversion, from focussing all our attention on the one universe we inhabit. The premise of this book is that there is one universe, and

that is all there is. The universe is a strange, beautiful, and surprising construct, and all the solutions we seek are contained within this universe — if we just direct our gaze at it instead of being distracted by fanciful hypotheses.

3

SPACE IS NOT A BOX

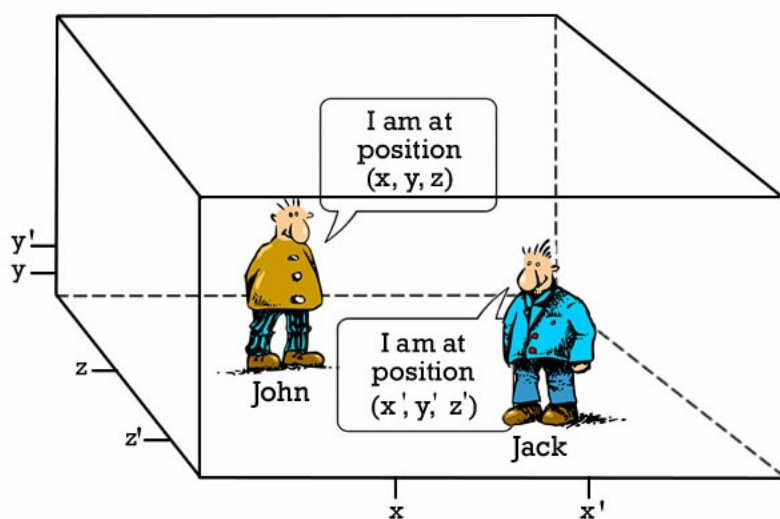
The discussion so far has focussed on the lack of absolutes in the universe. So now let us examine the implications of this lack of absolutes in space and time. This chapter is devoted to considering the implications of the lack of absolutes in space. The following two chapters will be devoted to considering its effect on our concept of time.

Let us start our analysis of how our everyday concept of space must be altered.

As soon as we ask about the nature of space we very quickly find it to be something about which we all have an intuitive notion, but which is very hard to define. And, unfortunately, space is one of those concepts about which human beings have very strongly-held preconceptions which are very hard to shake. Space is a concept with which we are all intimately acquainted, which we have known from birth. We all deal with space as we appear to move around "in" it all day long. Most people like space. They pay lots of money to get more of it, be it a bigger apartment or a bigger garden.

In this respect, space feels like a "real thing" — it costs money to buy. This is the picture we have of space. We know how it works, and we resent being told by logic or experiment that our personal, deeply-held concepts are wrong. This is a particular problem for space as it does, indeed, appear that our preconceived notions are very far from an accurate model of the reality. It turns out that space is not a "real thing" after all, so if you have spent a lot of money buying some recently, then maybe you should take it back to the shop!

Isaac Newton believed in the concept of absolute space, which meant it was possible to define the position of each point in three-dimensional space. Even if all the matter in the entire physical universe was removed, Newton believed absolute space would still exist as an entity in its own right — as if space was a three-dimensional box, and the physical universe was positioned at some point in the box. The position of any object could then be absolutely defined by some sort of measurement scales along the sides of the box:



This absolute view of space is perhaps the most intuitive picture of space. It feels very natural for us to imagine space in this way, and there was perhaps an evolutionary advantage in developing spatial awareness which modelled space along these lines.

So now, consider a little story. Recently, I decided I needed more room in my apartment, so this morning I made a start putting all my old books and CDs into storage. I bought four large transparent boxes, and I put most of my books into those boxes and slid them under my bed. It's a good solution — boxes are really good for storage. We have all lived our lives knowing that we can always put things into boxes for storage.

Now let us imagine Nature has seen us putting things into boxes and so Nature decides it wants to put things into boxes as well. Specifically, Nature decides it wants to put the universe into a box. But how can Nature find a box into which it can put the universe? The universe — by definition — is everything that exists. Therefore, all boxes must be **inside** the universe; there can be no boxes outside the universe. So Nature is stuck. Nature cannot find a box into which it can put the universe into storage. There are no boxes outside the universe. Nature will just have to move to a bigger apartment.

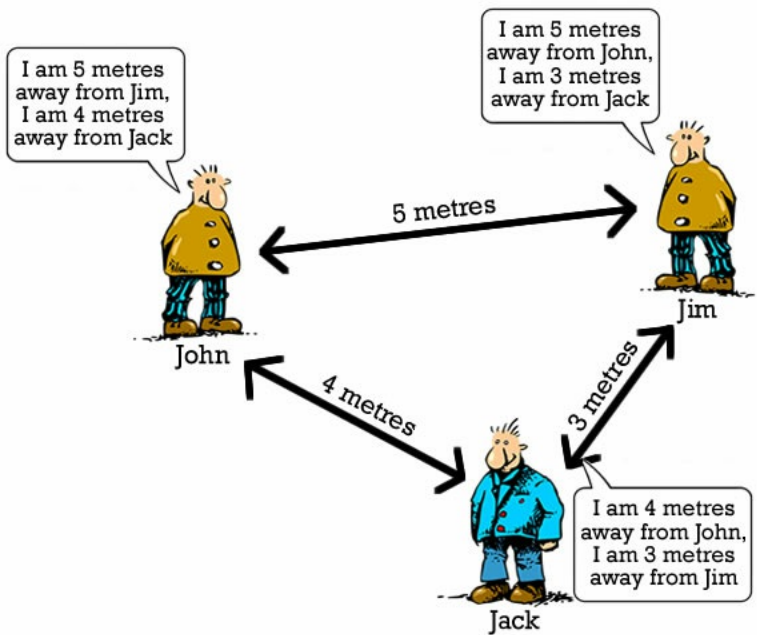
As we have just described, Newton believed absolute space would exist as a box in its own right, even if all the matter in the universe was removed. However, if there is nothing outside the universe then how can there possibly be a box external to the universe? There can surely be no system of coordinate axes outside the universe we can use to determine the absolute position of an object.

With this in mind, we find Newton had a competitor with different ideas, the great German mathematician and philosopher Gottfried Leibniz. The story of the competitiveness between Leibniz and Newton is fascinating. It certainly was not a friendly rivalry, with Newton giving an impression of being rather ego-centric. It is believed Leibniz discovered mathematical calculus a few years before Newton, though Newton disputed this, and much of Europe found it hard to believe that Leibniz could have discovered calculus independently of Newton. By the time of his death, Leibniz's reputation was in decline (Newton played a rather dubious role in this decline). However, Leibniz's reputation has been recently restored, and he is perhaps now held in higher esteem than was ever the case when he was alive.

Leibniz rejected Newton's idea of absolute space. Leibniz believed that space was defined only on a relative basis, with the position of objects being defined in terms of the position of other objects, not defined via some absolute coordinate system. If we state the distance between objects, then we define a geometry. We then get an impression of space emerging from those relationships, without space existing as an independent entity in its own right. If we removed the objects and their relationships, then space would not exist on its own. Due to this elimination of space as an entity in its own right, philosophers call this theory *eliminative relationalism*.

Leibniz had a famous debate via a series of letters to Samuel Clarke, an English supporter of Isaac Newton, between 1715 and 1716. Leibniz asked Clarke the hypothetical question: if the whole universe was moved ten feet to the left, how would we ever know? According to Newton, the two scenarios were distinctly different (positioned differently in absolute space), but for Leibniz, all the spatial relationships were maintained so the two situations were equivalent. Clarke found it hard to argue his position against Leibniz. Leibniz's argument for relative space was compelling.

The following diagram shows Leibniz's model of relative space — with space emerging as a result of the relationships between the men. Contrast it with the diagram of absolute space ("two men in a box") earlier in this chapter. Instead of each man having to store an (x, y, z) position property as was the case in absolute space, each man now has to store the distance between himself and each of his fellow men. This representation still maintains all of the information which was present in the absolute space example:

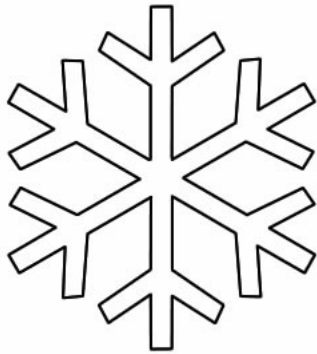


Do not be fooled by the diagram above of the three men in relative space appearing to be separated by some form of "distance" in "space" — this is just a weakness in the way the diagram is drawn. The men are not "in" space (as was the case in the earlier diagram showing them in absolute space). The arrows merely show the relationships between the men — they should not be considered as physical arrows with an extent in space. Remember, space does not exist as an entity in its own right: if all the matter in the universe was removed, there would be nothing left — no "space" left with an independent existence of its own. As Einstein said: "Spacetime is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not *in space*, but these objects are spatially extended. In this way, the concept *empty space* loses its meaning." [5]

If there is nothing outside the universe — and, logically, there cannot be — then absolute space is clearly refuted: Leibniz was surely correct. We do, indeed, live in Leibniz's relative space, not Newton's absolute space. However, towards the end of the chapter we will see how Newton proposed a powerful counter-argument to Leibniz which led to Newton's idea dominating for two centuries.

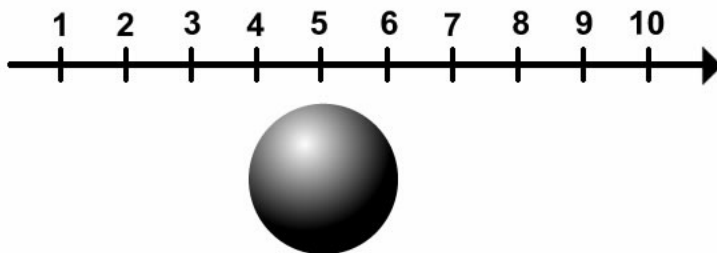
Symmetry

We are probably all well-acquainted with the concept of symmetry, but perhaps have not given much thought to the question of why something is considered symmetrical. We are probably most familiar with geometrical symmetry, such as a snowflake:



If you were to rotate a snowflake by 60° then it would appear unchanged. This is because the snowflake is said to possess *rotational symmetry*. Similarly, if you were to view the snowflake in a mirror, it would look unchanged (*mirror symmetry*). So this gives us a better idea of how to define symmetry: if something remains unchanged after a transformation, it is said to possess symmetry.

Any type of transformation could reveal symmetries, not just rotations and mirrorings. For example, we might consider the transformation of *spatial translation*, in other words, simply moving an object to a different location. If an object is defined relative to an absolute axis incorporating a scale, then it is not possible to translate an object without changing the physical situation. This is how Newton's absolute space would function. Considering the following diagram (showing absolute space), if we were to move the ball from position 5 to position 7, then the physical situation would have altered from "the ball is at absolute position 5" to "the ball is at absolute position 7":



However, if the object is not defined relative to an absolute axis with a scale, then the object can be translated at will, and the physical situation will not be altered:



This is how relative space behaves.

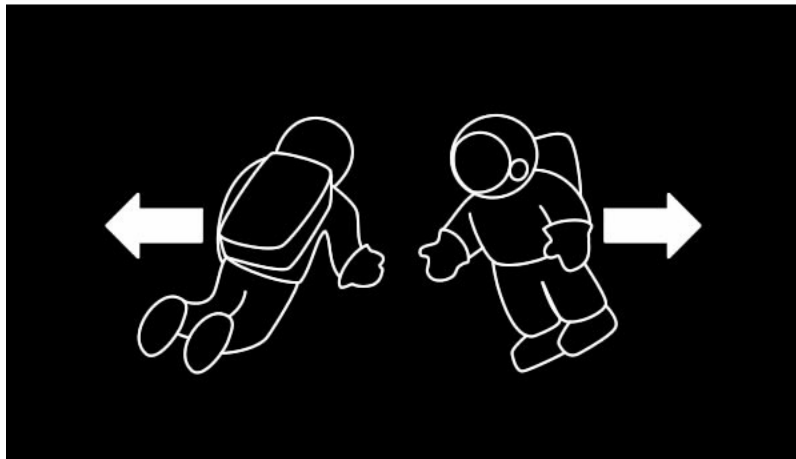
So, the nature of relative space ensures that all objects possess spatial translation symmetry. Fairly obviously, if you were to perform an experiment, and then perform the same experiment a second time but this time with the apparatus moved six foot to the left, you would get the same result. The experiment would be unchanged after the transformation of spatial translation. In fact, everything in the universe has spatial translation invariance. This is due to the lack of any absolute scale "outside the universe" to differentiate any particular position from any other

position.

So perhaps we could propose a deeper explanation for symmetry in physics: **symmetry reflects Nature's fundamental inability to distinguish between one physical situation and another**. If Nature is unable to distinguish between two situations, then we can transform one physical arrangement into another without altering the situation. This represents a symmetry.

As has been said earlier in this book, Nature always does the best it can with the tools available to it. However, Nature is limited by the lack of absolute scales available to it, which is why we see so many symmetries in the physical world. The concept of symmetry is extremely important in physics, and it will be a recurring theme throughout this book. Just remember that whenever you hear symmetry mentioned it is a result of Nature's inability to distinguish between physical situations.

Now let us consider another implication of symmetry on the laws of Nature. Imagine you are an astronaut, floating in the darkness of space. You are so far away from any planets or stars that all you can see is darkness. You feel completely stationary. Suddenly, on your right-hand side, you see a fellow astronaut floating towards you at a constant velocity. Your friend passes by you quite closely, before vanishing to your left-hand side into the darkness of space.



This story can be described from the point of view of the other astronaut, who will describe exactly the same experience as you — a symmetrical experience. The other astronaut felt completely stationary in space, he saw you appearing on his right-hand side floating by at a constant velocity, and it was you who drifted off into the darkness of space. So, the question arises: who was stationary and who was moving? Which of the two astronauts has the greater claim to be stationary?

In the hypothetical situation of absolute space, Nature could endow every particle with an (x, y, z) position property (just as it endows every particle with a momentum property, for example). Nature could then easily determine which astronaut was stationary and which was moving. Nature could tell that the stationary astronaut's position was unchanged, whereas the moving astronaut's position would be altered. As we discussed in the last chapter, though, Nature can only do the best it can with the tools available to it. Without access to absolutes of space, there is no way for Nature to distinguish if one astronaut is in uniform motion or if one is stationary. Hence, by definition, they are fundamentally in the same state of motion.

And if Nature cannot tell the two situations apart — uniform motion and stationary — then you will naturally feel the same experience in both situations. If you were sitting in an enclosed room in an office block, you would consider yourself to be stationary, but if you were sitting in an enclosed room in an ocean liner moving smoothly on a calm sea you might also consider yourself to be stationary — you would certainly feel as if you were stationary. [6]

This inability of Nature to distinguish types of motion forms the basis of Galileo's unification of "uniform motion" and "being stationary" known as *Galilean invariance*.

So here we have an example of a unification — the very first historical example of a unification — which is caused by Nature being unable to access absolute values. As discussed in the previous chapter, it is the belief of this book that the most pressing question in current physics — the unification of relativity and quantum mechanics — can also be achieved by realising that the two phenomena are both caused by Nature being unable to access

absolutes. There might be a wonderful symmetry here, if the general principle behind Galileo's first unification provides the solution for a modern unification.

The gravitational field

But how is this relative space defined? What determines the structure of space? What controls the motion of objects? This is achieved by an entity which permeates the universe: the *gravitational field*.

So what, exactly, is a field?

If we have an electric charge, either negative or positive, and we move it through a region of space, we will find it either attracts or repels any other electric charges around it, even without directly touching them. It appears the first charge can directly move a second charge, even if there is nothing in-between the charges, and the two charges are separated by a distance. It appears as if the first charge has an "invisible hand" some distance away from it which could instantaneously move the second charge. This is called *action-at-a-distance*.

A similar situation applies to the force of gravity. Newton realised that the force which pulled an apple from the tree was the same force which held the Earth in orbit around the Sun. Newton explained this force of gravity in terms of action-at-a-distance, as though the Sun extended a giant hand to hold the Earth in its orbit. But how can something move something else across the vacuum of empty space without touching it, or apparently directly influencing it in any way? Newton was certainly not happy with his own conclusion, as he revealed in a letter in 1692: "That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance thro' a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers."

Indeed, Newton's instincts were correct: action-at-a-distance does not appear to be an accurate picture of reality. Considering our electric charges again, we find any movement of the first charge is not instantly reflected by movement of the second charge (instantaneous communication being forbidden by special relativity). Instead, the influence of the first charge spreads out through space in all directions at the speed of light, taking time before it reaches the second charge. So, instead of action-at-a-distance, the accurate physical picture is of the first charge being the source of a *field* which extends out into space. The field is a continuous structure, which is defined at every point in space. When the first charge moves, it causes a disturbance in the electric field, and this spreads out through the field — as if you had dropped a rock into the sea, and the waves spread out over the water. Only when the disturbance reaches the other particles do they move accordingly (repelled or attracted).

In the case of the electric field described here, when we move a charged particle it creates a changing electric field. In turn, that changing electric field generates a magnetic field. That magnetic field generates an electric field, and so on in an oscillatory fashion. The resultant self-sustaining wave is an *electromagnetic wave*, and can carry energy across empty space. Visible light is a form of an electromagnetic wave, so we can certainly see types of fields: fields have a reality, they are not invisible figments of our imagination.

So a field is a structure which spreads through space, and when we put a particle in it, the particle feels a force. Hence, we could view gravity as a field — the gravitational field — which extends throughout all space and exerts a force on all particles. According to Newton's action-at-a-distance model, if the Sun disappeared then the Earth would instantaneously fly off into deep space, no longer held in place by the Sun's invisible hand. However, Einstein realised that such instantaneous action-at-a-distance was incompatible with special relativity which prohibited faster-than-light transfer of information. Instead, Einstein revealed that gravity should be explained in terms of a gravitational field, and the motion of the Earth around the Sun can be explained by the nature of the field in the immediate vicinity of the Earth. If the Sun disappeared, the Earth would continue to orbit the Sun's position for seven minutes, until the bad news reached the Earth via the gravitational field.

Einstein's insight occurred when he realised that an observer in a closed box undergoing constant acceleration would not be able to distinguish the force he was feeling from the force of gravity. Conversely, an observer falling freely in a closed box would experience no force of gravity. If a force can disappear purely because the point of view of the observer changes, then this means the force does not exist: it is dependent on the observer, it has no objective reality (i.e., not all observers experience it as real). It is not a real force. Therefore, Einstein realised gravity was just a fictitious force.

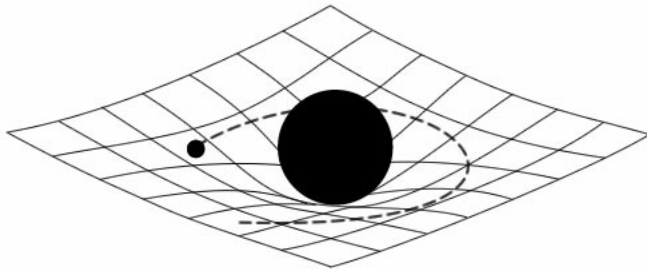
Not all forces are fictitious, and disappear with a change in the observer's perspective. As a comparison with the electromagnetic force, if an observer in a closed box has a particle with a positive electric charge, we could repel that positive particle using a positively-charged particle outside the box. However, we could then move the

observer's box away in the direction of the repulsion to make it appear as though no force was being applied. In this way, it would appear we could make the observer think that no electromagnetic force was being applied to his particle. So, does that mean the electromagnetic force is a fictitious force like gravity? No, because if the observer had a negatively charged particle as well as a positive charge, he would find the negative charge attracted to the external positive charge with increased force. So it is not possible to make the electromagnetic force disappear merely by moving the observer: the electromagnetic force is a real force, not a fictitious force like gravity. We can only deduce this about gravity because gravity has the same attractive force on all objects — unlike the electromagnetic force.

So if gravity is a fictitious force, what is the cause of the force we all feel due to gravity? To answer this, consider an object moving freely in space, without undergoing any acceleration. Such an object would tend to continue in a straight line in space (called a *geodesic*) and would not experience any force due to gravity. Only if a wall, or any solid object, was placed in its way to restrict its movement would the object feel the force we recognise as gravity. The observer would feel the solid object pushing back against him, restricting his progress. This is just how we feel when we are standing on the surface of the Earth. Our natural motion should be towards the centre of the Earth, but the planet's surface restricts our motion. The resultant force we feel, making us tired when we stand up on the surface, is interpreted as the force of gravity.

What determines the nature of the force which we interpret as gravity? Clearly, it is anything which modifies our straight line through space — anything which modifies the geometry of space. In other words, gravity is the curvature of space. As we continue in what feels to us like a straight line in space, if space is curved then our motion will be deflected. It is this deflection of motion which is interpreted as gravitational pull.

What could curve space? Well, we know that objects appear to be attracted to large masses, such as planets, by the force of gravity. This means that large masses must curve space around them so that an object, while proceeding in a straight line in curved space, is deflected toward the mass. A two-dimensional demonstration of the principle behind the curving of three-dimensional space involves placing a heavy ball in the middle of a rubber sheet. The weight of the ball deforms the sheet downwards. The heavy ball is supposed to represent a large mass, for example, the Sun. If we roll another smaller ball around the sheet, it will roll in circles around the indentation. If we consider the smaller ball to represent the Earth, we can see that its resultant motion effectively orbits the Sun.



After observing these orbits, you might come to the same conclusion as Newton that there is an attractive force between the objects, holding the Earth in an orbit. Whereas, all that is happening is the Earth is following a straight line in curved space.

The principle that the force of gravity is actually the curvature of space — with the curvature being caused by the presence of mass — forms the basis of Einstein's theory of general relativity.

Newton's bucket

Let's return to our discussion of absolute space earlier in this chapter. If you remember, Leibniz did not believe in the existence of absolute space. According to Leibniz, the positions of objects were only defined in relation to other objects. By extending this reasoning, we can see that — according to Leibniz — it should be possible to treat any object as stationary, with the rest of the universe moving around it.

However, Newton posed a counter-argument to Leibniz which effectively killed-off Leibniz's idea of relative space for two centuries. Newton's thought experiment is now known as *Newton's bucket*. Newton noted that the

surface of water spinning in a bucket would become concave, with the edges of the water rising up the sides of the bucket. Newton asked the question: relative to **what** is the water spinning? You might suggest the water is spinning relative to the environment and the objects surrounding the water, but if you consider the bucket (which is the water's most immediate environment) you will see that the water is spinning at exactly the same speed as the bucket. So the water is not moving at all relative to its immediate environment.

According to Leibniz, objects are only defined relative to other objects, and so it was just as valid to suggest the water was stationary and it was the rest of the world was spinning. This meant that Leibniz's argument could not explain the change in the shape of the surface of the water. If the water was stationary, why was its surface being deformed? Newton argued that if the water was not spinning relative to its immediate environment then it had to be spinning relative to absolute space, and its movement relative to absolute space was what was causing the deformation of the water surface. Leibniz was forced to admit defeat. Is our proposed concept of relative space in trouble?

However, in the mid-1800s, the Austrian physicist Ernst Mach presented an alternative to Newton's absolute space. Maybe the disturbance of the water in the bucket was not due to it spinning relative to absolute space, maybe it was because it was spinning relative to the rest of the world around it. Even though the water was not moving relative to the bucket, it was spinning relative to the ground, and the trees, and the sky. Wasn't this enough to determine that the water was spinning? Does Nature really need absolute space to tell it that the water is spinning when it has all these other clues?

In his book *The Fabric of the Cosmos*, Brian Greene presents a discussion of Mach's principle. Imagine you are an astronaut spinning in empty space, many millions of miles away from the nearest stars or planets. Clearly you would feel like you were spinning because of the acceleration you would feel. Your arms would splay outwards, and your tummy might feel funny. Newton would say you experience the spinning feeling because you are spinning relative to absolute space. Mach disagreed with Newton's notion of absolute space, and sided with Leibniz's concept of relative space. In that case, Mach argued, the only reason you feel you are spinning is because you can clearly see distant stars and planets around you, and so you are clearly spinning relative to the rest of the universe. According to Mach, the rest of the universe forms a reference by which Nature decides whether or not you are spinning. The motion could be determined relative to all the other masses in the universe — no absolute space was necessary.

The reciprocal nature of gravity

Einstein took Mach's idea and modified it by introducing the concept of the gravitational field. We might think of the gravitational field as being generated by all the masses in the universe. The field spreads throughout the length and breadth of the universe, and the astronaut knows he is spinning because he is accelerating relative to the gravitational field.

Even though Einstein's concept of a gravitational field superseded Mach's idea, this basic principle of Mach still holds true: in relative space, there is simply no alternative to defining position in terms of the other masses in the universe. So this principle inevitably applies to the gravitational field. Being unable to access any absolutes outside the universe, Nature is forced to make the gravitational field an entirely relational structure, i.e., not being defined in terms of the coordinates of absolute space **outside** the universe, but having to be defined in terms of the structures which exist **within** the universe. In other words, the gravitational field has to be defined in terms of the distribution of matter inside the universe — Nature has no option. This dependency explains why, when matter moves in the universe, the gravitational field is inevitably re-shaped.

Although this is a speculative theory, we should not be surprised to find that this inevitable dependency of the shape of the gravitational field on matter can result in a deformation of the gravitational field. In other words, we find mass curving space. The only alternative would be a gravitational field which was flat in all circumstances. However, such a structure would effectively perform a function identical to Newton's absolute space — and we have already refuted the notion of absolute space.

In his book *Time Reborn*, Lee Smolin described Einstein's justification for replacing Newton's theory of gravity by Einstein's theory of general relativity: "Einstein's point was that Newton's absolute space tells bodies how to move, but nothing is reciprocated; the bodies in the universe do not influence absolute space. Absolute space just is. In Einstein's theory of general relativity, the relationship between matter and geometry is reciprocal: Geometry tells matter how to move and, in turn, matter influences the curvature of spacetime."

Smolin is actually paraphrasing a famous quote by the great physicist John Wheeler: "Matter tells space how to curve, and space tells matter how to move."

Essentially, the necessity for relative space means space loses its regular rigid box-like structure, and instead

becomes a curved and distorted structure: space is not a box.

So once again we appear to have a side effect caused by Nature being fundamentally unable to access absolutes. Nature does the best it can with the tools it has available, and, for the most part, we do not notice any problems — space appears flat to us. Light appears to travel in straight lines. We only notice the side effects caused by the lack of absolutes when Nature is pushed to extremes, in this case, in the presence of extreme masses. The inevitable side effect in this case is a curving of space around those large masses. For example, if we look closely we will find that the direction of light is bent slightly as it travels round stars due to the curvature of space. We interpret this curvature of space — which appears to attract objects to large masses — as the force of gravity. Hence, gravity itself is shown to be a side effect of the lack of absolutes in the universe.

4

TIME IS NOT A CLOCK

Let us go back to 1905. We find a young Albert Einstein working as an assistant examiner in Bern patent office. Einstein had suffered recent disappointment. He had just finished a four year mathematics and teaching programme at the Zurich Polytechnic, but had failed to obtain an academic position. However, Einstein was not disheartened, and continued his personal research, despite the setbacks. His time at the patent office is often pictured as a dreary waste of time for the greatest mind in modern science, though it is more likely his job provided him with the financial support and freedom to pursue his own agenda which he likely would not have enjoyed in university. Einstein's friend, Abraham Pais, described Einstein's time at the patent office as "the closest he would ever come to paradise on earth".

Einstein spent his spare time trying to solve the most pressing physics problems of the day. In particular, he tried to solve a conundrum which had been troubling him from childhood: what would you see if you moved fast enough to catch up with a ray of light?

The Scottish physicist James Clerk Maxwell had just shown that light should be considered as being a type of electromagnetic wave. This posed a dilemma for physics. All types of known waves took the form of a disturbance in some type of underlying medium. For example, waves on the sea are a form of disturbance on water, while sound waves are a form of disturbance in air. But what medium carried light? Light was a disturbance of which medium? Physicists at the time called the proposed medium the *ether*. It was proposed that light took the form of a travelling wave of disturbance through the ether.

What form would this ether take? Sound waves require air, and there is obviously no air in space, but light can reach us from the distant stars. So the ether had to be a mysterious, invisible background substance which pervades the entire universe.

But Einstein was unhappy with the proposed ether idea. Galilean invariance stated that the laws of motion were the same in any uniformly moving environment — you could not conduct an experiment to determine if you were moving or not. However, if we introduce the idea of the ether it would be possible to perform an experiment to measure the speed of light and hence determine if you were stationary or moving: only if you were stationary with respect to the ether would you get the correct measure of the speed of light. So in many ways, the ether played the role of Newton's absolute space — a form of absolute coordinate system which spread throughout space. But we have already refuted the notion of absolute space.

It did not seem right to Einstein that the laws of motion were the same in any uniformly-moving environment, but the laws of electromagnetism should be different (different observers obtaining different values for the velocity of light). Furthermore, in another blow to the ether idea, Albert Michelson and Edward Morley performed a famous experiment in 1887 which failed to detect any trace of the ether.

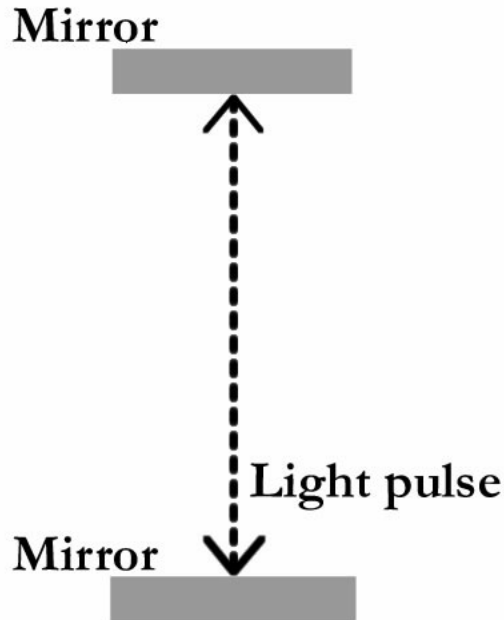
In a brilliant flash of inspiration, Einstein decided that the only way out of this dilemma was to reject the notion of the ether and extend the principle of Galilean invariance to the whole of physics. He proposed his principle of relativity: all the laws of the physics (not just motion) are the same in all uniformly moving environments. It might seem quite an innocuous principle, but it had tremendous implications. That simple principle formed the basis of the theory of special relativity, and from that point on, our concept of space and time would be forever altered.

Once again, we find we can derive this result from our fundamental principle. Considering our discussion of the two floating astronauts in the previous chapter, we saw that Nature could not distinguish which astronaut was stationary and which was moving. This is due to Nature being unable to access any absolute reference scale "outside the universe" (remember: there is nothing outside the universe). No astronaut can claim to be preferred. The experience of both astronauts is identical. We saw that this principle is called Galilean invariance. It is due to this inability of Nature to access **any** absolute reference axes outside the universe which means that Galilean invariance must be extended to **all** of physics. This leads to the principle of relativity: all the laws of physics are the same for all observers, no astronaut can claim to be preferred, the experience of both astronauts is identical. Crucially, this means that both astronauts must measure the same value for the speed of light.

We shall now consider the implications of this invariance in the measured speed of light for all observers.

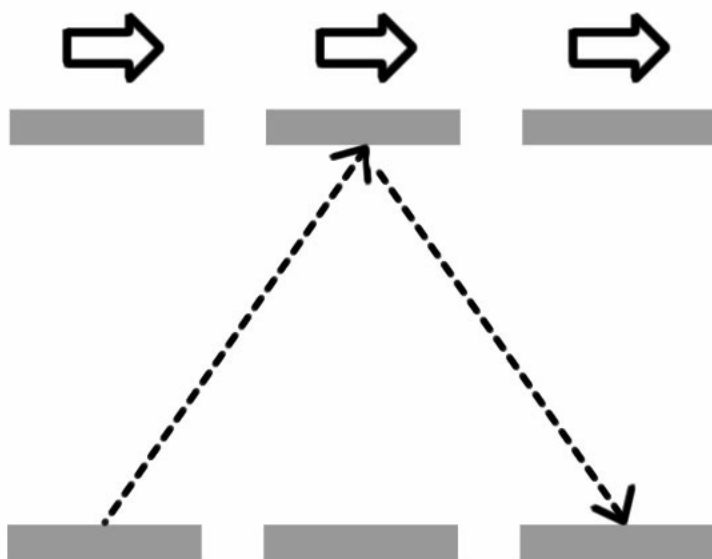
What time is now?

We are going to reveal the implications of Einstein's great insight by performing one of his famous thought experiments. Let us imagine we are riding on a train, and we have the latest technological marvel on our table: a light clock (there is no such thing in reality — it is purely a construct of our imagination). A light clock consists of two mirrors, and a pulse of light bounces backwards and forwards between the two mirrors at regular intervals. So this is what the light clock would look like if you were on the train:



It is, in principle, easy to use the light clock to measure time as we know the distance between the two mirrors and we know the speed of light. What is more, the light clock is wonderfully accurate as we know the speed of light is a constant.

However, we now ask the question, what would the light clock look like to someone standing on the platform at a station as the train passes by? As the train is moving, anyone standing on the platform would see the pulse of light having to travel further between each pulse as the pulse now has to travel diagonally. So, for an observer standing on the platform, this is what the light clock would look like at three separate moments:



So, for each "tick" of the light clock, it appears to the observer on the platform that the pulse of light has to travel a greater distance than is the case for the passenger on the train. But the principle of relativity tells us that the speed of light is measured to be the same speed in every uniformly moving environment. That would appear to indicate that the observer standing on the platform would see a longer time interval between ticks than the passenger on the train would see. In other words, the observer on the platform sees the clock on the train running slow.

As bizarre as it might seem, this is precisely what happens. But it is vital to stress at this point that this result has nothing to do with light or light clocks in particular. What applies to the light clock applies to any clock, or indeed any physical process. It is not only the light clock which runs slow, but — according to the observer on the platform — it is time itself which runs slow on the train!

This phenomenon of the slowing-down of time for observers in relative motion is called *time dilation*.

However, the principle of time dilation is often badly expressed as "moving clocks run slow". Such a statement is relativistically flawed, and only adds to confusion. Who is to say which clock is stationary, and which is moving? Remember, there is no such thing as absolute space, no fixed coordinate axes to determine which clock is stationary. It is true that an observer will see the clock of another observer — who is in relative motion — running slow. But exactly the same applies from the point of view of the other observer. Observer 1 will see the clock of observer 2 running slow, and, because of the symmetry of the situation, observer 2 will see the clock of observer 1 running slow as well.

"How can this be?", you might ask. "How can both observers see the clock of the other observer running slow?" Without going into too much detail, the answer is that we have to bring the clocks together for direct comparison. If both observers decelerate to a stop in the same way, and then come together again (in a symmetrical manner), then when both clocks are stationary in the same reference frame and are compared, they will both say the same time.

So, instead of summarizing time dilation as "moving clocks run slow", be careful to say "a clock which is moving relative to an observer will run slow relative to the observer's clock."

This is no mere theorizing. In 1971, Joseph Hafele and Richard Keating flew four highly-accurate caesium-beam atomic clocks twice around the world on a jet liner, first eastward, then westward. When they got back to base, they compared the time on the clock with the time on a clock which had remained at base. They found the clock which went around the world had run very slightly slower: just a few hundred billionths of a second less elapsed time, but this was perfectly in accordance with Einstein's theory.

The rate at which time passes appears to vary depending on the motion of the environment. It would appear that each observer, moving through the universe, has his own personal clock which tells his own personal time. How can this be?

Time is not a clock

Isaac Newton believed in the concept of absolute time, along very much the same lines as absolute space. Just as absolute space proposed one series of absolute coordinate axes for space, absolute time proposed one single measure of time for the entire universe. According to Newton, it is as if there exists an invisible clock, which only Nature can access. This clock forms the universal standard, and "ticks" at the same unvarying rate for all objects. According to Newton, all physical processes are controlled by this universal clock: "Absolute, true, and mathematical time, of itself and from its own nature, flows equably without relation to anything external". [7]

However, once again, Gottfried Leibniz took issue with Newton's concept of absolute time in just the same way as he had attacked his concept of absolute space. As with the case of absolute space, Newton believed that if all the matter in the entire physical universe was removed, the universal clock would still exist, ticking-away the absolute time. However, similar to the argument regarding absolute space, we can see that if there is nothing outside the universe then there can be no universal clock outside the universe providing this absolute time measure.

As Einstein's discovery of time dilation revealed, in the absence of the universal standard of absolute time, it is as though every object in the universe is now free to use its own personal clock, ticking at a different rate from every other person's clock.

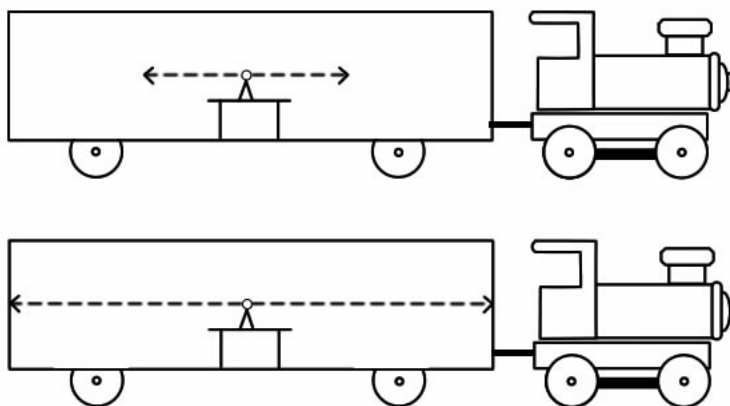
In the last chapter we saw how the lack of absolutes in space meant that Nature was unable to distinguish between objects which had been spatially translated. This led to a symmetry: if you performed the same experiment but moved it six feet to the left, you would get the same result. But if we see symmetry in space due to lack of absolutes, then we would surely expect to see a similar symmetry in time. And this is precisely what we do see. Just as we found spatial invariance, we now find time translation invariance: if you shift your entire experiment in time (perform the same experiment at a later date) then you will get precisely the same result.

Once again we find a symmetry caused by Nature's fundamental inability to distinguish between two physical situations.

Spacetime

Let us now consider another implication of the principle of relativity. Imagine in the precise centre of a carriage on a moving train there is a lamp standing on a table. When the lamp is turned on, an observer riding in the carriage will obviously see the light beam hit the front and rear of the carriage at precisely the same time.

So the following diagram shows the situation as seen by an observer riding in the carriage. As shown in the diagram, the observer sees the emitted light strike the front and the rear of the carriage at the same time:

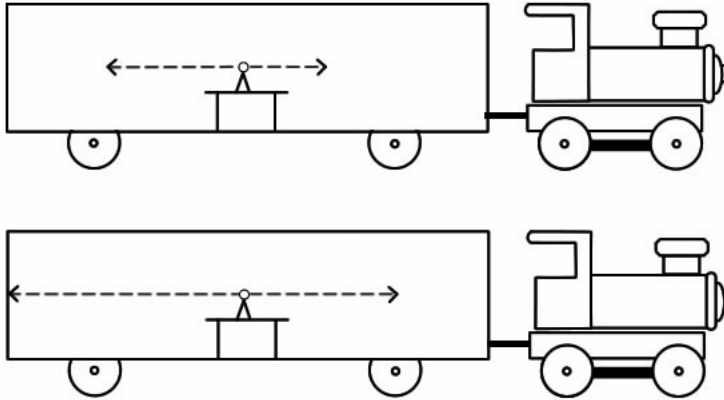


However, the situation is different for an observer standing on a platform watching the train pass by. According to the principle of relativity, all observers must get the same reading for the speed of light. So the observer on the platform will measure the same speed of light from the lamp on the train both in the forward and backward direction — despite the forward movement of the train.

In the time it takes the light to reach the ends of the carriage, the observer on the platform will see the rear of the

carriage advance in the forward direction, due to the forward motion of the train. This has the effect that the light will reach the rear of the carriage first.

So the following diagram shows the situation for an observer standing on the platform. As shown in the diagram, the observer sees the emitted light strike the rear of the carriage first:

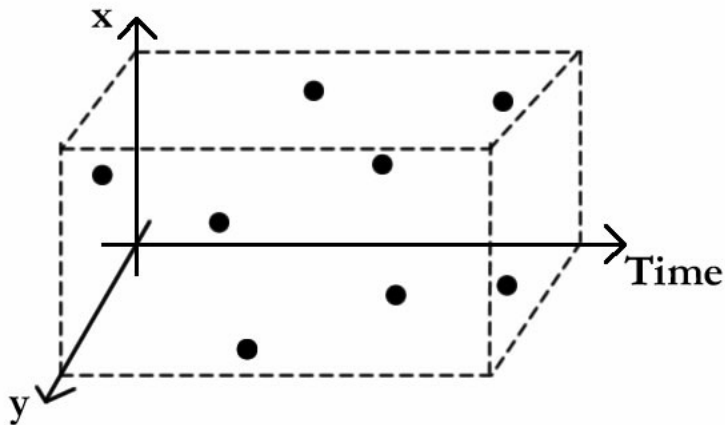


At first glance, this might not appear particularly remarkable. We might expect that the forward movement of the train results in the light striking the rear of the carriage first. Indeed, we would expect precisely the same result if sound signals replaced the light signals. The difference with sound, however, is that sound travels through a medium — effectively an ether — and that ether is air. Light is different. As explained earlier, light requires no ether. Both the observer riding in the carriage and the observer standing on the platform will measure the same speed of light. The only conclusion we can draw — and it is a remarkable conclusion — is that the events which are simultaneous for the observer standing on the platform are not simultaneous for the observer riding in the carriage.

This result shows that events which are simultaneous for one observer are not necessarily simultaneous for another observer who is in relative motion. This extraordinary, counter-intuitive behaviour only becomes noticeable at speeds close to the speed of light. As was explained in Chapter Two, at human scales and at human speeds we do not experience the strange glitches of quantum mechanics and relativity. It is only when Nature is pushed to the limit that the complete lack of absolutes available to Nature starts to show, and we experience the strange, counter-intuitive side effects.

This so-called *relativity of simultaneity* means that the ordering of events can be different depending on your viewpoint. From my viewpoint, event A might happen before event B, whereas from your viewpoint event B might happen before event A, depending on our relative motion. As a result of this, when we are drawing events in space, it therefore makes no sense to attempt to draw all the events at a particular specified time, as different observers will disagree as to which events occurred at that time. The only way to unambiguously draw events in space is to add an extra time dimension onto a diagram of space, and then draw events in a block which incorporates both space and time. The resultant block of space and time is called *spacetime*.

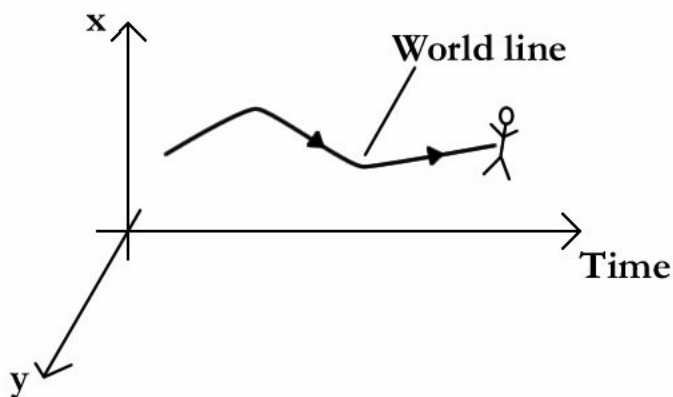
The following diagram shows events (the black dots) in a block of spacetime (only two dimensions of space, x and y , are shown):



Spacetime is believed to be the most accurate representation of space and time. When considering the structure of space and time, we should treat the time dimension as being combined with the three spatial dimensions to form a four-dimensional spacetime. Although it sounds rather far-fetched, we in fact treat time as a fourth dimension every day. For example, when we arrange to meet someone, we not only have to say where (in space) we want to meet them but we also have to say when (in time) we want to meet them. So the meeting event is specified by four pieces of information: the three dimensions of space, and the one dimension of time.

It is hard for us to imagine time as the fourth dimension because, whereas objects are free to move in any direction in the space dimensions, they only move forwards in the time dimension. This makes it especially difficult for us to imagine time as a dimension as — psychologically — it seems so very different from the space dimensions. And, while we can visualize three orthogonal axes, it is simply impossible to visualize four orthogonal axes. However, if we overcome our psychological objections we find that time does, indeed, behave very much like the dimensions of space.

As we move about in space, we are also moving forward in time. This means we effectively navigate a path through spacetime called a *world line*. This is an important concept and we will be returning to this idea later:



It was Hermann Minkowski, one of Einstein's teachers, who first conceived of four-dimensional spacetime. Minkowski famously said: "Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a union of the two will preserve an independent reality."

Invariants

In our light clock thought experiment, we have already seen how Einstein showed that time would pass slower for an observer who is in relative motion. It would appear that space and time are very much relative quantities, and the measure you get for these quantities depends on your viewpoint. However, when we combine space with time to form spacetime we find we get some joint quantities which do not depend on your viewpoint. Such quantities are called *invariants*.

An example of an invariant is the distance travelled by an observer in spacetime. In the following equation, the spacetime distance, s , is equated with the length of time measured by an observer, t , the spatial distance travelled by the observer, x , and the speed of light, c :

$$s^2 = (ct)^2 - x^2$$

It so happens that the spacetime distance travelled by an observer — as calculated by this equation — is invariant, i.e., all observers will agree on this distance.

What are the implications of this invariant spacetime distance? In order to answer that, let us consider two observers. One observer stays on planet Earth, while the other observer decides he wants to be an astronaut and announces his intent to travel to the edge of the solar system before returning to Earth. Both observers synchronize their watches before the astronaut starts on his journey. When the astronaut returns to Earth, the two observers compare their watches again.

You will note that the value for x^2 in the spacetime distance equation is negative. This means that the observer which covered the greater spatial distance will have the smaller distance in spacetime. In other words, the spacetime distance — which represents the amount of time experienced by an observer — will be smaller for the astronaut who went on the round-trip to the edge of the solar system. Less time will have passed for the astronaut than for the observer who remained on Earth.

This is precisely in accordance with Einstein's theory of time dilation: the moving astronaut's clock runs slow compared to the clock of the observer who remained on Earth. If the astronaut travelled far enough and fast enough he would have returned to find his friends had aged considerably, while he remained young.

What else can the spacetime distance equation tell us? Well, if our spatial distance, x , is zero, i.e., if we do not move through space, then the spacetime distance we travel is equal to ct . In other words, just by standing still we are all travelling through spacetime at the speed of c , the speed of light!

How absolutely bizarre, you might think. You might think that when you are standing still or sitting down, you do not feel as if you are travelling at all. Well, you do have the sensation, really: you feel as if you are travelling in time. You feel a kind of motion of the present moment, as the future becomes the past. Just by sitting down, you are travelling through spacetime at the speed of light (do not take this as an excuse to do less exercise).

So how should we interpret forward motion in the time dimension? It means you are getting older! That is how to interpret motion in the time dimension: the object doing the travelling in the time dimension gets older

This invariant quantity — that everyone is moving in spacetime at the same speed — gives us a different way to look at Einstein's theory of special relativity. When we combine space and time into spacetime, we find that all observers move through spacetime at the same speed. This means that if you see another object is moving at high speed relative to you, its speed through space is greater than yours. Hence, its speed through time must be less than yours. This is what you will find when you compare your clock with a moving clock: as the moving clock is travelling faster through space, it is travelling slower through time, i.e., time runs slower for the moving clock relative to your clock. Actually, if an object could move through space at the speed of light (as massless photons can), they would not move through time at all — all their speed would be motion through space, with no speed left to travel through time. For this reason, photons do not experience the passage of time at all.

As Brian Greene says in his book *The Elegant Universe*: "We now see that time slows down when an object moves relative to us because this diverts some of its motion through time into motion through space." This is time dilation expressed from the point of view of invariants: everyone's speed through spacetime is the same invariant quantity. In fact, Einstein did not originally want his theory to be called "relativity", he wanted it to be called "invariance", precisely for this reason.

So we now see that the speed of light is not actually the cosmic "speed limit" in the space dimensions it is usually portrayed to be. It is, in fact, the speed at which **everything** is travelling — in four-dimensional spacetime! So the next time that someone in the pub tells you that no one can travel at the speed of light, you can tell him that he is travelling at the speed of light right now!

The speed of light is no speed limit — it is the universal speed. Everything travels at the speed of light.

The invariant speed of light

So if all observers measure the same value for the speed of light, this appears to suggest that the speed of light is an absolute speed. So are there absolutes in the universe after all?

Well, it is still the case that in a relative universe everything must be defined relative to everything else in the universe. In that sense, the speed of light is perfectly analogous to the length of the planks of wood considered in Chapter Two (remember the "plank length" used to build houses). Everyone has a plank of wood the same length, and everyone measures the same size of their plank of wood (just as everyone measures the same speed of light). However, the plank length cannot be considered an absolute because if everyone's plank length doubled (or halved) nothing would change in the universe.

This suggests that while the speed of light is invariant (everyone agrees on the value), it not a true absolute: it is not like the metre rule in Paris, an absolute reference which resides outside the closed system. If there was a true absolute speed then velocities in the universe could be defined absolutely — not relatively. Hence, there would be no Galilean invariance in such a universe (as it would be possible to distinguish "stationary" from "uniform motion").

So, in order that every observer can measure the same speed of light, we have seen in this chapter that there must be an extraordinary side effect: the clocks of all the observers must run at different rates. In fact, time itself must run at different rates.

5

THE BLOCK UNIVERSE

In this chapter we will continue to consider the implications of there being no absolute axes of time outside the universe. The implications of this turn out to be so remarkable that this discussion may very well change your conception of time forever — I know it had that effect on me. I genuinely view time, and events in my life, in a different light now that I understand the full implications of the block universe model.

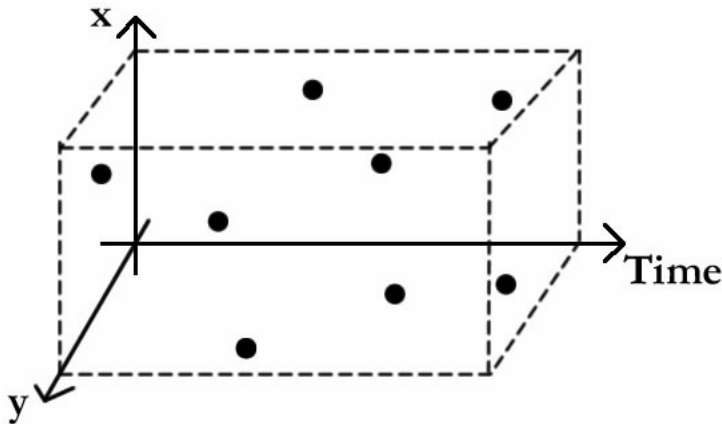
The path we will take will be purely logical, and our conclusions will be clear and unarguable. This makes it all the more remarkable that many professional physicists seem unaware (or choose to ignore) the implications of basic logic when applied to time. As Lee Smolin says in his book *Three Roads to Quantum Gravity*: "There are unfortunately not a few good professional physicists who still think about the world as if space and time had an absolute meaning."

It is time to spread a bit of logical light ...

How fast does time flow?

In the last chapter, we discovered how time is a relative notion. This is an inevitable consequence of our principle that there is "nothing outside the universe" — different observers in the universe can effectively have their own "clocks". Time appears to pass at different rates for different observers, relative to other observers.

Then, in our discussion of the relativity of simultaneity, we found it made no sense to attempt to draw all the events at a particular specified time, as different observers will disagree as to which events occurred at that time. We found that the only way to unambiguously draw events in space is to add an extra time dimension onto the diagram of space, and then draw events in a block which incorporates both space and time. Thus, we represent spacetime graphically as a block, and this is the most accurate way to think about space and time.



But there is another, quite fascinating, logical way to consider time which also suggests that we should consider spacetime as a block. We have all seen objects changing with time. We see cars driving down a road, or birds flying in the sky. In slightly more formal terms, what does this motion actually represent? It represents a change in the position of an object with respect to time. As time progresses, the object's position alters. We interpret this change in position as motion. Some objects move slowly with respect to time, some objects move quickly with respect to time.

Bearing this in mind, in 1951 the American philosopher D.C. Williams asked a simple question: "How fast does time itself move?"^[8] This might seem like a fairly innocuous statement, but it is far from easy to answer. We have discussed how we see objects moving with respect to time, but if time itself is moving, then is it moving with respect

to itself? This sounds nonsensical. Maybe we shall have to elaborate on what the movement of time actually means.

We all have an intuitive feeling of the passage of time. We feel the immediacy of a "now" moment as if it is the only real moment, we remember the past as "somewhere we have been", and we look to the future as "somewhere we are going". In this sense, it feels as if our "now" moment is moving through time, from the past to the future. The movement of the "now" point has the effect of turning the uncertain and malleable future into the fixed and unchangeable past.

So, if we are going to answer the question of "How fast does time itself move?" then it would appear we need to consider how fast the "now" point moves. If the "now" moves then it must move with respect to some time reference. So is time moving with respect to itself? Surely not. To say "Time moves at the rate of one second per second" is meaningless. Rather, the rate of time flow would have to be measured with respect to some secondary, external time reference. However, as we have discussed in earlier chapters, we know that there is no clock outside the universe, so there could not be any such external time reference. It is simply logically impossible for there to be a moving "now". The only logical conclusion we can draw is that time does not flow!

So what is the alternative? The alternative is to consider a universe in which all of time is laid-out (just as the space dimension is laid-out), and there is no moving "now". We would imagine this as a solid block of unchanging spacetime, containing all the events of all time. As there is no special "now", there is no distinction between past and future. Amazingly, this means that **all times are equally real**. The future and the past are just as real as the present!

If all times are equally real, then the times and events you remember earlier in your life are just as real as now: the current moment can have no particular claim to be a special moment in time. So, you remember that moment as a child when you fell off your bike and grazed your knee? That moment is just as real as the current moment — it can be said to exist just as much as the current moment. All times exist, all times are real.

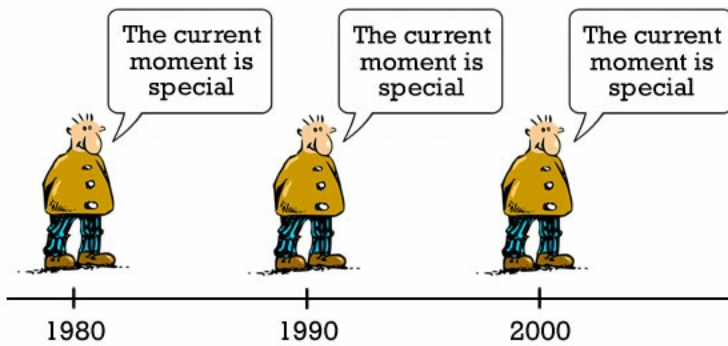
This principle forms the *tenseless* theory of time. It is also called the *block universe* model because all of spacetime can be viewed as being laid-out as an unchanging, four-dimensional block. The block universe model can be considered the orthodox model of spacetime as it has its roots in special relativity and basic logic, and is the model of spacetime adopted by the vast majority of physicists.

I first became aware of the full, extraordinary implications of the block universe model in 2006 when I read a superb *Scientific American* article by Paul Davies entitled *That Mysterious Flow*. I suspect that for a lot of people — not just me — the article was a revelation. Paul Davies presented the argument against the conventional, intuitive notion of a moving "now" in a way which really made you stand up and take notice: "It makes sense to talk about the movement of a physical object, such as an arrow through space, by gauging how its location varies with time. But what meaning can be attached to the movement of time itself? Relative to what does it move? Whereas other types of motion relate one physical process to another, the putative flow of time relates time to itself. Posing the simple question 'How fast does time pass?' exposes the absurdity of the very idea. The trivial answer 'One second per second' tells us nothing at all."

A link to the original article is contained in the footnote. [\[9\]](#)

I reproduced Paul Davies's article on my website and got a tremendous response. The general consensus from the comments told me that the average scientific lay-reader was already well-acquainted with the idea of all of space and time being laid-out in a spacetime block (i.e., they were already well-acquainted with the notion of a four-dimensional spacetime — thanks to Einstein). However, they were still under the impression that there was a "now" moment which moved through this spacetime structure, turning the future into the past. Brian Greene also noted this general misunderstanding in his book *The Fabric of the Cosmos*: "A less than widely appreciated implication of Einstein's work is that special relativity really treats all times equally." It is this misunderstanding which I hoped to clarify — with the aid of Paul Davies's article. All of space and time is laid-out, yes, but there is no moving "now". All times are equally real.

According to the block universe scenario, the movement of time is just an illusion. "But", you might protest, "I clearly feel the current moment is special. The past seems distant and hazy, and the future is unknown. So the current moment is definitely special for me." Well, yes, but do not forget that this is precisely how you have felt at every other moment in your life. In 1980, you felt that the current moment was special, and the 1970s were the blurry past. In 1990 you felt that the current moment was special, and the 1980s were the blurry past. In 2000 you felt the current moment was special, and the 1990s were the blurry past. The way you are feeling now is precisely how you have felt at every other moment in your life. So, again, there is nothing to identify the current moment as special in any way.



It is as if there are multiple copies of you in existence at every point in time, and they are all equally real. Remember the discussion about your world line in the previous chapter. That is the accurate representation of reality: you exist as a world line across all times. Just considering yourself at the current moment does not reflect the true reality.

Are we *The Sims*?

David Deutsch provides an excellent description of the block universe model in Chapter Eleven of his book *The Fabric of Reality*. In fact, he comprehensively demolishes the generally-held view of time in favour of the block universe view: "The reason why the common-sense theory of time is inherently mysterious is that it is inherently nonsensical. It is not just that it is factually inaccurate. We shall see that, even in its own terms, it does not make sense ... Common sense frequently turns out to be false, even badly false. But it is unusual for common sense to be nonsense in a matter of everyday experience. Yet that is what has happened here."

Deutsch even considers the possibility that there might be an axis of time external to the universe by which we might answer the question "How fast does time flow?" Deutsch achieves this by considering the possibility that our universe might be a computer simulation, the simulation being performed by an advanced civilisation. If you have seen the movie *The Matrix*, you will be aware of a theory similar to this. In *The Matrix*, the advanced civilisation kept Keanu Reeves's character in a vat and fed his brain false stimuli to make it appear as if he was living in a completely false, simulated universe. The latest theories on this subject have attained a degree of scientific credibility, but they do not propose keeping anyone in a vat. Instead, these theories consider the possibility that our entire universe might be a simulated construct in a vast supercomputer run by an advanced civilisation (as if we were simulated characters in the computer game *The Sims*). The motivation behind such a simulation being just the same as why we enjoy playing games such as *The Sims*: for entertainment.

If we were in such a position, then there would be two axes of time: there would be our time axis as residents inside the simulated universe, and there would be another, entirely separate axis of time for the advanced civilisation performing the simulation — effectively outside our universe. The two axes of time need not run at the same rate, e.g., the advanced civilisation could be watching us go about our daily activities in slow motion.

It would then appear that we could provide an answer to the question "How fast does time flow?" We could say something like "Our time inside the universe flows at five seconds for each elapsed second of time outside the universe." In other words, although it is a nonsense to say that time flows at a rate of "one second per second", it would appear possible to say that time flows at a rate of "one second per external second, according to the time scale outside the universe."

Is this a way out of the logical certainty that we inhabit a block universe?

Well, no. Deutsch shoots down this theory as soon as he proposes it. He points to the fact that we would be just pushing the problem back from our simulated universe to the universe of the advanced civilisation. We may have avoided the problem "How fast does time flow?" in our simulated universe, but we are now left with the question "How fast does time flow?" in the universe of the advanced civilisation. We are no better off.

There is no way out: it is a logical certainty that we inhabit a block universe.

Eternal life

It might come as a surprise that this orthodox block universe view of time leads us to conclude that we possess a form of eternal life! This is a consequence of the principle that in the block universe model all periods of time are equally real. If a loved one dies, you might take some comfort from the knowledge that this period of time in which your loved one is dead has, in fact, no greater reality than the time when your loved one was alive. According to physics, it is just as valid to consider your loved one as alive as it is to consider them dead!

Einstein took comfort from this knowledge when his lifelong friend Michele Besso died. He wrote a letter consoling Besso's family: "Now he has departed from this strange world a little ahead of me. That means nothing. People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion."

Of course, the flip-side is that you're already dead!

Free will

The idea that all of space and time is laid-out in one unchanging block might appear unsavoury to some people as it appears to deny the possibility of free will. This is because it appears we are unable to change the future, which is written in stone. This is not the first time that science has appeared to deny the possibility of free will: Newton's laws of motion seemed to imply a deterministic "clockwork universe", in which, once the initial conditions are set, the universe proceeds along a fixed path which cannot be altered. The arrival of quantum mechanics, though, implied that the universe is not totally deterministic. Quantum mechanics only supplies the probability of an event occurring. It is as if quantum mechanics decides which way the world is going to work by throwing a dice.

But does quantum mechanics actually provide you with more free will than Newton's clockwork universe? I fail to see how having your decisions controlled by a random dice throw somehow gives you more control than having your decisions controlled by a deterministic mechanism. It seems that the proponents of free will try to deny that their thought processes are controlled by fundamental physical processes at all, as somehow their thoughts are "above all that". Descartes, for example, believed that the human mind did not have to follow the physical laws of the universe. This is surely not the case. However you define free will it is surely controlled by the laws of Nature and fundamental physics.

The main problem is that "free will" has no proper scientific definition, and until it is given a proper definition it is simply impossible to analyse it scientifically to see if it is present or not. In the rather unscientific way that it is normally described, free will is "the ability to make decisions", and that is something we all clearly have. Whether the underlying universe is deterministic, or random, or a block universe, it makes no difference: we all have the freedom to make decisions. This is because "the ability to make decisions" is, again, not sufficiently defined scientifically. In this unscientific sense, the only way we could ever lose this ability to make decisions is if a drug was put in our drink to turn us into a zombie-like, suggestible state. So, in the absence of someone drugging your drink, I can definitely say, yes, you obviously have free will — you can obviously make decisions. The underlying laws of physics are irrelevant.

If you disagree, please present a clearer definition of "free will", a better definition than "the ability to make decisions". In the absence of such an alternative definition, relax — you obviously have free will.

The arrow of time

The block universe model tells us that all times are equally real, and the passage of time is just an illusion. It certainly feels like a very strong illusion, which is why it is sometimes so hard to accept the reality of the block universe. So what is causing this illusion of the passage of time?

The intuitive feeling we all experience is of a moving "now" which turns the future into the past. This seems to indicate a clear directionality of the movement of the "now" from the past into the future. There is a clear asymmetry in the time direction, most notably we can remember the past but the future is completely unknown. This asymmetry in our memory seems to be the main reason why we feel we are in motion in the forward time direction. Because we can remember the past, we feel that it is somewhere we have already been, and because we have no knowledge of the future we feel it is somewhere we have yet to visit. Hence, despite what the block universe model tells us, we feel we are moving in time — we feel the passage of time.

So the asymmetry of the time axis causes an apparent directionality to time. But what is the cause of this asymmetry? What is the cause of the so-called *arrow of time*?

The asymmetry is not just in our minds and memory. As we look around our world, we see wine glasses breaking, but we never see broken pieces of glass forming a wine glass. We see eggs breaking, but we never see a broken egg reforming. So there is asymmetry in the physical world along the time axis. This is particularly puzzling when you consider that physicists believe that almost all physical processes are reversible. There should be no fundamental reason why objects behave differently in the forward time direction to the backward time direction.

Instead of considering time, we should consider which processes appear to be irreversible. We should consider what a breaking wine glass and a breaking egg have in common. In both these cases, we see an increase in disorder. It would appear that it is much more likely that a system could change from a state of order into a state of disorder rather than vice versa. Indeed, this does appear to be the reason why we see an arrow of time.

The scientific term for the amount of disorder in a system is *entropy*. It is known that the entropy of a closed system increases with time, i.e., a system will gradually become more disordered over time. Hence, we see cars rusting (i.e., their molecules become more disordered), but we do not see rusting cars becoming new again. This principle that the entropy of a closed system increases with time is called the *second law of thermodynamics*.

The reason for this increase in entropy can be seen from a purely probabilistic argument: a system will have many more possible disordered states than ordered states, so a system which changes state randomly will most likely move to a more disordered state. It is really just a matter of likelihood. For this reason, the second "law" of thermodynamics is not really a "law" at all, certainly not an unbreakable law on the same basis as other physical laws — it is a statistical principle. In fact, it might be possible for a room full of randomly-distributed particles to re-order itself quite by chance so that all the particles end up in one corner of the room — it would just be incredibly unlikely.

While the second "law" of thermodynamics is "just" a statistical principle, it is a mightily powerful statistical principle. This is because the basis of the second law — that "disorder will increase" — seems so obvious, and seems to appeal to a fundamental, platonic principle of mathematics. For this reason, the second law manages to appear even more fundamental and unbreakable than the other physical laws, some of which (for example, the amount of electric charge on an electron) seem rather arbitrary in comparison. This fundamental strength of the second law was described well by the astrophysicist Sir Arthur Eddington: "If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations, then so much the worse for Maxwell's equations. If it is found to be contradicted by observation — well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can offer you no hope; there is nothing for it but to collapse in deepest humiliation."

I would consider this principle — that disorder will tend to increase — to be so strong that it would be "obviously true" in all conceivable universes. For this reason, I would consider the second law of thermodynamics to be one of those rarest of things: a true fundamental principle, a principle with the potential to be one of the foundation stones of the laws of Nature.

Ex nihilo solutions

To my mind, the disconnect between theoretical physics and basic logic about the subject of time is greatest in the field of cosmology. Cosmology is the study of the entire universe, including its origin. One of the most popular fields of study attempts to explain the origin of the universe by invoking quantum theory. The resultant theory is known as *quantum cosmology*.

According to quantum theory, there exists some unavoidable uncertainties at the base of reality. It turns out that the more accurately we measure a particular property of a particle, the less accurately we can know a different particular property. For example, the more accurately we measure the momentum of a particle, the less accurately we can know its position. One way of looking at this is to imagine that when we measure the properties of a particle we inevitably have to interfere with it in some way, for example, by forcing it to collide with another particle. This interference inevitably changes the property of the particle under investigation — by modifying its velocity, for example. This fundamentally limits the accuracy of the measurement.

Such pairs of properties — such as momentum and position — which behave in this way are called *conjugate variables*. The theory which expresses this uncertainty in conjugate variable values is called the *Heisenberg uncertainty principle*.

According to the uncertainty principle, another pair of conjugate variables is energy and time. This means there is a limitation on how accurately we can know the energy of a system at a given moment in time. Incredibly, this

means that for a short period of time, there can be energy produced in a vacuum in which all the matter has been removed. It is as if we can get something out of nothing! Even more incredibly, according to the mass-energy equivalence described by $E=mc^2$, this vacuum energy can be enough to produce a particle. It is as though the energy is "borrowed" from the vacuum, albeit for a very short period of time. These so-called *virtual particles* can appear out of nothing.

Quantum cosmology considers the possibility that one of these quantum fluctuations could have expanded extremely rapidly in a process known as *inflation*. The suggestion is that one of these fluctuations could have become our universe, blowing up like a balloon just a tiny fraction of a second after the big bang. Our universe would then have emerged from nothing! Theories which propose that our universe may have emerged from nothing in this manner are called *ex nihilo* solutions (*ex nihilo* being Latin for "out of nothing").

An *ex nihilo* solution which is very popular at the moment is based on the idea that the total energy of the universe can be calculated to be zero. That would be the only kind of universe that could come from nothing. The idea of the total energy of the universe being nothing might seem a strange idea as the universe contains matter, and we know through $E=mc^2$ that matter can be converted to energy. So how can the sum total of the energy in the universe be zero? This is possible if gravitational energy is considered to be negative. This requires explanation.

If objects are separated to infinity they feel no gravitational pull between themselves, so the gravitational energy of the system is zero in that case. But when those objects were initially clumped together, you had to put energy into the system to pull them apart. So if you have to put energy into a system just to get to a zero energy situation, this means the energy of the system when those objects were clumped together must have been negative.

So gravitational energy can be considered negative, and, if you actually do the arithmetic for the universe, you can show that the negative gravitational energy exactly cancels the positive energy due to the masses in the universe.^[10] Hence, the total energy of the universe is zero.

Once again, this result could actually be derived from our fundamental principle. If there is "nothing outside the universe" then it could never be possible to "stand outside" the universe and measure any value for the universe as a whole. This principle is expressed by Misner, Thorne, and Wheeler in their classic textbook *Gravitation*: "There is no such thing as the energy (or angular momentum, or charge) of a closed universe, according to general relativity, and this for a simple reason. To weigh something one needs a platform on which to stand to do the weighing." There can be no such platform outside the universe. Once again, we find that our fundamental principle ("there is nothing outside the universe") can be used to derive a remarkable proportion of the laws of Nature.

This result — that the total energy of the universe is zero — makes *ex nihilo* solutions very attractive. It really makes it appear as though the universe could just have emerged from nothing, and that is the reason why the universe exists at all. As Alan Guth, the discoverer of inflation, said: "It is rather fantastic to realise that the laws of physics can describe how everything was created in a random quantum fluctuation out of nothing."

But it is not all good news. Some questions have been raised as to whether it is valid to apply quantum reasoning — which is only ever used to describe behaviour inside the universe — to the universe itself. Our later analysis of quantum mechanics will appear to show that quantum mechanical behaviour arises from the interactions of objects within the universe. In which case, it would indeed be invalid to apply such reasoning to the universe itself.

But a more fundamental problem is that ... ***ex nihilo* solutions make no logical sense whatsoever!**

This conclusion is entirely a consequence of the block universe. In order to see this, first it has to be stressed that accepting the reality of the block universe is not an option. To disregard the implications of the block universe is not only to ignore the conclusions of special relativity, it is to ignore basic logic. Remember the logical argument based on "How fast does time pass?" It is logically absurd to state how fast time itself passes, and it is therefore logically absurd to consider we do not live in a block universe. We have a definite logical conclusion: the universe has a block universe structure.

And the implication of the block universe is that all times are equally real — no particular moment is preferred. The current moment of the universe is just as real as the first moments after the big bang. The entire spacetime block is laid-out as one unchanging structure. No time is dependent on any other time: all times are equally real, all times exist.

So to suggest that in some way that a particular moment of time, such as the time of the big bang, is somehow more important, more real, than other times makes no sense. The last moments of the universe are just as real as the moment of the big bang. And to suggest that the events of any particular moment are responsible for the existence of the universe is logical nonsense! No time depends on the existence of any other time. The universe is one unchanging block of spacetime. The last moments of the universe are just as important for the existence of the universe as is the time of the big bang.

This is surely an incredible conclusion. It has been derived logically, and so it is not open to rational argument. As such, it should be regarded as orthodox physics. And yet, not only is this result ignored by a large proportion of

cosmologists, it renders a large proportion of their research logically absurd.

It seems incredibly counter-intuitive to suggest the big bang is not the reason the universe exists, but this is what logic tells us. The big bang was a massively important event for objects **within** the universe. It explains why the universe takes the form it does. But it tells us nothing about why the universe exists at all.

Ex nihilo solutions make no logical sense. The events of the big bang are not the reason the universe exists. The universe exists as an unchanging spacetime block, the form of which is described by Stephen Hawking in this extract from his book *A Brief History of Time*: "If the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply **be**."



6

QUANTUM REALITY

We are now approximately halfway through this book. As we have concentrated mainly on relativity so far, this would seem like a good point to turn our attention to quantum mechanics.

As far as the general public is concerned, quantum mechanics has a bad rep. It is perceived as being the ultimate in inaccessible, esoteric theoretical physics, only to be understood by the likes of Sheldon from TV's *Big Bang Theory*.^[11] I think this is a tremendous shame as the basic principles of quantum mechanics are really remarkably straightforward. Perhaps physicists must bear part of the blame for not communicating this inherent simplicity to the general public. I do take a fair bit of personal pride in going the other way, identifying the fundamental principles which underlie a subject, and then expressing those principles as simply as possible.

I have always wanted to present the principles of quantum mechanics to a general audience in a form which differs from the approach of most popular science books. The general approach of most books is to start by describing the most bizarre and counter-intuitive examples of quantum mechanical behaviour. I am not quite sure as to what is the intention of this approach — maybe to get you into thinking "Ooh, isn't that difficult and weird!" This approach appears rather self-defeating to my eyes.

I have always felt that a better approach is to emphasize the fundamental logic which underlies quantum mechanical behaviour, which really is quite straightforward and can be described in a few sentences. Quantum mechanical behaviour would only be bizarre if it did not apply its rules consistently. On the contrary, quantum mechanics is totally consistent in applying the same underlying logic to all areas of application, and so should not be considered bizarre — perhaps "counter-intuitive" might be a better description. The presentation of quantum mechanics in this book will emphasize the logic, and de-emphasize the bizarre.

Another bugbear of mine about the presentation of quantum mechanics in the popular literature is that all too often it just becomes a history lesson, parading out the life-stories and achievements of the pioneers of the subject in chronological order. The result can resemble an episode of TV's *This is Your Life* rather than a popular science book. As truly great and heroic the achievements of those pioneers were, the important message to convey is the principles — not the personalities. I am going to try to get through this chapter without describing the story of a single pioneer of quantum mechanics. If you are looking for a book on the history of the subject, there are plenty on the market for you to choose from.

The logic of quantum mechanics

In general, we use our knowledge of quantum mechanics to predict the behaviour of systems. In the most general sense, this means predicting the result we will get when we measure some aspect of the system. So, in essence, quantum mechanics is all about measurement.

In order to explain the logic of quantum mechanical measurements, we need to consider the results of just three experiments. The first experiment we will consider tells us about the wave nature of light. It was first performed at the beginning of the 19th century by Thomas Young.

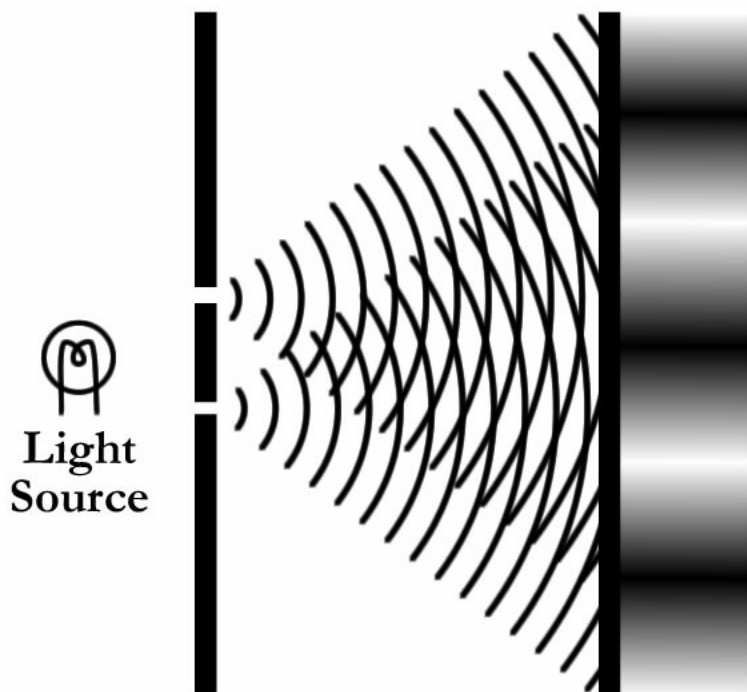
At the time, Newton's views on light were dominant. Newton believed light was "corpuscular" (made of particles), this conclusion being largely based on the observation that light moved in straight lines — just like any other matter in inertial motion. Thomas Young realised that this corpuscular model could not explain effects such as diffraction, which could only be explained if light behaved like a wave. So Young proposed an experiment which he believed revealed the true, wavelike nature of light.

In Young's experiment, a light source is in front of a board. Two narrow slits are cut into the board. Light can only pass through these two slits, and the light which passes through the two slits illuminates a screen behind the board.

The two light rays from the two slits meet at the screen. Due to the wavelike nature of light, the peaks and troughs of the light waves interfere with each other at this point. This means that, if we consider a single point on the screen, if the light wave from one slot has a peak in its waveform at that point, and if the light wave from the other slot also has a peak, then this represents constructive interference and there will be a bright spot on the screen. However, if there is a trough projected from the second slot, then this represents destructive interference: the trough from one slit

cancels-out the peak from the other slit. As a result, there will be a dark point on the screen.

Because of the variations in distance between the two slots and points on the screen, the resultant pattern shows both constructive and destructive interference. The result is a pattern of bright and dark lines being projected on the screen. The following diagram shows the experimental set-up, and the pattern of dark and bright lines being projected on the screen:



So Young's experiment clearly showed that light behaves as a wave. However, the next experiment shows that this does not capture the full description of the behaviour of light. The second experimental result we shall consider is the *photoelectric effect*, and it is here that quantum effects shall start to become noticeable.

Next time you are in a queue at the supermarket, take note that you are in the presence of the experiment which launched quantum theory. When you put your groceries on the rubber conveyor belt, and your onions trundle along towards the person on the till, you will notice the conveyor belt always stops before your groceries fall off the end of the belt. This is because your onions break a narrow beam of light. This beam of light hits a photoelectric sensor, which converts the light into an electric current. When the beam of light is broken, the electric current ceases, and the conveyor belt stops.

In the late 19th century, when the photoelectric effect was first discovered, it posed a great mystery. As we have seen in Tesco (or Walmart), the photoelectric effect generates a current when light shines on a metal plate. It was discovered that this current is caused by light knocking electrons from the metal surface. You might imagine that if the brightness of the light was increased, the energy of the emitted electrons would also increase, but this was not what was found. Instead, it was found that the energy of the emitted electrons depended only on the frequency of the incident light. For example, a current was generated when blue light was used (high frequency), but not red light (low frequency). In contrast, if the brightness of the light was increased, the energy of the emitted electrons did not

increase — there was just more of them. This posed a great mystery. Once again, it took Einstein to shed some metaphorical light on this particular problem.

Einstein proposed that light was made up of packets of energy, which are now known as photons. Brighter light did not have more energetic photons — it just had more of them. This explained why the energy of the emitted electrons was not dependent on the brightness of the light: an electron was knocked out of the atom by being hit by a single photon, the energy of the photon transferring to the kinetic energy of the electron. The number of photons (the brightness of the light) was irrelevant to the energy of the emitted electron. The only important factor was the energy of the single photon which hit the electron, and that was dependent only on the frequency of the light.

So Einstein revealed that light was "quantized" into particles — individual packets of energy. It was for this discovery — not relativity — that Einstein won his only Nobel Prize in 1922.

It is now believed that all of energy and matter follows this quantum structure and is composed of discrete "chunks" rather than being smoothly continuous. So this first conclusion of quantum theory tells us that the structure of reality is composed of discrete "bits".

On the basis of the two experiments we have considered so far, it appears that light can behave as both a wave and a particle, depending on the experiment that is performed. This might appear strange, but it is all due to the quantum mechanical behaviour of light. It is only by understanding this quantum mechanical behaviour that we can make sense of the behaviour of light.

The third and final experiment we will consider reveals all we will need to know about the logic of quantum mechanical behaviour. As Richard Feynman once said: "The double-slit experiment has in it the heart of quantum mechanics. In reality, it contains the **only** mystery of quantum mechanics."

The double-slit experiment is just Thomas Young's interference experiment (which we considered earlier), but with a slight modification. As we have just seen in the photoelectric effect, it appears that light is composed of particles called photons. In the double-slit experiment, the intensity of the light source is hugely reduced so that only a single photon is emitted at a time. In other words, at any point in time there is only a single photon travelling from the light source, through one of the two slits (we do not know which slit), before hitting the screen behind the board.

We perform this experiment many times, each time when a photon hits the screen it makes a mark. Over time, these marks accumulate. At the end of the experiment, when we investigate the pattern of marks, we find something extremely peculiar. The pattern of marks seems to follow the same pattern of light and dark areas that we found earlier in Young's wave experiment. But in Young's experiment, many billions of photons were being emitted at any moment, with the photons passing through **both** slits at the same time. The two waves of light from the two slits created the interference pattern. But when there was only one photon travelling in the experiment, how could the interference pattern be formed? To get an interference pattern we would need light to be passing through both slits, but a single photon cannot pass through both slits — a single photon cannot interfere with itself.

However, this appears to be what the double-slit experiment is telling us. The result of the experiment only makes sense if the single photon is, indeed, passing through both slits. It is as if the photon can be in more than one place at the same time.

So now we can present the conclusion of the double-slit experiment, and it really does — as Richard Feynman stated — capture the whole essence of quantum mechanics. As we stated at the start of this section, quantum mechanics is really all about measurements, and the double-slit experiment means we can capture the logic of quantum mechanical measurement in just two statements:

1) Before we measure certain properties of a particle (e.g., position, momentum) the particle behaves as though it has **all possible values** for that property.

2) After we have performed the measurement, we find the particle property takes only one of the possible values at random. It is fundamentally impossible to predict which value the property will take.

And that, basically, is all you need to know about quantum mechanics. Armed with these two statements, we can now make sense of the result of the double-slit experiment.

In the double-slit experiment, when the particle hits the screen, we are effectively making a measurement: we are measuring the position property of the photon. Before the photon hits the screen, though, the first statement of quantum mechanical logic states that the photon behaves as though it has all possible values for that measured property: we say the particle is in a *superposition* state. In other words, as the photon leaves the light source, it behaves as though it is in all possible positions. This does, indeed, mean that the photon appears to pass through both slits! Strange as it may seem, this is what quantum logic tells us: before measurement, quantum reality appears

to be in a multi-valued superposition. For now, just accept the logic, and be reassured that this quantum logic is applied consistently in all experiments.

The superposition state — in which all the various possibilities are superimposed on the particle — is a crucial and unexplained feature of quantum mechanics. In Chapter Eight I present a speculative explanation for this extraordinary behaviour: a logical rationale for the superposition state.

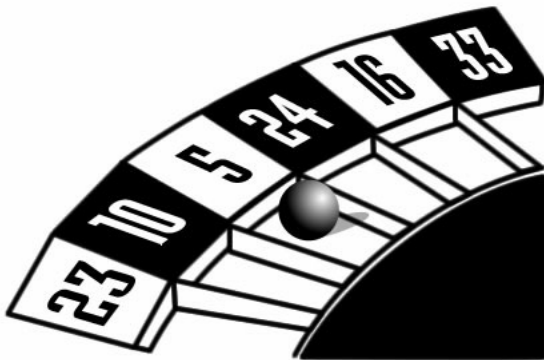
The second statement of quantum mechanical logic states that after we make the measurement, we find the value for the measured particle property is a single value selected at random. So, in terms of the double-slit experiment, this means that when the photon hits the screen and we measure its position, we find we get a single value — a single mark on the screen. But that appears to imply that the photon only went through one slot, not both. Strange as it may seem, just accept for now that this is what quantum mechanical logic tells us. Before measurement, the particle is in a superposition and behaves as though it passes through both slots, but, after measurement when the photon hits the screen, we find only a single, randomly-selected result.

The quantum casino

The first statement of quantum logic reveals that, before we make a measurement we have to consider a property of a particle to have all possible values. We saw this principle in action in the double-slit experiment when the particle appeared to pass through both slits.

But we have not yet considered the implications of the second statement of quantum logic. That states that, after we make a measurement, the property value is selected at **random** from all possible values. Quantum mechanical behaviour is actually starting to sound remarkably similar to a roulette wheel.

We could imagine a roulette wheel as being a device which determines property values during the process of taking a quantum mechanical measurement. When we considered the photoelectric experiment earlier, we came to the conclusion that reality was composed of discrete "bits": property values could only occupy discrete integer slots (e.g., 1, 2, 3) rather than taking completely continuous values (e.g., 1.342937492 ...). So the slots on the roulette wheel represent the only available property values.



When the ball is racing around the wheel, this represents the situation before the measurement is taken. With no idea of what the final result will be, it is as if we must consider the ball as potentially occupying any **and all** of the slots in the wheel (just as a photon in a superposition state is capable of being in more than one place at once, passing through the two slits).

When the ball comes to a rest, it is equivalent to taking a measurement of a property value — the value is the number of the slot in which the ball rests. There is a completely random choice of which value is selected — just like a real roulette wheel. However, the principles behind this randomness are different to that of a normal roulette wheel.

On a normal roulette wheel in a casino it is actually possible to predict (in theory) where the ball will land. If you can measure the precise speed at which the wheel spins, and you can measure the precise speed that the croupier throws the ball, then, by using our knowledge of classical physics and Newton's laws of motion it is theoretically possible to work out where the ball will finish. It is not easy, but it is possible.

The quantum casino works differently. In the quantum casino there is no way of calculating where the ball will land. In a normal casino, there would be a bouncer preventing you from making your measurements. You would be prevented from measuring the speed of the wheel. You would be prevented from measuring the speed of the ball. You would be prevented from seeing that information. Similarly, in the quantum world when we are measuring a

property of a particle we are fundamentally prohibited from digging deeper to analyse the quantum mechanism to try to predict the result. That is a fundamental limit on physics. We just have to accept that the result of the measurement we get will be random. We can never do any better. This is why we have to consider the quantum behaviour of Nature as being **fundamentally** random — because no deeper layer can ever be accessible to our analysis.

The only information we can extract from a system has to be obtained via measurement. In the double-slit experiment, the only information we can obtain is when we measure the photon position when the photon hits the screen. We have no more information about the earlier trajectory of the photon because we have performed no other, earlier measurements. For this reason, we have no deeper information about the photon's path: without taking measurements, that information is fundamentally hidden from us. Comparing with the roulette wheel, we can obtain no deeper information about the speed of the wheel or the speed of the ball in order to predict the result.

But, if we decide to take an earlier measurement to help our prediction, to remove the randomness, we fundamentally change the experiment. In the double-slit experiment, if we put any form of sensor on each of the slits to determine which slit the photon has passed through, we do indeed detect the photon passing through just one slit — not both. But this has the effect of destroying the interference pattern on the screen — we only see the interference pattern when the photon passes through both slits.

So quantum randomness is not a result of our ignorance of the situation. We cannot determine the behaviour of the system by attempting to reduce our ignorance by taking more measurements. If we take more measurements, we irretrievably alter the experiment.

This random behaviour reveals something very fundamental and remarkable about quantum mechanics: quantum mechanics only tells us the probabilities of a measurement outcome taking a particular value — quantum mechanics can never make an exact prediction about which value will result. This is because quantum mechanics is a statistical theory: it cannot accurately predict the outcome of a single measurement, it can only give the probabilities of outcomes when we make a series of measurements. You might think that is a major shortcoming of quantum mechanics, but actually it can be a very powerful tool to know the probability of an outcome, especially when you are dealing with millions of random events (as is the case with millions of particles). In that case, with millions of measurements being averaged, the randomness appears to vanish. No casino knows the outcome of each spin of the roulette wheel, but casinos know that probability is on their side. And you never see a poor casino!

Schrödinger's fridge

Clearly, our discussion of the double-slit experiment has raised some questions about the nature of quantum reality before observation. This also raises the more general question about what it is possible to say about everyday, human-scale reality (i.e., *macroscopic* reality) before we observe it. These questions can be summed-up by the example of the light inside the refrigerator.

Imagine you have a refrigerator whose door is closed. Your task is to find whether or not the light is on inside the fridge. In order to find out, you open the door of the fridge wide, and you can then tell that, yes, the light is definitely on inside the fridge.

However, I am sure you can see the flaw in this observation. The very act of observation (opening the fridge door) modified the object under observation (the light is turned on). It would appear there is no way of making the observation without modifying the object under observation.

Of course, at macroscopic scales it is always possible to modify the experimental set-up to obtain more information without significantly modifying the object under observation. For example, an additional light sensor could be placed inside the fridge, and this could communicate the state of illumination inside the fridge via a wireless connection. However, at the quantum level, this is simply not an option. As we discussed in the double-slit experiment, if we put any form of sensor on each of the slits to determine which slit the photon has passed through, we irretrievably modify the experiment. By adding a sensor to determine which slit the photon passed through, this has the effect of destroying the interference pattern on the screen.

The Copenhagen interpretation

If our fridge was a "quantum fridge" then we would be fundamentally prohibited from determining if the light was on or off before we open the door of the fridge. In that case, what can we possibly say about the reality of the fridge light before we open the door? It would seem that we are prevented from finding out what is going on before we

open the door.

In quantum mechanics, this limitation opens the possibility to create any number of different interpretations of what is happening to reality "behind the scenes" before we make a measurement. As long as your interpretation makes accurate predictions about the result **after** measurement, then you are free to make whatever interpretation you like about what happens **before** measurement. No one can claim that their interpretation is superior to your interpretation. As a result, there are many different interpretations of quantum mechanics.

The first interpretation of quantum mechanics was proposed by the discoverers of quantum mechanics in Copenhagen in the 1920s. This so-called *Copenhagen interpretation* was for many decades effectively the official interpretation, and was taught in schools and colleges as though the matter was settled, when, in fact, this is far from the case. As Murray Gell-Mann put it: "Niels Bohr brainwashed a whole generation of physicists into believing that the problem had been solved."

The Copenhagen interpretation is only interested with the results of experiments, i.e., the result we get when we make a measurement. So, according to the interpretation, we should simply not talk of the reality of the system before we make our measurement — it would be unscientific, the subject of philosophy, to consider that.

In taking this approach the Copenhagen interpretation neatly sidesteps any philosophical questions such as "Does the particle exist before we observe it?" But there is a price to be paid for this apparently neat tying together of the loose ends. In fact, there are a couple of unsatisfactory implications of this interpretation.

Firstly, the interpretation does not state what, exactly, constitutes an observation. This seems like a major shortcoming, especially when the act of observation is such an important factor in the Copenhagen interpretation. As we have seen in the double-slit experiment, before observation, a particle is in a superposition state, appearing to have all possible property values. However, after observation, the particle appears to have only a single property value. What possible process could cause this sudden "quantum jump"? This is called the *quantum measurement problem*, and its resolution remains a major challenge in quantum mechanics.

What does it take to produce an "observation"? Can a machine take an observation, or does it require a human being?

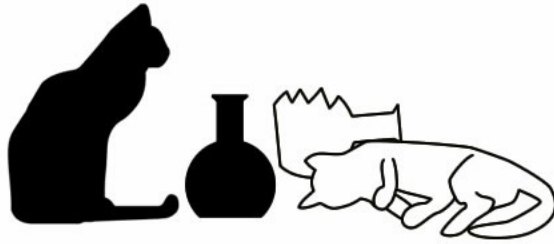
In his 1932 book *The Mathematical Foundations of Quantum Mechanics*, the great mathematician John von Neumann suggested that the consciousness of the experimenter is the last link in the chain which brings objects into reality during a measurement process: "There exist external observers which cannot be treated within quantum mechanics, namely human (and perhaps animal) minds, which perform measurements on the brain causing [quantum observation]."

So does it really take a conscious human being, performing an observation, to generate reality? Surely not. For example, a radioactive uranium nucleus buried in rock on a distant planet will decay to emit an alpha particle. It does not matter if a human observer looks at the rock or not. Einstein, who never accepted the implications of the Copenhagen interpretation, summed up the absurdity of the situation when he said: "Do you really think the moon isn't there if you aren't looking at it?"

As Carver Mead has said: "That is probably the biggest misconception that has come out of the Copenhagen view. The idea that the (human) observation of some event makes it somehow more 'real' became entrenched in the philosophy of quantum mechanics. Even the slightest reflection will show how silly it is. An observer is an assembly of atoms. What is different about the observer's atoms from those of any other object? What if the data are taken by computer? Do the events not happen until the scientist gets home from vacation and looks at the printout? It is ludicrous!"

In his statement about the unimportance of human consciousness in the act of observation, Carver Mead was probably influenced by the famous thought experiment of Schrödinger's cat. Erwin Schrödinger presented the tale of his cat in 1935 to reveal the shortcomings of the Copenhagen interpretation (which was dominant at the time), and, specifically, to reveal the absurdity of the idea that only human consciousness can produce an observation.

Schrödinger's cat is placed inside a sealed box. In the box with the cat is a sealed glass jar of poison. There is also a small piece of radioactive material. If the piece of radioactive material decays (the decay being dependent on quantum randomness), the poison is released and the cat dies. If the radioactive material does not decay, the cat lives.



According to the "human consciousness" interpretation, the reality of the radioactive decay is only determined when it is examined by a human being. This would mean that, until the box was opened and the radioactive material is examined by a human, we must consider the material to be in a superposition state of both "decayed" and "not decayed". We must therefore treat the cat as being in a state of both "dead" and "not dead"!

From this *reductio ad absurdum* argument, we have to conclude that human consciousness is not the only mechanism capable of making an "observation" and reducing a quantum superposition to a single value.

So how can we define an "observation" in a more general sense? An excellent definition can be found in the book *Quantum Enigma* by Bruce Rosenblum and Fred Kuttner: "Whenever any property of a microscopic object affects a macroscopic object, that property is 'observed' and becomes a physical reality." For example, when a microscopic photon hits the macroscopic screen in the double-slit experiment, then that will reduce the quantum superposition state of the photon to a single value (the single mark it leaves on the screen). This explains why we do not see bizarre quantum superpositions — such as a cat being both alive and dead at the same time — in the human-scale, macroscopic world. So as long as there is a macroscopic effect from a quantum entity, that object can be considered to be "observed" or "measured" — with no need for a conscious human observer.

But, note we have said nothing about the details of the physical process of observation. What actually occurs at the quantum level when an "observation" is made? For a detailed discussion of the act of observation, we must wait for the next chapter.

The Many Worlds interpretation

In a recent survey, the Copenhagen interpretation remains the most popular interpretation of quantum mechanics among physicists. However, in second place (and rising fast) we find the *Many Worlds interpretation* (MWI). The MWI was proposed by Hugh Everett in 1957, and might be regarded as the "parallel universes" interpretation. If you remember from earlier in this book, I am certainly not an advocate of theories based on parallel universes, and I do not believe they should be given the same credence as conventional theories.

The MWI attempts to solve the main two problems associated with the quantum measurement problem:

1) Before observation, a particle is in a superposition state of all possible values. During measurement, what causes the reduction of this state to a single value?

2) Before observation, we have many values. After observation, we only have a single real value. So what happened to all the other values that never became "real"?

According to the MWI, when we make an observation — for example, when the particle hits the screen in the double-slit experiment — the universe splits into a series of parallel universes. In each parallel universe, each possible value of the quantum superposition becomes real. For example, in the double-slit experiment, you will remember that the single photon appears to pass through both of the two slits. So when the particle hits the screen, the MWI proposes that the universe splits into two parallel universes. In one universe, the particle passes through one of the slits, and in the other universe, the particle passes through the other slit. As another example, in the case of Schrödinger's cat, when we open the box the universe splits into two: the cat is alive in one universe, and dead in the other.

This must necessarily mean that the entire universe splits — including you! Every time any measurement is made, you must split to make a duplicate of yourself, and that duplicate resides in a different parallel universe.

This simple (though extravagant) explanation appears to solve the two problems associated with the quantum

measurement problem given earlier. Firstly, it explains how a quantum superposition is reduced to a single value. The answer, according to the MWI, is that there is no reduction, no non-linear quantum "jump". All possible values of the quantum superposition become real after measurement, we just happen to inhabit one of those universes so it appears the particle only goes through one slot.

The MWI also explains the second problem associated with the quantum measurement problem: what happens to all the values of the superposition which do not become real? The answer, according to the MWI, is clearly that all values in the quantum superposition become real — in different parallel universes.

Throughout this chapter on quantum mechanics I have emphasized the philosophical questions about quantum reality before observation. Hence, the title of the chapter is "quantum reality" rather than "quantum mechanics". It is quite extraordinary how the so-called theories of everything — string theory and loop quantum gravity — say nothing at all about this crucial concept of quantum reality nor the measurement problem. This is all the more astonishing as it is my firm belief that the principle behind quantum reality plays the vital role in providing the link between relativity and quantum mechanics.

OBSERVING THE OBSERVER

In the discussion in the last chapter on quantum reality, we were left with a big question mark over the role of the observer. This is a major omission, as the observer plays such a central role in quantum mechanics. In order to resolve the quantum measurement problem, it seems essential to define the nature of the observer, and to determine what, exactly, occurs during an "observation".

In the Copenhagen interpretation, the role of the observer is to bring an object into reality. Before observation, the object appears to be in a peculiar, multi-valued superposition state, and it is only after observation that we find a single, well-defined reality. The role of the observer is clearly crucial in this case. As for defining the nature of the observer, as we discussed, it was believed at one point that only a conscious human observer was capable of performing an observation, though I think we can discount this theory.

In the Many Worlds interpretation (MWI), the role of observation is again crucial as it is the process of observation which causes the universe to split. However, the MWI claims to avoid the need for any non-linear quantum "jumping" during the observation process, as is required by the Copenhagen interpretation. According to the MWI, not only does the object under observation split into a different universe, but the observer also splits.

However, it is the belief of this book that the proponents of both the Copenhagen interpretation and the MWI did not fully appreciate the implications of a relative universe. The paradoxes which are associated with the quantum measurement problem only arise because a model of the universe is used which is not fully relational. By using a fully relational model of the universe, all the confusion about the quantum measurement problem can be eliminated — no need for the "quantum jumping" of Copenhagen, or the parallel universes of the MWI. Everything can be explained quite rationally and logically, in a single, relational universe.

Lost in space

Our first task is to get the definition of the "observer" and "observation" onto a firmer footing. Let us return to consider the example of the two astronauts, floating past each other in empty space. We initially considered this example in our discussion of relativity in Chapter Three. Imagine you are an astronaut, floating in the emptiness of space. On your right-hand side, you **observe** (note the emphasis) a fellow astronaut floating past you, travelling at a constant velocity. Your friend passes by you, before vanishing into the darkness.

Because Nature is unable to access any absolute axes of position, there is a perfect symmetry in this scenario. No astronaut can claim to be preferred. The experience of both astronauts is identical. Nature cannot assign a stationary position to one astronaut, and a moving position to the other — neither astronaut has a greater claim to be stationary. As a result, both astronauts feel stationary throughout.

So, here is an interesting thought. If, as we described, you **observed** the other astronaut throughout the scenario, then, due to the symmetry of the situation, it is obviously equally valid to state that the other astronaut observed you in precisely the same way throughout. Just as Nature could not assign one astronaut to be stationary and one moving, Nature clearly cannot assign one astronaut to be the "observer" and the other to be the "object under observation".

We are starting to see that — as far as Nature is concerned — there is simply no fundamental distinction between "observing" and "being observed". The distinction is purely a human invention.

You could replace the other astronaut with an unmanned spaceship floating past at constant velocity, and argue that the astronaut is capable of "observing" the spaceship, but it is impossible for the spaceship to "observe" the astronaut as the spaceship is not a conscious entity. However, in trying to preserve the distinction between "observing" and "being observed" in this way, you are having to reintroduce the notion of "conscious observation" which we considered and refuted in the last chapter on quantum mechanics. As far as Nature is concerned, it is just as valid for an inanimate object to observe a conscious object, as it is for a conscious object to observe an inanimate object.

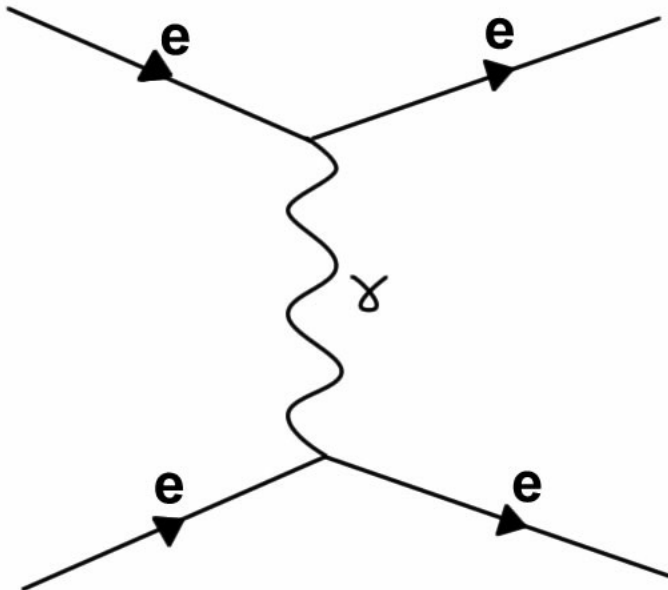
Fundamental observation

To understand how Nature views the concept of "observation" we have to examine the lowest scale, the level of particles. We find that even at this fundamental level, Nature makes no distinction between "observing" and "being observed".

To show this, let us imagine we want to observe an electron to find out its current position. Essentially, this means we want to measure its position property. The obvious way to observe anything is to look at it. This works perfectly well for everyday macroscopic objects (for example, when you lose your keys), but does the principle still hold at the fundamental level of particles? Can you look at an electron, for example, to find where it is?

Well, it turns out that you can. The simplest way to detect the location of an electron is to shine a light on it. But, as we discovered in the previous chapter, at the fundamental level we find that light is made out of photons. When we hit the electron with a photon, the electron absorbs the photon (temporarily raising itself to a higher energy level) before emitting the photon again. So by attempting to observe the electron by using the photon, we inevitably disturb the object we want to observe.

At the fundamental level, all Nature consists of is interactions — collisions — between elementary particles. This can be seen in the following Feynman diagram which shows electromagnetic repulsion between two electrons. The two electrons come in from the left of the diagram, they exchange a photon between themselves (represented by the wavy line), and this has the effect of throwing them both off course, just like billiard balls:



We can simplify this diagram by hiding the nature of the collision (i.e., we are not interested in the behaviour of the photon), and just showing the deflection of the electrons when they collide:

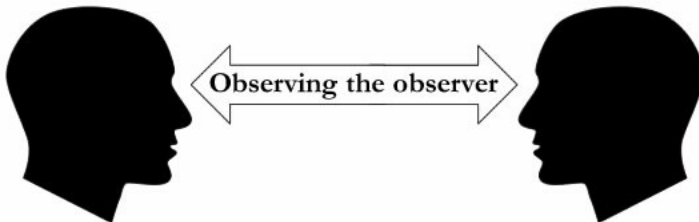


This diagram reveals the symmetry of the interaction. No particle can claim to be the "observer" with the other particle "being observed". Both particles are on an equal footing.

When we attempt to "observe" the electron using the photon, we inevitably disturb the electron — the supposed object "being observed". So the electron (the object "being observed") alters the course of the photon (the "observer") as we intended. But the photon ("the observer") also alters the course of the electron (the object "being observed") in a way which we did not intend. As a result of the symmetry of the situation, it is just as valid to say that the electron "observed" the photon as it is to say that the photon "observed" the electron!

As we discovered earlier in our discussion of the two floating astronauts, we again see that — at the fundamental level — as far as Nature is concerned, there is simply no fundamental distinction between "observing" and "being observed". The distinction is purely a human invention. Whenever you observe an object, it is just as valid to say that the object is observing you!

It is truly a case of the object under observation "observing the observer":



This symmetry reminds us of another symmetrical law, Newton's third law of motion: "Every action has an equal and opposite reaction". Essentially, if I press on a stone with my finger, the stone also presses onto my finger with a precisely equal and opposite force. Forces are interactions between two bodies, and those forces are always equal and directed in the opposite directions. Once again, this symmetry is caused by Nature's fundamental inability to distinguish between two situations: as far as Nature is concerned, your finger pressing on the stone is essentially equivalent to the stone pressing on your finger. Nature views your finger and the stone as just groups of atoms — it has no access to any absolute reference by which it could distinguish the two objects.

We are reminded of the two astronauts floating past each other in space: the experiences of both astronauts is identical. The observation made of the second astronaut by the first astronaut is equivalent to the observation made of the first astronaut by the second astronaut. Let us turn that into a general principle:

The observation of an object by an observer results in an equivalent observation of the observer by the observed object.

Maybe we should call this the "principle of the two astronauts"!

Of particular interest to quantum mechanics (in which it is impossible to measure a particle without modifying it):

The physical action on the observed object by the observer will be equal and opposite to the physical action

on the observer by the observed object (this is just a restatement of Newton's third law of motion: "Every action has an equal and opposite reaction").

Armed with these two principles, we now have a much greater understanding of what is involved during an "observation", and we are now in a position to reveal what really happens during a quantum mechanical observation. We can at last attempt to find a solution to the quantum measurement problem.

Environmental decoherence

Throughout this book we have emphasized that there is only one universe, and the universe should be treated as a single, connected object. We will now see that this provides the vital clue to solving the quantum measurement problem.

In order to understand the process of observation at the quantum level, and to solve the quantum measurement problem, it is essential to treat objects as being connected and interacting, rather than being isolated and independent. The key to solving the quantum measurement problem is to treat the object under observation and the measurement apparatus as a single, connected, interacting system. We not only have to consider the effect of the object under observation on the measuring apparatus (e.g., moving a dial on a meter), but we also have to consider the effect of the measuring apparatus on the object under observation.

We all have a natural, human bias to imagine objects under observation as isolated and independent of any measuring apparatus. This is because, at the human-scale, macroscopic level, when we measure an object we do not notice any significant change in the object under observation. For example, if we are measuring the air pressure in a tyre, we would use a pressure gauge — which inevitably results in a small quantity of air leaking out of the tyre. Hence, by measuring the pressure in the tyre, we are inevitably altering the object under observation (we are reducing the pressure in the tyre). However, the reduction in pressure would not be noticeable when compared with the overall pressure of the tyre — it would be an insignificant fraction. So at the macroscopic level, we simply do not have to worry about how our observations and measurements affect the object under observation.

This is not the case at the fundamental, quantum level. The Heisenberg uncertainty principle showed we cannot observe or measure an object without fundamentally altering it. At the quantum level, the effect of the measuring apparatus on the object under observation becomes unavoidable.

It was not until the 1970s that the effect of the role of the measurement apparatus on the object under observation was considered in detail. We have seen that a measurement apparatus is capable of reducing a quantum superposition state to reveal a single measured value, but there is nothing particularly special about measurement equipment which gives it this ability. A simple screen, for example, is capable of revealing the position of a photon in the double-slit experiment. As we quoted from the book *Quantum Enigma* earlier: "Whenever any property of a microscopic object affects a macroscopic object, that property is 'observed' and becomes a physical reality". In the 1970s, it was revealed that the general environment around a particle was capable of reducing the quantum superposition of a particle. The process by which this occurred was called *environmental decoherence*.

Essentially, the general environment (air molecules, photons, dust) performs the role of the measurement apparatus in that it betrays the position (or other property) of the particle under observation. It is the effect of the environment on the particle under observation which explains why we do not see quantum superpositions at the human scale.

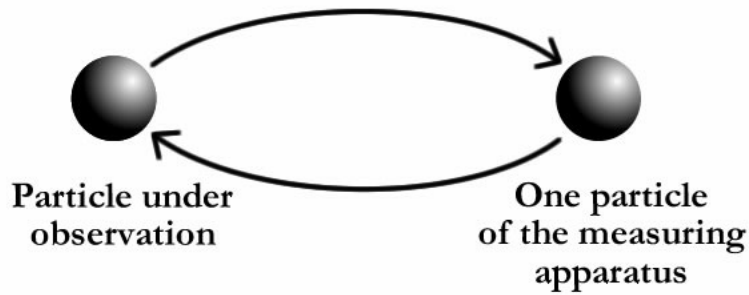
So how does quantum decoherence work? For example, if we are measuring some property of a particle using a meter with a dial, how would the particle (in a multi-valued quantum superposition state) be reduced to a single-valued state? Where would the other interference states go?

The discussion in the previous section has given us a good basis for understanding what actually happens in an "observation". The key element was seen to be the symmetry of the observation. We have seen that any physical effect the object under investigation might have on the observing apparatus must be balanced by a symmetrical effect which the measurement apparatus has on the object under observation.

Considering the example of a single particle being measured by a meter, we are trying to measure the value of some property of a single particle — using a meter which is composed of billions of billions of particles. Straight away, we can see a clear asymmetry in the set-up — this is a clue as to why we get the result we see. However, let us ignore the discrepancy between observer and observed for the moment, and consider what happens to a single particle.

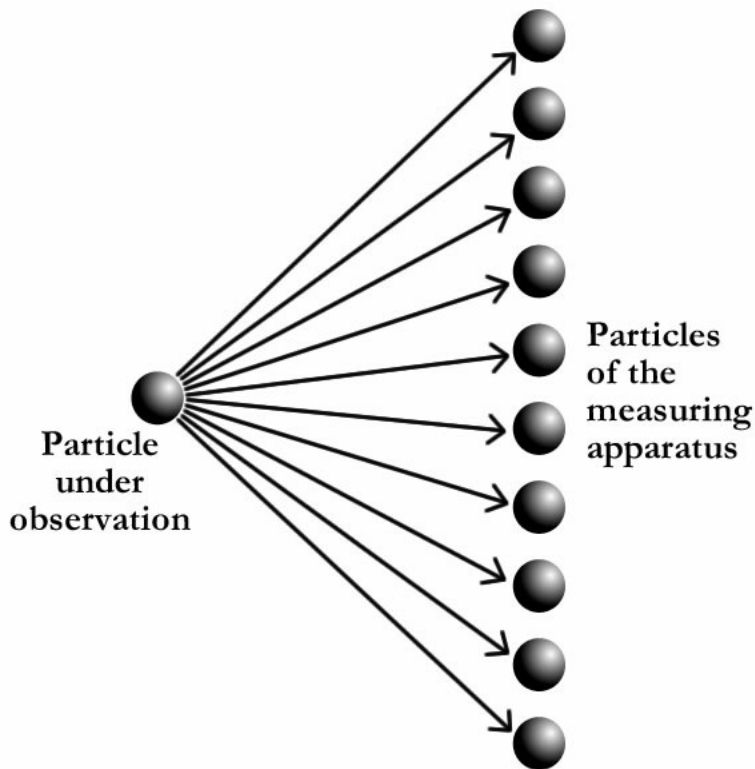
As we discussed in the previous section, when we attempt to measure a particle, it does not matter how big your measurement apparatus is, all measurements at the fundamental level have to be considered as interactions between

individual particles.



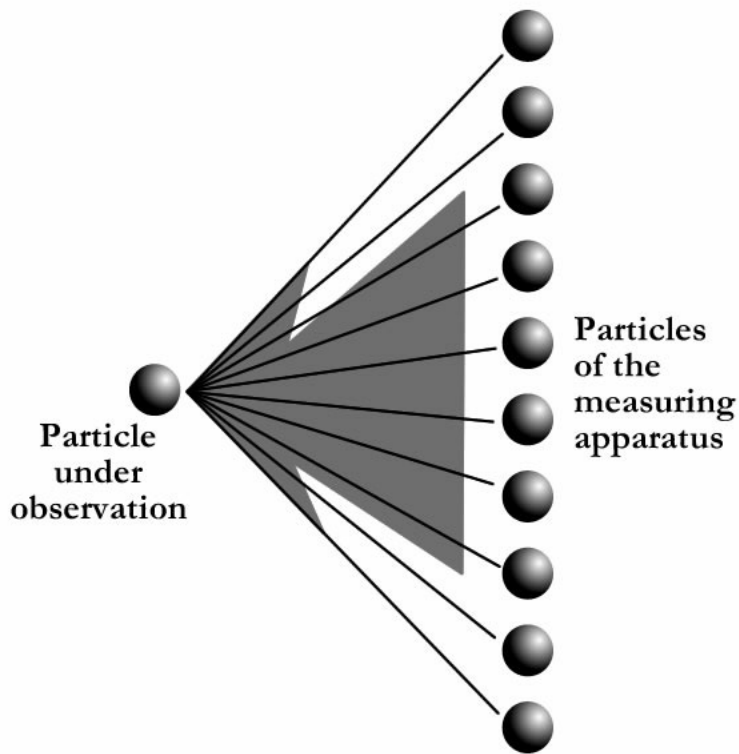
As far as Nature is concerned, at this level there is no distinction between the observer and the particle under observation. There is a perfect symmetry. There has to be a perfect symmetry. We have reached this conclusion by building-up from fundamental principles: this is caused by Nature being unable to access any absolute axes of position. No particle can claim to be preferred.

So now let us expand our model to consider the entire measurement apparatus. Clearly, this consists of vastly more particles, but the basic principle remains the same: all measurement must consist of symmetrical interactions between individual particles. The following diagram shows the first half of this symmetrical interaction — the effect of the particle under observation on each particle in the measurement apparatus:



Clearly, the effect of the single particle on each particle of the measuring apparatus is going to be small — those are small arrows I have drawn on the diagram above. The effect of the single particle is dissipated through all the billions of atoms in the measuring device and becomes effectively unnoticeable at the macroscopic level.

However, the interactions between particles has to be symmetrical. Each of those little arrows drawn on the diagram above has to produce a symmetrical reaction from each particle of the measuring apparatus back onto the single particle being measured. It is this combined reaction which is devastating for the single particle being measured:



The asymmetry of this arrangement shows that the impact of the measuring apparatus on the particle under observation is hugely larger and more significant than the impact of the particle under observation on any single particle of the measuring apparatus. The result of this huge impact is to reduce the superposition state of the particle under observation to a single, measured value.

The details of how this reduction of state is achieved is not so important (it is an active research topic, and there are various theories) — it is the asymmetry of the arrangement which is the important and decisive factor. However, it appears it is the randomness of the environment which destroys the regularity of the peaks and troughs (the *phase*) of the particle's wavelike nature. If we consider the double-slit experiment, for example, we only see the interference pattern on the screen (representing the particle's superposition state) if the regular *coherent* phases of the particle's waves are not disturbed. Any randomization of the phases causes the particle to *decohere* — the superposition interference terms dissipate unnoticed into the general environment. As Brian Greene said in his book *The Fabric of the Cosmos*: "Decoherence forces much of the weirdness of quantum physics to 'leak' from large objects since, bit by bit, the quantum weirdness is carried away by the innumerable impinging particles from the environment." For all intents and purposes, the interference effects have completely disappeared. The particle is reduced from a superposition state to a single-valued state.

Environmental decoherence provides a simple solution to the paradox of Schrödinger's cat. Long before the box is opened by the human observer, the environment inside the box (e.g., air molecules) has interacted with the radioactive material and "observed" it to discover if it has decayed or not. The state of the cat — either alive or dead, but not both — is set long before the box is opened.

Environmental decoherence also avoids the need for any non-linear quantum "jump" during the observation process. Previously, it had been believed that there was an unexplained jump between the particle's multi-valued

superposition state and the single-valued final measurement. Decoherence avoids this jump by revealing that all the interactions between the observed particle and the measuring apparatus are perfectly linear — no jumping required. Instead, the interference terms disappear due to the progressive influence of billions of particles as the particle under observation passes through the measuring apparatus. So there is a progressive filtering (of the interference terms) and amplification (of the eventual measurement). Niels Bohr referred to an "irreversible act of amplification". In this respect, the measuring device behaves very much like a radio receiver, picking out a signal on a single frequency and amplifying it, while simultaneously reducing the interference signals on all the other frequencies.

Though it appears that there is an instantaneous non-linear "jump" to particular defined state, it emerges that the process is, in fact, linear, and only appears like a sudden jump because of the sheer speed of the decoherence process. Decoherence is believed to happen in the region of 10^{-27} seconds, and is therefore one of the fastest processes known to science — but it is not instantaneous.

Experimental evidence for environmental decoherence is now emerging. In 1996, a team at the National Institute of Standards and Technology (NIST) in Boulder, Colorado isolated an atom from the environment by trapping it in an electromagnetic force field. Then, when they hit it with a laser beam they managed to force it into being in two places at once, separated by about a thousand times the diameter of an atom. Other teams based at the State University of New York and the Technical University of Delft managed to force an electric current to flow around a ring in opposite directions at the same time! [\[12\]](#)

So we now have the basis for an explanation for the quantum measurement problem. We can see why the measurement apparatus appears relatively unchanged, while the superposition state of the particle under observation is reduced. The key concept to remember is that we cannot treat particles as being isolated from the rest of the universe. We cannot consider the particle in isolation from the measurement apparatus. We have to consider the universe as a single, connected object.

Irreversibility

One of the features of quantum "jumping" is that it is irreversible. We only ever see quantum jumps in the forward time direction, from a superposition state to a well-defined state — never vice versa. This remains an unexplained mystery for some interpretations of quantum mechanics — such as the mystical Many Worlds interpretation — but can be simply explained in environmental decoherence.

There is nothing mystical about environmental decoherence — it is just a physical process like any other physical process. Hence, it comes under the remit of the second law of thermodynamics (remember back to our discussion of the arrow of time in Chapter Five). Indeed, the irreversibility of quantum jumping in the forward time direction — just like the irreversibility of a wine glass breaking in the forward time direction — is the greatest clue that increasing entropy is the underlying mechanism behind quantum jumping. Just like a wine glass breaking, or a car rusting, the entropy of a closed system will always increase with time. Likewise, when an isolated particle encounters a randomised environment, the effect of the environment will be to destroy the ordered coherent phases of the particle's wavelike nature. The regularity dissipates into the environment and can never be reformed — just like a broken egg.

Imagine you throw a rock in the sea off the coast of the United Kingdom. After the initial big splash, the ripples dissipate and apparently disappear. But of course, they have not really disappeared. The ripples have decreased in size as they have mixed and interfered with other waves, but they have not disappeared. Two weeks later, on the rocky shore of Tierra del Fuego off the Argentinean coast, one of the small waves washing to shore is maybe an imperceptible fraction of one micron higher because of that rock you threw.

So the ripples (interference terms) do not actually disappear. They dissipate into the environment and become effectively undetectable. It is certainly not possible to associate the microscopic change in the height of the wave in Tierra del Fuego with the rock you threw — there have been so many interactions with other waves along the way. In this sense, the process of decoherence is irreversible. We can't reverse the process to regenerate the initial interference components — they are gone for good. And even the "little ripple" echoes of the interference effects have become imperceptible due to interactions with the environment. Then, **for all intents and purposes**, the interference effects have completely disappeared.

THE QUANTUM RATIONALE

This is a book about reality. It is about *physical* reality. By limiting the term "reality" to mean physical reality we are immediately rejecting any notion that dreams, or ideas, have any form of reality — at least by our definition. Reality — in this book — refers to physical objects we can touch and hold. This means the material of reality is, essentially, matter.

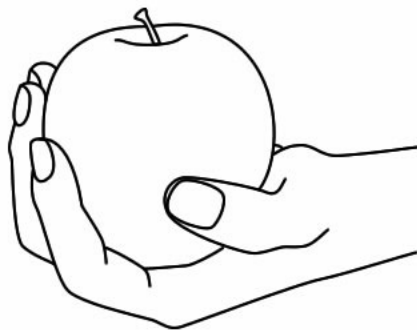
Our definition of reality is also about *objective* reality, objects which everyone agrees are "real". This is to avoid any possible confusion with *solipsism* — the idea you are the only real consciousness in existence, and everyone else (and everything else) is just a figment of your imagination, a fictitious dream world — just like season eight of *Dallas*.

Though it can never be possible to disprove that you are living in a solipsistic world, we have to assume that we are not or else we have to accept that nothing is real and there is no point analyzing the universe around us. We have to continue our discussion on the basis that everyone's consciousness is equal, and that there is no "master consciousness" in which everything else exists only as a dream. If everyone agrees that an object is real, then we accept that it truly is real and is not just a figment of our imagination.

But this leaves the challenging question: what do we actually mean when we say something is "real"? We have an intuitive notion of what the word means which is satisfactory for our purposes, and we all use the term in our everyday vocabulary without thinking too deeply about the meaning of the word "real". But what, exactly, does it mean? What property does a "real" object have which determines its reality? How does something become real? Can an object become unreal? These are questions to which we cannot provide a satisfactory answer because we simply do not appear to have an answer to the question of what, precisely, does it mean to be "real" in the first place. We have to be careful to avoid using any linguistic terms — which might well be in common usage — without making sure those terms have clear definitions. If we are going to be serious about our quest to uncover the nature of reality, we had better make sure we know just what we mean by "reality".

David Deutsch in his book *The Fabric of Reality* suggested that real objects should "kick back". For example, if we kick a rock with our foot, the rock "kicks back" and stubs our toes. This suggests that if something is outside of our consciousness, and is able to interact with us, then it forms an independent, objective reality. I would agree with David Deutsch, and this is a good example of how we decide an object is real. But I believe his explanation of the example does not fully explain the underlying principle by which we define real objects — how we truly know that something is real when we kick it.

The key is that our reality is relative, not absolute. We define real objects in terms of other objects which we already consider to be real, or tangible. For example: "I know the apple is real because I can hold it in my hand". The apple's reality is defined in terms of the presumed reality of the hand. That is the best definition of physical reality we can ever possess, a rather circular definition.



We can see that the whole of reality is composed of a self-supported structure of relationships, objects which are

assumed to be real because they interact with other objects which are presumed to be real. There is an interconnectedness to reality, a unity. While this might seem like a very circular state of affairs, it is inevitable in a relative universe.

Reality is relative

In the previous chapter, we stressed the importance of the connectedness of the universe, and this provided us with a proposed solution to the quantum measurement problem in the form of environmental decoherence. This connectedness is, once again, an inevitable consequence of there being nothing outside the universe, and the resultant lack of absolutes available to Nature. This leads us to an extremely important conclusion: if there is nothing outside the universe, and no absolutes, then:

The properties of any particle — or any object — are determined by all the other objects in the universe.

This is an incredibly important principle, but it seems to be not generally realised. The universe is a relative structure: all properties of all objects are only defined relative to the other objects of the universe. With no absolutes available to Nature, there is simply no other way by which objects can be defined.

But what if Nature is unable to assign these relative property values? Imagine an object which is the only thing in existence — there is nothing else in the universe. What would it mean to assign property values to this isolated object? Surely, with no other objects in the universe, such property values would be meaningless. What is the point in assigning a certain mass to the object if it is unable to interact with other objects? What is the point in assigning a velocity value to the object if there is no other object by which that relative velocity could be measured? On their own, property values are meaningless. Amazingly, we see that properties do not describe the isolated object itself, **properties describe the relationships between objects** — they describe the effect we will see when that object interacts with other objects.

In an article entitled *What Is Real?* in the August 2013 edition of *Scientific American*, the philosopher Meinard Kuhlmann emphasizes this point: "A growing number of people think that what really matters are not things but the relations in which those things stand. We may never know the real natures of things but only how they are related to one another. What is the reason that we can know only the relations among things and not the things themselves? The straightforward answer is that relations are all there is." [\[13\]](#)

As the great Niels Bohr said: "Isolated material particles are abstractions, their properties being definable and observable only through their interactions with other systems."

Even though this seems like an extraordinarily important principle, I hardly ever see it mentioned. Lee Smolin is one of the few who appears to realise: "The fundamental properties of the elementary entities consist entirely in relationships between those elementary entities." And again: "A relational view requires that the properties of any one particle are determined self-consistently by the whole universe." [\[14\]](#)

A perfect example of this principle is provided by the recent discovery of the Higgs boson. It had always been believed that mass was an intrinsic property of a particle — a measure of the "amount of substance" in a particle. However, with the discovery of the Higgs boson it became clear that mass emerged as a result of the interactions between elementary particles and the Higgs field. In other words, mass arose from the relationships **between** particles — it is not an inherent property of an elementary particle.

Back in Chapter Two we considered the importance of units in our measurements. Units provide the essential relational link between the unknown object being measured and the rest of the known world. In the absence of any external absolute scale, the only way we can define an object's properties is by measuring it with equipment already located inside the universe, i.e., the object's properties are defined by its relationships with other objects inside the universe. The object's properties simply **cannot** be defined in any other way. Again, this shows that meaningful properties are not inherent in an object, but the meaning is determined by the other objects in the universe. For example, the length property of a plank of wood arises from its relationship with the measuring tape. Giving property values to isolated objects is meaningless — that would be equivalent to omitting units in your measurements and just saying "This goes up to 11".

This principle was described by Sir Arthur Eddington in 1932: "Length is necessarily relative. That is one of the results of Einstein's theory which has become almost a commonplace of physics; but it was a rather complicated kind of relativity that Einstein considered — relativity to the motion of our frame of reference. I am going to refer to another much more elementary relativity of length, viz. that length always implies comparison with a standard of length. It is only the ratio of lengths that enters into our experience. Suppose that every length and every distance in

the universe were suddenly to be doubled; nothing would seem altered. I do not think we could attach any meaning to the change."

The quantum rationale

We now have a principle that particle properties are defined solely by the relationships between the particle and the rest of the universe. By turning this principle on its head, we are led to a remarkable and important conclusion. If the rest of the universe is responsible for defining the properties of a particle, then **an object which is isolated from the rest of the universe must have completely undefined properties**. There would be no way for Nature to assign any property values — absolute or relative — to that object. The property values would be fundamentally undefined.

Let us reconsider a particle which is isolated from the rest of the universe, or has been generated as a new particle and has not yet interacted with the rest of the universe, i.e., it has not yet been measured or observed. What can we say about its properties? Once again, in the absence of absolutes, Nature is fundamentally unable to assign any absolute values to the particle. And, because the particle has not yet interacted with the rest of the universe to be measured or observed, Nature is unable to assign any relative values either. As discussed in the last section, all we can say about its property values is "They go up to 11", an essentially meaningless statement reflecting the fact that the particle's property values are undefined — they have no relation to the rest of the universe.

Before observation or measurement, the object must be like a blank sheet: it must be an undefined object with the potential to take **any** possible property values. So, before observation, the object must have a multi-valued form of reality — as is observed in quantum mechanical behaviour. It is only when the object interacts with the rest of the universe that its properties become progressively tied down to particular values.

This is precisely what we saw in the case of environmental decoherence. It is through interaction with the rest of the universe (via the measuring apparatus) that the properties of a particle become fixed. Before observation, the particle's properties are undefined.

So here, rather wonderfully, we have a rationale — an explanation — for the multi-valued nature of quantum behaviour before measurement (or observation). Here are the logical steps we followed to get to this conclusion:

- 1) Nature has no access to absolutes, so it is always fundamentally unable to assign absolute property values to a particle.
- 2) Therefore, particle properties are defined by the relationship of that particle with the rest of the universe.
- 3) Bearing this in mind, if we consider an isolated particle, or a newly-generated particle which has not yet been measured or observed, Nature has fundamentally no way of assigning any form of property values — absolute or relative — to the particle.
- 4) The properties of the particle are therefore fundamentally undefined — like a blank sheet. Its properties must have the potential to be any possible value.
- 5) The object must therefore have a multi-valued form of reality before it is observed. It is only after observation — when the object interacts with the rest of the universe — that the properties of the object become fixed.

So we now perhaps have an explanation for the apparently peculiar superposition state of objects before observation, an attempt to answer John Wheeler's question "How come the quantum?" We see that this behaviour is not so strange after all — it is, in fact, just what we should expect in a relational universe. And because we have come to this conclusion using a logical approach, we should expect this to be true in all possible universes: quantum mechanical behaviour is fundamental.

There have been many descriptions of the multi-valued nature of quantum reality, but these have always been presented as a *fait accompli* — an established fact, which should just be accepted at face value. For example, you may have read statements such as Murray Gell-Mann's *Totalitarian Principle*: "Everything which is not forbidden is compulsory". This describes quantum mechanical behaviour by saying that anything which is not forbidden can and must happen. However, statements like these do not explain **why** we see multi-valued behaviour. The rationale for multi-valued behaviour which has just been presented in this book is the first logical rationale for quantum behaviour I have read. It does not just seek to **describe** quantum mechanical behaviour, it seeks to **explain** it. It is seen that quantum mechanical behaviour is expected behaviour in a relative universe.

In the macroscopic, human world, we do not see quantum mechanical behaviour. Environmental decoherence has long since removed the quantum weirdness before it reaches the macroscopic scale. Just like the roulette wheel at the quantum casino, if you spin the wheel enough times (i.e., make many quantum measurements), the randomness inherent in quantum behaviour becomes unnoticeable. Nature always does the best it can with the tools available, and it generally does a very good job in hiding quantum mechanical behaviour from our eyes. However, when Nature is pushed to its limits, in single measurements at the smallest scales, the lack of absolutes starts to show through and we perceive the inevitable "glitches".

So, once again, we find bizarre behaviour in Nature arising as a **side effect** caused by the lack of absolutes. These side effects only start to show through at the extremes. In our discussion on relativity, we have seen these side effects emerge at extremes of speed, or in the presence of extremely large masses. We now see side effects occurring at extremely small scales.

Quantum magic

In the introduction to quantum mechanics in Chapter Six, I made it clear that I wanted to avoid emphasising the more bizarre aspects of quantum mechanical behaviour, and I hope I was successful in that respect. However, it is true that there are many aspects of quantum behaviour which do appear extremely counter-intuitive and, indeed, bizarre.

We have already considered the double-slit experiment in which a particle can apparently be in two places at one. It is also true that particles can spontaneously appear and disappear out of nothing — like a rabbit pulled out of a magician's hat. Now that we are armed with a greater understanding of quantum behaviour, can we start to make more sense of these impressive tricks from the quantum magician?

The double slit experiment is a classic example of the multi-valued nature of quantum reality, the particle being able to pass through both slits. In the discussion in this chapter, we have seen that this multi-valued behaviour is a consequence of the relative universe in which every particle must be defined in terms of its relations with the other particles of the universe. We naturally think of particle properties as being inherent in a particle, as though the particle would still have those properties if it was the only isolated object in the universe. However, when we change our mindset to accept the idea that particle properties only arise in relation to other particles, we find quantum behaviour begins to make a lot more sense, and we can then start to discover the secrets behind the quantum magician's tricks.

However, it is very hard to get out of the mindset that particle properties are not inherent in the particle. This is why quantum behaviour appears so mystifying. It is a principle employed by many human magicians. For example, the trick in which a rabbit is pulled from the magician's hat appears completely mystifying because you considered the hat to be an isolated object, with its own inherent properties. The magician did his best to divert your attention from the other objects around the hat, such as the table with the hole drilled into it through which the rabbit was passed into the hat. It is only by considering the hat's relation with the other objects in the environment that the mystery is solved — just as the effect of environmental decoherence is a solution to the puzzling quantum measurement problem.

Now let us perform a thought experiment to uncover the secrets of the quantum magician, and see how he manages to pull his particles out of a magic hat. Let us imagine — once again — that we want to measure the length of a plank of wood. Clearly, in order to obtain this measurement, we can only use objects already present inside the universe. This means we can only use the rulers, gauges, etc. which exist inside the universe. This dependency was described by Sir Arthur Eddington in his 1923 book *The Mathematical Theory of Relativity*: "Any apparatus used to measure the world is itself part of the world." There is no alternative way to obtain this reading. There is no absolute axis of length outside the universe which we could use to obtain an absolute, unequivocal reading.

So let us say we use our ruler to measure the object, and, according to the ruler, the object is one metre long. Now, bear with me on this, let's presume something really strange happens. Let's imagine every object in existence in our peculiar universe — apart from our plank of wood — bizarrely shrinks by 50%. We now find that our plank of wood has become two metres long — according to our ruler.

But this is to be expected, you might argue. There is nothing surprising here, you might say. The object has not really doubled in size, you might argue, it is merely our ruler which is giving an incorrect reading. The object was previously measured as being one metre long and, in the absence of any external influence acting on the object, it is always going to be one metre long. The property of being "one metre long" is an intrinsic, unvarying property of the object. At least, that is what you might argue.

Well, you would be wrong. Remember that any object in the universe can only be defined in terms of every other

object in the universe — Nature has no other way of defining the properties of an object. There is no absolute axis of size outside the universe to which Nature can refer. If the universe tells us the object has doubled in size then, **by definition, the object really has doubled in size!**

This is extraordinary, and we are left with an apparently bizarre conclusion which goes against all intuition. No force has acted on the object, and yet it has doubled in size. It is as though some self-contained internal magic of the object has made it change its state. It appears a property of the object — which we believed to be innate and unvarying — has been radically modified. We would naturally attribute this change in the object's state to some peculiar mechanism **inside** the object. Just as with the magician's hat, we would think the hat was magic, and try to understand what was special about the hat.

However, the secret to the trick does not lie with the hat, and it does not lie with the isolated particle. The secret to the trick is the environment: the hole drilled into the magician's desk, or the doubling of the scale of the universe. Even the very existence of the particle itself is dependent on the universe around it — if the universe says the particle does not exist then, by definition, it ceases to exist. There is no other external standard by which Nature can determine the existence of the particle.

It is all too easy to ignore the environment and concentrate on the single particle under observation, but it is only by considering the complete magician's set-up, and the relationship of the particle with the environment, that we can finally uncover the secrets of quantum magic.

Symmetry and quantum mechanics

To end this chapter's discussion on quantum mechanics, it is interesting to consider underlying connections between symmetry and quantum mechanics.

It is important to stress that it is not only measurements of space or time that must be taken as relative. As there is a complete absence of any absolutes — of any form — in the universe, this means that Nature cannot have access to absolute standards for **any** type of properties. This explains why the quantum formulation applies to all of Nature, describing all forms of particle properties, not just those associated with space and time.

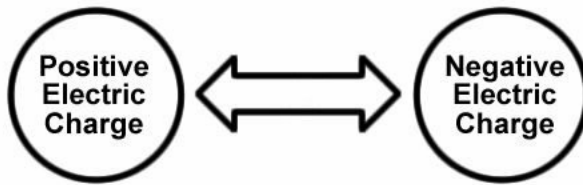
Carrying on this thought, in our discussion on symmetry in Chapter Three we saw how the lack of absolutes available to Nature caused symmetries. As was explained then, symmetry reflects Nature's fundamental inability to distinguish between one physical situation and another. If Nature is unable to distinguish between two situations, then we can transform one physical arrangement into another without altering the situation. This represents a symmetry.

If reality is completely defined by relations then those relations are unchanged under a symmetry transformation. As the philosopher Meinard Kuhlmann (who was mentioned earlier in this chapter) explains: "In quantum mechanics as well as in Einstein's theory of gravitation, certain changes in the configuration of the world — known as symmetry transformations — have no empirical consequences. The transformations exchange the individual things that make up the world but leave their relations the same. By analogy, consider a mirror-symmetric face. A mirror swaps the left eye for the right eye, the left nostril for the right, and so on. Yet all the relative positions of facial features remain. Those relations are what truly define a face."

So if Nature has no access to absolute standards for particle properties, then we would expect to see similar symmetries in particle properties — and this is exactly what we do see. It has long been known that symmetry plays a remarkable role in particle physics. Different types of particles can be classified into groups, those groups exhibiting symmetries. The discovery of new particles has even been predicted because they are required to complete a perfect symmetry. From our discussion, it is clear that the cause of all this symmetry in particle properties is a result of the fundamental limitations on Nature due to the lack of absolutes, which results in Nature's inability to distinguish situations.

In Chapters Three and Four we considered relativity and we found that there was symmetry in the universe in both space and time (space and time translation invariance) due to the lack of absolute space or time. In this chapter we have considered the properties of the elementary particles and, again, we have found symmetry in their properties. On the basis of our analysis we can see that there is the same underlying cause for both types of symmetry: no absolutes means reality must be relative. This is a quite remarkable conclusion: an apparent unification of symmetries! Symmetries in space, time, and particle properties have the same underlying cause.

Now let us examine an example of particle property symmetry, the symmetry between positive electric charge and negative electric charge. The technical name for this symmetry is U(1) symmetry:



This symmetry arises because the property of positive charge is **defined** as the opposite of negative charge. The two properties — positive charge and negative charge — are defined in terms of each other, and in **no other way**. This is perhaps what we might have expected to find based on our discussion throughout this book. There is no absolute definition of any particle property: particle properties must be defined relative to each other.

Because these properties are defined solely in relative terms (and not in absolute terms), if every positively charged particle in the universe became negatively charged, and simultaneously every negatively charged particle became positively charged, then the overall situation would be unchanged — the universe would continue as if nothing had happened. This is because the relation between the charged particles (which is the only important measure) would be unchanged.

This means that we are essentially free to define "positive charge" differently at every point in space. However, Nature needs to have some way of ensuring that "positive charge" at one point in space is the same type of charge as "positive charge" at a different point in space — it needs to keep track throughout the universe. Otherwise, particle charges would be free to swap between positive and negative at random, and the result would be chaos (and would also break the law of conservation of energy [15]). The way Nature keeps track is to have a field passing through space, defining which type of charge is actually the definitive positive charge. This type of field is called a *gauge field*, and is a result of the perfect symmetry of elementary particles. For the case of electric charge, the gauge field is the electromagnetic field and is carried by photons.

To quote Robert Oerter from his book *The Theory of Almost Everything*: "Our inability to define the charge in any **absolute** [my emphasis] sense is the ignorance that gives rise to a quantum field: the photon field." So not only is particle symmetry due to Nature's inability to access absolutes, we now find that the electromagnetic field is also due to this restriction on Nature. The electromagnetic field allows Nature to keep track of charge in the same way that the gravitational field allows Nature to keep track of masses. In fact, it can be shown that all four fundamental forces (electromagnetic, strong, weak, and gravity) are a direct result of different types of gauge symmetry. [16]

As we have discussed, it has long been known that relativity is due to the absence of **absolute** space, and, as we have just found in the quote from Robert Oerter, it has been known that the quantum mechanical behaviour of gauge theory has been due to Nature's "fundamental inability to define the charge in any **absolute** sense". So here we have a quote describing the cause of relativity as being due to a lack of absolutes, and another quote describing the cause of quantum mechanical behaviour as also being due to a lack of absolutes. So why has this obvious connection between quantum mechanics and relativity not been identified earlier? It is not as though this is arcane knowledge hidden away in obscure scientific journals. Quite the opposite in fact: both of these quotes are taken from popular science books which you could find in your local bookstore. I am surprised that such an obvious link could have been overlooked for so long.

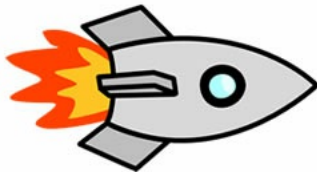
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HIDDEN IN PLAIN SIGHT

In our study of quantum mechanics in Chapter Six, we considered the importance of the role of the observer in quantum mechanics. The role was of such significance that, at one time, it was even believed that a human consciousness was required to bring reality into existence at the quantum mechanical level. If quantum mechanics and relativity truly share a common root — as proposed in this book — we would expect relativity to exhibit a similar fundamental observer dependence. However, at first glance, it would appear this crucial observer dependence is not found in relativity. This belief is expressed in a quote from Lee Smolin in his book *Three Roads to Quantum Gravity* comparing Newton's view of the observer to Einstein's view: "The problem is that, while quantum theory changed radically the assumptions about the relationship between the observer and the observed, it accepted without alteration Newton's old answer to the question of what space and time are. Just the opposite happened with Einstein's general relativity theory, in which the concept of space and time was radically changed, while **Newton's view of the relationship between observer and observed was retained.**"

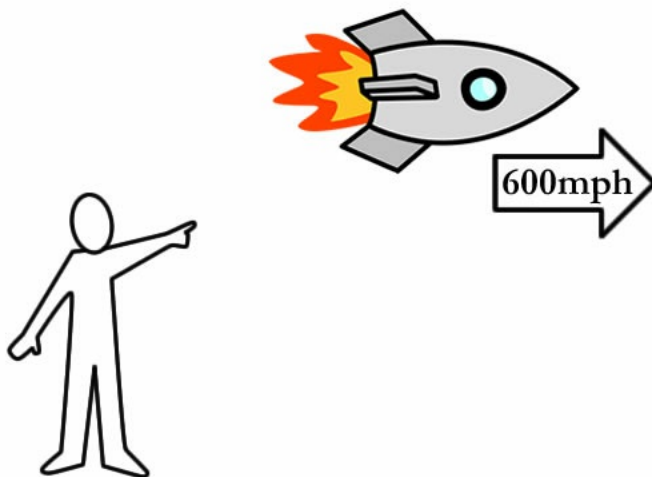
However, the more you think about it, the more you realise that "Newton's view of the relationship between observer and observed" was most certainly **not** retained in the theory of relativity. In fact, relativity is the very epitome of an observer-dependent theory!

Let's start by asking a simple question: how fast is the spaceship travelling in the following image?



Clearly, if there is "nothing outside the universe" then, in the absence of any absolute measurement scale outside the universe, we cannot assign any absolute speed to the ship — we have nothing to measure it against. We cannot assign a speed to the spaceship on which all observers in the universe will agree. In fact, the only way we can assign any numerical value to the speed of the ship is by giving up all hope on finding an absolute, observer-independent speed, and by considering its relative speed instead.

So, if we want to obtain a numerical value for the speed of the spaceship, we have to first define our observer:

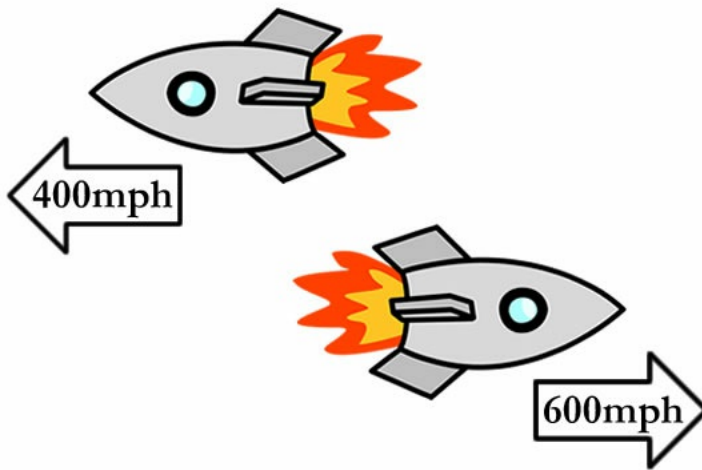


In the previous image, we have defined a position for our observer and we can now obtain a value for the velocity of the spaceship — relative to our observer — which happens to be 600mph, travelling to the right.

However, according to Newton, the function of the observer was unimportant. In Newton's absolute space, it can be stated with certainty that the spaceship is moving at an absolute speed of 600mph. The role of the observer plays no part in determining the velocity of the spaceship. However, when the theory of relativity was proposed, the idea of absolute space was refuted. Let's say we make contact with the captain of the spaceship and ask him to "observe our observer". According to the captain, it is in fact our observer who is moving at 600mph, and, as no frame of reference is preferred in relative space, the captain must be considered to be just as correct as our initial observer. In relative space, if a spaceship is moving at 600mph relative to an observer, it is just as valid to say the observer is now moving at 600mph relative to the spaceship. In Newton's model, the observer is stationary, but in Einstein's model it is valid to say the observer has a relative speed of 600mph! To answer Lee Smolin, I would say that constitutes a rather severe modification of "Newton's view of the relationship between observer and observed"!

As I said earlier, relativity is the very epitome of an observer-dependent theory. And this point is vital to this current discussion: quantum mechanics and relativity are both observer-dependent theories.

Now let us imagine we have a second observer on a second spaceship travelling to the left at 400mph:



According to this second observer, the first spaceship is in fact travelling to the right with a relative velocity of 1000mph (the sum of 600mph + 400mph). So we now have two different observers who make two different measurements for the velocity of the spaceship. Our initial observer measures a value of 600mph, whereas our second observer (in the second spaceship) measures a value of 1000mph. This clearly shows how observer-dependent this velocity measurement really is.

We have seen that there can be no measurement of velocity without first defining an observer. To assign any form of velocity to an isolated object with no relation to the rest of the universe would be absolutely meaningless. Velocity is only defined relative to another object in the universe.

At this point, alarm bells should be ringing in your head — where have we heard a similar statement before? It is exactly the same principle as we revealed in the discussion of particle properties in the previous chapter: the properties of a particle are determined by its relationship with all the other objects in the universe. So now have uncovered the same principle underlying the properties of a particle and the measurement of relative velocity. Could this possibly be starting to sound like the start of another link between quantum mechanics and relativity?

But in our discussion of particle properties in the last chapter, we derived the result that objects which were isolated, or had never been measured, would have properties which would have to be in an undefined state, a strange multi-valued state. This led us to form a rationale for quantum mechanical behaviour. But this is surely not true for the spaceship's velocity — the spaceship's velocity is clearly not in a multi-valued state before observation.

Or is it?

As we have just seen in our previous illustration of measuring the spaceship's velocity, one observer measured the velocity of the spaceship at 600mph, while the other observer measured the velocity of the spaceship at 1,000mph — clearly a multi-valued reality! In the absence of absolute space, either velocity value — or both — is equally valid.

But having two different answers to our question "How fast is the spaceship travelling?" is not a very satisfactory answer. Can't we do any better? Can't we get an observer-independent, absolute value for the velocity of the spaceship — before any observer-dependent measurement is taken? Well, the standard answer is, no, in our universe only relative velocity has a meaning. But, you might say, that is totally unsatisfactory. Before any measurement is taken, the spaceship clearly has a velocity — we know it is moving. So why can't we determine its value before observation? Its velocity clearly has a reality before observation — why can't we assign a value to it?

Well, I suppose the best we could do is assign the spaceship with a **potential** velocity which has to take **any possible value** from zero up to the speed of light. For example, if the spaceship of the second observer in the previous example is travelling at a million miles an hour, we now find our measurement of the initial spaceship's relative speed is 1,000,600mph. With an infinity of potential observers in the universe, we could say that the before-measurement, observer-independent velocity of the spaceship is **any** possible value.

So let's recap:

1) Before measurement, we know the spaceship's velocity has a reality (we know the spaceship is moving), but we cannot assign a value to it.

2) If we want to obtain a measurement then we have to specify an observer as the measurement is completely observer-dependent.

3) But if we want to assign a velocity to the spaceship **before** observation we have to assign all possible velocity values to it.

So where have we heard a description like this before? **There are clear parallels with quantum mechanics!** Compare this with the situation of quantum mechanics:

1) In quantum mechanics, we know a particle has a reality before observation, but we cannot assign a value to its properties.

2) If we want to obtain a measurement then we have to specify an observer as the value is completely observer-dependent.

3) But if we want to assign a value to its properties before observation, we have to assign all possible values to it.

These three points are absolutely identical to the three points raised in our previous relative velocity scenario!

So clearly the two scenarios — relative velocity (which leads to relativity) and quantum mechanics — show astounding similarities. This is because quantum mechanics and relativity share the same underlying cause, a common root to their behaviour. And that common cause is a universe in which Nature is denied access to absolutes, a universe in which everything must be defined in terms of everything else, and in which all of reality is relative.

It might seem rather astonishing that no one has pointed out this incredibly simple link before. A startlingly obvious link between relativity and quantum mechanics due to the two theories having the same underlying cause. I believe this has gone unnoticed purely due to the quite stupendous simplicity of the solution — it has truly been hidden in plain sight.

Actually, when I say no one has pointed this out before, I must say that the loop quantum gravity researcher Carlo Rovelli has hinted at a connection: "Quantum state and values that an observable takes are relational notions, in the same sense in which velocity is relational in classical mechanics (it is a relation between two systems, not a property of a single system). I find the consonance between this relationalism in quantum mechanics and the relationalism in general relativity quite striking. It is tempting to speculate that they are related." [\[17\]](#)

CONCLUSION

In this book, an incredibly simple link has been suggested between relativity and quantum mechanics. By building-up from fundamental principles, it can be shown that both theories share a common root: the fundamental inability of Nature to access any absolutes in the universe.

Perhaps the reason why such a simple solution to the problem of unification could have gone unnoticed for so long is that the proposal depends on an explanation of the foundations of quantum mechanics. Sadly, with a few exceptions, there is little interest or research in foundational questions of quantum mechanics at the moment. This has not always been the case — the rapid progress in quantum mechanics in the early years of the twentieth century placed foundational questions at the forefront of research. However, in the current academic climate, foundational questions seem to be considered the remit of philosophy — not physics, and get precious little attention. As a relevant example, string theory and loop quantum gravity seem to have nothing to say about the quantum measurement problem — an absolutely fundamental component of quantum behaviour.

This is a great shame, because if the principle described in this book is even remotely accurate, it would appear that foundational questions have a vital role to play in uncovering the unification of relativity and quantum mechanics. It would appear true unification can only be found at a deeper level of analysis than is considered by current approaches which attempt to mesh relativity and quantum mechanics together at a higher level of reality. It is not my fault if people are looking for unification at the wrong level. If the work described in this book is correct, then until foundational questions are tackled head-on, there will be no unification.

This conventional approach to unification — of attempting to mesh relativity and quantum mechanics together at a high level — leaves me with a rather surprising thought. Surely, the first approach one should try when attempting to unify two theories should be to stand back and consider the **similarities** between the two theories. What do the theories have in common? This would seem the obvious approach. The commonality would then direct the researcher towards the unification. I like to think that this approach has been followed in this book, especially in the common link revealed in Chapter Nine. However, it seems this "obvious approach" of considering the similarities between the theories is not what has happened. Instead, there appears to have been something of a "brute force" approach to unification, attempting to weld the theories together. As far as I am aware, no one has bothered to stand back and say "What have these theories got in common?"

To those who would criticise the hypothesis described in this book on the basis that it is absurdly simple, I would simply direct them to the discussion in Chapter One which revealed how all unifications in physics have been based on incredibly simple ideas, ideas which can be understood by anyone. Indeed, based on the discussion in Chapter One, it was stated that any successful unification hypothesis **has** to be extremely simple — a criterion which is not met by string theory or loop quantum gravity. As Bruce Schumm says in his book on particle physics, *Deep Down Things*: "Physicists like to believe that, in its essence, the universe is guided by a small set of such beautiful organizing principles — principles free of complex hypotheses that do little more than telegraph our ignorance."

To criticise a unification hypothesis on the basis of it being overly-simplistic seems perverse to say the least!

Certainties and absolutes

I would like to finish the book with a few general discussion points which have been raised by the proposal.

As has been discussed throughout this book, at the human macroscopic scale, we are able to operate as though we have access to absolute scales of measurement. We can access measuring tapes and speedometers which apparently allow us to make absolute measurements of length and speed. However, what must be realised is that in a relative universe everything must be defined in terms of everything else in the universe — there are no genuine absolutes. This inevitably results in very circular definitions of measurements. Just like the example of the apple being held in the hand in Chapter Eight: "I know the apple is real because I can hold it in my hand", we find that the whole of reality is composed of a self-supported structure of relationships. In this case of the apple, we assume an object to be real because of its relationship with another object which we already presumed to be real: the hand.

So all the objects in the universe — at the macroscopic level — are connected in an endlessly complex mesh of

interrelationships. Everything supports everything else. This gives us the luxury of an impression of absolutes and certainties: our impression of reality might be an illusion, but that illusion is at least supported by the rest of the universe.

Considering the position of particles, for example, the relative nature of environmental decoherence means we get an impression of complete certainty as to the position of a particle. The environment — the universe around the particle — works together to provide an impression of certainty. However, as we delve deeper into the fundamentals of the universe, we find that self-supporting network is progressively stripped away. Eventually, we reach the fundamental layer when objects can be isolated from the rest of the universe. At this point, we say quantum mechanical effects are dominant, but what we really mean is that that mesh of certainty is completely stripped away. At this point, we see our macroscopic certainties and absolutes for what they really are: an illusion of the relative universe. We find certainties stripped away in the Heisenberg uncertainty principle. We find absolutes stripped away in similar fashion, leading to multi-valued behaviour.

Put simply, there are no such things as certainties and absolutes. In the mathematical world, yes, we can find these things, but not in the physical world.

When Nature is stripped naked, we find the emperor has no clothes (or certainties or absolutes). We call the result quantum mechanics.

As Sheldon Cooper has said: "Quantum physics makes me so happy. It's like looking at the universe naked."

Too Many Worlds

The universe is a structure of such elegance, simplicity, and economy that I can't help thinking that whoever first proposed the concept of multiple parallel universes did Nature a great disservice — that is to ignore the evident simplicity and economy of the universe. I am sure the proponents of parallel universes did it with the best intentions but, really, the damage has been done. It seems almost impossible to pick up a popular science book these days without reading how there exists a parallel universe in which a forty-foot gorilla has just won the Olympic gold medal in synchronised gymnastics.

Articles such as that must make great copy — and maybe good book sales — but the message of physics is one of economy and simplicity. In physics we find energy is minimized, structures are symmetrical, simpler explanations are preferred over more complex explanations. As William of Occam said: "Entities should not be multiplied unnecessarily". We should only add complexity to our explanations as a last resort, if there is no other solution available. At all times, the thrust of our drive should be towards simplification.

Ironically, by postulating the existence of multiple parallel universes, researchers are missing out on the analytical power of the principle that the universe is the one thing that exists. By saying that "everything that can possibly happen will happen", the theorists who advocate parallel universes are losing any constraints to their theories. Anything goes, basically. But, ironically, constraints can make our job much easier. Imagine you are an author, and you are seeking inspiration for a new book. You might sit down in front of your typewriter or word processor and stare blankly at a sheet, waiting for inspiration before you can get started. However, if you are commissioned to write a book about a certain subject — for example, a book about a kidnapping — that instantly gives you a start and gets your mind thinking along certain lines. Constraints help us in finding a solution. In fact, if the problem becomes completely constrained — your commission telling you the entire plot of the book — then the solution becomes completely obvious.

A theory that predicts everything predicts nothing — it is completely unconstrained. This makes our job of finding a solution much harder. By imposing fairly obvious constraints, such as saying there is nothing outside the universe, we make our job in finding a solution much easier, because then we realise that our solution must be found within the universe, and not in some parallel universe scenario. In the case of relativity and quantum mechanics, I believe it is the constraint that there is nothing outside the universe which, indeed, completely constrains the problem so the solution does, indeed, become completely obvious. I believe the results in this book show how the constraint leads directly to both quantum mechanics and relativity. This result could never have been derived if we had lazily jumped to the conclusion that we needed parallel universes to explain these phenomena.

We should not be lazy. We should seek to explain the universe on the basis of what we already know, not on the basis of some flight-of-fancy science fiction. Wild speculation does our quest more harm than good, and hinders our progress. The answers we seek are contained within the universe. The answers we seek are located much closer to home than we might imagine.

Reductionism and emergence

In its efforts to understand the universe, physics has always taken a *reductionist* approach. This means that research has progressed based on the principle that we can understand things by breaking them down — and analyzing — their smallest constituent parts. As an example, particle physics attempts to discover the smallest particles and the most basic forces. The belief is that the smaller the particle, the better your understanding of the physical world.

For many simple applications this approach works well. For example, analyzing the large-scale properties of materials on the basis of their particle chemistry (finding the strength of materials, the temperature at which they melt, etc.). However, for more complex applications this approach proves woefully inadequate. This is because many large-scale phenomena which result from the complex interaction of billions of particles could never be predicted purely by analyzing the properties of a single particle. In this way, the whole is greater than the sum of its parts.

One classic example of an emergent phenomenon is intelligence. You could never realise that such an extraordinary phenomenon could arise if you followed the reductionist approach of analyzing only a single brain neuron. A single neuron is just a simple switch, basically. There is no clue in the structure of a simple switch that it might lead to high-level brain function.

Throughout this book, it has been stressed that the properties of single particles should not be considered in isolation. Properties describe the relationship between objects and arise through the interaction of an object with the rest of the universe. This clearly shows that a reductionist approach is not suitable at the fundamental level.

If, for example, a single particle is moving, how can we define its velocity? Clearly, the velocity is not an inherent property of the particle, but, rather, it has to be defined relative to some other particle. So if we add an additional particle, we can now determine the velocity of the first particle relative to the second particle. But what quantitative result can we possibly get with just two particles? Not very much is the answer — we can just determine that the particles are moving relative to each other. In order to quantitatively measure that velocity, we need some standard measure of speed, and that means we need some more particles with which we can produce standards of distance and time, eventually forming meters and clocks. In fact, to get any useful meaning from our initial particle, we find we need more and more particles, introducing additional layers of meaning. So we see that properties of particles are not held in single particles, but rather those properties progressively **emerge** as the universe is built-up in layer-upon-layer of meaning.

In fact, this shows the importance of treating the universe as one object, with properties of particles only emerging when the universe is treated as a whole.

This realisation raises a problem for physics research which been firmly based on a reductionist model of the universe. The mathematics used by physicists is simply not up to the job of analysing a complex, emergent universe. The neat and simple equations used by physicists might be only suitable for analysing a "toy model" simplified version of the universe, which ignores the possibility of emergence, complexity, and chaos. These processes which can be simplified are called *computationally reducible*. As Stephen Wolfram has said: "Almost all of what traditional equation-based science has been doing is looking just at those computationally reducible parts." However, if the universe is truly computationally **irreducible** then it might be simply impossible to analyse it using simple equations. In fact, the only way to analyse it would be to create a computer with the same complexity as the universe itself!

The laws of Nature

In Chapter One, it was stated that one of the goals of this book was to determine how much of the universe could have been created differently, and how much is a logical necessity. The eventual goal was expressed by Einstein: "What I am really interested in is whether God could have made the world in a different way; that is, whether the necessity of logical simplicity leaves any freedom at all."

Because our approach was to build-up from fundamental principles, we could be sure that any result we discovered would have arisen from logical necessity. Rather astonishingly, we discovered that a remarkable proportion of the laws of Nature could be derived from our fundamental principle — that there is "nothing outside the universe". From the analysis, it appeared that both relativity and quantum mechanics could be derived from the fundamental principle, and so both these behaviours would appear to be fundamental, i.e., there would have to be quantum mechanical and relativistic behaviour in any conceivable universe. Not only that, we find we can derive the requirement for a gravitational field, symmetry in both space and time — and symmetry of particle properties, the

requirement that the total energy of the universe is zero, and the necessity of gauge fields. The fact that we can derive such a high proportion of the laws of Nature from our fundamental principle gives us great confidence that it is, indeed, the fundamental principle.

A remarkable proportion of the laws of Nature, therefore, could be considered to be necessary and not contingent. However, it remains true that it is hard to imagine how the arbitrary nature of the physical constants of Nature could ever be derived from fundamental principles. The 19 numerical constants in the standard model of particle physics, for example, appear to have values which are completely arbitrary.

To my mind, on the basis of this study, it appears that the major laws of Nature (quantum mechanics, relativity, the second law of thermodynamics, etc.) appear to be fundamental, derived from fundamental principles, and would necessarily have to apply to every conceivable universe. However, it is the remaining arbitrary free parameters which would appear to give the universe its actual form (the properties of the elementary particles, etc.), and it would appear that these values could not be derived from fundamental principles.

This problem is exacerbated by the fact that it appears the fundamental constants have fine-tuned values which have resulted in a "life-friendly" universe. The fashionable answer to this conundrum seems to be to resort to anthropic reasoning, and to suggest the constants are set to different values in different parallel universes. However, the central tenet of this book is that there is only one universe. In the analysis in this book, we have found that building-up from that principle has proved to be a wonderfully effective predictive tool, which suggests that the principle is correct. In which case, to find the solution to the apparent fine-tuning of constants we should restrict our search to solutions contained **within** the universe. I would agree with Lee Smolin from *Three Roads to Quantum Gravity*: "This first principle means that we take the universe to be, by definition, a closed system. It means that the explanation for anything in the universe can involve only other things that also exist in the universe."

The secrets we seek can all be found **within** the universe. We just have to look more closely — they are hidden in plain sight.

FURTHER READING

Three Roads to Quantum Gravity by Lee Smolin

Fascinating guide to the state-of-the-art, by one of the leading researchers in the field. Highly-relevant to this book.

The Theory of Almost Everything by Robert Oerter

A comprehensive and readable account of the development of the standard model of particle physics, including a useful exploration of symmetry.

Quantum by Jim Al-Khalili

The best introduction to quantum theory.

The Elegant Universe by Brian Greene

A thorough guide to string theory, unification, and quantum gravity.

The Fabric of the Cosmos by Brian Greene

Excellent guide to relativity, Mach's principle, and the gravitational field.

Introducing Time by Craig Callender and Ralph Edney

A guide to time, and the history and principles behind the block universe theory.

The Complete Idiot's Guide to String Theory by George Musser

Not really a guide to string theory — more a comprehensive and accessible introduction to all aspects of quantum gravity research.

Simply Einstein by Richard Wolfson

A comprehensive walkthrough of relativity.

The Mind of God by Paul Davies

Fundamental questions about why the universe is the way it is. Could the universe have been built differently?

The Trouble with Physics by Lee Smolin

A provocative and informative book.

Deep Down Things by Bruce A. Schumm

An excellent guide to particle physics which is more technical than Robert Oerter's book.

Introducing Quantum Theory by J.P. McEvoy and Oscar Zarate

The "Introducing" series of books are extremely well constructed.

New Theories of Everything by John D. Barrow

Deep consideration of the laws of Nature.

The Fabric of Reality by David Deutsch

Fascinating discussion of reality and the block universe model.

ACKNOWLEDGEMENTS

Several people have been a considerable annoyance during the writing of this book. Chris Parker and Steve Skelton have repeatedly pressed me to include teenage vampire love interest, while Paul Noonan's suggestion of offensive chapter titles has also been incredibly irritating.

However, I would like to thank Chris for all his help with the graphical layout, general comments and ideas, and proof-reading, and Paul for additional proof-reading.

Steve, unfortunately, was of little use.

PICTURE CREDITS

All photographs are public domain unless otherwise stated.

NOTES

[1] Even though quantum entanglement appears to predict instantaneous communication, it does not, in fact, contradict special relativity as it is impossible to send information via entangled particles.

[2] Such timber-framed kit houses do actually exist — the German HUF Haus company being the most famous.

[3] Max Tegmark, *Parallel Universes*: <http://arxiv.org/abs/astro-ph/0302131>

[4] The principle "there is nothing outside the universe" should not be taken as making any profound statement about the existence of God. After all, a God which exists would be a part of the universe — by our definition, the universe being defined as "everything that exists". This is a book about quantum mechanics and relativity — other questions about deeper philosophical and theological issues are beyond the scope of this discussion and can be left to other, more contentious, books.

[5] Albert Einstein, *Relativity*, 1916

[6] Note the emphasis on uniform motion, i.e., motion not undergoing acceleration. If acceleration is involved, the situation is profoundly different and Galilean invariance no longer applies.

[7] Isaac Newton, *Principia*, 1687

[8] Donald C. Williams, *The Myth of Passage*, *Journal of Philosophy* 48 (15):457-472

[9] Paul Davies, *That Mysterious Flow*: <http://tinyurl.com/ThatMysteriousFlow>

[10] See Curtis Menning's website *Calculation of the Energy of the Universe*:
<http://www.curtismenning.com/ZeroEnergyCalc.htm>

[11] A string theorist.

[12] Tony Leggett, *New life for Schrödinger's cat*: <http://tinyurl.com/TonyLeggett>

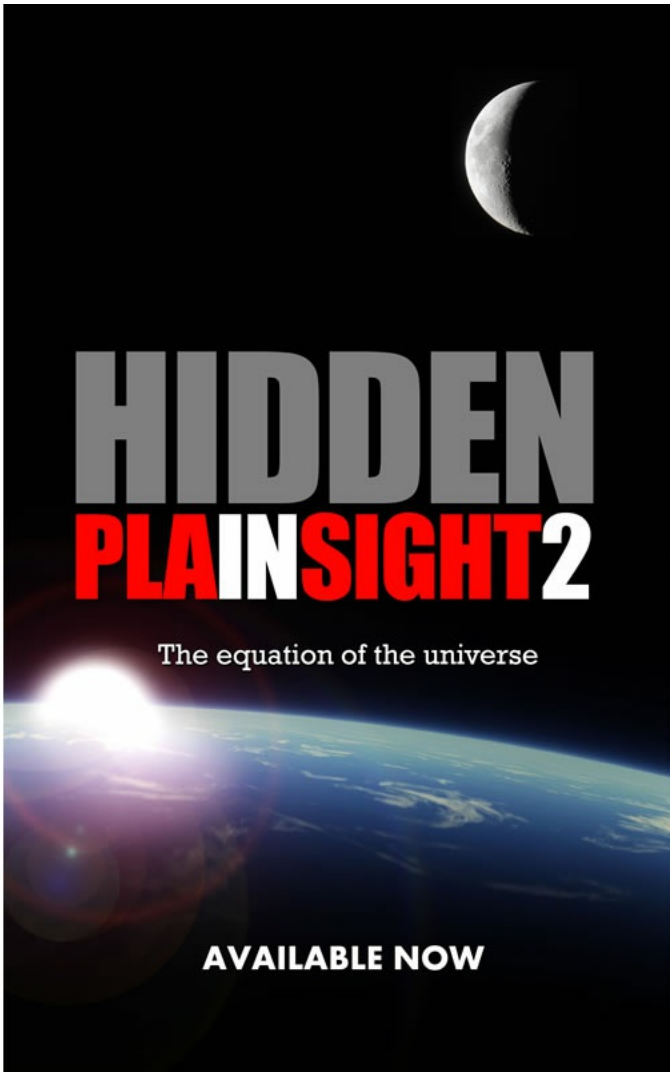
[13] Kuhlmann reveals that this theory in philosophy is given the name *ontic structural realism*.

[14] Lee Smolin, *The case for background independence*: <http://arxiv.org/abs/hep-th/0507235>

[15] For details, see Chapter Eight of Bruce Schumm's book on particle physics: *Deep Down Things*.

[16] For a clear explanation of the gauge approach to gravity, see Chapter 10 of Vincent Icke's book *The Force of Symmetry*.

[17] Carlo Rovelli, *Quantum spacetime: what do we know?*: <http://arxiv.org/abs/gr-qc/9903045>



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DEDICATION

To Mum and Dad

CONTENTS

PREFACE

1) INTRODUCTION

Simple solutions to big problems

Forces

The principle of least action

Fundamental principles

Structure of chapters

2) GRAVITY

A history of gravity

General relativity

3) COSMOLOGY

The scale of the universe

Olbers' paradox

The Big Bang

The shape of the universe

Inflation

4) DARK MATTER AND DARK ENERGY

Dark matter

MOND

Dark energy

The accelerating expansion

The biggest error in science

5) BLACK HOLES

Supermassive black holes

Black hole thermodynamics

Information and entropy

The holographic bound

The black hole information loss paradox

Black hole complementarity

6) THE SOAP BUBBLE UNIVERSE

[The universe must be flat](#)
[The hybrid expansion](#)

7) GRAVITY REVISITED

[The accelerating expansion \(revisited\)](#)

8) BLACK HOLE UNIVERSE

[Secrets of the black hole](#)

9) CONCLUSION

PREFACE

This is my second book. I was absolutely delighted at the success of my previous book, *Hidden In Plain Sight*. If you bought my previous book, then thank you very much. If you have not already read *Hidden In Plain Sight* I can recommend it as some of the work in this book builds on the principles described within it.

The discussion and reasoning in this new book might appear to be extraordinarily simple. This is quite deliberate. As I explained in my previous book, I am convinced that the fundamental principles which underlie reality **must** be simple. The drive to uncover the fundamental truths of physics must surely be a drive toward simplicity.

After considering the link between quantum mechanics and relativity in my previous book, this book considers a possibly simple solution to the unsolved mysteries behind gravity, dark energy, black holes, and many other cutting-edge problems in current theoretical physics. My books are nothing if not ambitious!

I deliberately make my books fast-paced and easy to read, packed with only relevant information and no padding. So it's a book with a real big bang!

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2013

I now have a Twitter account on which I will post updates: twitter.com/andrewthomas101

grav·i·ty (grāv'ī-tē)

n.

1. The natural force of attraction between any two massive bodies.
2. A serious situation or problem.

1

INTRODUCTION

As physics progresses along its path of unlocking the secrets of the universe, it might be thought that the number of unsolved problems would be reduced. However, this does not seem to be what is happening. Instead, the more we find out about the universe, the more problems we unearth. And the problems we discover seem deeper, more profound, and more insoluble than the problems we have just solved. This was summed-up by the great physicist John Wheeler: "We live on an island surrounded by a sea of ignorance. As our island of knowledge grows, so does the shore of our ignorance."

It has been suggested that the field of theoretical physics seems to be in less-than-superb shape at the moment. The main thrust of research towards a possible "theory of everything" is directed towards string theory. This may well eventually emerge to be the correct model of Nature, and a great deal of very clever people seem convinced by it, however, considering the amount of research effort which has been directed at this theory over more than four decades, it is hard to disagree that progress has been disappointing. But there appears to be a lack of diversity of alternative research.^[1] String theory has been called "the only game in town", and maybe that is the heart of the problem.

Meanwhile, the highly-publicised discovery of the Higgs boson by the Large Hadron Collider (LHC) seems to have created panic among particle physicists. You might find that surprising, after all, didn't they predict that the Higgs boson was there to be found? Well, yes, they did — and that's the problem. An experiment which just verifies your prediction tells you nothing new about reality. It so happens that the properties of the discovered Higgs boson were a particularly close match to those predicted. Eight billion euros to tell you something you already knew does not sound like good value for money. There is no hint in the LHC results of new directions for research, and hence there is no convincing motive to spend new money. This sounds very much like the end of the line. A lot of particle physicists are scared for their jobs.

It appears that the LHC has also brought bad news for string theory. The full name of string theory is "superstring" theory, with the "super" standing for "supersymmetric". According to supersymmetry (or SUSY), each elementary particle is paired with a superpartner particle. However, the LHC has not detected any of these predicted particles.

If I had to sum up the current state of theoretical physics, I would say it lacks direction. It appears that we have come to the end of a long road — and we have no map to tell us which direction to take next.

So where do we go from here? Well, if you are like me, you got interested in physics because you want answers. You want to get to the bottom of things. We want to know "why" things happen. However, most physics research is merely aimed at **describing** the phenomena of Nature — it is not aimed at answering fundamental questions of "why". Such questions would be considered the domain of philosophy, not physics.

A good example are the equations of general relativity, which describe gravity as emerging from the curvature of spacetime. These equations are clearly an improvement in accuracy over Newtonian gravity, but seem to get us no further along the road of explaining just **why** masses attract each other. Saying that masses follow straight lines in a curved spacetime does not answer the fundamental question of **why** objects follow a straight line in curved spacetime. We are just describing the phenomena — not explaining it.

And so many of these descriptions seem excessively complicated to my eyes, string theory in particular seeming to revel in excessive mathematical virtuosity. It seems as though we are moving away from a search for simplicity in favour of increasing complexity. Is this really the likely route to unlocking the secrets of the universe? I feel very strongly that as we dig deeper, and approach more fundamental levels, then our theories should actually become simpler and easier to understand. My books reflect this belief.

The majority of current research seems only interested in capturing the minutiae of the complexity of Nature — there is no consideration of the bigger picture. I would agree with Sir Patrick Moore, the sorely-missed presenter of the long-running BBC television programme *The Sky At Night*: "The one inescapable fact is that we exist, and so does the Sun, the stars, and the Earth, and everything else. And no one has yet explained how the matter came into existence in the first place. Which adds force, I think, to my own contention that **we are pretty strong on detail but we are still very weak on fundamentals.**"

In my series of books, I am trying to get to the bottom of things. By working with fundamental principles it appears we can get satisfactory answers to questions of **why** Nature behaves the way it does.

Simple solutions to big problems

We could list several of the most puzzling and important unsolved problems in current theoretical physics:

- The unification of quantum mechanics and relativity. The two dominant theories of physics remain stubbornly at odds with each other. However, it should be possible to combine them into a single, deeper theory.
- How can we make sense of the "weirdness" of quantum mechanics? What does it all mean?
- Dark matter. What is the mysterious substance which greatly exceeds the amount of normal mass in the universe?
- Dark energy. What unknown force is powering the acceleration of the expansion of the universe?
- The black hole information loss paradox. General relativity says that information can be lost in black holes, but, according to quantum mechanics, this should be impossible.
- Inflation of the universe. The theory which has been at the cornerstone of cosmology for thirty years has been found to be flawed. But any replacement theory has to be able to explain why the structure of the universe is so smooth.

The first two problems I have listed — the unification of quantum mechanics with relativity, and how to make sense of bizarre quantum mechanical behaviour — were considered in my previous book. I am pleased to say that this new book is going to propose a potentially simple solution to many of the remaining problems.

Forces

Why do things move?

That's a fairly profound question. Why do apples fall? Why do the planets orbit the Sun? Why do magnets attract pieces of metal? [\[2\]](#)

The general answer to the question of why things move would be to say that they have been acted-on by a force. It was Isaac Newton who first correctly identified the role of a force in producing motion. If a force is applied to a stationary object, then the object will start to move. The force acts to accelerate the object.

There are four fundamental forces: the electromagnetic force, the strong nuclear force, the weak nuclear force, and gravity. These are all *conservative* forces. A conservative force does not lose energy as it acts (hence, "conservative"). This means that if an object is moved in a closed loop by a conservative force, and thus returns to its starting position, the net work done is zero.

As an example of this feature of a conservative force, imagine throwing a stone directly upwards at a speed of ten miles per hour. The stone will gradually lose speed as it rises, and will come to a halt at a maximum height. The stone will gain speed as it descends and, when it passes your hand on the way down, it will again be moving at ten miles per hour. This conservation of the speed of the stone is due to gravity being a conservative force.

However, this will only be the case if we ignore the effect of air resistance, which is a form of friction. Friction is an example of a non-conservative force. Friction acts to slow the speed of the stone, to decrease the energy of the stone, and to dissipate that energy into the environment in the form of heat. For example, if you throw a stone up a sand dune at ten miles per hour, the stone will find the sand sticky due to friction, and when the stone passes your hand again on the descent, its speed will be considerably less than ten miles per hour. The energy of the stone will have been dissipated into the environment.

Conservative forces (i.e., forces without friction) are perfectly reversible. For example, if you made a video of snooker balls knocking into each other on a snooker table, and you reversed that video, it would still look like normal behaviour. Even when the action is reversed, you would still see balls hitting other balls and rebounding according to Newtonian mechanics. However, non-conservative forces are not reversible. This is because non-

conservative forces dissipate energy into the environment. Eventually, the snooker balls would slow to a halt due to the effect of friction. This is an irreversible effect.

The real reason behind the irreversible nature of non-conservative forces is due to a quantity called *entropy*. Entropy can be thought of as the amount of disorder or randomness in a system. We will be considering entropy in detail in Chapter Five, but for now all we need to know is that the entropy of a system will always increase, and can never decrease. This seems to make a lot of sense: a system tends to increasing disorder over time. For example, your glistening new car will wear-out over time as its atoms become increasingly disordered through wear and tear. The non-conservative force of friction converts energy into heat, which is the random motion of atoms. This randomness of heat means it has a high entropy. This is what introduces the irreversibility of friction: the second law of thermodynamics states that this increased randomness and disorder of the heat cannot be reversed. So just as your old car can never reverse its wear and tear to become shiny and new again, so a non-conservative force such as friction cannot be reversed.

The principle of least action

There is clearly a connection between forces and energy. This is because a moving object possesses *kinetic energy*. So a force which produces motion in an object actually transfers energy to that object.

As an example of the connection between energy and motion, consider dropping a ball from your hand. When the ball is in your hand, it stores *potential energy* within itself. Potential energy is the energy an object possesses purely due to its location. When the ball is held in your hand, its location is a certain height above the surface of the Earth, so the ball contains gravitational potential energy. This is not the only type of possible potential energy. For example, a stretched spring can contain elastic potential energy.

When you let go of the ball in your hand, it picks up speed. So the kinetic energy of the ball is increasing. However, it is falling closer to the surface of the Earth so its potential energy is decreasing. So the potential energy of the ball is being converted to kinetic energy as the ball accelerates ever faster.

There seems to be a balance here, in that the amount of potential energy in the ball is being reduced by precisely the same amount that its kinetic energy is increasing. This is what we would expect due to the law of conservation of energy which says that the total amount of energy in a closed system remains constant over time.

We could ask the question, why is there this conversion from potential energy to kinetic energy? After all, the total energy of the system is going to be unchanged. So, if that is the case, why does Nature bother doing the conversion from potential to kinetic energy? What is the point?

Well, that's a good question. And, as we shall see in this book, I think the answer holds an important key to understanding the universe. All we can really say at the moment is that Nature tries to reduce potential energy to its minimum possible value. This has been called the *principle of minimum potential energy*. Nature appears to have something of an obsession with reducing potential energy.

As an example of this principle, consider a soap bubble. A soap bubble is an extremely thin film of soapy water which contains a volume of air. That thin surface has elastic properties, so, like the spring example, we could consider the surface as having elastic potential energy. It turns out that the potential energy contained in the soap film is proportional to its surface area. Nature tries to reduce this potential energy to a minimum, so Nature tries to reduce the surface area to a minimum — bearing in mind that the bubble still has to enclose a certain volume of air. As a result, soap bubbles are spherical, a shape which represents the minimum possible surface area for a given volume.

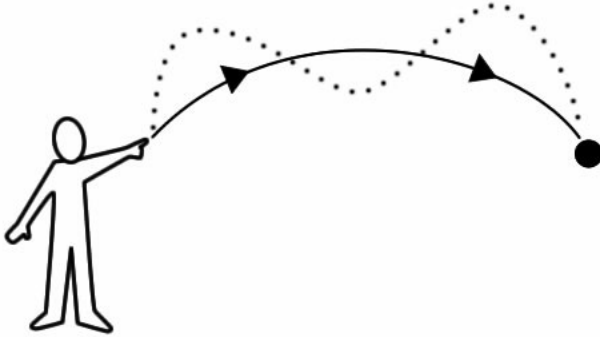
So the shape of soap bubbles is determined by Nature trying to reduce potential energy. The resultant shape is an elegant, efficient curve — we do not find soap bubbles with wasteful, ostentatious corners and spikes. Nature abhors waste and complexity and will always prefer a smooth, simple, elegant solution — purely because Nature always tries to reduce potential energy.

In the field of mechanics (the science of moving bodies), it is known that this minimisation of potential energy, and its conversion to kinetic energy, is the key to analysing the movement of a system — no matter how complicated that system might be. If we consider a moving system, possibly composed of many parts, we can calculate the difference between the kinetic energy of the system minus its potential energy. This value is known as the *Lagrangian*.

We can calculate the Lagrangian of a moving system at any point in time to get a series of values. If we then sum all those values we get what is known as the *action*. The action is a very important concept which is often used by physicists, but is not very well known by non-physicists. The action is important for our purposes because it appears to tell us something very deep about the behaviour of Nature.

If we consider the action of our moving system over a period of time, we will find that the value of that action will always be the lowest possible value. It is as if Nature always moves objects so as to minimise the action. This very important and useful principle is called the *principle of least action*.

As an example, consider the following image of the trajectory of a ball which has been thrown:



I am sure you can tell that the ball will follow the smooth curve of the black line — it would never follow the irregular dotted line. Just as with the soap bubble example, Nature prefers smooth curves to wasteful twists and turns.

We can calculate the Lagrangian of the motion of the ball (remember: the Lagrangian is the difference between the kinetic energy and the potential energy) at each point, and then we can sum all of those points to calculate the action. The principle of least action tells us that the action will be the smallest possible value for the path taken by the ball. In this case, the smooth path taken by the ball results in the smallest action.

As another example, imagine you are a long-distance runner trying to decide on a strategy for your next race. You could start off very quickly, running the first half of the race very fast, and just trying to hang-on as you slow down in the second half of the race. Or else you could start more conservatively, running the first half of the race slower but putting in a sprint to run the second half faster. But, as any distance runner will tell you, the strategy which will result in the quickest finishing time is an even-paced race, running both halves of the race in the same time. So, once again, we find that the smooth trajectory with minimal variations is the most efficient strategy and wastes least energy. Just as the long-distance runner tries to minimise his energy output and so selects a smooth trajectory, so does Nature try to conserve energy and also selects the smoothest trajectories. This is analogous to the principle of least action.

We can use the principle of least action to predict how a system will behave. We know that the system will always move in such a way that the smallest action will result. This is a very useful way to analyse and predict the behaviour of a mechanical system. The Lagrangian approach is a very flexible approach which allows a variety of widely-differing systems to be analysed.

However, action remains something of a mystery. This was summed-up by Robert Matthews talking about action in a *New Scientist* article: "For reasons as yet utterly mysterious, this quantity stays as small as possible under all circumstances. Theorists are convinced that action must be incredibly important — so much so that the discovery of any new fundamental law prompts a race to work out the particular action needed to produce it. The trouble is that no one understands the principles behind Nature's infatuation with action." [3]

Might it be possible to uncover this principle behind "Nature's infatuation with action"? There seems to be some principle underlying Nature's obsession with the efficient reduction of potential energy. This principle seems to lie at the heart of motion in the universe, and therefore the evolving structure of the universe itself. As Robert Adair says in his book *The Great Design: Particles, Fields, and Creation*: "If Nature has defined the mechanics problem of the thrown ball in so elegant a fashion, might She have defined other problems similarly? So it seems now. Indeed, at the present time it appears that we can describe all the fundamental forces in terms of a Lagrangian. The search for Nature's One Equation, which rules all of the universe, has been largely a search for an adequate Lagrangian."

The principle of least action makes it clear that it is the balance (and imbalance) of energies which is the key factor in determining the motion of objects, and it is this balance of energies which we will be considering in the later chapters of this book.

Fundamental principles

Let's return to the fundamental question of why things move. In the 1973 film *The Rat's Death*, a woman slips over her child's toy, so she slaps the boy, the boy kicks the dog, the dog barks at the cat, so the cat pounces on a rat. So if we try to find an answer to the question "Why did the cat move?" we very quickly find ourselves moving progressively down a chain of cause and effect. Movement inspires other movement. We might then start to wonder what could possibly come at the end of the chain. What could possibly start this chain of causality, or does it simply progress forever, an infinite regression?

A similar question was asked in my previous book, *Hidden In Plain Sight*. In that book, we considered the unification of two different theories to create a simpler theory. For example, Michael Faraday unified electricity with magnetism to produce electromagnetism. The process of unifying theories was compared to moving down a tree, with twigs merging into branches, and the branches merging into the trunk. As we move down the tree, we find our theories getting fewer and simpler. The question then arose, what could possibly lie at the base of the tree? What could possibly hold up the entire structure? We would surely expect to find a principle which is simple and elegant. As John Wheeler said: "To my mind there must be, at the bottom of it all, not an equation, but an utterly simple idea. And to me that idea, when we finally discover it, will be so compelling, so inevitable, that we will say to one another: 'Oh, how beautiful. How could it have been otherwise?'"

The fundamental principle at the root of John Wheeler's tree would have to be strong in the sense that it could never be refuted — it had to be obviously correct. It would have to contain within itself the reason for its obvious correctness. It would have to be impossible to conceive of any universe in which it could not be true. For this reason, a fundamental principle could form the bedrock of any fundamental theory of the universe.

In my previous book, I decided that the principle that there was "nothing outside the universe" could be considered as being a fundamental principle. This is obviously correct: if the universe is defined as being everything that exists, then it could not be possible for anything to exist outside the universe — by definition.

Likewise, as we move down our chain of causality of moving objects, we seem to require some fundamental principle to lie at the base. From our earlier discussion of potential and kinetic energy it would appear that change of energy is intimately associated with the question of why things move, so we would probably expect our fundamental principle to have something to say about the balance of energies.

We will return to consider this point later on in the book.

Structure of chapters

The force of gravity plays a central role in this book. A fuller understanding of gravity will be seen to be the key to many problems in physics which appear mystifying at the moment.

Chapter Two provides coverage of our current knowledge of gravity, together with a history of how the main principles were discovered.

The importance of gravity in shaping the structure of the universe is a key aspect of this book, so Chapter Three will introduce cosmology, the study of the universe as a whole. We will be considering the main principles of the Big Bang theory, the shape of the universe, and the inflation hypothesis.

Chapter Four describes the mysterious dark matter and dark energy which seem to pervade the universe, dominating ordinary matter. Dark energy in particular is going to play a central role in the book.

Chapter Five will consider another mystery of the universe: black holes. The more we learn about black holes, the more important they appear to be. We will find out how they hold galaxies together. We will learn about the peculiar role of information and thermodynamics in black holes. We will discover how black holes seem to behave like holograms, and how the loss of information in black holes represents a tremendous paradox for physics.

In Chapters Six, Seven, and Eight we start to find potential solutions to all these mysteries. It appears that the problems of dark energy, the black hole information loss paradox, and many other problems associated with inflation could potentially be solved by a remarkable innovation.

2

GRAVITY

This is a book about gravity.

We are all well-acquainted with the force of gravity. Of all the four fundamental forces we only have to deal directly with gravity in almost all our daily activities. From an early age, we are taught that "things fall down". In this respect, we tend not to even think of gravity as a force — it is just a fact of life.

Gravity is, in many ways, an unusual force. Of the four fundamental forces, gravity is the only force which is always attractive for all objects. This is not the case with, for example, the electric force which treats negatively-charged and positively-charged objects differently (repels or attracts accordingly).

Another factor which separates gravity from the other fundamental forces is its extraordinary weakness. Out of the four fundamental forces, gravity is by far the weakest force. The force of gravity is actually a thousand million billion billion billion times weaker than the electromagnetic force. The Earth is a huge mass of six thousand billion billion tonnes, yet it is very easy to resist its gravitational pull on an object by, say, lifting an apple from its surface. All that mass, but the force is so weak. The reason behind the weakness of gravity is considered one of the great mysteries of modern physics.

However, even though it is the weakest force, gravity is the dominant force in the universe. It is gravity which holds the planets in orbit. It is gravity which forms the stars and galaxies and black holes. It is gravity which powers nuclear fusion in the Sun to produce our daylight. It is gravity which shapes the universe. So why should the weakest force turn out to be the dominant force in the universe?

Ironically, it turns out that gravity is the dominant force precisely because the other forces are so strong. The other forces are tied-up keeping particles bound together inside the atom. We do not realise the extraordinary forces which exist within the nucleus of each atom. We only truly realise the energy possessed by the strong nuclear force during a nuclear explosion. There is extraordinary energy inside an atom, but it is kept on a leash by the strongest of forces.

Considering the electromagnetic force, for example, the positive and negative electric charges are tightly-bound within atoms (electrons attracted to protons). Hence, the positive and negative forces are usually perfectly balanced. The net result is that the overall electric charge of most atoms is neutral. So, to an observer outside the atom, there is no overall electric charge detectable outside the atom — despite the great strength of the forces inside the atom. And there is no overall net electric charge of the universe.

Gravity is different. Gravity treats all objects in the same way, and is an attractive force for all masses. There is no concept of "positive" and "negative" charge for gravity. There is no such thing as "negative" mass — no objects fall upwards. Hence, even though gravity is a weak force, it is also a cumulative force, and when you consider how much mass there is in a star, for example, it is easy to see why gravity becomes so important.

Our best model of gravity is general relativity. This is a beautifully elegant theory which can be used to predict the trajectories of objects under gravity with great accuracy. The theory is one of the greatest achievements of the human intellect. The theory says that gravity is a by-product of the curvature of space caused by the presence of mass. But the theory has nothing to say about why this curvature occurs.

Out of the four fundamental forces, only gravity is not included in our best "theory of everything" — the standard model of particle physics. It is the weakest, dominant, always-attractive force, but it is also the most puzzling.

We really don't understand gravity.

A history of gravity

What is physics? Physics comes from the ancient Greek word *physika*, which means the science of natural things, and it is there in ancient Greece that our story begins.

In the fourth century BC, the Greek philosopher Aristotle asked the question: "Why do objects move toward the Earth?" His answer was that "Objects yearn to be united with the Earth". In other words, Aristotle did not imagine the existence of an attractive force, instead he imagined there was some intrinsic feature of an object which compelled it to move downward toward the centre of the universe, which was its natural place. The Greeks gave a name to this tendency: "gravity". However, Aristotle believed the sky was the natural place for light objects, which

explained why light objects floated upward. The Greeks also had a name for this light-hearted tendency: "levity".

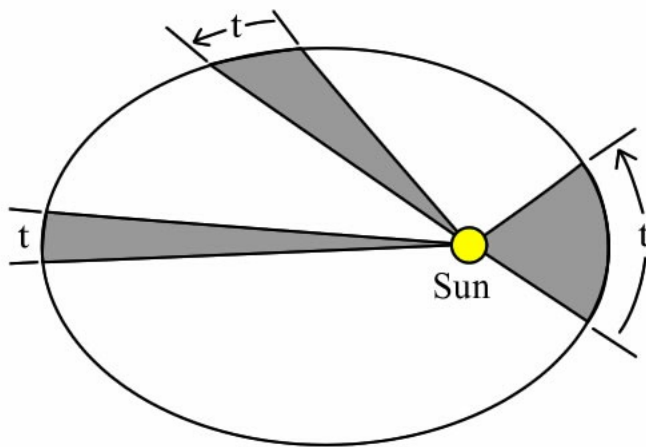
Aristotle's ideas held sway for almost 2,000 years until Galileo challenged these notions. Copernicus had just shown that it was the Earth which revolved around the Sun — not vice versa. This indicated that the Earth was not the centre of the universe, as suggested by Aristotle. But when you drop an object, it does not fly to the Sun. This indicated that Aristotle's idea about objects always seeking to fall to the centre of the universe was wrong.

Aristotle also argued that heavy objects fell faster than light objects. Again, Galileo challenged Aristotle's ideas with a thought experiment. Imagine two balls dropped from a great height, one of the balls being significantly heavier than the other ball. According to Aristotle, the heavier ball would fall faster than the light ball. Galileo then wondered what would happen if the two balls were tied together by a rope. The obvious answer would be that the slow-falling ball would hold back the faster ball, and the resultant speed would be an average of the previous two velocities. However, according to Aristotle, the two balls joined together would represent a heavier object which would therefore fall faster than either of the balls previously fell individually. This appeared to be a logical flaw in Aristotle's argument. Galileo realised that the only way out of this problem would be if the two balls fell at identical speeds, i.e., the weight of an object does not determine how fast it falls.

Galileo is often called the "father of modern science" because he tested this hypothesis by experiments (supposedly dropping objects off the Leaning Tower of Pisa). This showed that, indeed, light objects and heavy objects both accelerated at the same rate when they fell, any difference in the rates of descent being due to air resistance.

This principle was dramatically demonstrated in 1971 when Apollo 15 mission commander David Scott dropped a geological hammer and a feather on the surface of the Moon. The lack of atmosphere meant a complete lack of air resistance, and both objects clearly fell at the same rate. (YouTube: "The Hammer and the Feather". Ignore the comment that the feather was made of lead and was clearly fake!)

Isaac Newton was born in the same year Galileo died.^[4] Legend has it that a 23-year-old Newton was looking at an apple tree in his estate in Woolsthorpe (the tree still stands) when he wondered if the force which pulled apples to the ground could also be responsible for holding the Moon in its orbit. Newton knew that the Danish astronomer Johannes Kepler had shown that the planets moved in elliptical orbits around the Sun. The speed of the planets as they orbited the Sun was such that a line connecting the planet to the Sun swept out an equal area in equal times:



Newton wanted to analyse this motion, but found the mathematics of the day was not sufficient. As a result, Newton invented calculus (he actually invented calculus at the same speed at which it is normally taught in schools). Using calculus, Newton could deduce the form of the law of gravity: "I began to think of gravity extending to the orb of the Moon, and having found out how to estimate the force with which a globe revolving within a sphere presses the surface of the sphere. From Kepler's rule of the periodical times of the planets, I deduced that the forces which keep the planets in their orbs must be reciprocally as the squares of their distances from the centres about which they revolve, and thereby compared the force requisite to keep the moon in her orb with the force of gravity at the surface of the Earth and found them to answer pretty nearly."

So in 1687, Newton published the *Principia*, which has become generally recognised as one of the most important books ever published. In the *Principia*, Newton presented his law of universal gravitation for the first time. He stated that every mass in the universe attracted every other mass by means of the force of gravity. This gravitational force

is proportional to the masses multiplied together, and inversely proportional to the square of the distance between the masses:

$$F = G \frac{m_1 m_2}{r^2}$$

where F is the gravitational force between two masses m_1 and m_2 , r is the distance between the centres of those masses, and G is the *gravitational constant*. The value of the gravitational constant has to be found from experiment.

Newton's formula for universal gravitation is still used today for calculations involving masses which are not too huge. It was Newton who revealed gravity to the world.

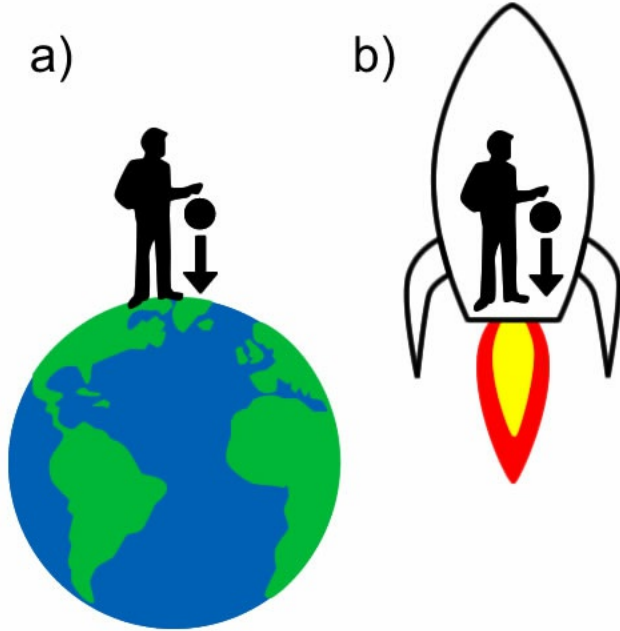
However, there was an aspect of universal gravitation which left Newton dissatisfied. The formula seemed to imply that there was an instantaneous force exerted by one mass on the other — despite the fact that the two masses could be separated by a great distance over the vacuum of empty space. There was no indication of any intermediary substance between the masses which might be used to transmit the force. Newton would have been happy if one of the masses had pulled the other mass by a mechanical means, for example, but this "invisible hand" stretching out over vast distances with nothing in between made no sense. As Newton said in a letter in 1692: "That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance thro' a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers."

This principle of Newton's "invisible hand" which can magically reach great distances in space is more generally called *action-at-a-distance*. Newton's instinct that action-at-a-distance was wrong eventually proved to be correct, but it took 200 years and Albert Einstein to provide an alternative.

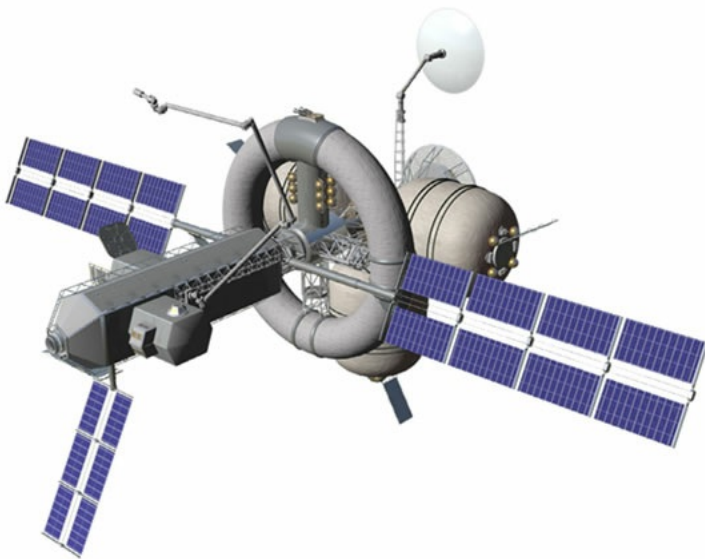
General relativity

In 1907, when Einstein was sitting in his chair at the patent office in Bern, he had what he later called the "happiest thought of my life". Einstein imagined a person standing inside a stationary lift (or "elevator" in America) at the top of a tall building. Obviously such a person would feel the force of gravity. If, for example, the person dropped a ball then the ball would fall to the floor of the lift. But Einstein then imagined that the chain supporting the lift broke. As the lift fell many floors to the ground, the person inside the lift would not feel the force of gravity in any way. If, for example, the person tried to drop the ball again, the ball would not drop to the ground but instead it would just float in mid-air (relative to the person).

So Einstein realised that the force of gravity could be eliminated if the observer was accelerated in a particular way. This made Einstein believe that the force due to gravity and the force due to acceleration were equivalent. For example, if a person who is standing on the surface of the Earth (Figure a) in the diagram below) drops a ball, then the ball will drop to the ground under the force of gravity. This is different for an observer in a spaceship in deep space, far away from sources of gravity. If that observer drops a ball it will just float in mid-air. But if the spaceship is accelerated, as in Figure b) below, then a ball which is dropped will fall to the floor of the spaceship as if it is under the force of gravity:



Einstein realised that the force due to gravity was **completely equivalent** to the force experienced during acceleration. This is called the *equivalence principle*. For example, a spaceship might generate its own artificial gravity by continuously rotating, rotation being a form of acceleration. NASA's proposed long-duration space exploration vehicle, NAUTILUS-X, includes a centrifuge to generate artificial gravity for its six-person crew:

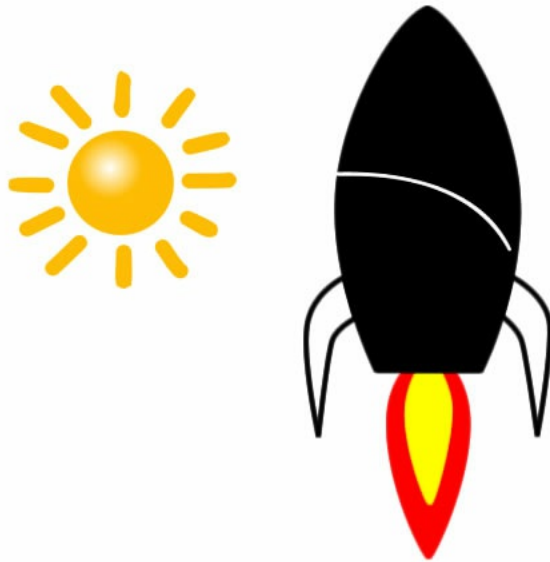


Remember that, according to the equivalence principle, the artificial gravity produced by the NAUTILUS-X centrifuge is **precisely equivalent** to conventional gravity. It is exactly the same thing.

Einstein then again imagined our spaceship in deep space undergoing acceleration. And he also imagined that there was a small window in the side of the spaceship through which light from a nearby star was entering the spaceship. According to the point-of-view of the occupant, the beam of light entering through the window appears to

curve to the floor as the spaceship accelerates (as the light crosses the spaceship, it moves closer to the floor as the spaceship accelerates upward).

The following image shows this curved beam of light inside the spaceship:



So, the acceleration appears to curve light. But the equivalence principle states that this situation of the spaceship undergoing acceleration is equivalent to the spaceship under the influence of gravity. Hence, Einstein realised that gravity would also curve light. This was a radical thought: as light is massless it was assumed that it would not be affected by gravity.

Einstein realised that this prediction that gravity bent the path of light provided a way to test general relativity. He stated that light from the stars would bend as it passed the Sun. In a 1911 paper, Einstein proposed an ingenious experiment to test this bending of light: "As the stars in the parts of the sky near the Sun are visible during total eclipses of the Sun, this consequence of the theory may be observed. It would be a most desirable thing if astronomers would take up the question."

If we jump forward in time at this point, we find it was not until May 1919 that the British astrophysicist Arthur Eddington travelled to the African island of Principe in order to test Einstein's theory. Eddington was going to take photos of the Sun during a solar eclipse, which, as Einstein had suggested eight years earlier, was the only occasion when photographs of the stars around the Sun would be possible.

Unfortunately, the weather was not good, and for many days the cloud cover threatened to prevent a clear view of the eclipse. The weather was no better on the day of the eclipse, May 29th. However, the clouds broke for just a few minutes to allow Eddington to capture sixteen photographs of the eclipse. Two of Eddington's photos showed the positions of the stars clearly enough to confirm the bending of starlight around the Sun, thus providing the first experimental confirmation of Einstein's theory.

Eddington announced his result at a joint meeting of the Royal Society and the Royal Astronomical Society in London. As he was leaving the meeting, Eddington was famously asked if it was true that only three people in the world understood the theory of general relativity. When Eddington delayed in answering, the reporter said: "Don't be so modest, Eddington", to which Eddington replied: "Not at all. I am just wondering who the third person might be."

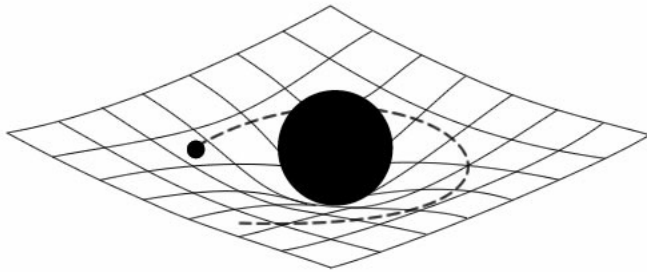
When the news of Eddington's confirmation reached Einstein, he was delighted but not surprised. Einstein noted that had the result been different, he "would have been sorry for the dear Lord, since the theory is correct."

So as gravity treats all objects equally — including light — Einstein realised that the type of the object is irrelevant for interacting with the gravitational force. Instead, the critical factor was the nature of space itself, as the motion of all moving objects depends on the underlying shape of space.

Einstein realised this could only be explained if space itself was curved by large masses. The trajectory of an object in free-fall, attempting to travel in a straight line in space, would then be curved towards mass.

The time-honored way of demonstrating this curvature of space is to consider a two-dimensional experiment:

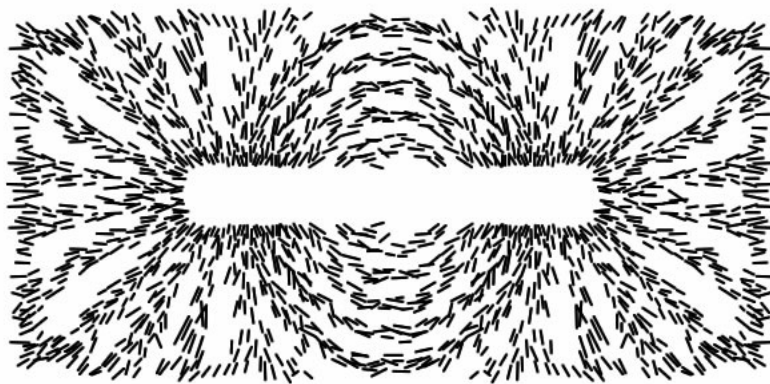
obtain a rubber sheet and place a large mass in the middle so that it deforms the sheet. A small ball will then "orbit" the central mass as if it was a planet orbiting the Sun:



Another attraction of considering gravity as being the curvature of space was that it introduced the concept of the gravitational force being represented by a *field*, in the same way that other forces — such as the electromagnetic force — is carried by a field. The great attraction of the field approach is that it provided an alternative to the Newtonian action-at-a-distance interpretation of gravity.

Einstein was in agreement with Newton that action-at-a-distance was unacceptable, but for a different reason to Newton. Einstein realised that action-at-a-distance implied instantaneous transmission of information over great distances — something forbidden by Einstein's theory of special relativity which did not allow anything to travel faster than light. The only alternative to action-at-a-distance was provided by a field in space.

We are probably best acquainted with the idea of field being emitted from a magnet. If you place a magnet under a sheet of paper and sprinkle iron filings over the paper, the field lines become obvious:



So we can imagine a field as being an invisible entity which spreads through space, an entity which has a direction and strength which is specified for every point in space. Instead of action-at-a-distance, which implies Earth reaching out over thousands of miles of empty space to hold the Moon in orbit, under the field approach we now consider Earth as sending out a *gravitational field*. The direction of the Moon's travel is only affected by the strength and direction of the gravitational field in the immediate vicinity of the Moon.

The field approach eliminates the problems associated with action-at-a-distance. Instead of an instantaneous connection between two masses, any disturbance in the field takes time to travel between the two masses — it is no longer instantaneous. Special relativity is no longer contradicted as the rippling distortion in the field travels at the speed of light, and no faster. If the Sun was to disappear, for example, the Earth would continue to orbit the last position of the Sun for seven minutes until the bad news reached the inhabitants of Earth via the gravitational field. At that point, the elimination of the Sun's gravitational field would result in the Earth spinning-off into space.

After his great intuitive realisation of 1907 about gravity being the curvature of space, Einstein spent many years trying to represent this curvature in mathematical form. He soon realised the mathematics describing the curvature of four-dimensional spacetime was beyond him, so he enlisted the help of his former classmate at the Zurich

Polytechnic, Marcel Grossmann (now a professor of mathematics), and the Italian mathematician Tullio Levi-Civita who had invented *tensors*, essentially a way of mathematically describing curvature of space.


In 1915, Einstein finally published the *general theory of relativity* which revealed how the curvature of spacetime depended on the distribution of mass and energy according to the following equation (don't worry about the details of the equation):

$$\begin{array}{ccc} \text{The curvature} & & \text{Mass-energy} \\ \text{of spacetime} & & \text{distribution} \\ \hline R_{\mu\nu} - \frac{1}{2}R g_{\mu\nu} & = & \frac{8\pi G}{c^4} T_{\mu\nu} \end{array}$$

The left-hand side describes the curvature of spacetime and is called the *Einstein tensor*. The right-hand side describes the distribution of mass-energy and includes the *stress-energy tensor*. The equation as written in this form is deceptively simple. It hides the fact that this actually represents ten complex, non-linear equations that are very hard to solve (we will be considering one solution — the very first solution which considers the field around a spherical mass — in Chapter Five which is about black holes).

However, when Einstein wrote down this equation, he realised it had a problem. It appeared to indicate a universe which would contract and completely collapse due to the mass contained within the universe.^[5] This was unacceptable to Einstein who — like most of his contemporaries — considered the universe to be a static structure which had existed forever. After all, the stars had shone in constant positions in the sky for the whole of recorded human history. The only solution Einstein could see was to introduce a new repulsive force which acted to counteract the contraction of the universe. So Einstein added a factor, Λ , which he called the *cosmological constant*:

$$R_{\mu\nu} - \frac{1}{2}R g_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$


 Cosmological constant

It is interesting that Einstein placed his correction factor on the left-hand side of the equation which describes the curvature of spacetime. He might have chosen to place his correction on the other side of the equation, thus modifying the predicted energy of space. In fact, as we shall see later, this latter approach is the one favored in modern cosmology.

So Einstein went ahead and added the cosmological constant to his equation. However, in the 1920s, Edwin Hubble considered the redshifts of galaxies beyond our Milky Way and discovered the universe was actually expanding. On hearing this news, Einstein realised his blunder in horror. An expanding universe had no need of a cosmological constant to keep it static. Einstein realised he could have predicted the expansion of the universe from his equations before Hubble discovered it from observation, a prediction which would have stood as one of the greatest in the history of science. As a result, Einstein called his introduction of the cosmological constant the "biggest blunder" of his life.

However, as we shall see later, recent observations have revealed that the expansion of the universe is actually

accelerating. This suggests the universe has a small but positive cosmological constant — so maybe Einstein was right after all!

Einstein's theory of general relativity remains our best theory of gravity — one hundred years after it was published. It has been tested many times, for example, to measure the deflection of light around the Sun, and it has always proved to be accurate.

So the general theory of relativity is undoubtedly accurate, and correctly models the curvature of spacetime. But there is nothing in the theory to explain **why** a large mass curves space. The equation captures the behaviour, but does not explain it.

But can we make an attempt to explain why spacetime is curved by mass? In other words, can we understand what gravity is, and why it exists at all. I believe we can, and in the later chapters of this book we will see why.

But for now we are going to move on to understand the effect of gravity on the universe as a whole.

3

COSMOLOGY

Cosmology is the study of the universe itself at the very largest scales. It considers the size and shape of the universe, the expansion of the universe, the beginning of the universe, and the eventual fate of the universe. It is distinct from astronomy which is the study of individual celestial bodies such as stars and planets, whereas cosmology is the study of the universe as a whole.

Cosmology does not focus on considering each individual star in the universe, which would be an impossible task for our current level of technology. Instead, cosmology operates by taking averages, for example, finding an average value for the density of the universe. Inevitably, this means cosmology is not a precise science, but fortunately the universe looks quite similar at very large scales so these approximations work surprisingly well.

It has to be said that until well into the 20th century, cosmology was not considered a proper science. It seemed to ask such profound questions — such as the origin of the universe — which did not seem to be the sort of questions which analytical science should be asking. Surely such questions should be the domain of metaphysics, and forever beyond the experimental reach of science? However, throughout the 20th century a series of observations about the origin of the universe and its expansion proved that these profound questions were not beyond scientific enquiry, and cosmology became established as a valid science.

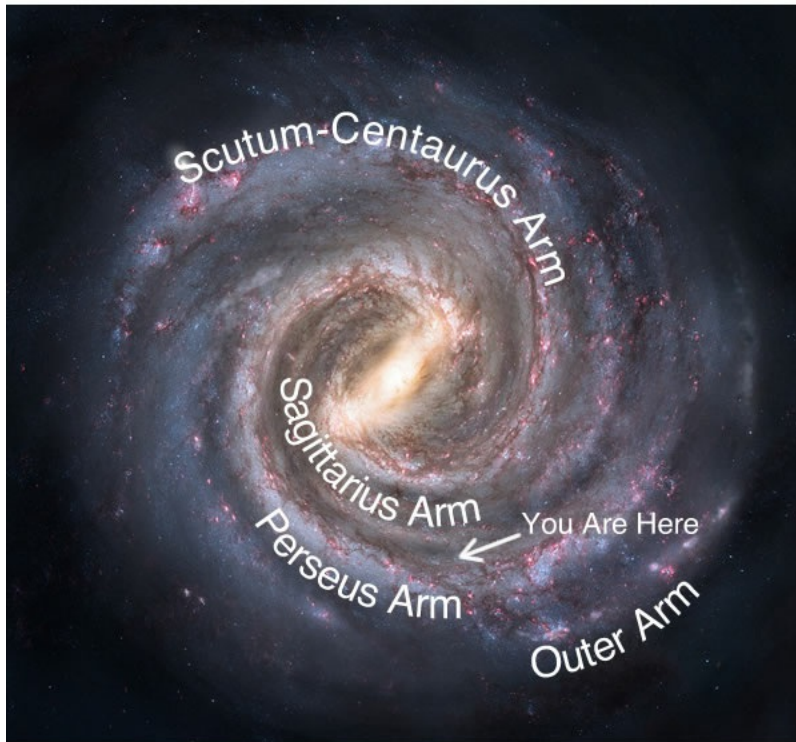
The scale of the universe

Perhaps the most remarkable fact about the universe is its sheer scale. I do not think it is at all generally realised how extraordinarily vast the universe is. I believe this scale is important, and I would like to try to convey to you some feeling for this vastness. So in this section I will present some examples from astronomy.

I am sure you are aware that the Earth is one of eight planets orbiting the star that is the Sun. This forms the Solar System. But the Sun is just one star in our galaxy which is called the Milky Way (a galaxy is a collection of stars, gas, and dead stars such as black holes). The closest star to the Sun is Proxima Centauri which is 4.2 light years away, which means it would take light (which travels at the incredibly fast speed of 186,000 miles per second) 4.2 years to reach our nearest star.

It is a little bit hard to get our heads around the concept of a "light year" — it is not a measure of distance we use every day! Perhaps if I tell you that one light year is six million million miles you might get a better feel of the extreme distance involved.

Our galaxy is truly vast: 100,000 light years across. It is a spiral galaxy with four distinct arms (see the following diagram). The spirals are caused by the rotation of the galaxy:



All the famous constellations of stars in the night sky are found within our galaxy. The Sagittarius constellation is located near the galactic centre (we will be considering the importance of the galactic centre in the chapter on black holes). The Solar System is located about two-thirds of the way out from the galactic centre.

There are many other fascinating structures to be found within our galaxy, including spectacularly beautiful giant clouds of gas called nebulas which may be as much as 100 light years in diameter. You may have seen beautiful pictures from the Hubble Space Telescope of the Eagle Nebula, located 7,000 light years away in the Sagittarius Arm, which includes the "Pillars of Creation" in which stars are formed (<http://tinyurl.com/2wbzt9b>).

So, how many stars do you think there are in our Milky Way galaxy? A hundred million? A billion? Well, there are actually about 200 billion stars in our galaxy! When you think how large the distance is between individual stars, I hope this gives you an impression of how vast our galaxy is.

Now let us consider other galaxies. The nearest galaxy to our galaxy is the Andromeda galaxy. This is also a spiral galaxy and is located about 2.5 million light years away. Galaxies attract each other and orbit each other just as planets orbit a star. This clearly shows how gravity is the dominant force in shaping the universe.

The Milky Way and the Andromeda galaxy are the two largest galaxies in a group of about 50 galaxies known as the *Local Group*. Andromeda — just like the Milky Way — has its own series of satellite galaxies which orbit it. The Andromeda galaxy made the news in 2012 when it was announced that the mutual gravitational attraction between it and the Milky Way was so strong that Andromeda will collide with the Milky Way in about 4 billion years time.

So here is the big question: how many galaxies do you think there are in the universe in total? A million? A hundred million? You might be astonished to hear that there are **over 100 billion galaxies in the universe!** When you think how large galaxies are, and how far apart they are, I hope this gives you a feel for the truly staggering scale of the universe. This is perhaps something which is not generally realised: the universe is really incomprehensibly huge.

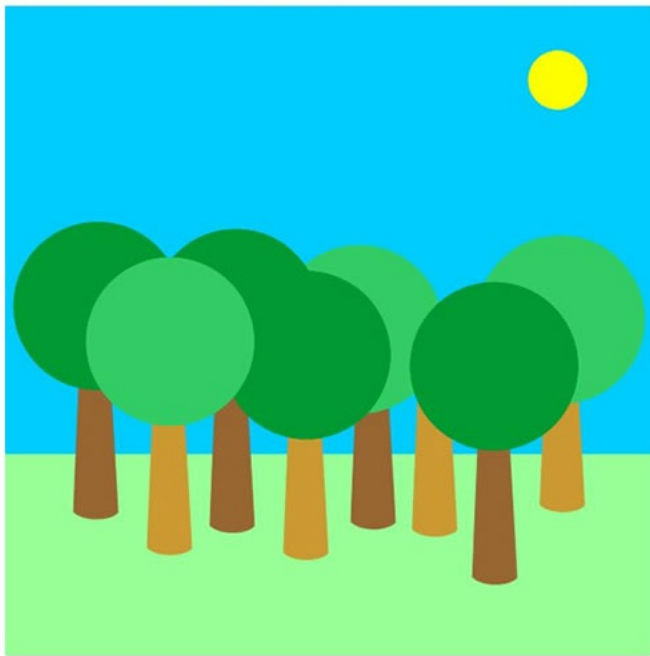
And this will be one of the themes of the later chapters in this book. The universe is of such a completely different scale to any of the objects we encounter in our everyday lives. The difference is so vast that the universe effectively represents a completely different type of object. Might it be possible that the laws of physics — which we know so well at human scales — work differently at the scale of the universe itself?

All will be revealed later.

Olbers' paradox

The paradox I am going to describe now is interesting because it shows how much of the nature of the universe it is possible to deduce just by pure thought alone.

Several centuries ago, when hardly anything at all was known about the structure of the universe, several astronomers were puzzled why the night sky should be dark. At the time, the universe was assumed to be static and infinite. However, if there were an infinite number of stars in the sky, then any straight line drawn from your eye into the deepest depths of space would be bound to hit the surface of a star at some point. In this respect, the stars were like trees in a forest: if there were enough trees in the forest then it would be impossible to see through the forest to the other side — your line-of-sight would be bound to hit a tree at some point.



So if your line-of-sight was bound to hit a star at some point, then this would appear to indicate that the entire night sky should be covered with light, as there would be no point that was not covered by a star. The fact that the night sky is dark was therefore something of a mystery, and this apparent paradox is called *Olbers' paradox*.

The most obvious solution to the paradox was that there was not an infinite number of stars in the universe, which would appear to indicate that the universe was finite in size. This would represent a major revision of the model of the universe. So just by thinking logically about the problem, we can make discoveries about the universe from our armchair.

You might be tempted to raise various objections about Olbers' paradox which might occur to you. For example, you might say that the distant stars are so far away that their light would be so dim when it reached Earth it would be undetectable. Hence, the sky would be mainly dark. This is a strong objection. It is true that distant stars are more dim. However, it is also true that distant stars appear to have a smaller surface area to our eyes. Because of this, for a certain sized region of the night sky, it is possible to fit more dim stars into an area than it is possible to fit bright stars. The overall effect is that any area of the night sky should have exactly the same brightness.

Another objection you might raise is that the distant stars might appear dim due to interstellar dust obscuring the light. However, this would not work as the dust would increase in temperature and would then radiate the same light as the stars.

So Olbers' paradox was an early pointer to indicate that the model of an infinite and static universe was flawed. A new model of the universe was required.

The Big Bang

Up until the 20th century the universe was assumed to be an eternal and unchanging structure: the so-called *Steady State theory*. However, our model of the universe changed when the world's largest telescope was completed in 1917.

The Hooker telescope is located in the Mount Wilson Observatory in the San Gabriel Mountains near Pasadena in California. At the time of its construction, it was the largest telescope in the world, a title it held for 30 years. A 4,000kg slab of glass was ground for five years to produce the 2.5 metre mirror.

The astronomer Edwin Hubble arrived at Mount Wilson in 1925 and used the telescope to examine the faint cloud-like objects which were believed to be nebulas. He revealed that these were not nebulas at all, but were in fact separate galaxies outside of our own galaxy.

Hubble went on to show that these galaxies were moving with respect to the Milky Way. The technique he used was discovered by Christian Doppler of Prague 100 years earlier. Doppler considered moving objects which emitted a sound of a constant wavelength. While it is true that the speed of the wave would not alter (we all know that the speed of light is a constant), the effect of the motion would be to "bunch up" the waves. In this way, an object moving toward an observer would appear to be emitting a sound of a higher pitch (the wavelength would be shorter), and an object moving away from an observer would appear to be emitting a sound of a lower pitch (the wavelength would be longer).

Doppler tested his theory on the flatlands of Holland, arranging for six trumpeters to ride outside a wagon on a steam train. The trumpeters emitted a constant middle C note. As the train passed the observers, the note was heard to rise and fall by a semitone. This change in wavelength is called the *Doppler shift*.

So it is possible to use the Doppler shift to determine if an object is moving towards you or away from you. Edwin Hubble examined the wavelengths of light from distant galaxies and found that they were shifted towards the longer, red end of the spectrum. Hence, the galaxies were said to have a *redshift*. This showed that the galaxies were moving away from us. This could mean only one thing: the universe was expanding.

From his observations, Hubble realised that the further away a galaxy was, the more it was redshifted. This meant that further objects were moving away from us at a faster speed. Hence, Hubble was able to express the relationship between the speed at which a galaxy was moving away, v , and its distance from us, d :

$$v = Hd$$

where H is called the *Hubble constant* (it is not really a constant — its value is known to have changed over time).

Now, here's a surprising thing. I am sure you are well aware of the law which says that nothing can travel faster than light. Well, strange as it may seem, it is actually possible for distant galaxies to be moving away from us faster than the speed of light. This is because the expansion of the universe is caused by the expansion of space itself (we will be examining this in more detail in the section on "The Shape of the Universe" later in this chapter). The cumulative effect of the expansion of space over vast distances means that distant galaxies can actually move away from us faster than the speed of light. The further apart galaxies are, the faster they are moving away from each other.

Bearing this in mind, we can obtain a value for the radius of the observable universe by considering the distance at which distant galaxies recede from us at a speed faster than the speed of light (and are hence invisible to us). If we put $v = c$ in the previous equation, we get a value for the distance:

$$R_H = \frac{c}{H}$$

where R_H is called the *Hubble radius*. We will be seeing this equation again later.

But if the universe is expanding, then that means if we look back in time then the universe was progressively

smaller. And if we look far enough back in time we find that the universe must have emerged from an extremely small space. Hubble had discovered that the universe was not eternal and unchanging: the universe had a beginning. There must have been a single point of creation from which everything burst into existence. This event is called the *Big Bang*.

The Big Bang occurred 13.7 billion years ago. During the first moments of the Big Bang, the universe expanded from an extremely hot and dense point which contained all the matter and energy of the universe. Just imagine the mass of 100 billion galaxies squeezed into the size of a single atom. The temperature of the universe in these early stages was 1,000 trillion trillion degrees Celsius. At this temperature, everything melts. The tiniest building blocks of matter — quarks — swirled around freely in this particle soup called *quark-gluon plasma*.

However, after the first millisecond of its existence, the universe had cooled to a relatively chilly ten quadrillion degrees Celsius. At this lower temperature, three quarks could bond together to form protons or neutrons. Amazingly, every single proton and neutron in existence today was formed in this first millisecond after the Big Bang.

At this stage, the universe was opaque, meaning that photons of light could not travel freely but kept colliding with free protons and neutrons. Imagine you are at the bottom of a dark lake — you could not even see your hand in front of your face. That is what the opaque era must have been like.

However, when 380,000 years passed, the temperature had cooled to 10,000K. Electrons were now travelling slowly enough to be pulled into orbit around atomic nuclei composed of protons and neutrons. Hence, atoms were formed for the first time. This is known as the *recombination era*. Photons were now free to travel freely without being constantly scattered by protons and neutrons. So at this point the universe became transparent.

The photons which were released at this moment can be detected even today as they form the cosmic microwave background (CMB) radiation. This radiation has cooled over the last 13.7 billion years and it now has a temperature of only 2.7K. However, this radiation is everywhere, and is even responsible for 1% of the "snow" noise which you used to see on old analogue televisions. It is amazing to think that the interference on your TV screen was emitted 13.7 billion years ago! When it was discovered by accident in 1964, the CMB was the strongest evidence in support of the Big Bang theory.

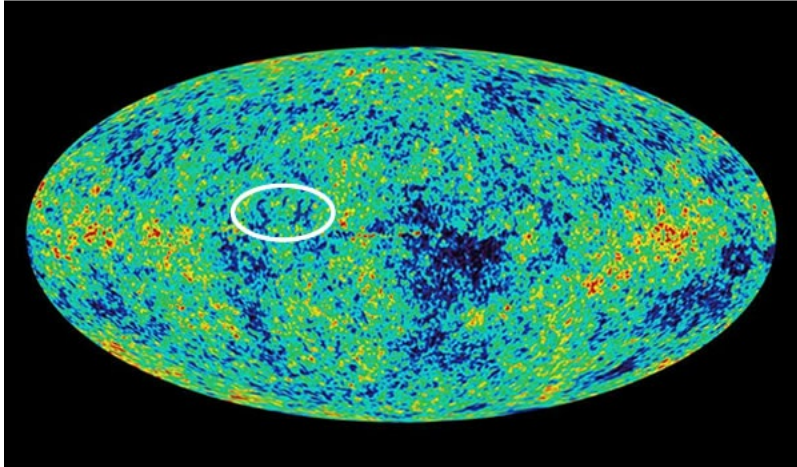
When we look out into space with our most powerful telescopes, we are effectively looking back in time. This is because we are looking at objects whose light has taken longest to reach us. The Hubble Space Telescope is capable of producing distant images of galaxies in the earliest stages of formation. Eventually, at the furthest distance, we find we are looking at the point when the universe was opaque, so we can look no further back in time. At that point, we are looking at the CMB — the furthest (and earliest) thing we can ever see.

The Wilkinson Microwave Anisotropy Probe (WMAP) was launched in 2001. It is located far enough away from the Earth to avoid the magnetic field or any other source of interference. Temperature measurements taken by WMAP of the CMB revealed it to be relatively smooth in all directions, with only small clumps and ripples (see following image).

These clumps and ripples at the dawn of time were extremely important, though, because they formed the seeds of the present-day structure of the universe. The gravitational attraction of the clumps pulled-in more mass, so the clumps grew to ever larger size, eventually becoming stars and galaxies.

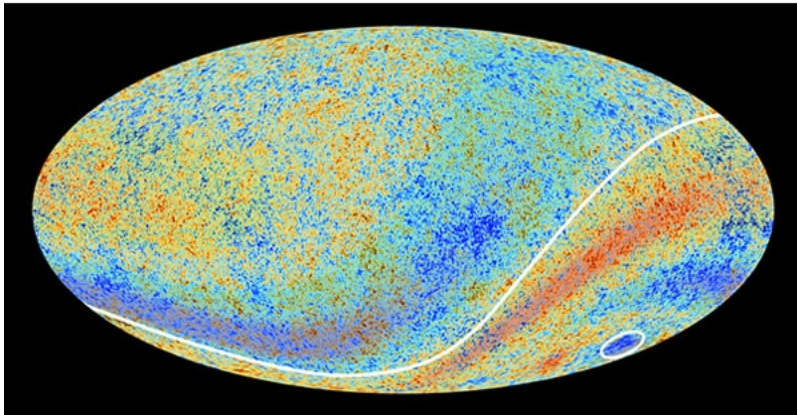
Intriguingly, a paper was published in 2010 which revealed there was one remarkable feature clearly visible on the CMB.^[6] As the paper's authors explain: "Shortly after the WMAP sky maps became available, one of the authors noted that the initials of Stephen Hawking appear in the temperature map. Both the "S" and "H" are beautifully vertical in Galactic coordinates, spaced consistently. We pose the question, what is the probability of this occurrence?"

If we examine the image of the CMB, Stephen Hawking's initials can indeed be quite clearly seen (inside the white ellipse):



More recent results, most notably from the Planck space observatory in 2013, no longer show the Hawking initials, but other unexpected anomalies have been revealed.

The image below was produced from the Planck observatory and has two anomalous features enhanced. Firstly, the curved line shows asymmetry in the average temperatures revealing that the sky is slightly warmer in the south than in the north. This is the wonderfully-named "Axis of Evil". There is also a large cold spot (shown inside the ellipse). This has been called the Great Void of Eridanus as it is in the direction of the Eridanus constellation:



These are not the only anomalies to have been discovered recently. Only relatively recently has it become possible to map the positions of galaxies and galactic clusters in three dimensions. This has revealed peculiarities in their motion and positioning. Galaxies have a tendency to clump together in clusters and filaments, leaving large voids which are free of galaxies. This clustering introduces gravitational forces which pull galaxies out of their expected trajectories.

As was discussed earlier, our Milky Way galaxy is one of a number of galaxies which form the Local Group. It has been discovered that the Local Group is travelling at about 400 miles per second in the direction of the Virgo cluster of galaxies. This area to which so many galaxies are attracted is called the Great Attractor. The reason for this mass movement is unknown as the gravitational pull of the Virgo cluster is not powerful enough. This migration of galaxies has been called *dark flow*.

No one knows the reason for these anomalies. However, it is clear that the universe is not as smooth and featureless as had been believed.

The shape of the universe

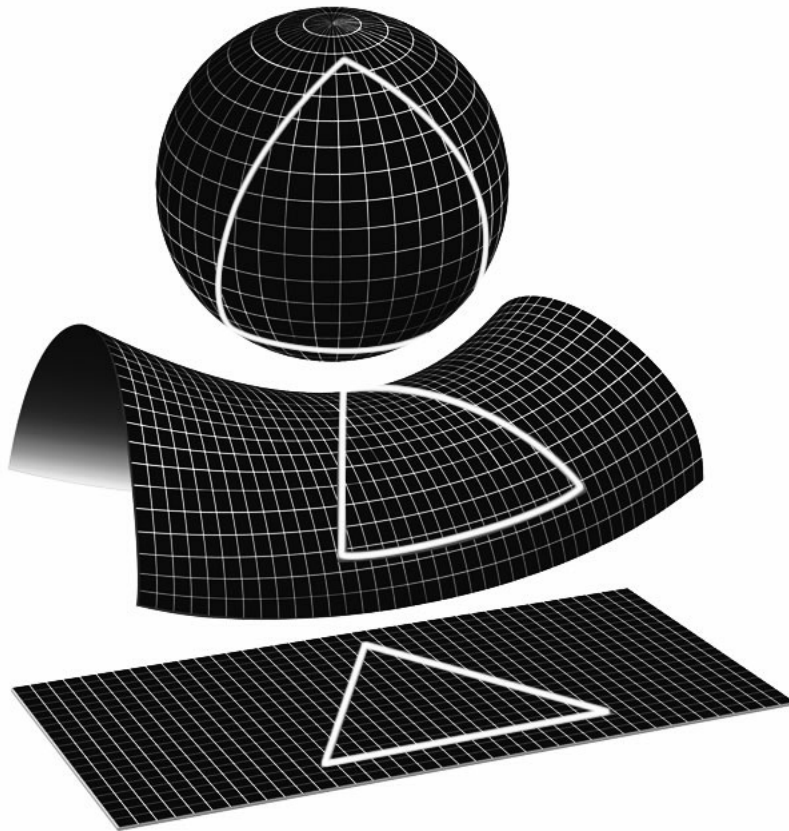
In our discussion of gravity in the previous chapter, it was explained how the presence of mass in general relativity curves space. Well, the universe obviously contains mass, so the universe must logically have some form of curvature. So it appears we can talk about the "shape" of the overall universe. What shape is the universe?

You might find it a bit strange talking about the "shape" of the universe, because you might think the universe doesn't have a shape — it just goes on forever, doesn't it? Surely it is inconceivable that the universe has an edge, like a wall, or a drop at the end which you fall off if you go too far? Well, maybe it is the case that the universe is infinite in size, but, surprisingly, it is also possible for the universe to be finite in size but still have no edge. Which situation is true depends on the shape of the universe.

If the density of mass in the universe is high enough then space can become so curved that it loops around on itself. Imagine space looped around in a circle as if it is the inside of a ping pong ball. You could travel forever around the inside of the ball but never reach an edge. It has also been called the "Pac Man" universe: you go out of one side of the game and come back in on the opposite side. This is the situation when the universe is finite in size but has no edge. This is called a *closed* universe. Imagine the universe as a "ball" of space.

The expansion of the universe is a unique form of motion. Normally, motion involves the movement of an object against a pre-existing background of space. But when the universe expands, it is not a case of the farthest galaxies flying away through pre-existing space. After all, there is nothing outside the universe, so that means there is no pre-existing space outside the universe, so what could the universe possibly expand **into**? No, what is actually expanding is this "ball" of space itself.

There are two other possibilities for the shape of the universe, depending on the density value. These possibilities are illustrated in the following images of three equilateral triangles drawn in the three different types of space:



The first example shows a closed universe, as if it was the inside of a ping pong ball. In this case, parallel lines eventually meet, and the sum of the angles of a triangle exceeds 180 degrees (although this would only be noticeable on vast triangles of cosmological scale).

The second example shows the case when the density is sufficiently small. This is called an *open* universe. Instead of space being closed, space diverges in an open universe as if it is drawn on a saddle. In this case, parallel lines eventually diverge, and the sum of the angles of a triangle is smaller than 180 degrees.

The last example shows a *flat* universe. In this case, the value of the density is a particular value so that space is neither closed nor divergent. The sum of the angles of a triangle is equal to 180 degrees.

Let us now try to analyze these three scenarios in more depth. At the end of the previous chapter we were introduced to Einstein's equation for general relativity, and it was explained how the equation is very difficult to solve. In fact, exact solutions have only been found when simplifying approximations have been made. For the case of the entire universe, the first exact solution was developed by the Russian physicist Alexander Friedmann in 1922. The solution was only possible if we make the simplifying assumption that the universe has a very similar consistency and structure throughout its entire volume. We say that the universe must be *isotropic*, meaning that the universe looks the same in all directions — no matter where you stand in the universe. [7]

Of course, you might argue that the universe is far from isotropic: there are different galaxies in different directions. However, with there being over 100 billion galaxies in the universe, the distribution of those galaxies is very equal, and the resultant texture of the universe at the largest scales is very smooth. The universe does indeed appear to be isotropic.

The following equation is the first of the two Friedmann equations. The equation is derived from Einstein's equation. It relates the curvature of the universe, k , to the density of the universe, ρ . So it can be used to derive the curvature of the universe if we know the density of the mass in the universe:

$$H^2 = \frac{8\pi G}{3} \rho - \frac{kc^2}{a^2}$$

In the equation, we have already met the Hubble constant, H . The only other term you might not recognise is the scale factor, a , which basically says how large the universe currently is. We won't be seeing this term again, so don't worry about it. You should be able to recognise every other term (including the gravitational constant, G , and the Hubble constant, H).

We would like to calculate the vitally-important density of a flat universe. This is because a flat universe is perfectly balanced between being open and closed. A flat universe has zero curvature, so to derive the equation for that universe we set the curvature, k , to zero in the previous Friedmann equation. When you multiply something by zero, that term disappears, so we are left with:

$$H^2 = \frac{8\pi G}{3} \rho$$

and if we reorganize the terms in this equation we get a formula for the density of a flat universe:

$$\rho = \frac{3H^2}{8\pi G}$$

This density value for a flat universe is perfectly balanced between being an open universe and being a closed universe. Hence, this is called the *critical density*. If the actual density of the universe is more than this critical

density then the universe is closed. If the actual density of the universe is less than this critical density then the universe is open.

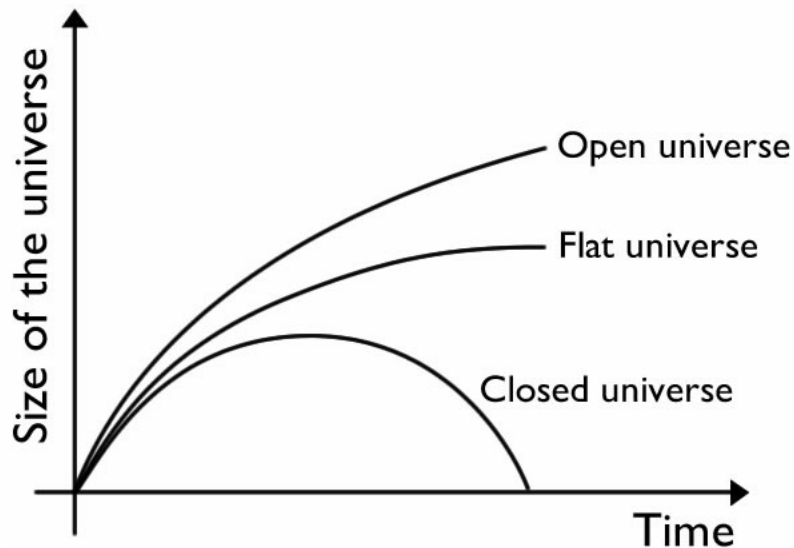
We will be seeing this vital equation again later.

But a flat universe contains matter, so how is it possible that a flat universe is not curved? Well, this is possible because the curvature of space (which pulls the universe inward) is perfectly balanced by the energy of the outward expansion of space. In the previous equation for the critical density, we can therefore see that the density depends on the rate of expansion of the universe described by the Hubble constant, H . If the universe is expanding faster, the critical density is larger.

So in a closed universe, the density of the universe is greater than the expansion energy given by the Hubble constant. This means that gravity will tend to pull the universe back together again. In the long run, this means that a closed universe is bound to eventually collapse. Even if a closed universe is currently expanding, gravity is bound to eventually win the day: the expansion will slow and eventually reverse, and the universe will collapse.

This is not the case in a flat or open universe. As was described earlier, in a flat universe the gravitational pull is perfectly balanced by the expansion energy: the expansion of the universe will slow down, but it will never collapse. In an open universe, the expansion energy is much greater and the universe keeps on expanding forever.

So the actual density of the universe — and its relation to the critical density — determines the eventual fate of the universe.



So is the universe actually closed, open, or flat? The evidence is obtained from the CMB radiation images which we considered in the previous section. The curvature of the universe makes it act like a magnifying glass, bending light and making distant objects either larger or smaller. If the universe was closed, distant clumps in the CMB would appear larger. If the universe was open, the clumps in the CMB would appear smaller. The fact that the clumps appear to be precisely the predicted size has resulted in NASA recently announcing: "We now know that the universe is flat with only a 0.5% margin of error."

This is really quite a remarkable result, and very unlikely to happen by chance. It requires the density of mass-energy of the universe to be set extremely precisely. If the density was slightly greater then the universe would have rapidly collapsed into a "Big Crunch". If the density was slightly less then the universe would have expanded too quickly for complex structures such as galaxies and stars to form.

So what could possibly be the reason behind this crucial flatness of the universe? One theory thinks it has a solution ...

Inflation

We have just seen that a flat universe is essential to the development of interesting structures such as stars and

galaxies (and therefore humans!). But this poses something of a mystery. Why should the universe be flat? Why is the density of the universe apparently fine-tuned to such a precise value? Why is the universe such an interesting place to live in, rather than just collapsing or flying apart? This is called the *flatness problem*.

In 1981, the American physicist Alan Guth believed he had found a solution. He proposed that in a tiny fraction of a second after the Big Bang, the universe expanded at an incredible rate. In just one hundred million trillion trillionth of a second the universe expanded from about the size of a subatomic particle to the size of a baseball. This period of incredibly rapid expansion is called *inflation*.

(It is proposed that the reason for this inflation is the negative pressure of the vacuum in the universe at that early stage. I won't go into detail about this at this point because we will be considering negative pressure in the next chapter.)

After this period of inflation, the universe is then predicted to expand at the normal, much lower expansion rate. But the period of inflation was enough to expand the universe to a much larger size than that predicted by the conventional Big Bang theory.

So how does this solve the flatness problem? Well, inflation works by smoothing and flattening the universe. If you imagine you have a rubber sheet full of ripples, as you stretch the sheet to a much larger size, the sheet becomes flatter and the ripples disappear. This is the effect inflation has on the universe.

If you are standing on a bowling ball, the curvature of the ball will be very obvious to you. However, if you expand that ball up to the size of the universe, then, at a local level, the ball will appear completely flat. The same principle applies to a universe that has undergone inflation. Inflation is proposed to have expanded the universe to a vastly larger size than the observable universe (at least a hundred sextillion times larger [8]). This means the part of the universe we can actually see is just the tiniest fraction of the entire universe. So, just like the blown-up bowling ball, our observable universe appears flat.

There is another reason why inflation is an attractive hypothesis. Let us consider two galaxies, positioned either side of the Earth, and both of them 9 billion light years from Earth. This means the distance between the galaxies is 18 billion light years. As the universe is only 13.7 billion years old, this means there has not been enough time for light to pass between the two galaxies. Essentially, they are isolated from each other. But when we look around the universe, we find it looks remarkably uniform, and the CMB temperature of all areas of the universe is remarkably similar. This is surprising because it appears that the temperature has had a chance to equalise, ironing-out any differences. However, because it is not possible for light to have travelled between the galaxies, it should not have been possible for this equalisation to occur. Heat could not have flowed from warmer regions of the universe to the cooler regions. We would expect to see a universe with far less uniformity than we observe. This is called the *horizon problem*.

Inflation presents a possible solution to the horizon problem because, once again, the stretching of the universe during the inflationary period has the effect of smoothing the universe. According to inflation, our observable universe represents only a small fraction of the total universe. Therefore, the region which has become our observable universe was actually a very small volume of the universe before inflation occurred, and the objects in that small volume could all communicate with each other. There was enough time for heat to flow from the warm regions to the cold regions and smooth-out any differences.

The inflation hypothesis has been widely accepted and has been incorporated into what is known as the "standard model of cosmology" which, like the standard model of particle physics, has about 20 free parameters (numbers which cannot be derived but have to be obtained by observation). However, the standard model of cosmology has nowhere near the same level of experimental verification. I recently read that the standard model of cosmology is a "triumph of modern physics". I am not convinced. I would describe it more as "a list of things we do not yet understand". It is also the case that, thirty years after it was first proposed, serious cracks are now starting to appear in the model of inflation.

In a 2011 *Scientific American* article, Paul Steinhardt — one of the developers of the inflation hypothesis — asked "Is the theory at the heart of modern cosmology deeply flawed?" (see <http://tinyurl.com/PaulSteinhardt>). According to Steinhardt, inflation would have to be fine-tuned to produce the smooth properties of the universe we observe today. Another strong criticism is that inflation should keep occurring throughout our universe: it is very easy to start inflation, but it is very difficult to stop it. Bubble universes are predicted to keep appearing in space. In fact, inflation predicts an infinite number of bubble universes will appear, with each bubble universe having different properties: some smooth, some highly non-uniform. So inflation is not such a predictive theory as had been assumed. In fact, a theory which predicts everything predicts nothing.

The simplistic original theory of inflation as proposed in the early eighties has been replaced by a theory which lacks predictive power, and seems fundamentally flawed. The opportunity is there for a new theory. In the later chapters of this book, a new, simple hypothesis will be presented for producing a flat universe.

4

DARK MATTER AND DARK ENERGY

The recent discovery of the Higgs boson represents the last piece of the jigsaw of the standard model of particle physics. The standard model was formulated in the late 1970s and it is one of the greatest achievements in the history of physics. It describes all of the known particles and their interactions. However, because the standard model does not describe gravity, it has been called the "theory of **almost** everything". Unfortunately, we have recently discovered that it is more like the theory of not very much at all.

We have discovered that the standard model only describes about 5% of the material of the universe.

To put it another way, we simply have no idea what the vast majority of the universe — 95% — is made of. In this chapter we will examine the mystery of the missing 95%. We will see that there are two components to the missing substance, and these are known as dark matter and dark energy.

This is what the universe is really made of.

Dark matter

In 1933, the Swiss astronomer Fritz Zwicky considered the motion of galaxies in the Coma Cluster (a large cluster which contains about 1,000 galaxies). He estimated the mass of the cluster by measuring its brightness, and, based on that mass, he predicted the motion of the galaxies on the edge of the cluster. Zwicky discovered that much of the required mass appeared to be missing. Though the nature of this missing mass was completely unknown, Zwicky gave the German name "dunkle materie" to the material, which translates to "dark matter". It is now believed that 90% of the mass of the Coma Cluster is in the form of dark matter.

Unfortunately, Zwicky was a difficult man to get along with (he was dubbed "borderline psychopathic" in a BBC documentary *Most Of Our Universe Is Missing*, available on YouTube). Zwicky referred to his colleagues as "spherical bastards" — because they were bastards no matter which way you looked at them. As a result, Zwicky's work was ignored for many decades.

However, in the 1970s, Vera Rubin of the Carnegie Institution of Washington had access to more accurate equipment and she used it to measure the speed of rotation of stars lying on the edge of spiral galaxies. She started by examining the Andromeda galaxy which, as was described in the previous chapter, is the nearest spiral galaxy to our own galaxy.

If you consider our solar system as an example, the outer planets orbit the Sun slower than the planets which are nearer the Sun. For example, Neptune, the farthest planet, takes 164 Earth years to orbit the Sun. And for galaxies as well, this is what we would expect. We would expect the stars on the edge of the galaxy to orbit the galactic centre at a slower speed than the stars nearer the centre.

However, this is not what Vera Rubin discovered. She discovered that the stars on the edge of the galaxy orbited the galactic centre in the same time as the stars nearer the centre. This meant the outer stars were travelling much faster than expected. Put simply, she discovered that the stars were orbiting too fast: the gravitational pull of the galaxy should not have been sufficient to hold the stars in orbit. Rubin's calculations revealed that galaxies must contain ten times more matter than is held in the visible stars. Eventually, other astronomers corroborated Rubin's result and it soon became accepted that most of the material in galaxies was dark matter. It appears that each galaxy resides inside a sphere of dark matter, and the radius of that sphere is approximately ten times the radius of the galaxy.

So just what is this mysterious dark matter? The first possibility is that it is just conventional matter, i.e., atoms composed of protons and neutrons. This would have to be in a form so that it does not emit any light (and is therefore "dark" and invisible). This might include black holes or very dense neutron stars. These type of bodies which are proposed to constitute dark matter are called MACHOs (Massive Astrophysical Compact Halo Object). However, MACHOs seem unlikely to be the solution to dark matter as they tend to be isolated objects, whereas it is known that dark matter is spread fairly evenly over a galaxy.

The opposite of being MACHO is to be a WIMP, so the other possibility is that dark matter is composed of WIMPs (Weakly Interactive Massive Particles). These would be new particles, not contained in the standard model.

These particles would have to be much more massive than protons, but would have to interact only minimally with ordinary matter — which makes them very difficult to detect. They could not radiate light or scatter it, so they could have no electric charge.

Several experiments to detect WIMPs are based deep underground in converted mine workings. The Large Underground Xenon (LUX) dark matter detector is located in a converted gold mine in the Black Hills of South Dakota, not far from Mount Rushmore. It is located underground to shield its detector from background radiation and cosmic rays. The idea is that most particles from space will interact with conventional matter in the earth and will not reach deep down through the rock — only the non-interacting WIMPs will fly straight through the earth to the detector.

The LUX detector is the most sensitive dark matter detector in existence. The detector consists of a two-metre tall titanium tank filled with liquid xenon. If WIMPs exist then they would be expected to occasionally collide with the xenon atoms in the tank. This would result in a burst of light which would trigger extremely sensitive light detectors.

However, initial results from LUX released in 2013 showed no evidence of dark matter collisions. As the LUX spokesman Richard Gaitskell said: "We saw nothing. We do not have a single dark matter candidate event." In fact, results were able to eliminate possible candidate results from earlier experiments by other dark matter detectors. So the nature of dark matter remains a mystery. As Richard Gaitskell went on to say: "We have entered the new millennium and yet we still have no idea what 95% of the universe is made of. Our level of ignorance is quite staggering, and it's one of the largest challenges we have right now."

It remains possible that there is yet another possible solution to the dark matter conundrum, and that is that dark matter might not exist at all ...

MOND

Mordehai Milgrom of the Weizmann Institute in Israel is not a fan of dark matter: "People who deal with dark matter will not stop by themselves — they will stop when the money stops. And this is what they will want to continue to do as long as they are given the chance and the resources to do it."

Milgrom believes that dark matter is not necessary to explain the flat rotation curves of galaxies. The extra gravity required can come instead from a modification to Newtonian gravity. Milgrom noted that stars on the edge of galaxies do not have to accelerate as much as stars near the galactic centre (this is because their radius of orbit is less curved). Milgrom's suggested modification to gravity is that an object which is undergoing less acceleration would experience a greater pull of gravity. This meant that stars would orbit at constant velocities, no matter their distance from the galactic centre. This theory was given the name MOND (Modified Newtonian Dynamics).

MOND has been criticised for violating the law of conservation of momentum — not something you really want in your theory. Also, recent observations of gravitational lensing (whereby light is seen to bend around galaxies) have lent further weight to the theory that dark matter really exists in its own right. The galactic cluster known as the Bullet cluster was formed when two clusters collided. As a result of this tremendous collision, measurements of gravitational lensing has revealed that the dark matter has been separated from the main mass of galaxies. This result cannot be explained by a modified theory of gravity such as MOND.

So dark matter remains a mystery for the time being. But what about the other puzzling constituent of the universe ...

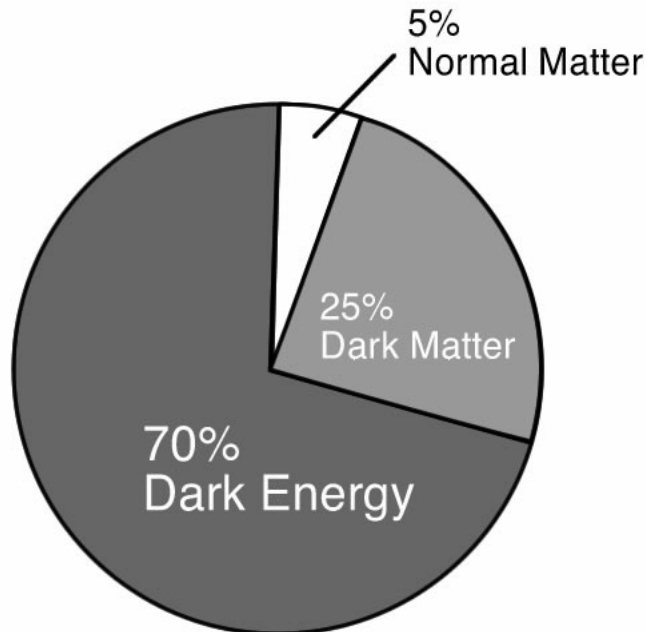
Dark energy

As discussed in the previous chapter, it is known that the universe is very close to spatially flat. This spatial flatness is achieved when the mass-energy density of the universe is equal to the critical density (the formula for which we derived in the previous chapter). However, this raises a problem as the total amount of matter (including dark matter) is measured to be only 30% of the amount required to bring the density up to this critical density. As Ta-Pei Cheng says in his excellent textbook *Relativity, Gravitation, and Cosmology*: "The Friedmann equation requires a flat universe to have a mass-energy density exactly equal to the critical density. Yet observationally, including dark matter, we can only find less than a third of this value. Thus it appears that to have a flat universe we would have to solve a missing energy problem."

What could possibly account for the missing mass-energy? Even taking dark matter into account, it appears that a further 70% of our universe is missing!

So what is this missing 70%? It is generally stated that there must be a vast amount of energy in space which we

cannot detect, and even though we cannot detect it we know precisely the amount of this missing energy which exists: it is the amount required to raise the mass of the universe up to the critical density. So it is proposed that there is another invisible substance known as *dark energy* which pervades space, and makes up this missing 70% of the total mass-energy of the universe.



There is another reason why the dark energy hypothesis is popular. And that is because of a truly remarkable recent result ...

The accelerating expansion

In the 1990s it had been known for several decades that the universe began with the rapid expansion of the Big Bang. It was also believed that in the billions of years since the Big Bang, the sum total of mass and energy in the universe would have been attracted together due to gravity, and this would inevitably have the effect of slowing the expansion of the universe. So in the 1990s, two competing groups set out to determine the expected rate of deceleration of the universe. One group was the Supernova Cosmology Project based at the Lawrence Berkeley National Laboratory in California, and was headed by Saul Perlmutter. The other group was the High-Z Supernova Search based at the Mount Stromlo Observatory in Australia, and was headed by Brian Schmidt and Adam Riess. But how could it be possible for these teams to measure how much the expansion rate was slowing down?

The only way to do this would be to consider extremely distant objects, over 5 billion light years away, which would also have to be extremely bright so that their emitted light would be visible. What was needed was an object whose brightness was known and was constant. These objects which all have the same known brightness are called *standard candles*.

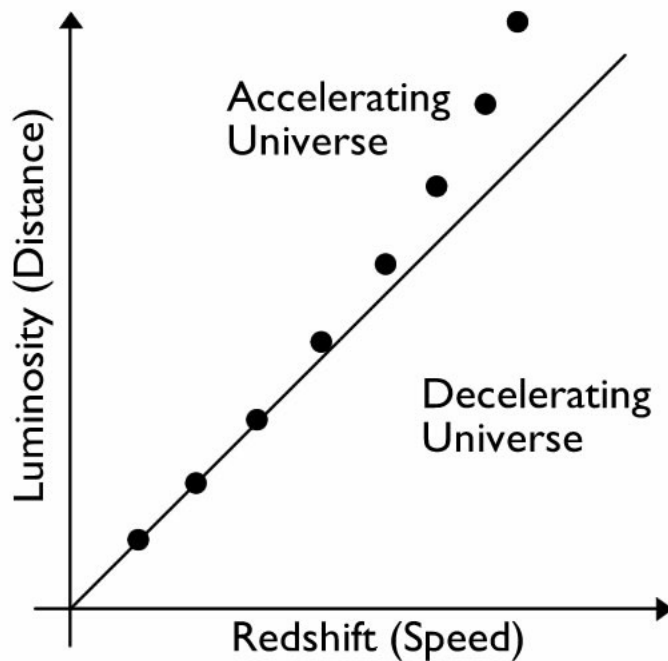
One type of celestial body perfectly fitted the role of a standard candle. A supernova is a star which has burnt all its fuel and undergoes a thermonuclear explosion, emitting a tremendous amount of energy (we will be encountering supernovas again in the next chapter on black holes). There are different types of supernovas. The particular type of supernova we are interested in is called a Type 1a supernova. These occur in white dwarf stars, which are old stars which are small and incredibly dense. These stars are stable as long as their mass remains below 1.4 solar masses (known as the Chandrasekhar limit). If they attain any additional mass, maybe from neighbouring stars, these stars undergo a nuclear explosion, exploding in just ten seconds, and releasing a tremendous amount of energy. Because these white dwarfs all have the same amount of mass before they explode — 1.4 solar masses — the resultant supernova explosions all have the same brightness. This means that Type 1a supernovas make perfect standard

candles for measuring the expansion of the universe.

Unfortunately, it is very difficult to find supernovas. They only burn brightly for three weeks, and in any given galaxy a supernova will explode without warning only once every 300 years. However, all is not bad news. With billions of galaxies in the observable universe, there are dozens of supernovas every night. So the international team had an ingenious idea. They took snapshots of thousands of galaxies, and then repeated those snapshots three weeks later. If any object in the second set of photos was considerably brighter than it could be recognised as a supernova. By scanning the entire sky in this method, the team were assured of a regular supply of supernovas. Perlmutter and his team dubbed this method "Supernovas on Demand".

The supernovas were then observed by the Keck telescope in Hawaii, and also by the Hubble Space Telescope. Because the brightness of the supernovas was precisely known, it was possible to determine how far away they were by measuring that brightness. So the distance to a supernova was determined by its brightness, and the speed at which it was moving away was determined by its redshift.

When the team plotted their results, they were puzzled. They found the plots of their supernovas deviated from the usual linear Hubble curve, but in a way which suggested that the expansion of the universe was accelerating — not decelerating! The graph showed that the expansion rate of the universe was smaller in the past, so that an object at a certain distance was not receding as fast as would be expected. The following diagram is typical of the sort of supernova plots (the black dots) they examined:



If you remember back to our discussion about the expansion of the universe in the previous chapter, you will recall that none of the available scenarios (open, closed, or flat universe) led to an accelerating expansion. In fact, in all three cases the rate of expansion of the universe was predicted to slow down. So this result came as a complete shock to the cosmology community. Saul Perlmutter, Brian Schmidt, and Adam Riess received the Nobel prize for this extraordinary discovery.

So what could possibly be causing this accelerated expansion of the universe? Intriguingly, a perfect candidate is Einstein's cosmological constant which we considered back in Chapter Two. If you remember, Einstein introduced the cosmological constant to prevent the collapse of the universe which was predicted by general relativity. The cosmological constant introduced a form of anti-gravity force which could hold the universe in a steady state. It was only when Edwin Hubble discovered the universe was expanding that Einstein realised his blunder.

Well, the cosmological constant can potentially do more than just hold the universe in a steady state: its anti-gravity force could be powering the expansion of the universe. But just what is this cosmological constant? Well, it might be the case that the cosmological constant is just another mathematical constant, with no obvious physical

cause. In other words, maybe Einstein was correct and we should adjust the form of his equation to include this additional constant. But physicists seem reluctant to modify the equation for general relativity, and would rather seek some additional physical cause which plays the same role as the cosmological constant.

It is currently believed that dark energy might be nothing more than the energy of empty space, otherwise known as the *vacuum energy*. That might sound very strange: how on earth can empty space have an energy? Well, it turns out that empty space is not so empty after all, and that is all due to the effect of quantum mechanics.

In quantum mechanics, the Heisenberg uncertainty principle says that there will always be a degree of uncertainty in how accurately we can know a combination of certain particle properties. You may have heard that the more accurately we determine the position of a particle, the less accurately we can know its momentum. For example, if we arrange for a particle to hit a screen, we can determine the particle's position with 100% accuracy, but we will have no way of knowing how fast the particle was travelling when it hit the screen — there is maximum uncertainty about its momentum.

There is a similar uncertainty about a particle's time and energy. This means there is a fundamental limit on how accurately we can measure the energy of a system at a given moment in time. Incredibly, this means that for a short period of time, there can be energy produced in empty space in which all the matter has been removed. Even more incredibly, according to the mass-energy equivalence described by $E=mc^2$, this vacuum energy can be enough to produce a particle! It is as though the energy is "borrowed" from the vacuum. These so-called "virtual particles" can appear out of nothing.

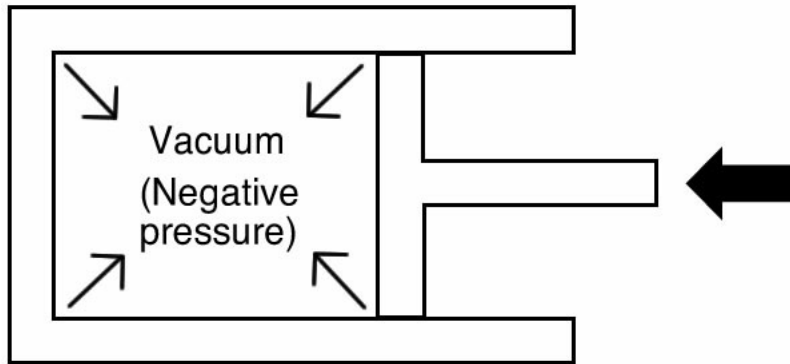
These virtual particles can only exist for a very short period of time before the energy debt has to be paid back. Very shortly after the particles appear, they annihilate each other and disappear again. However, for the period that the particles are in existence they generate a very small amount of energy in empty space: the vacuum energy, also known as *zero-point energy*.

You might find it hard to believe that empty space can contain energy. However, this has been experimentally proved by measuring the *Casimir effect*. The Casimir effect is quite a remarkable experiment in which two metal plates are placed very close to each other — just a few micrometres apart. Virtual particles pop in-and-out of existence between the plates, but because of the very small distance between the plates this introduces a limitation on the type of particles which can be produced. As a result, fewer virtual particles are produced between the plates than outside the plates. The resultant difference in pressure generates a small force which pushes the plates together. This force has been measured: virtual particles are a reality.

Interestingly, if you have two ships floating next to each other, they will gradually come together for a very similar reason to the Casimir effect. This is because only waves of a limited number of wavelengths can fit between the ships — the wavelengths of the waves outside the ships being unlimited. As a result of this inequality, there is a small pressure which forces the ships together.

Of course, as you might have predicted, the idea of empty space producing energy has attracted the attention of many inventors who believe they can harness this energy to produce power. Unfortunately, all their efforts are doomed to failure. Zero-point energy is the lowest amount of energy that can exist. If you try to draw-off that energy from a region of empty space — to produce warmth, for example — you will only end up heating the empty space with your own equipment as the energy of the vacuum is guaranteed to be less than the energy of any equipment you might attach to it.

Vacuum energy has a particular property which makes it very interesting from the point of view of explaining the accelerated expansion of the universe, and that property is *negative pressure*. If you consider the cylinder filled with a vacuum in the diagram below, it can be seen that the vacuum will inevitably try to pull the piston further into the cylinder (this is inevitable as the vacuum has the lowest possible energy). In this sense, we can consider the vacuum as having negative pressure (if the vacuum had positive pressure then it would be forcing the piston out of the cylinder):



Now let us consider a normal gas under normal positive pressure in the cylinder. The gas would tend to push the piston out of the cylinder (as might happen in a steam engine, for example). In which case, the gas has done work, and the energy contained in the gas is **reduced** as a result.

However, if we now consider our cylinder full of vacuum, as we have seen, the vacuum will tend to pull the piston in. If the piston moves out of the cylinder instead, then the energy contained in the vacuum is **increased** as a result (the opposite to the case of the gas with positive pressure).

So the vacuum energy can result in negative pressure. And this is very interesting, because pressure is a form of energy. General relativity predicts that not only is mass gravitationally attractive, but positive pressure is also gravitationally attractive. And so, quite incredibly, negative pressure is predicted to result in gravitational repulsion! As Alan Guth says in *The Inflationary Universe*: "According to general relativity, a positive pressure creates an attractive gravitational field, as one might guess. A negative pressure, however, creates a repulsive gravitational field."

So next time someone says that gravity is a force which is always attractive, you can correct them: negative pressure results in gravitational repulsion!

And this is why the vacuum energy is a candidate for the mysterious dark energy: the repulsive gravitational effects of negative pressure could be powering the expansion of the universe.

You might be wondering why the gravitational attraction due to the energy of the vacuum does not negate the gravitational repulsion due to the negative pressure. After all, Einstein showed that energy is equivalent to mass, so surely the vacuum energy should be gravitationally attractive. The answer is, yes, the vacuum energy **is** gravitationally attractive, but this does not completely cancel-out the gravitational repulsion. This is because the mass (attractive) and pressure (repulsive) elements affect the accelerated expansion of the universe differently.

In order to see this, we need to consider the second of the two Friedmann equations. This equation provides a formula for the acceleration of the expansion of the universe, which is given by:

$$-\frac{4\pi G}{3}(\rho + 3P)$$

Where ρ is the density (which we have seen before), and P is the pressure. We can see that the pressure term is multiplied by three. This is because, very unusually, all observers must measure the same energy and pressure of the vacuum — no matter how they are moving. As a result, this value of three is there purely because there are three dimensions of space! [9]

The repulsive component of the vacuum energy is therefore three times stronger than its attractive element. So the second Friedmann equation predicts an accelerating expansion.

But this all depends on the actual value of P . And that is where the problems really start ...

The biggest error in science

The required value for the vacuum energy is extraordinarily small — in the order of a millionth of a billionth of a joule per cubic centimetre. The effect has a cumulative effect over distance, so it must be extremely small or else the universe would be ripped apart over large distances. Even at the vast scales of the Milky Way, the effect is unnoticeable. The repulsive effect only becomes noticeable at the scale of the whole universe.

So we need an astonishingly small value for the vacuum energy. However, when attempts are made to calculate the amount of vacuum energy, the result is very different to that required to be the dark energy. In fact, the value for the vacuum energy is calculated to be an enormous figure: a trillion trillion trillion trillion trillion trillion trillion trillion trillion trillion trillion times larger than the observed value of dark energy density. And that's a lot of trillions! Famously, this has been called the "biggest error in the history of science". Vacuum energy is predicted to be far too large to be dark energy.

This sounds suspicious. The sums for this vacuum energy hypothesis simply do not add up. Not only do they not add up, they are astronomically wrong. It is possible that there is some mechanism which greatly reduces the vacuum energy, for example, the energy of different types of symmetrical particles might cancel each other out. But we would generally expect this cancelling mechanism to result in a zero vacuum energy, not a tiny value.

However, the problem with the necessary value of the vacuum energy is not that it is so much smaller than the predicted value. The problem is that it is set to a **particular** tiny value which results in an "interesting" universe. If the universe expanded at too fast a rate, galaxies would be unable to form. If the universe expanded too slowly, it would collapse back on itself before intelligent life could form. The amount of vacuum energy required is not just set to a much lower value than predicted, it is set to **just the right** much lower value than predicted. This gives an impression of fine-tuning of the vacuum energy.

There are more bizarre coincidences. The predicted density of dark energy in the universe is remarkably close to the density of matter in the universe. This is surprising as the density of matter reduces sharply as the size of the universe increases (the matter becomes more diffuse), whereas the dark energy density remains constant. The dark energy density remains constant purely because it is the energy of empty space: as the size of the universe increases, so does the amount of empty space. This apparent balance between the amount of mass and the amount of dark energy has been called the *cosmic coincidence problem*. This coincidence — this unlikely balance — appears to indicate that there is something very special about the current era.

In order to explain these apparent fine-tuning problems, the dreaded "multiverse" model has been introduced. A series of parallel universes are postulated with the vacuum energy being set to different values in each parallel universe. However, most physicists would find such an idea highly fanciful. They may even accuse it of being unscientific.

More bad news for the dark energy model was provided by the most recent observations of Type 1a supernovas from the Pan-STARRS observatory in Hawaii. The observations revealed that dark energy does not provide an accurate model for the observed expansion of the universe.^[10] Multiple experiments are now coming to the same conclusion. "This paper is now the third survey of distant supernovas that's coming to this conclusion," explains Adam Riess, who was introduced earlier for winning the Nobel Prize for the discovery of the accelerating expansion. "We can't just say this survey or that survey screwed-up. It could be that dark energy is more interesting in a way that actually we hope."

In the later chapters of this book, a simple alternative explanation for the acceleration of the expansion of the universe will be presented, an explanation which requires no fine-tuning of the vacuum energy to some bizarrely tiny value. I believe we are looking at the problem from the "wrong end". Instead of the setting of vacuum energy to a particular value which just coincidentally happens to produce an "interesting" universe, the hypothesis will be presented that such a universe is a fundamental necessity.

BLACK HOLES

Put simply, a black hole is an object of such extraordinary mass and gravitational pull that nothing can escape it — not even light. Just the name "black hole" conjures an image of a fearsome entity, dark and malevolent, stalking space ready to catch any unlucky passing object in its unbreakable grip. It seems like an object out of science fiction more than science fact. However, the existence of black holes is now a well-established reality.

Black holes are stars which have collapsed under their own weight. This can happen at the end of a star's lifetime. A star produces its energy via nuclear fusion, a process which fuses hydrogen nuclei together under immense temperature and pressure to become helium nuclei. The energy released is sufficient to overcome the immense gravitational force which continually tries to collapse the star. However, when a star burns off all its hydrogen fuel, it starts to collapse under its own weight. As a result of this extra pressure, the helium in the star starts to fuse. Energy is released, and the star expands in size to become a *red supergiant*. These are the largest stars in the universe, up to 1800 times the size of our Sun. Inside the red supergiant, progressively heavier and heavier elements are fused to produce energy. This process stops when iron is produced in the core. Iron is the equivalent of ash for nuclear fusion as it requires more energy to fuse iron than the process produces.

At this point, the red supergiant collapses and the outer layers of the star get blown off in a huge supernova explosion. A supernova is so bright that for a few days it can outshine all the other stars in a galaxy put together.

We considered how white dwarf stars explode as Type 1a supernovas in the previous section, describing how those supernovas make excellent standard candles. However, Type 1a supernovas never result in black holes — the exploding white dwarfs leave no remnant. The type of supernova we have described here, which start from red giants, are called core-collapse supernovas, otherwise known as Type II supernovas. These supernovas can leave behind a remnant at their centre, so only Type II supernovas can generate black holes.

What happens to the collapsing star now depends on how heavy the remnant is. For remnants of mass 1.5 to 3 times the mass of the Sun, the result of gravitational collapse after a supernova explosion can be a *neutron star*. Neutron stars are incredibly dense: six million tons to the cubic inch.

For even larger stars, if the mass of the remnant exceeds about three solar masses then the gravitational collapse can be unstoppable. In less than a second, the core of the star implodes from a ball about the size of the Earth to a ball about the size of a small city. And this implosion continues down to a small point. It is this point which becomes a black hole.

The black hole then increases in mass by attracting other mass from its surroundings. In this way, black holes can grow to possess extraordinary mass, and an extreme gravitational field to match.

The wonderfully evocative name "black hole" was coined by John Wheeler in 1967. However, surprisingly, we can trace the first proposals back to the eighteenth century.

The idea was suggested independently by the British geologist John Michell, and the French mathematician Pierre-Simon Laplace. By using Newtonian physics they considered the escape velocity of an object trying to break free of a gravitational field around a star or planet.

This means an object is propelled off the surface of the planet with a velocity, v , and that initial kinetic energy must be greater than (or at least equal to) the gravitational energy pulling it back to the planet.

In which case:

$$\frac{1}{2}mv^2 = \frac{GMm}{r_{esc}}$$

where m is the mass of the object trying to escape, M is the mass of the planet, and r_{esc} is the escape velocity (the left-hand side of the equation is the kinetic energy, the right hand side of the equation is the gravitational energy).

On rearranging the equation we find:

$$r_{esc} = \frac{2GM}{v^2}$$

For black holes, we put v equal to the speed of light, c , to indicate that any object trying to escape the clutches of a black hole would need an escape velocity faster than the speed of light (which is impossible, of course):

$$r_{esc} = \frac{2GM}{c^2}$$

This black hole radius calculated by the eighteenth century physicists remains an accurate formula still in use to this day.

Of course, light is not slowed down by gravity — light always travels at a constant speed. So light is actually trapped in a black hole by the extreme curvature of space.

This result of Michell and Laplace was ignored throughout the nineteenth century as it was not believed that light (which was known to be massless) was affected by gravity. It took the arrival of general relativity before the idea was revisited.

As we saw in the earlier chapter on gravity, merely from a thought experiment involving a window in a spaceship, Einstein was able to predict that gravity bent the path of light. This was a revelation: light might be massless, but it was still affected by gravity (gravity being the curvature of space itself). This again raised the possibility of an object whose gravitational pull was so strong that not even light could escape. Hence, from a mere thought experiment, Einstein predicted the existence of black holes. The existence of black holes is now an accepted fact in astrophysics — more evidence of the validity of general relativity.

Einstein's equations of general relativity published in 1915 were complex, non-linear, and very difficult to solve. In this respect, solving the equations is similar to solving non-linear equations of fluid dynamics, or weather prediction. Even to this day, exact solutions for Einstein's equations have only been found for very simplified models, with the solutions to more complicated situations only capable of being solved by number-crunching on extremely powerful computers. For example, it is now possible to simulate the results of black hole collisions using the Einstein equations and super-computers capable of performing one thousand billion calculations per second.

The very first exact solution to the equations was presented by Karl Schwarzschild just months after Einstein published his result. Schwarzschild used a simplified version of the Einstein equations to produce a *vacuum solution*, a solution for an empty space. This considered the curvature of empty space around a spherical mass, for example, a star. Further simplifications meant the star should not be rotating, and had no overall electric charge. These are considerable simplifications, but they did allow the equations to be solved.

The Schwarzschild solution predicted a black hole radius which is called the *Schwarzschild radius*. The value for this Schwarzschild radius is the same as that produced by the classical derivation for the black hole radius presented earlier:

$$r_s = \frac{2GM}{c^2}$$

Remember this formula. We will be seeing it again later.

Rather incredibly, Schwarzschild derived this solution while serving in the trenches for Germany in the First World War. Sadly, he was killed on the Russian front just months after publishing his result.

The Schwarzschild radius around the black hole is usually referred to as the *event horizon*. Once any object passes the event horizon into the black hole, it has passed the point of no return. It can never get out again.

If you were approaching a black hole in a spaceship, you might not even notice the moment you passed the event horizon. However, you have already signed your death warrant once you pass the event horizon. It is like falling over the edge of a waterfall on a river. There is no way you can swim back up. From that point on, you are doomed to be dashed on the rocks below.

As you pass further into the interior of the black hole, it is believed that the gravitational stresses on your body would increase. Your feet would be pulled into the centre faster than your head — a process given the wonderfully descriptive term *spaghettification*.

Although we can have no direct, certain knowledge of the behaviour of physics inside a black hole (we are fundamentally prohibited from obtaining information from inside a black hole), conventional theory suggests that material entering a black hole will continue to fall to the centre, which has become a region of unimaginable density. According to general relativity, at the very centre we will find that the density increases to an infinite amount, a point called a *singularity*. Current theories of quantum gravity say that the singularity would not occur in reality — it is only the shortcomings of our current theories which suggests singularities. This is because singularities are so distasteful to physicists: they are the point at which the laws of physics break down. When we find infinities emerging in theories it usually means that the theory is inaccurate, or has been pushed too far. Einstein never accepted black holes because he did not believe a singularity could occur. If we had the right theory, the singularity would surely disappear from our theory.

Bear this in mind, because we will be returning to this important point (and proposing a singularity-free theory) later.

Supermassive black holes

A black hole increases its mass by attracting other mass which surrounds it. In this way, the mass of a black hole can rise to an extraordinary value: as much as a billion times the mass of the Sun. These giants are called *supermassive* black holes.

There is believed to be a supermassive black hole at the centre of our galaxy called Sagittarius A*. This has a mass of about 4.3 million solar masses. Everything in our galaxy is spinning around this supermassive black hole at its centre. It is now believed that there is a supermassive black hole at the centre of every galaxy, its huge gravitational pull essentially holding the galaxy together. So while black holes have a reputation as fearsome objects of destruction, they actually play a vital role in shaping the universe and holding it all together.

While black holes do not themselves emit X-rays, material falling into a black hole gets heated by the extreme gravitational field and X-rays are produced. This material, which is external to the event horizon, forms an *accretion disk* of debris which orbits the black hole at great speed (the rings of Saturn are another example of an accretion disk).

As Eliot Quataert of Berkeley's Theoretical Astrophysics Center explains: "That picture that matter gets sucked into a black hole, that's one of the biggest confusions that's out there, partially because of science fiction like *Star Trek*, and things like that. For matter that's far away from a black hole it actually doesn't get sucked in: it's very much like the planets in the solar system going around the Sun. Things just go around and around and around and around."

It is believed that these accretion disks rotate at great speed and generate huge jets of matter which emerge from the polar regions of the black hole travelling at near to the speed of light. The radiation from these jets can be a thousand times more powerful than the luminosity of our entire galaxy, and these incredibly bright objects — the brightest objects in the entire universe — are called *quasars*:



It is ironic that the brightest objects in the universe are actually black holes!

It is so difficult to observe supermassive black holes because they are simply too far away and too small. Black holes are extremely compact. The black hole at the centre of our galaxy would appear about as big to us as an orange on the Moon. No conventional telescope based on Earth would be able to resolve such a small angular distance. The angular resolution of a telescope is proportional to the size of its aperture. So, in order to achieve the necessary angular resolution, a telescope has been created with an aperture the size of the entire planet Earth.

The *Event Horizon Telescope* has been constructed with the specific aim of observing the supermassive black hole at the centre of our galaxy. The telescope actually consists of a global network of seven radio telescopes, the data from which is combined to produce an image. It really is a telescope as big as the world.

The telescopes which form the Event Horizon Telescope tend to be based on the top of mountains, and include the James Clerk Maxwell telescope in Mauna Kia, Hawaii, the Atacama Pathfinder Experiment in Chile, the Pico Vileta Telescope high in the Spanish Sierra Nevada, and the South Pole Telescope in Antarctica:



The first images from the Event Horizon Telescope are due to be produced in 2016. The images of the behaviour of gravity in the most extreme situations will either provide the final confirmation of the correctness of Einstein's theory of general relativity — or provide the first evidence that the theory needs modification.

Black hole thermodynamics

You might be surprised to learn that a science developed to analyse 19th century steam engines is now our main tool in analysing black holes. The science of thermodynamics was established as a means for studying the heat and motion of steam engines. Thermodynamics considers the energy and motion of atoms, and the heat and pressure that motion produces. We are now finding that the fundamental principles behind thermodynamics have particular relevance to the mechanisms associated with black holes. As Jim Al-Khalili says in his excellent BBC documentary *Order and Disorder: Episode 1* (available on YouTube): "As unlikely as it sounds, steam engines held within them the secrets of the cosmos."

In the 19th century, Britain's Victorian industry led the world. That industry was based on the newly-invented steam engine. The expansion of the British Empire around the world was powered by the steam engine, allowing the construction of the railways and steam ships, and providing a huge boost to manufacturing. Britain emerged as the world's most powerful trading nation.

In the early 19th century, Britain's defeat of Napoleonic France motivated humiliated French scientists to learn more about steam power in an attempt to catch up with the British technological lead. The French engineer Sadi Carnot is known as the "Father of Thermodynamics". Carnot was determined to analyse how steam engines work. In 1824, he wrote the legendary *Reflections on the Motive Power of Fire*. Carnot realised that heat would flow from a hot source to cooler surroundings, and that flow could be harnessed to do work.

But it was only when the principle of atoms was proposed that we could really make sense of heat and motion. It was realised that heat was nothing more than the random motion of atoms. If the atoms move more vigorously, then the object heats up. This provides us with a greater understanding of how heat moves. If one corner of an object is hot, then that heat will spread through the object so that the entire object becomes one temperature. This is due to the

motion and collision of atoms within the object, but there is a deeper principle at work here to explain why the flow of heat works in only one direction.

If we have a small amount of gas molecules in one corner of a room, then, over time, that gas will spread over the entire space of the room. What is happening is that a very ordered state is changing to a very disordered state. When all the gas molecules were carefully positioned in the corner of the room, this represents an ordered state. Over time, when the room becomes full of randomly-moving molecules of gas, this represents total disorder.

This principle — that the state of a system will tend to move from order to disorder — is known as the *second law of thermodynamics*, and is one of the most important and fundamental principles in physics. It applies to all systems throughout the universe, from steam engines to black holes.

The second law of thermodynamics introduced a quantity of a system called its *entropy*. Entropy can be considered to be the amount of disorder in a system. The second law says that the entropy of a system only ever increase — it can never decrease. Essentially, the disorder of a system can only ever increase over time.

This principle — that disorder can only ever increase with time — seems so fundamental, so obviously correct, that the second law of thermodynamics is considered to be a completely unbreakable fundamental law of physics.

This one-way principle of entropy increase might remind you of a one-way property of a black hole. Can you think of anything about a black hole which always increases and can never decrease? Well, the mass of the black hole can only ever increase (nothing can ever leave a black hole). Which means the corresponding Schwarzschild radius — and, specifically, the associated area of the event horizon — can also only ever increase. Because of this similarity, in 1972, Jacob Bekenstein proposed that a black hole has entropy proportional to the area of its event horizon.

It might seem strange that we consider a black hole to have entropy at all. But, remember the second law of thermodynamics which says that entropy can only ever increase. It might appear that we can eliminate the entropy of matter by sending it into a black hole, in which case its entropy would appear to have gone for good. This sounds like a method for reducing entropy, which would break the unbreakable second law. So, to prevent the second law from being broken, the entropy of any mass entering the black hole gets added to the total entropy of the black hole. This is reflected in the increased area of the event horizon. In this way, entropy only ever increases.

Consideration of black hole entropy is perhaps the main tool we possess for analysing the properties and behaviour of a black hole. This area of study is called *black hole thermodynamics*.

Information and entropy

There is an important connection between the information contained in a system and the entropy of that system. A simple way to understand this is to imagine you are in a library, and there are ten different books on the table in front of you. Each book is about a different subject, and each book contains useful information. So each book can be clearly distinguished from any of the other books by means of the distinct useful information it contains.

Over time, however, the books start to decay. First the pages fade, then the paper rots. Eventually the whole book crumbles into a pile of dust. The entropy of each book has therefore massively increased. In fact, the entropy of each book is now at a maximum — they cannot get more disordered. All the useful information contained within each book has now been lost. The books can no longer be distinguished — all we are left with is ten piles of crumbly dust.

So as entropy increases, information is lost. If entropy is at a maximum, information is at a minimum, and if entropy is at a minimum then information is at a maximum. You might often read that "entropy is information" in the scientific literature. As we can see from our discussion, this is worse than misleading: it is simply wrong. Entropy is actually the **inverse** of information: entropy is a measure of information **loss**. We can consider entropy to be the amount of invisible information **lost or hidden from us**. As Seth Lloyd says in his book *Programming The Universe*: "Entropy, which is just invisible information, is also a measure of ignorance."

If we have a room full of gas, and we leave it for a while, the gas will all become the same temperature. At this point, the entropy of the gas is at a maximum. The molecules of the gas are flying around in a completely random manner. We cannot keep track of the individual gas molecules, so we can only describe the gas by a single value: its temperature. That single value is the only information we have left. At this point, we say the gas is in a random, *thermal state*, a state of maximum entropy.

Returning to consider our ten books, our definition of the amount of information that a book contains is rather dubious. We are saying that all the information in a book is contained in the letters and words of that book. We are, of course, unable to keep track of the position and motion of all the atoms in the books — that information is hidden from us. But Nature does not recognise letters and words. All Nature sees are the atoms and particles in the book. As

far as Nature is concerned, the fundamental information contained within the book is the position and velocities of the atoms which make up the book. And that amount of fundamental information is, of course, retained even when the books crumble into dust. The book still contains the same number of atoms. Those atoms still have the same number of velocities. Even when we dig down to the quantum level, the mathematics of quantum mechanics insists that all the information about elementary particles is conserved (this is called *unitarity*). So this introduces a very important principle: at the fundamental level, **information is always conserved**.

The holographic bound

Any information (e.g., contained in a book) entering a black hole is clearly going to become hidden information — we are never going to be able to read that book again. So that hidden information acts to increase the entropy of the black hole. This means a black hole can really be considered to be a store of hidden information.

As we saw in the previous section, Jacob Bekenstein proposed that the area of the black hole's event horizon was proportional to the entropy of the black hole. This means that the area of an event horizon is proportional to the information hidden inside the black hole. This is a surprising result: the information is proportional to area. More likely we would have expected information to be proportional to the volume of the black hole, after all, the amount of information stored in a book is proportional to the number of pages — not the area of its cover.

What is more, Bekenstein was able to extend his result to calculate the maximum information content of **any** region of space. His logic was ingenious:

- Consider some matter (and its associated information) enclosed in a sphere.
- Some mass is added to force the region to collapse to a black hole.
- The entropy of the resultant black hole is proportional to the area of its event horizon. This area is obviously smaller than the area of the original region.
- Entropy never reduces, so the entropy of the original region must have been less than the entropy of the black hole.
- So the maximum information content of any region of space is less than a black hole of equivalent radius.
- Therefore, the maximum information content of any region of space is proportional to the area of that region.

This result — that the maximum information content that can be held in a region of space is proportional to the area of that region — might appear surprising. Intuitively, we might consider the maximum information content to be proportional to the volume of that region. This result was realised by Jacob Bekenstein, and this limit on information content is called the *holographic bound*. In his book *The Black Hole War*, Leonard Susskind says this result is "profound and probably holds the key to the puzzle of quantum gravity."

I am sure you have encountered holograms before. There are holograms on most driving licenses and credit cards. They are the small shiny foil squares which seem to contain an image. Holograms are generated by splitting a laser into two beams: one beam illuminates the object, while the other beam shines directly on a photographic plate. As a result of the two beams, an interference waveform pattern is generated on the photographic plate. Inevitably, the pattern saved on the photographic plate appears completely scrambled, but when the photographic plate is illuminated again, the three-dimensional representation of the object is regenerated. So holograms reveal the general principle that a three-dimensional object can be accurately captured on a two-dimensional surface. This is what the holographic bound suggests about any region of space.

String theorists have latched onto the implications of the holographic bound and developed a theory which suggests that all the information in the universe is "painted" on the outer boundary of the universe (taking their lead from the assertion of the holographic bound that the maximum information content of the universe would be proportional to the area of its boundary). The theory suggests that you are a three-dimensional projection of a two-dimensional structure on the boundary of the universe. This is called the *holographic principle*.

However, Jacob Bekenstein is also sceptical of extending his principle to the entire universe: "My result is not applicable to horizons which are not event horizons." According to Bekenstein, the holographic principle could only apply if the universe itself was a black hole. And that surely could not be the case!

Or could it? We shall see in the later chapters. The answer might surprise you.

The black hole information loss paradox

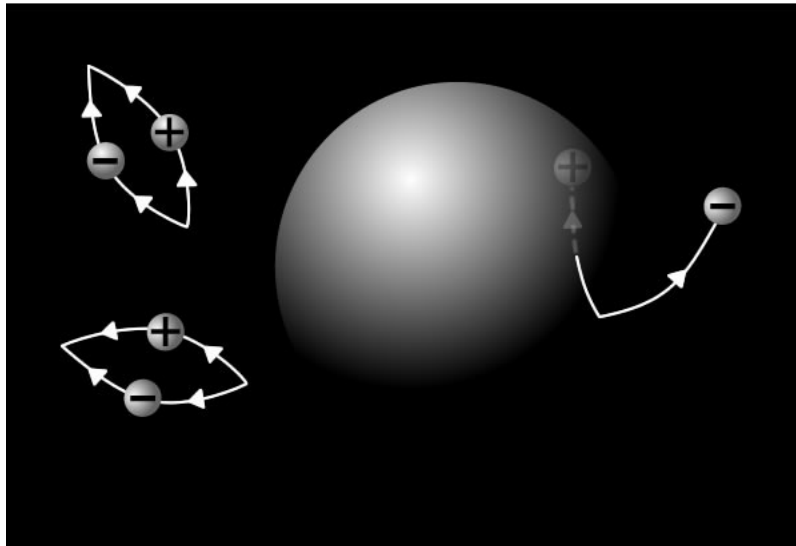
In 1972, when Bekenstein proposed that black holes had entropy, no one really knew what to make of the result. That all changed in 1974 when Stephen Hawking made his greatest discovery. Hawking realised that black holes not only have entropy, they also have an associated temperature. This might come as something of a surprise. It might be imagined that a black hole is completely cold and dark. If a black hole has a temperature, then that means it emits radiation. How on earth could that occur?

So far in our analysis of black holes, we have only considered the effects of general relativity. In order to understand black hole radiation, we need to also consider the effects of quantum mechanics.

If you remember from the discussion about the vacuum energy in the last chapter, quantum mechanics allows enough energy to be borrowed for a short period of time to create particles in empty space. These virtual particles have to be produced in pairs: a particle and its antiparticle. For example, an electron and a positron may be produced — but only for a very short period of time. Very shortly after the pair of particles appear, they have to annihilate each other.

Stephen Hawking realised that if a pair of virtual particles was produced at the event horizon of a black hole, one of the particles might be sucked into the black hole while the other particle remained outside. In this case, there would be no way that the particle inside the horizon could re-emerge. The particles would be incapable of annihilating each other. The particle which remained outside the horizon would be free to be emitted as *Hawking radiation*.

The diagram below shows some virtual particles (on the left) being created and annihilating each other. However, on the right-hand side we see one of the virtual particles being sucked into the black hole. The remaining particle is emitted as Hawking radiation:



As surprising as Hawking radiation may appear to be, it is even more surprising to realise that this will inevitably result in the evaporation of the black hole. If a black hole is radiating energy, then its mass will inevitably reduce (through $E=mc^2$). Eventually, the black hole evaporates to nothing.

The evaporation process is incredibly slow and weak, because the predicted temperature of a black hole is only a fraction of a degree above absolute zero. It would take billions of years before any black hole would disappear through evaporation. Nevertheless, the fact remains that every black hole will eventually evaporate.

When he announced his discovery of black hole radiation, Stephen Hawking dropped another bombshell. He announced that when a black hole finally evaporates, all the information that ever entered the black hole would have vanished as well. This is because the radiation was considered to be completely thermal — random — and could not be responsible for carrying any information away from the black hole.

This was such a bombshell because, as we considered earlier, quantum mechanics states that fundamental

information is always conserved. This principle is a cornerstone of physics. If information could genuinely be lost from the universe then this would represent a crisis in physics, and would cast doubt on our understanding of the basic principles of Nature. In essence, we have a clash between quantum mechanics which says that information must be conserved, and general relativity which says that nothing can come out of a black hole. So, we have our two great theoretical pillars which support the whole of physics, and, incredibly, one of them must be wrong — but we don't know which theory is wrong!

So physicists eagerly got to work trying to find a way out of what is now known as the *black hole information loss paradox*. The proposed solutions include:

- The radiation somehow manages to carry the information away from the black hole. However, the radiation has always been assumed to be thermal, i.e., completely random. There is no way for anything to leave the interior of a black hole.
- There is a microscopic remnant left behind after evaporation which includes all the information which has ever entered the black hole. This is generally considered impractical.
- The singularity forms a connection with a baby universe so that even when the black hole evaporates, all the information is maintained in the baby universe. Which is fine, but it effectively represents a loss of information in this universe.

None of these solutions is entirely convincing. However, one proposal has found widest acceptance, and we will consider it next.

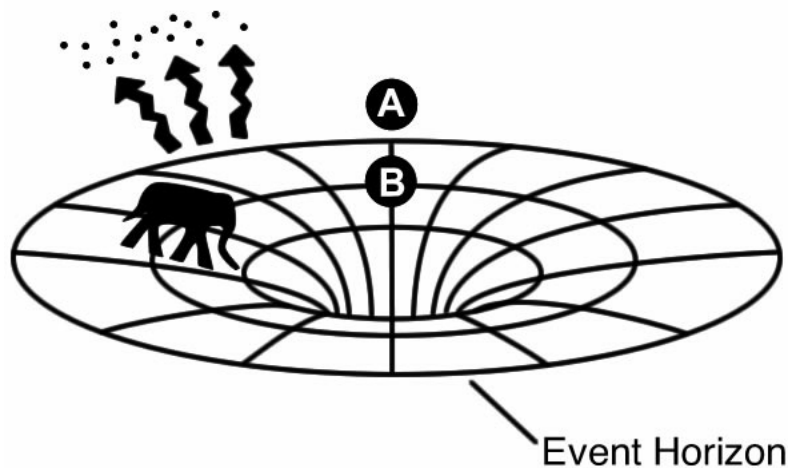
Black hole complementarity

The principle of black hole complementarity was proposed in 1993 by Leonard Susskind, Larus Thorlacius, and Gerard 't Hooft as a solution to the black hole information loss paradox. Complementarity avoids the paradox by suggesting that the information both enters the black hole and is **also** reflected at the event horizon. This appears to imply there are two copies of the information. How can this be true?

Well, it all depends on your point of view. When an observer falls through a black hole event horizon, he might not feel anything out of the ordinary to tell him he is irretrievably doomed. As he is in gravitational free-fall, Einstein's equivalence principle means he does not even feel the pull of gravity. However, for an observer outside the event horizon, the situation is different. To an observer outside the event horizon, the infalling object appears to slow down and stop at the horizon. Time itself appears to stop for the infalling object. This is because it becomes progressively more difficult for light to escape from the black hole. When the object reaches the event horizon, light can no longer escape and the object appears to freeze in time at the horizon.

So we have two different views of reality depending on where the observer is positioned. For an observer outside the event horizon, the infalling object appears to freeze at the horizon, but the experience of the infalling object is different as it notices no change as it passes the event horizon and continues unhindered toward its doom at the singularity.

The diagram below shows these two points of view. Observer A is outside the horizon, and sees the infalling object (usually chosen to be an elephant for some reason) freeze at the horizon. It is then broken down due to the temperature of the black hole and is radiated away into space. So the information is preserved in the radiation. Observer B is inside the event horizon and sees the object continue unhindered towards the singularity:



However, there is a problem with this Xerox machine at the event horizon. Quantum mechanics prohibits the precise copying of any object. If we could take a precise copy of a particle, for example, we could take one particle and measure its velocity, and we could take the copied particle and measure its momentum. Hence, we could know both the velocity and momentum of the particle — something prohibited by the Heisenberg uncertainty principle. This law prohibiting precise copying is called the quantum *no-cloning theorem*.

Black hole complementarity has a clever way of avoiding the no-cloning theorem. Each observer — observer A outside the horizon, and observer B inside the horizon — can only see one copy of the information. Observer A can see the information in the radiation, while observer B can see the information in the unharmed elephant. But, crucially, neither observer can see both copies of the information.

So black hole complementarity seemed like a very satisfactory solution to the information loss paradox. In 1997, Stephen Hawking had made a public bet with John Preskill that information was definitely lost in black holes. However, in 2004 Hawking announced that he was conceding the bet — so even Stephen Hawking was convinced that the information came out with the radiation. For winning the bet, John Preskill received a baseball encyclopedia from Stephen Hawking (because it was heavy and difficult to get information out of it).

However, it now appears that Hawking conceded the bet prematurely. In the summer of 2012, the physics community got very excited when a group of physicists based in California (Almheiri, Marolf, Polchinski, and Sully — collectively known as AMPS) realised there was a flaw in complementarity.

According to AMPS, the observer outside the event horizon could obtain his information about the infalling object from the emitted radiation. But the flaw in complementarity was based on the fact that the observer could then jump into the hole and catch up with the object itself. The observer would then have two copies of the information, and that breaks the no-cloning theorem.

The only way out of this paradox is, according to AMPS, that any object entering the black hole is no longer unaware of the moment it crosses the event horizon. The moment the object crosses the event horizon there has to be a dramatic instant incineration of the object by Hawking radiation. This appears to be the only way to ensure that the no-cloning theorem is not violated. The AMPS theory has obtained the nickname "firewalls" because of this.

But why should a firewall appear out of empty space? No one seems happy with this conclusion, not even AMPS. There have been a host of different papers published over the last few months, all arguing different viewpoints. There is no consensus of opinion. In fact, this area of research seems to be in a state of chaotic flux. Most of the papers seem to be tinkering around the edge of the event horizon, trying to save the old model. The information paradox seems to be as far away from being solved as it has ever been.

I think we can safely say the information loss paradox remains unresolved. As I said earlier, either quantum mechanics or general relativity must be wrong. I believe it is general relativity which requires modification. Later in this book we will be revisiting the paradox armed with a new theory, a theory which does away with the tinkering and proposes a radical reassessment of general relativity and our model of black holes.

6

THE SOAP BUBBLE UNIVERSE

So far in this book, the material has not deviated from orthodox physics and cosmology. At this point, I have to warn you that we are now going to take a different turn. Over the next few chapters, a startlingly original hypothesis will be presented. We will build toward the hypothesis in a logical manner, and I firmly believe the hypothesis has a firm grounding in orthodox physics. However, the nature of the hypothesis is inevitably far removed from the mainstream. If the hypothesis appears too far-out for your liking, I can only ask you to bear with me as we explore the remarkable implications and apparent success of the hypothesis. Clear evidence will be presented. I hope you will be won over.

Sometimes you can stare at a problem for too long that you become unable to see a solution. Sometimes you need a radically different way of looking at a problem.

Up to now, we have studied several of the greatest mysteries in physics. We have considered the mystery of gravity, the puzzling acceleration of the expansion of the universe, problems with the inflation hypothesis as a means of explaining the flat universe, undesirable singularities in black holes, the mystery of black hole entropy being proportional to the surface area of the event horizon, and the apparent loss of information in black holes. It is now time to present a single, simple, logical solution which we shall see has the potential to solve **all** these problems.

There is a remarkable result in physics that has been known for many decades. The result seems to point to something very important and profound about the universe, yet it appears that no one quite understands or knows what to do with the result. It is the principle that the universe has zero total energy.

But how on earth can the universe have zero total energy? The universe obviously contains mass, and we know through $E=mc^2$ that mass can be converted to energy. So how can the total energy in the universe be zero? In order to understand this, we have to think a little bit more about how the force of gravity works.

Consider two masses which are quite close together. If we try to separate those two masses, we will have to perform work against the force of gravity. In this respect, the force of gravity between the two masses functions very much like a spring, the spring (gravity) attempting to pull the two masses back together:



When you move the two masses apart, energy is stored in the gravitational field: energy is stored in the gravity "spring". The density of the energy is actually proportional to the square of the field. How can energy be stored in a spring? Well, just imagine a traditional clockwork wristwatch. When you wind the wristwatch, you transfer energy to the spring, and it is the spring which stores the energy. Slowly over time, the energy in the spring is released and can power the motion of the hands of the wristwatch. And it appears to be a very similar situation with gravity. When masses are pulled apart, energy is transferred to the "spring" of the gravitational field. Energy is stored in the field, and then over time that energy is released to generate motion, i.e., to bring the masses back together again.

But, when you think about it, you realise this "spring" of gravity does not behave like a normal spring. With a normal spring, the further apart you pull the two objects, the greater the force the spring exerts to pull the objects back together. So, with a normal spring, it becomes ever harder to pull the objects further apart. Gravity does not work like that. If you consider the equation for Newton's law of gravitation, you will see that the force between the masses reduces as the distance between the masses increases. This behaviour is therefore different to the behaviour of a mechanical spring, and it is very hard to imagine a spring behaving like that. The spring would have to be very hard to pull apart initially, but it would get progressively easier as you pull the masses further apart. In this respect, the "gravity spring" is a very peculiar type of spring.

But it is this peculiar behaviour of the gravity spring which enables the universe to have zero total energy. This is possible because the behaviour of the gravity spring means the gravitational energy contained within the spring (i.e.,

the energy contained within the gravitational field) can be considered to be negative energy.

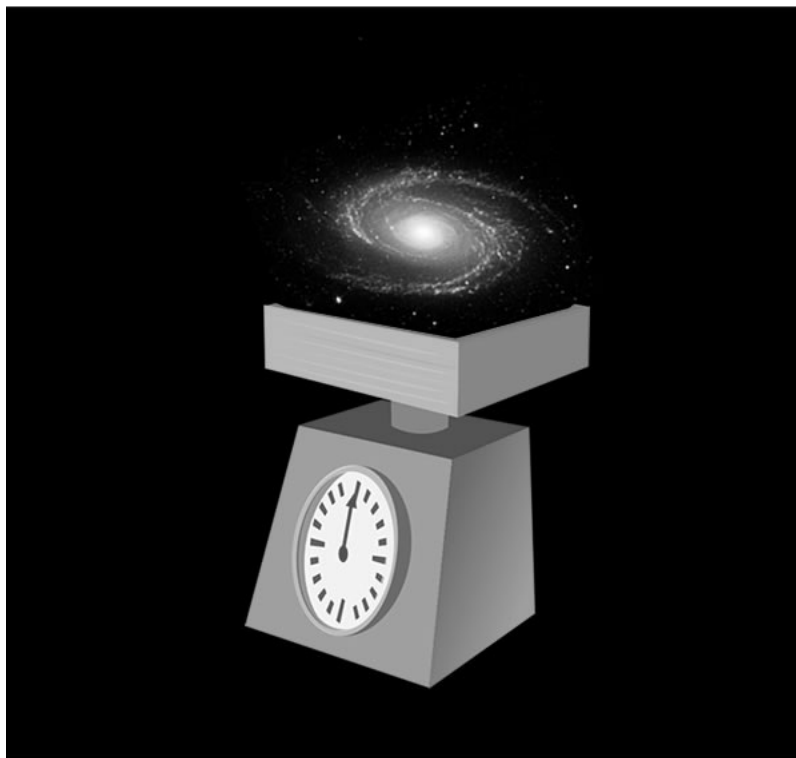
So how can gravitational energy be negative? Well, if objects are separated to infinity they feel no gravitational pull between themselves, so the gravitational energy of the system is zero in that case. But when those objects were initially clumped together, you had to put a lot of energy into the system to force them apart (remember: the gravity spring does not work like a normal spring — it is very hard to pull objects apart initially). So if you have to put energy into a system just to get to a zero energy situation, this means the energy of the system when those objects were initially clumped together must have been negative.

So gravitational energy is negative. But what is even more remarkable is that when we consider the actual data for the energy of the universe, the positive energy of the universe is precisely matched by the negative gravitational energy — giving a total energy for the universe of zero. As Richard Feynman said in one of his lectures on gravitation in the 1960s: "If now we compare this number (total gravitational energy M^2G/R) to the total rest energy of the universe, Mc^2 , lo and behold, we get the amazing result that $M^2G/R = Mc^2$ so that the total energy of the universe is zero. Why this should be so is one of the great mysteries — and therefore one of the most important questions in physics. After all, what would be the use of studying physics if the mysteries were not the most important things to investigate?"

So Richard Feynman considered the mystery behind the zero-energy universe to be "one of the most important questions in physics". Trusting his instincts, he knew this undoubtedly held the key to a principle of the greatest importance.

Perhaps there is a simple and profound way to realise that the total energy of the universe must be zero. And this method can be derived from our fundamental principle that there is "nothing outside the universe". This principle is beautifully expressed by Misner, Thorne, and Wheeler in their classic textbook *Gravitation*: "There is no such thing as the energy (or angular momentum, or charge) of a closed universe, according to general relativity, and this is for a simple reason. To weigh something one needs a platform on which to stand to do the weighing."

There can be no such weighing platform outside the universe — because there is nothing outside the universe. You could never put the universe on weighing scales to determine the total mass-energy of the universe:



Those who have suggested that there is a non-zero value for the total energy of the universe are surely committing a *category error*: taking laws which only apply to objects within the universe and applying those laws to the entire universe itself. These are entirely different circumstances, and cannot be compared.

What would a numerical value for the total energy of the universe actually mean? How could the energy be used? Obviously it could not be used to power anything outside the universe!

There is also a famous equation derived from general relativity called the Wheeler-DeWitt equation which suggests that the total energy of the universe is zero.

Another convincing argument that the energy of the universe is zero comes from the law of conservation of energy. By having a zero-energy universe, we find that energy is conserved over the period before and after the Big Bang. This might seem a very strange thing to say, after all, it would appear there was nothing at all in existence "before" the Big Bang, so how could energy possibly be conserved in comparison with the era after the Big Bang? Well, as Alan Guth explains in his book *The Inflationary Universe*: "If the creation of the universe is to be described by physical laws that embody the conservation of energy, then the universe must have the same energy as whatever it was created from. If the universe was created from nothing, then the total energy must be zero."

Basically, what this means is that the universe must have had zero energy before the Big Bang (as absolutely nothing was in existence), so the universe must also have zero total energy in the era after the Big Bang. This might sound like quite a trivial argument, and there is a fair amount of controversy about whether energy is necessarily conserved in general relativity, but I believe the argument is actually extremely convincing.

We can surely proceed with a fair degree of confidence that the total energy of the universe is zero. And because we have derived this result from our fundamental principle, we can be sure that this result must apply in all conceivable universes.

Now let's try and generate a few equations to describe this principle that the total energy of the universe is zero.

If we can consider gravitational energy to be negative, and we know from our fundamental principle that the total energy of the universe is zero, we can equate the total mass energy of the universe (obtained from $E=mc^2$) with the total gravitational energy:

$$M_U c^2 = \frac{GM_U^2}{R_U}$$

where R_U is the radius of the universe, M_U is the mass of the universe, c is the speed of light, and G is the gravitational constant.

You might recognise this equation as the equation referred to in the earlier quote from Richard Feynman.

Reorganising the terms in this equation leads us to a formula which appears to provide a means for determining the radius of the universe:

$$R_U = \frac{GM_U}{c^2}$$

This equation seems to be a quite remarkable formula: the ability to determine the radius of the universe from a combination of constants. It is as if the universe necessarily has to expand to this radius.

As I stated earlier, no one seems quite sure what to make of this result that the total energy of the universe appears to be zero. However, I believe this equation represents the first (but not the last) prediction of the zero-energy universe: it predicts the natural value of the eventual radius of the universe.

(The more foresighted reader is probably already realising that this necessitates a radical modification to the way the universe is predicted to expand — but more of that later.)

Note that, at this stage of the book, no particular force is being proposed as the reason for this expansion of the universe. That will come later. All that is being stated is that the universe necessarily has to expand to this radius: it is a logical necessity. This reflects a very important personal conviction I have. It is the **principle** which is

fundamental (in this case, the principle of the zero-energy universe). The force (i.e., the movement of objects) arises necessarily in order to satisfy the fundamental principle. So the force as such is not really fundamental — it is secondary. It is the principle which is fundamental. The fundamental principle is a statement which is obviously correct. The fundamental principle **must** be true.

According to the dark energy hypothesis, the vacuum energy will continue the expansion, and the expansion can potentially continue forever. However, if we allow the universe to continue to expand due to the presumed influence of the vacuum energy then, as the radius progressively increases, we will inevitably break Feynman's wonderfully mysterious equation for the zero-energy universe. And we are not going to allow that to happen — it is a fundamental principle.

So, for the purposes of this analysis, we are going to forget about the vacuum energy hypothesis for the expansion of the universe. We discussed the problems with the troublesome fine-tuned vacuum energy back in Chapter Four. The value of the vacuum energy would have to be an extraordinarily small fine-tuned value, and when we try to calculate the value we just get a silly result which is far too large. In reality, the value for the vacuum energy could be arbitrarily close to zero. So we are entitled to consider alternative explanations for the expansion of the universe. We are going to consider the situation in which the expansion of the universe is **not** due to the vacuum energy — instead it is due to the logical necessity that the total energy of the universe must be zero.

Returning to consider the previous formula for the necessary radius of the universe, the more eagle-eyed of you will recognise this resembles a formula which was introduced in the previous chapter: the formula for the Schwarzschild radius of a black hole:

$$r_s = \frac{2GM}{c^2}$$

What a surprise! Where did that come from? What has the radius of our universe got to do with the radius of a black hole? Well, actually, it is not so surprising to see the formula for the Schwarzschild radius appearing here. Remember how we derived the Schwarzschild radius by equating kinetic energy with gravitational energy? Well, we have arrived at this result in a similar manner by predicting that the total mass-energy of the universe should be equal to the gravitational energy, in order to produce a zero-energy universe. So we arrive at this equation when we consider the balance of energies. In the case of the black hole, the balance of energy is between an object trying to leave the hole, and the gravity which is pulling it back. Similarly, with the universe, we get a balance between the gravitational energy of the universe and the energy which is contained within the masses of the universe.

More and more we are discovering that the balance — and imbalance — of energies is the key to uncovering why objects move, and why the universe takes the form it does.

So a very nice analogy can be formed between the universe and a soap bubble! If you remember back to our analysis of a soap bubble in the introduction, we considered how the film of a soap bubble is elastic, and the potential energy of the surface is proportional to its area. Nature tries to minimise the potential energy, so the film tries to contract as far as possible, but this contraction is resisted by the outward pressure of the air within the bubble. Similarly for the universe, at the equilibrium distance we find a balance between the gravitational energy of the universe and its mass-energy. As the 19th century physicist Lord Kelvin said: "Blow a soap bubble and observe it. You may study it all your life and draw one lesson after another in physics from it."

Returning to consider our formula for the radius of the universe, let us replace our Newtonian derivation with the more accurate Schwarzschild formula which we derived earlier:

$$R_U = \frac{2GM_U}{c^2}$$

Is this result matched by observation? Does it provide an accurate value for the radius of the universe? In order to

check this equation, we substitute values for G , M_U , and c into the equation. We will take a value of 10^{54} kg for the mass of the universe. [11]

This gives us a predicted value for the radius of the universe, R_U , of 1.5×10^{27} m which compares reasonably well with the actual measured value of approximately 4.3×10^{26} m. There is a discrepancy, but, as I said earlier, cosmology is not an exact science and it is hard to get accurate measurements. So we can say that there is a fair degree of quantitative evidence that the hypothesis is correct: the radius of the universe has to expand to its Schwarzschild radius. The equation seems to work.

Can this accurate prediction of the radius of the universe really just be a coincidence? Surely not. As Feynman suspected, this equation is telling us something profound.

In fact, the data seems to indicate that the radius of the universe is rather less than its Schwarzschild radius. In other words, this seems to imply that the universe fits the criteria for a black hole! So is the universe really a black hole? We will return to consider this later.

The universe must be flat

So we have predicted that the radius of our universe should be equal to its Schwarzschild radius — and this compares with observation very well. But if the radius of the universe is equal to its Schwarzschild radius then we can make another prediction, and that is that the universe is spatially flat.

This is actually a well-established property of the Schwarzschild radius. If you remember in Chapter Five when we derived the Schwarzschild radius we considered the escape velocity of a particle. We found the escape velocity by equating kinetic energy with gravitational energy: a particle had enough energy — and only just enough energy — to leave the universe. This represents a flat universe. If the universe was closed, the particle would have looped back round into the universe again. If the universe was open, the particle would have left the universe at speed. So, again, it is all about the balance of energies.

Here is a bit of algebra which you should be able to follow.

Another way to show that the universe is flat at the Schwarzschild radius is to use the first Friedmann equation which we considered in Chapter Three. We saw there that the critical density of a flat universe (i.e., perfectly balanced between being open and closed) was given by:

$$\frac{3H^2}{8\pi G}$$

We also know from basic geometry that the volume of a sphere is given by:

$$\frac{4}{3}\pi r^3$$

so the volume of the spherical universe is:

$$\frac{4}{3}\pi R_H^3$$

where R_H is the Hubble radius, the radius of the observable universe.

So we know the density of a flat universe, and we know the volume of the universe. We can combine these two results to find the mass of a flat universe via mass = density \times volume:

$$M_U = \frac{3H^2}{8\pi G} \times \frac{4\pi R_H^3}{3}$$

Substituting for $H = c/R_H$ (as was discussed in Chapter Three):

$$M_U = \frac{3c^2}{8\pi G R_H^2} \times \frac{4\pi R_H^3}{3}$$

which, if you reorganise the terms of this equation and cancel a few terms, gives:

$$R_H = \frac{2GM_U}{c^2}$$

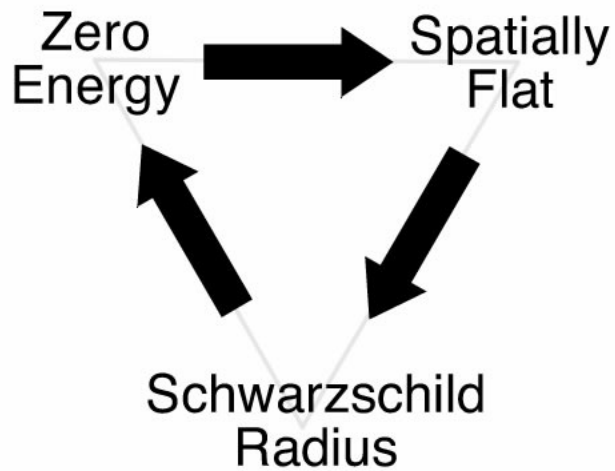
which is, once again, the formula for the Schwarzschild radius. So a flat universe has a radius equal to its Schwarzschild radius.

So we no longer need inflation to solve the flatness problem (as discussed in Chapter Three). If you remember, the flatness problem arises because it appears that the density of mass and energy is precisely fine-tuned to result in a flat universe. The radius of the universe is treated as a "free parameter", which means it could take any possible value. This leaves us with the problem of why the universe is flat, and the inflation hypothesis emerges as a possible solution.

If, however, we consider there to be a logical necessity for the total energy of the universe to be zero, then the radius of the universe has to be equal to its Schwarzschild radius. This means the radius of the universe is no longer a free parameter — the universe must expand to a certain value, and that value ensures a flat universe will result. So, effectively, our fundamental principle bypasses the fine-tuning problem, and we no longer need to introduce inflation as the reason for the flatness of the universe.

Generally, the fact that the radius of the universe is very close to its Schwarzschild radius, and the fact that the universe is spatially flat, is presented as a lucky coincidence. However, we can see from our fundamental principle — which predicts a zero-energy universe — that a flat universe with a radius equal to the Schwarzschild radius is to be expected. It is no lucky coincidence. It is as though the universe must logically and necessarily expand toward the

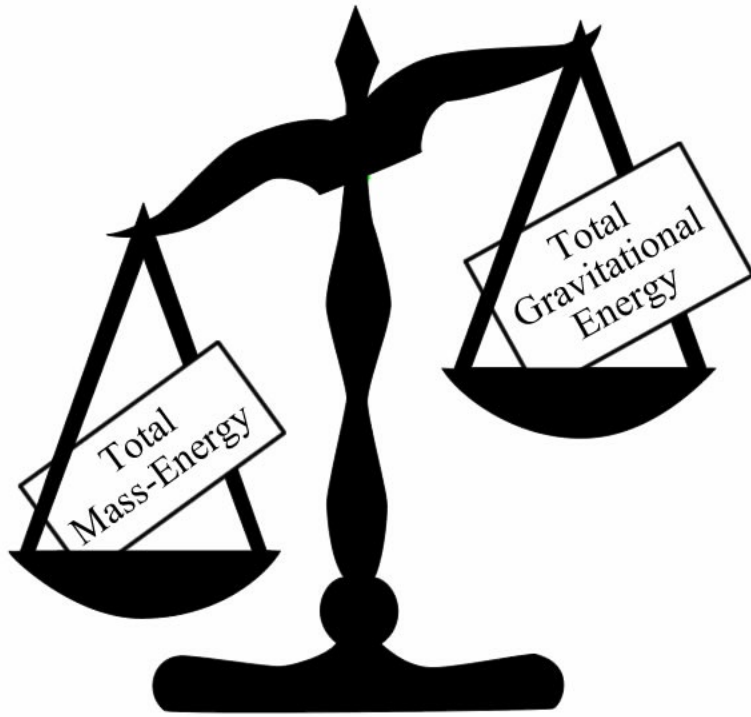
following scenario:



The hybrid expansion

Of course, if it is suggested that the universe will expand to a natural radius — like a soap bubble — then this clearly requires a radical modification to the existing model of cosmological expansion.

In the earliest stages of the universe, we could imagine the mass and energy of the universe being positioned in close proximity. Our analysis would suggest that, at this early stage, the total mass-energy of the early universe would be vastly greater than the gravitational energy contained in the field (gravitational energy is always negative — as we considered earlier — and at the time of the Big Bang with all matter so close together it would have been hugely negative):



This imbalance would result in a universe whose total energy would be far from zero. Nature could not tolerate such a thing — our fundamental principle says as much. There would be a logical necessity for the universe to rapidly expand until it reached the equilibrium point: the Schwarzschild radius. This initial acceleration is analogous to the situation believed to occur at the Big Bang.

Only after the universe has expanded to its Schwarzschild radius would the imbalance of energies be corrected:



So the hypothesis predicts a theory for the expansion of the universe which is a peculiar hybrid of the Big Bang theory and the Steady State theory. The expansion is predicted to accelerate from a point of great density until it reaches its Schwarzschild radius. Even when it reaches that point, the universe would continue to expand — probably for billions of years. However, once it passes the Schwarzschild radius it does start to decelerate. Eventually, the expansion would cease, and then reverse. The universe eventually settles at a constant radius. It really would be a "soap bubble" universe.

I do not believe anything similar to this hybrid expansion model has ever been suggested before. Undoubtedly, this is because it contradicts general relativity. As we saw in Chapter Three, general relativity either predicts a universe which collapses back in on itself or expands forever. The steady state position — with the universe remaining at a constant average radius — is unstable. However, the hypothesis presented in this book suggests that a stable equilibrium distance is not only possible, it is a certainty. We will consider the implications for general relativity in the next chapter.

It is time to present a new theory ...

GRAVITY REVISITED

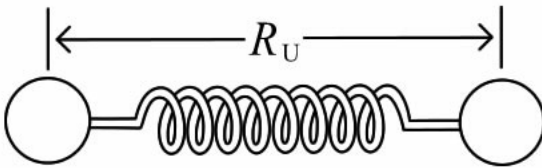
In the previous chapter, we saw how there could well be a logical necessity for the universe to have zero total energy. This could only be achieved with the assistance of gravity. Gravity was considered to provide a form of negative energy which could balance the positive mass-energy in the universe. The combination of the logical necessity for zero energy together with the theory of gravity meant the universe expanded to a certain radius.

The simplest way to think about this is to compare the universe to a soap bubble. The elastic film of the bubble always tends to contract (analogous to gravity), whereas the air pressure in the bubble is always directed outward (analogous to the mass-energy in the universe). The bubble eventually settles down to an equilibrium radius at which the two energies are balanced.

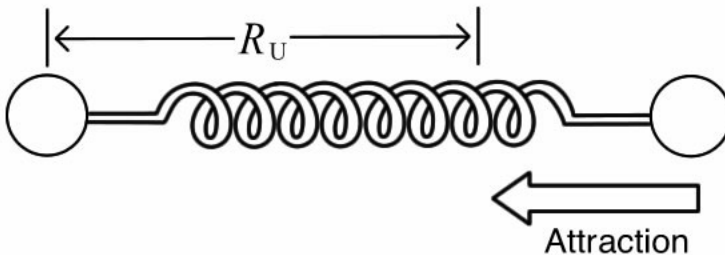
Considering the universe, it appears we could combine the logical principle and the conventional force of gravity together to produce a theory of *modified gravity*. This modified theory of gravity would act to move the radius of the universe to its equilibrium distance.

As we shall see, what makes this theory of modified gravity so compelling is not just that we have derived it in a logical manner, but because simple solutions to so many of the most intractable problems in cosmology fall naturally out of the theory. We have already seen how the theory predicts a flat universe, without fine-tuning or inflation. We will later see the remarkable implications for dark energy and black holes.

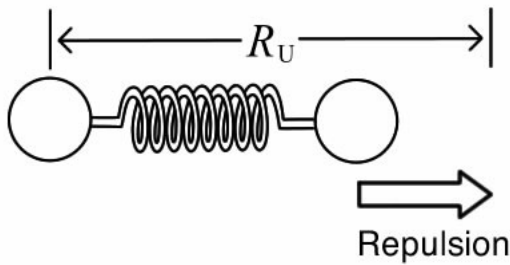
In order to consider the behaviour of this theory of modified gravity, we are going to use the spring analogy. It would appear the theory of modified gravity, like a normal spring, now appears to have a natural extension at an equilibrium distance:



If a mass is moved, the spring is stretched. Energy is transferred to the gravity spring, so the balance of energy is upset. Gravity then works to restore the natural equilibrium distance. This effect reveals itself as an attractive force between the masses:



This would be, by far, the most common observed effect of gravity in the universe. For example, the Earth attracting the Moon, trying to drag the Moon back to the Schwarzschild radius of the Earth (which is a very small distance). However, by analogy with a normal spring, this "gravity spring" can also be compressed as well as stretched. If the mass is moved closer to the other mass so that it is inside the Schwarzschild radius, the balance of energy is disrupted once again, but this time in the opposite direction. Gravity again works to restore the natural equilibrium distance, but this time the effect would reveal itself as a **repulsive** force between the masses:



At this point, you might very well throw up your hands in horror at the prospect of modifying gravity. The theory of general relativity is regarded as one of the greatest achievements of the human intellect. It has been tested many times (remember Eddington's solar eclipse?) and always found to be perfectly accurate. So it might come as a surprise to find out that almost all physicists would agree that the theory of gravity has to be modified!

Gravity has to be modified — but only at the smallest scales. Though gravity is extraordinarily weak, at the smallest distances it is predicted to increase to a huge force. These distances are in the region of the Planck length, the smallest distance at which our laws of physics still hold. In order to accurately predict the behaviour of gravity at these distances, a new theory of quantum gravity will be required.

So gravity needs modifying at small scales, but at large scales it remains a fact that general relativity remains wonderfully accurate. This might be proving somewhat frustrating for a group of physicists who believe that the accelerating expansion of the universe might be explained by modifying gravity at large scales. If the large-scale theory of gravity could be modified to become repulsive at large distances then it could eliminate the need for the proposed dark energy. Sean Carroll expresses this in a video entitled *Dark Energy, or Worse: Was Einstein Wrong?* (available on YouTube): "We only ever infer the existence of dark matter and dark energy through gravity. We have been given a theory of gravity by Einstein — general relativity — which has been tested very precisely in the Solar System, but now we are applying it to regimes that are orders of magnitude away from that. How do we know that our theory of gravity works on those scales? Well, we don't. This is not a situation where professional cosmologists are trying to save Einstein's honour by saying that his theory must be right even though the data contradicts it."

However, general relativity has proven just too accurate at large scales. These theories suggesting modifying gravity at large scales have not achieved much success or acceptance.

The novel feature of the theory of modified gravity being presented here is that for almost every object in the universe the theory does not suggest that the large-scale behaviour of general relativity is modified in any way. This is essential. The long-distance behaviour of general relativity is too well established. On the contrary, for almost all objects in the universe the theory of modified gravity presented here suggests a modification of gravity at **small** scales, the distances where everyone agrees that modification is essential. This is because the theory modifies gravity at distances inside the Schwarzschild radius of an object, and for most objects in the universe that is an extremely small scale indeed.

To put this into context, the Schwarzschild radius for the Earth is approximately 9mm. To see the repulsive gravity effect in reality, all the mass of the Earth would have to be compressed to the size of a peanut, and even then the effect would only be detectable inside the peanut. The Schwarzschild radius for the Sun is 3km. The Schwarzschild radius for a human being is less than the radius of an atom. So this repulsive gravity is not an effect which is going to be easily detectable. In fact, for just about every object in the universe, gravity would only ever manifest itself as an attractive force and standard general relativity would apply.

However, for the universe as a whole, the story is very different. The Schwarzschild radius of the universe is the huge distance of 1.5×10^{27} m (calculated from the mass of 10^{54} kg) — a distance which is larger than the radius of the current observable universe. So the whole mass of the universe is contained within its Schwarzschild radius. This means that, for the universe as a whole, the repulsive effect becomes highly-significant. Gravity would act to expand the universe.

We discussed the vast scale of the universe in Chapter Three, and here we see why this vast scale is so important. This ingenious hypothesis presented in this book suggests that gravity should be modified only at small scales. However, the universe is so vast, so utterly beyond our comprehension, that, for the universe as a whole, the small-scale becomes large-scale. So for the universe itself — and only the universe itself — gravity acts as a repulsive force.

The accelerating expansion (revisited)

As we discussed in Chapter Four, at the largest cosmological scale we find the accelerated expansion of the universe which is commonly associated with the presence of the mysterious dark energy. But the simple and elegant theory presented in this book suggests that this repulsive gravity effect is to be expected for any object whose mass is entirely contained within its own Schwarzschild radius — and that includes the universe. So the accelerated expansion of the universe could possibly be explained by this wonderfully simple principle of gravity acting as a repulsive force inside the Schwarzschild radius.

In which case, we are provided with a simple explanation of why galaxies are accelerating away from each other: they are simple "falling away". Just as when you drop a rock, it accelerates under the pull of gravity, so these galaxies are basically "falling" under the pull of gravity, and accelerating in just the same way as a dropped rock.

As another interesting thought, the Big Bang has always been presented as an initial explosion. After that initial impetus, gravity is predicted to take over and progressively slow the expansion of the universe, gravity being predicted to always act as an attractive force. So this explosive Big Bang set matter and energy on an inertial trajectory, acting very much like a ballistic bullet being shot from a gun.

However, this proposed new model of a hybrid expansion does away with the immense initial explosion and considers a universe with a slower initial acceleration due to gravity. Instead of the bullet being fired from a gun, imagine the bullet being dropped from your hand. The initial speed of the bullet will be low, but the bullet will accelerate under the influence of gravity and — given enough distance — the bullet will end up moving as fast as the bullet which was fired from the gun.

Similarly for the universe, the expansion would start slowly, and progressively pick up speed. This slower take-off provides an opportunity for the equalisation of temperature throughout the universe, resulting in the uniform distribution we see today.

So this theory avoids the need for inflation to explain the flat universe (the flatness problem) and avoids the need for inflation to explain the uniformity of the universe (the horizon problem). It appears there is no need for inflation.

So maybe the total universe is not a hundred sextillion times larger than the visible universe after all (as predicted by inflation).

If you remember back to our discussion of the dark energy hypothesis, we encountered the "cosmic coincidence problem" (just one of the fine-tuning coincidences associated with the dark energy hypothesis). This suggested that we are living in a very special era because the amount of mass and the amount of dark energy appear to be closely balanced at the moment (dark energy is predicted to carry on powering the expansion of the universe until it dominates the amount of mass). However, the hypothesis presented in this book predicts a universe which settles down to a constant steady state — in which case there would be nothing special about the current era. It is just one more coincidence eliminated by the hypothesis.

As well as considering the predicted effect on the whole universe, it is also important to consider the effect of the theory on the largest objects which exist within the universe: galactic clusters. Galactic clusters are groups of about 50 galaxies held together by gravity, and they represent the largest known gravitationally-bound objects. For the theory of modified gravity proposed in this book to be correct, it is essential that gravity is shown to be an attractive (not repulsive) force for galactic clusters. In this sense, the theory proposed in this book is very much a falsifiable theory: if the theory predicts that gravity should be a repulsive force for galactic clusters, the theory would have to be rejected (it is considered a good thing for a scientific theory to be falsifiable).

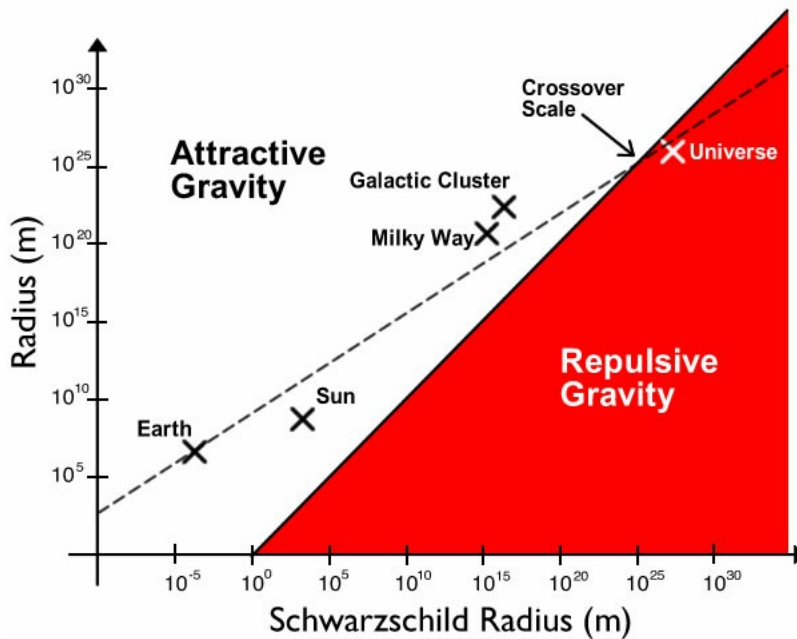
Fortunately, when we consider galactic clusters we find that the theory predicts gravity to be an attractive force. This is because the radius of a galactic cluster is in the order of 10^{22} m, and its Schwarzschild radius is much smaller at 10^{16} m. Hence, the theory has passed this test: galactic clusters are predicted to be held together by gravity.

All the galaxies within the cluster are predicted to attract each other according to conventional gravity. This is because the Schwarzschild radius of a galaxy is much smaller than the radius of the galaxy. The only objects which would exhibit gravitational repulsion would be those objects whose entire mass can fit inside their Schwarzschild radius.

The following graph shows the radius of various celestial bodies of different scales plotted against the Schwarzschild radius of those bodies. In this way, we can see if gravity is predicted to be an attractive or repulsive force for those bodies. The bodies all tend to lie very close to a straight line (shown dotted), as the bodies are all made of atoms and the line represents constant atomic density.

For most of the graph, the radius of the objects is greater than their Schwarzschild radius, and so gravity is an attractive force. However, in the shaded area, the radius dips to become less than the Schwarzschild radius, so gravity is predicted to be a repulsive force for these objects. Only the universe as a whole lies in this area, so only

the entire universe experiences repulsive gravity:



The point at which gravity switches from attractive to repulsive is called the *crossover scale*. For a successful theory which explains the acceleration of the expansion of the universe, it is generally accepted that the crossover scale should be in the region of the Hubble scale. From the previous graph, it appears the proposed crossover scale of approximately 10^{24} m would be absolutely perfect to explain the acceleration of the expansion.

This is by no means the only theory of modified gravity which attempts to explain the acceleration of the expansion by modifying general relativity. Let us consider what appears to be the leading modified gravity theory which is called the DGP theory, named after the surnames of the inventors, Dvali, Gabadadze, and Porrati.^[12] It is interesting to compare the predictions of the hypothesis presented in this book with the predictions of the DGP theory.

The DGP model is based on string theory. According to string theory, particles are composed of one-dimensional strings. But it is also possible for there to exist objects with a greater number of spatial dimensions. For example, a two-dimensional surface is called a *brane* (from "membrane"). Branes can have any number of dimensions. In particular, the string theory model suggests that our four-dimensional universe might be a brane inside a higher-dimensional space called the *bulk*. Other parallel universes might be separate branes inside the bulk.

This model has some interesting things to say about gravity. It proposes that the reason that gravity is such a weak force is because much of its power leaks out of our universe into the bulk. This leakage is not supposed to affect the other three fundamental forces which explains why they are so much stronger than gravity.

The DGP theory of modified gravity attempts to explain the accelerated expansion of the universe by proposing that gravity is weaker at very large distances. The theory proposes that the universe's four spacetime dimensions are on a brane which is actually in a five-dimensional space. At shorter distances, the four-dimensional term dominates which gives rise to the conventional strength of gravity. However, at very large distances, gravity leaks into the fifth dimension, explaining why it is a weaker force at cosmic scales.

However the crossover point in DGP theory at which gravity behaves differently was calculated to be only the size of the solar system, which is far too small. The DGP team suggest an ideal crossover scale for their theory would have been the vastly larger figure of 10^{21} m. As we have just seen, the crossover scale for the theory proposed in this book occurs at precisely the suggested scale. So the theory of modified gravity presented in this book more accurately models the universe than the most popular current theory.

So this is a really ingenious, simple theory, which matches available data. And this is not an *ad hoc* theory which has been invented to fit the data. On the contrary, we have derived this theory through a very simple logical thought

process, built-up from fundamental principles. We had no freedom to "fiddle" this theory. We discovered this theory — not invented it.

When I set out to construct this theory, I was only interested in seeing if a theory of gravity could be produced from the principle of the zero-energy universe. I had no idea that this "repulsive gravity" idea would pop-out, or that it would agree so closely with the observed acceleration of the expansion of the universe. This was a complete surprise.

Finally, I would like to end this chapter by recounting a funny true conversation I recently had with a friend of mine (who shall remain nameless!). I was explaining the principle of repulsive gravity, and I wondered what would happen to humanity if the force of gravity suddenly reversed so that all the objects on the face of the Earth flew upwards. I imagined us being trapped on the ceiling of our room — like in the *Poseidon Adventure*. My friend, though, had an ingenious solution to prevent himself flying upwards under reversed gravity: "There's no problem", he insisted, "You would just have to weigh yourself down with heavy weights!"

I hope you can see the flaw in my friend's logic.

8

BLACK HOLE UNIVERSE

Let us now turn our attention back to black holes.

In our analysis of black holes, we calculated that any object would become a black hole if all its mass was compressed to a smaller size than the Schwarzschild radius for that mass. At that point, the pull of gravity would become a one-way street and a singularity would inevitable occur. Well, that throws up an interesting scenario because the Schwarzschild radius of our universe appears to be larger than the radius of the universe. In other words, our universe fits the criteria for a black hole!

You might imagine that the density of the universe would not be enough to form a black hole. However, while it is true that small regions of space would require tremendous densities to form a black hole (Earth, for example, would have to be compressed to a 9mm radius), very large regions of space would require a far smaller density. For example, the average density of the region inside the event horizon of a supermassive black hole can be less than the density of water! This is because the Schwarzschild radius is proportional to mass, which is proportional to the cube of the radius. So as a region gets larger, its Schwarzschild radius increases at a much faster rate than its radius does. In fact, if you have a very large volume of mass at constant density, then it is **guaranteed** to become a black hole if the volume is large enough — **no matter how small the density!** [\[13\]](#)

This means that if we had a large volume of soft cotton wool, with a uniformly low density, it would collapse to form a black hole as long as the volume was large enough. Imagine a cotton wool black hole!

So people who say that the universe is arbitrarily large — or infinitely large — are surely saying that the universe has the characteristics of a region which will form a black hole. And certainly, if we consider the implications of inflation — which predicts a size for the entire universe which is a hundred sextillion times the size of the visible universe — then it would appear that such a universe would surely represent a black hole. This is what the equation tells us. To quote Steven Weinberg: "Our mistake is not that we take our theories too seriously, but that we do not take them seriously enough." That certainly seems to be the case here.

In this book, we have seen that a universe which reaches the size of its Schwarzschild radius is spatially flat. This would appear to indicate that a universe which is entirely contained within its Schwarzschild radius would be a closed universe. It is known that light cannot escape from a closed universe — just like a black hole. So there are clear parallels between a closed universe and a black hole, both in terms of their size and their behaviour.

When physicists consider this question of whether the universe is a black hole (which is not often), there appears to be a lot of skirting around the issue. Even though this appears to be a vitally important question, I get the impression that they feel uneasy about the possibility. I have seen criticisms that the universe cannot be a black hole because, of course, a black hole is defined to be a region inside a larger space, and there cannot be any larger space outside the universe. Though, of course, if you were an inhabitant of a black hole it would appear to you that your black hole was your entire universe, and there was no space outside. So I feel this is a very weak criticism.

But usually the conclusion is that the behaviour of matter inside the universe simply does not match the behaviour expected inside the event horizon of a black hole. Specifically, inside a black hole we would expect to find matter converging to a central singularity. However, in the universe, we find matter emerging **from** a central point.

So physicists make a comparison between our universe and a peculiar theoretical object called a *white hole*.[\[14\]](#) A white hole is like a time-reversed black hole. And, when you think about it, this makes a lot of sense. At the time of the Big Bang, the universe is believed to have been a point singularity, and from that time onwards matter was expelled from that singularity. In a black hole, matter is consistently attracted **to** the singularity — just the opposite of the Big Bang! Hence, the universe behaves as if it is a white hole, as if it was a black hole in reverse.

So the hypothesis of the universe being a black hole is usually rejected because, as I say, the behaviour of matter inside the universe simply does not match the behaviour expected inside the event horizon of a black hole. However — and this is a key point — **nobody knows what happens inside a black hole**. Nobody can ever know. It is impossible to get information out of a black hole, so no one knows what goes on inside a black hole.

But, as we have seen, the equations still point to the universe being a black hole. With this in mind, it would appear that when we look out on the universe, we are looking at the behaviour of matter inside a black hole. And rather than seeing matter collapsing towards a central singularity, we see space expanding outwards towards the Schwarzschild radius. I feel this is clear evidence that the hypothesis described in this book is correct. If the data

contradicts our model of gravity, we should not ignore the data — we should modify the model.

With this in mind, on the basis of the hypothesis that was proposed in the previous chapter, we can see that the reason matter is propelled from a point singularity in our universe is because of the predicted repulsive behaviour of gravity inside a black hole. We do not need to consider our universe as a time-reversed black hole, or "white hole" — it is simply our incorrect model of the behaviour of gravity inside a black hole which is reversed, not time itself being reversed.

Secrets of the black hole

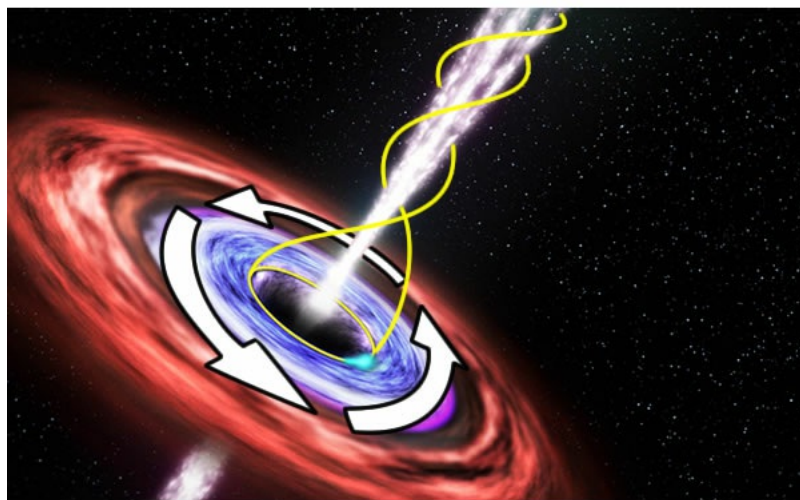
This modified behaviour of gravity has huge implications for all black holes. Outside the event horizon, the behaviour of a black hole would appear completely unchanged: mass would continue to be sucked to the event horizon, and the black hole would eventually evaporate on schedule. There would continue to be an extraordinarily high amount of total mass inside the event horizon of the black hole — together with an accompanying extraordinary gravitational pull. However, the behaviour of that mass inside the event horizon would be completely different. The hypothesis of this book predicts repulsive gravity inside the event horizon of a black hole. Inside the event horizon, repulsive gravity is repelling interior masses to the event horizon. Basically, gravity moves all mass to the Schwarzschild radius.

Note that the curvature of spacetime outside the event horizon is unaffected. To the exterior observer, the black hole interior would appear to be the same fearsome entity as before.

There are many remarkable features about this result. For a start, it appears to eliminate the singularity at the heart of the black hole. As we discussed in Chapter Five, if your physical theory has a singularity, it is a sign that your theory is wrong. Physics breaks down at a singularity. A theory with a singularity needs modification. Our current theory of black holes, derived from conventional general relativity, predicts the existence of singularities. However, the modified version of general relativity described in this book has the happy property of eliminating the singularity. The repulsive effect of gravity would fight against the tendency to collapse to a singularity.

Infinities do not occur in Nature. We have been too willing to accept the theory of singularities at the heart of black holes. The theory presented here has the unexpectedly pleasing side-effect of revealing why singularities — and associated infinities — would not occur inside black holes.

We can obtain another remarkable insight by considering a structure which we first encountered in Chapter Five: the quasar. It was explained how quasars are the brightest objects in the universe. A single quasar can outshine the combined brightness of all the other stars in its galaxy. So why are quasars so bright? It is believed that a quasar's radiation is generated by a black hole's accretion disk (the disk of matter at the event horizon) rotating at near the speed of light. Atoms in the disk are torn apart, creating a plasma of electrically-charged particles. The high-speed rotation of the disk also creates a magnetic funnel, and this funnel shoots the plasma out into space at tremendous speed — as shown in the following diagram:



This process of accelerating charged particles by using a magnetic field is essentially the same technique used by our modern particle accelerators (such as the LHC). The spinning accretion disk of a black hole is truly the universe's most powerful circular particle accelerator.

So now we see how the modified gravity hypothesis provides us with an insight as to why quasars are so astonishingly bright. According to the modified gravity hypothesis, **gravity acts to move all the mass of a black hole to its event horizon, in which case the mass of the accretion disk must be truly astronomical.** And the energy produced by such a massive disk rotating at nearly the speed of light would explain why a single quasar can outshine a million Suns.

We can obtain another insight about black hole behaviour from the modified gravity hypothesis. If you remember back to our discussion of the black hole information loss paradox in Chapter Five, you will recall the "firewalls" theory which suggests any infalling object has to be obliterated the moment it crosses the event horizon. This is in contrast with the "no drama" orthodox theory which predicts that the infalling observer will detect nothing out of the ordinary when he crosses the event horizon. According to AMPS, though (who proposed the firewalls theory), at the event horizon we will find this dramatic incineration process. But why should this dramatic region spring out of nowhere at the event horizon? A lot of physicists are uneasy about the firewalls proposal for that particular reason. However, as we can see, the modified theory presented in this book suggests that the mass of a black hole would all be concentrated at the event horizon. **Any incoming object would be obliterated on the event horizon when it hits the mass of the black hole, thus solving the information loss paradox.** The information of the object would be plastered around the mass at the event horizon, and emitted as Hawking radiation.

This aspect of the theory has similarities with the theory of *fuzzballs* based on string theory. According to the fuzzballs theory, there is no singularity inside a black hole. Instead, there is just a mass of strings, extending out to the event horizon. This is presented as a proposed solution to the information loss paradox as "the quantum information is not trapped at the centre but stays on the fuzzy surface and is emitted as Hawking radiation".^[15] This solves the information paradox in much the same way as the theory proposed in this book.

Most crucially, **this also explains why the entropy of a black hole — the trapped information — is proportional to the surface area of its event horizon.** This is due to all the mass (and, therefore, its information) being spread over the event horizon.

Clearly, this modified theory of gravity is an elegant solution to many of the most puzzling problems in physics and cosmology.

9

CONCLUSION

Let us travel back in time to 1859.

The French mathematician Urbain Le Verrier has examined the orbit of Mercury and discovered peculiarities: the orbit did not appear to agree with Newton's law of gravity. In order to explain this discrepancy, Le Verrier suggested that there was another small planet inside the orbit of Mercury which was dragging it off course. Le Verrier called this hypothetical planet "Vulcan". So, instead of suggesting that the law of gravity required modification, Le Verrier suggested that there was a physical cause behind the observation. However, despite the claims of several astronomers, the search for planet Vulcan drew a blank.

The solution to the peculiarity in the orbit of Mercury was only found when Einstein produced the theory of general relativity in 1915. So instead of there being a physical cause to the discrepancy, it was our theory of gravity which required modification.

Fast forward to the present day, and we find a very similar situation. Observations of the universe have revealed a discrepancy from the predicted behaviour: the expansion of the universe is accelerating. Physicists — like Le Verrier 150 years earlier — are once again loath to modify the theory of gravity. Instead, they are suggesting that there is a physical cause to this discrepancy: the existence of "dark energy". However, might it not be the case that the solution to the observed discrepancy could, once again, require a modification to the theory of gravity? This time, though, it would be general relativity requiring modification — not the Newtonian theory.

Maybe "dark energy" will turn out to be the new planet Vulcan?

In our discussion of the black hole information loss paradox, it was stated that either quantum mechanics or relativity must be wrong. There's no way round it. One of the two great theories of the 20th century **must** require modification. So which one is it going to be?

Well, after reading this book you now know which side of the fence I lie on. The suggestion is that general relativity requires a fairly subtle and ingenious modification. However, it is never going to be an easy task proposing a modification to one of the great theories. At first glance, it might appear that the challenge is to "prove Einstein wrong". However, this is not the case. Einstein did not prove Newton wrong. Both Einstein **and** Newton were correct. Einstein simply built on the theory of Newton to produce a more sophisticated, more accurate theory. Einstein's result had to agree with Newton's result in simple cases.

And this necessity to agree with previous theories is a challenge (a stumbling block?) for all theories of modified gravity: they have to agree with Einstein's proven theory. Theories of modified gravity which attempt to explain the accelerated expansion of the universe have all tried to modify gravity at large scales. The problem is, as you then move back to consider smaller scales you find your modified measurements deviating from those predicted by Einstein's theory. And Einstein's theory always gets it right. It is very hard to modify gravity at large scales for this reason. Einstein did such a good job.

The hypothesis of modified gravity presented in this book is really very ingenious because it avoids this drawback. Gravity is predicted to be modified only for objects whose entire mass is contained within their Schwarzschild radius. This eliminates almost every object contained within the universe! Ants, trees, planets, galaxies, galactic clusters, are all predicted to exhibit gravitational attraction precisely according to Einstein's theory. At long range, for every object, the hypothesis of modified gravity presented in this book is identical to Einstein's theory (an obvious exception is black holes, but more of that later).

However, the hypothesis predicts a modification to gravity at short range. Not all objects are affected: only objects whose entire mass is contained within their Schwarzschild radius are predicted to exhibit this repulsive gravity. Most importantly, the entire universe happens to be one of the very few objects affected. Hence, the acceleration of the expansion of the universe is predicted.

As a bonus, the hypothesis presents simple and elegant solutions to some of the greatest mysteries and paradoxes in cosmology. The universe is predicted to be necessarily flat — without inflation. Black holes (the only other objects whose mass fits entirely within their Schwarzschild radius) are no longer predicted to contain singularities, and a simple explanation is provided for black hole entropy being proportional to the area of the event horizon. The information loss paradox is also simply explained.

So this gives us a new way of looking at gravity. Gravity seems to play a much more central role in the universe

than is realised. If you asked the average person what gravity does, they would probably say it pulls apples off trees. If they were pushed a bit further, they might say it is the force responsible for holding the planets in orbit. And this is clearly the case. As an attractive force capable of spanning the width of galaxies and beyond, it is responsible for holding the universe together.

However, according to this hypothesis, gravity does not just "pull like mad" as if it is competing in a tug-of-war competition. Instead, we find gravity operating as more of a "positioning" force. Its behaviour is more subtle than we give it credit. Objects are positioned quite precisely at their Schwarzschild radius: it is all done with the precision of a surgeon. We might interpret this as a coarse attractive force, which is how it reveals itself to us for most of the time, but really gravity is so much more.

If the hypothesis described in this book is correct then one equation — for the Schwarzschild radius — controls the positioning of every object in the universe under gravity. It gives the universe its overall structure, from being the motivation behind the Big Bang, to powering the accelerating expansion of the universe and specifying its eventual radius. But it also holds the planets in orbit around the Sun, it forms galaxies, it controls nuclear fusion in stars, it describes the behaviour of black holes, and it pulls apples off trees. One force. One equation.

It is truly the equation of the universe.

FURTHER READING

The Black Hole War by Leonard Susskind

Very readable. How Leonard Susskind was delighted to prove Stephen Hawking wrong about the black hole information loss paradox — only for the recent firewalls theory to apparently prove that Susskind was wrong.

Black Holes and Time Warps by Kip Thorne

Everything you ever wanted to know about black holes can be found in this impressive book.

The Inflationary Universe by Alan H. Guth

Everything about inflation, by the man who invented it.

<http://www.spacetelescope.org>

Mind-blowingly beautiful images from the Hubble Space Telescope.

Edge of the Universe by Paul Halpern

The latest exciting developments in cosmology, including dark matter, dark energy, and the unusual structures which have recently been discovered in the universe.

Cosmology: A Very Short Introduction by Peter Coles

Good, solid, coverage of the basics.

Relativity, Gravitation and Cosmology by Ta-Pei Cheng

An intermediate book which is more mathematical, but not too heavy for the reader who wants to dig deeper.

ACKNOWLEDGEMENTS

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PICTURE CREDITS

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CMB and shape of the universe image is courtesy of NASA/WMAP.

Planck image of the CMB is courtesy of the European Space Agency.

NAUTILUS-X, NuSTAR, and black hole image courtesy of NASA.

NOTES

[1] Things seem to be changing, with only 9% of U.S. faculty hired in 2012 being string theorists, compared with 58% in 1999.

[2] You may be aware of the work of the young American gentlemen known as the Insane Clown Posse, a so-called "hip-hop" group who wondered about the nature of the electromagnetic force in their track "Miracles" (video available on YouTube).

[3] Robert Matthews, *I is the Law*, *New Scientist*, 30th January 1999.

[4] And Albert Einstein was born in the same year James Clerk Maxwell died.

[5] It is interesting to note — though it is rarely mentioned — that the prediction that the universe should collapse in on itself was just as much a problem for Newtonian gravity as it was for general relativity. Newton was aware of the problem, but avoided it by saying the stars were so far away from each other that their gravitational pull was negligible.

[6] C.L. Bennett et. al., *Seven-Year WMAP Observations: Are There Cosmic Microwave Background Anomalies?* <http://arxiv.org/abs/1001.4758>

[7] Sometimes it is said that the universe must also be *homogeneous*, meaning that it must be the same all over. However, an isotropic universe is necessarily also homogeneous.

[8] Figure taken from *The Inflationary Universe* by Alan H. Guth.

[9] For the technical details of this, see the superb paper by John C. Baez and Emory F. Bunn, *The Meaning of Einstein's Equation*, <http://arxiv.org/abs/gr-qc/0103044>

[10] *Leading Dark Energy Theory Incompatible with New Measurement*, *Scientific American*, October 22nd, 2013. <http://tinyurl.com/k28et3o>

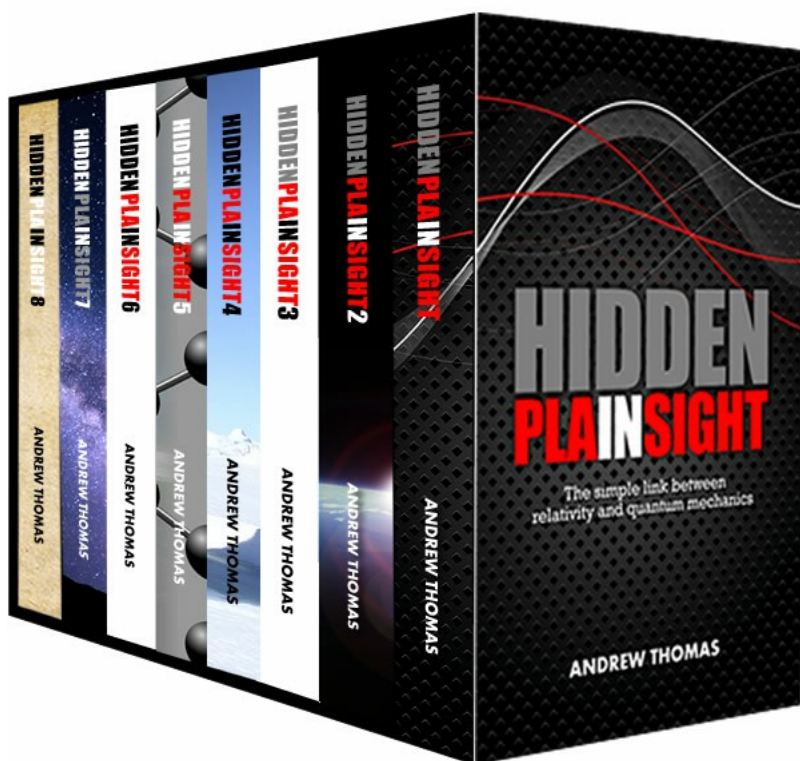
[11] The most common value for the mass of the universe is in the region of 3.3×10^{54} kg. However, this value includes the dark energy "fudge factor", as described back in Chapter Four. The dark energy value is included just to "balance the books" to produce a flat universe. We do not want to include this fudge factor in our calculations, especially as the theory introduced later in this book proposes an alternative to dark energy. So we will remove 70% of the mass of this dark energy universe to produce our value of 10^{54} kg.

[12] G. Dvali, G. Gabadadze, M. Porrati, *4D Gravity on a Brane in 5D Minkowski Space*, <http://arxiv.org/abs/hep-th/0005016>

[13] As Andrew Steane says in his book *Relativity Made Relatively Easy*: "At any given density we can attain the condition where the radius is less than the Schwarzschild radius just by making the radius big enough."

[14] Philip Gibbs, *Is the Big Bang a black hole?* <http://math.ucr.edu/home/baez/physics/index.html>

[15] Wikipedia article on fuzzballs: [http://en.wikipedia.org/wiki/Fuzzball_\(string_theory\)](http://en.wikipedia.org/wiki/Fuzzball_(string_theory))



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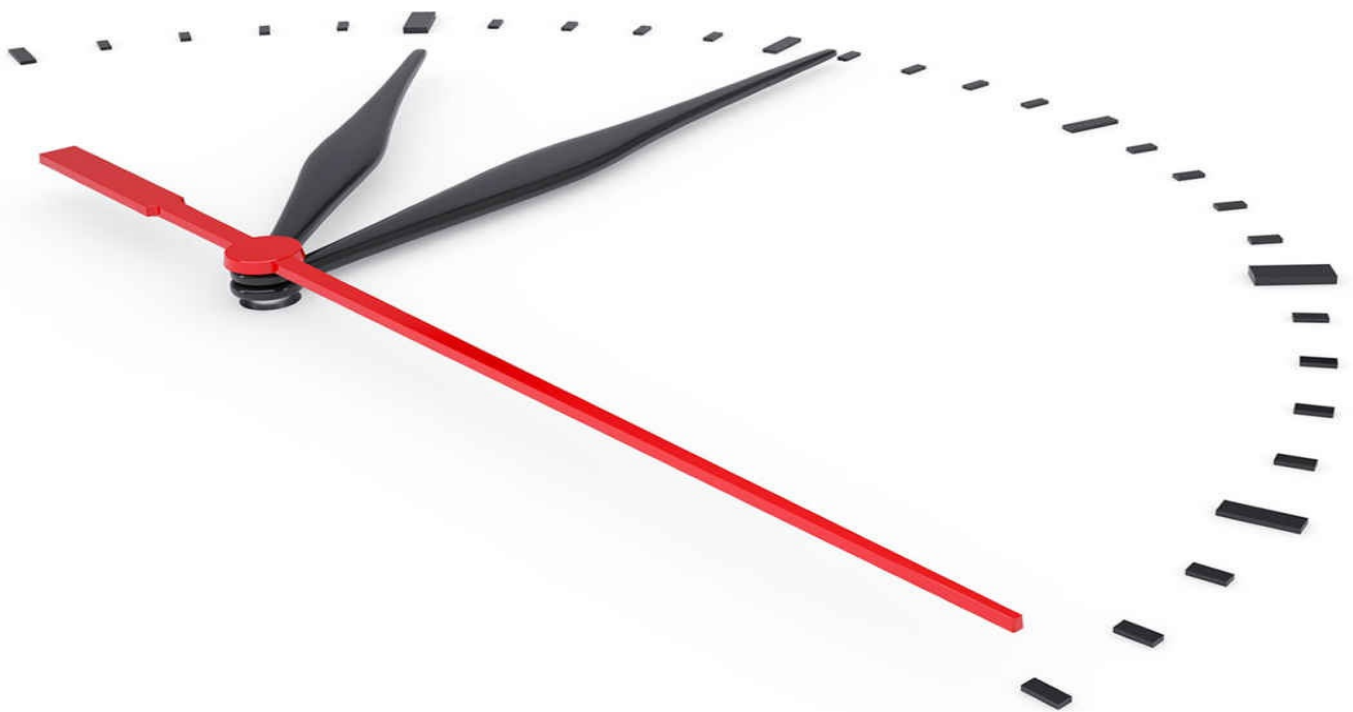
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CONTENTS

1) INTRODUCTION

[A brief history of time](#)

[The world's most accurate clock](#)

2) THE SPEED OF LIGHT

[The Galilean transformation](#)

[Measuring the speed of light](#)

[Maxwell's equations](#)

3) SYNCHRONICITY

4) SPACETIME

[The block universe](#)

[The block universe in literature](#)

[The Ulysses Pact](#)

5) THE ARROW OF TIME

[The feeling of "now"](#)

[The moving "now"](#)

[Why can't we remember the future?](#)

[The thermodynamic arrow of time](#)

[Loschmidt's paradox](#)

[Entropy and biology](#)

6) TIME AND RELATIVITY

[The twin paradox](#)

[Gravitational time dilation](#)

[Time travel](#)

7) INERTIA

[Perpetual motion](#)

[Inertial mass and gravitational mass](#)

[Inertial forces](#)

8) THE UNIVERSAL SPEED

Why can't you travel faster than light?
Sliding through time

9) TIME AND ENERGY

Why does $E=mc^2$?
The antimatter connection
The dawn of time

1

INTRODUCTION

The date: October 1971.

Pan Am flight 106 from Washington's Dulles International Airport is taking off on its scheduled flight to London. To all outward appearances, this was just like any other flight. Passengers were fastening their seatbelts and preparing for the eight-hour trip as the flight stewardesses gave their safety drill. However, we can only imagine the puzzled looks on the faces of some of the travellers as they observed the extraordinary hand luggage of two of their fellow passengers.

For assistant professor of physics Joe Hafele and his colleague, the astronomer Richard Keating, this flight was to form a unique experiment. On the two seats in the middle aisle next to Joe Hafele, no passengers were seated. Instead, the seats were occupied by large cases of electronic equipment, approximately one metre high. These cases contained four highly-accurate caesium atomic clocks.

As part of an experiment, these clocks were being flown around the world. This was to be the first time that the effect of Einstein's theory of special relativity was to be measured using actual clocks. This experiment was going to reveal the true nature of time.

The following photograph shows Hafele and Keating with their clocks onboard the Boeing 747:



Hafele and Keating were attempting to test one of the great insights into the nature of time. For many centuries, philosophers had wondered about the nature of time, without making much progress. The main problem is that the nature of time is tied so closely to our own feelings of the passage of time that it is hard to move away from an intuitive, subjective notion of time to a more objective analysis. We all have our own internal notions of what constitutes time, but it is almost impossible to explain it. Saint Augustine described this dilemma when he said: "What then is time? If no one asks me, I know. If I wish to explain it to one that asketh, I know not."

In his *Critique of Pure Reason*, published in 1781, Immanuel Kant continued Augustine's theme by suggesting that space and time did not exist independently but were constructed by the human mind in order to make sense of the world around us. After all, if time is just a feeling — as Augustine suggested — then maybe it was all in the

mind? The French philosopher, Henri Bergson, even believed that this model of time in the human mind would not be present at birth and would have to be constructed via experience. So Bergson believed a newborn baby would not experience time at all! The baby would have to learn to create its own model of time in its head as it grew up.

These philosophical arguments — which seemed to suggest that time purely existed as a subjective notion in our heads — were swept away by Albert Einstein at the start of the 20th century. Einstein was greatly influenced by the philosopher-physicist Ernst Mach who was an advocate of *logical positivism*. According to logical positivism, physics should only make statements about phenomena which could be directly observed and measured. Using logical positivism as his guide, Einstein simply stated: "Time is what we measure with a clock". According to Einstein, there was no place in physics for philosophical musings about the nature of time — all that was important was what could be measured.

This statement of Einstein is particularly important because the theory of special relativity states that a clock which is moving will appear to run at a slower rate than a clock which is stationary. And, as Einstein stated that "Time is what we measure with a clock", this would appear to indicate that time itself runs slower for an observer who is moving relative to a secondary observer.

So this effect of *time dilation* is what Joe Hafele and Richard Keating were trying to measure on their round-the-world aeroplane journey. As Richard Keating said in an earlier interview: "I don't trust these professors who get up and scribble in front of blackboards claiming they understand it all because I've made too many measurements where they don't come up with the numbers they say. It always seemed to me that the best proof is to measure it."

Joe Hafele had been preparing notes for a physics lecture when he performed a brief calculation which showed that an atomic clock on board a commercial airliner should have sufficient accuracy to reveal the effect of time dilation. In order to perform this experiment, Hafele and Keating flew their four clocks around the world: once in the eastward direction, and then in the westward direction. The values on the clocks at the end of the journey were compared with the reference atomic time scale at the U.S. Naval Observatory.

It was found that the flying clocks lost time (aged slower) during the eastward trip, and gained time (aged faster) during the westward trip. The difference between east and west was due to the rotation of the Earth underneath the aeroplane. The variation in time was exactly as predicted by special relativity.

There was also an effect due to the altitude of the aeroplane. As we shall see later in this book, Einstein's theory of general relativity predicts that time passes faster in a weaker gravitational field — such as in an aeroplane cruising at altitude.

As Joe Hafele explained: "Suppose you lived for 100 years, and you spent your entire life on one of these aircraft flying around the world. You could expect to be younger than a person who did not do that by about one ten-thousandth of a second."

We will be considering special relativity and general relativity and the extraordinary effect of time dilation in detail in Chapter Six of this book.

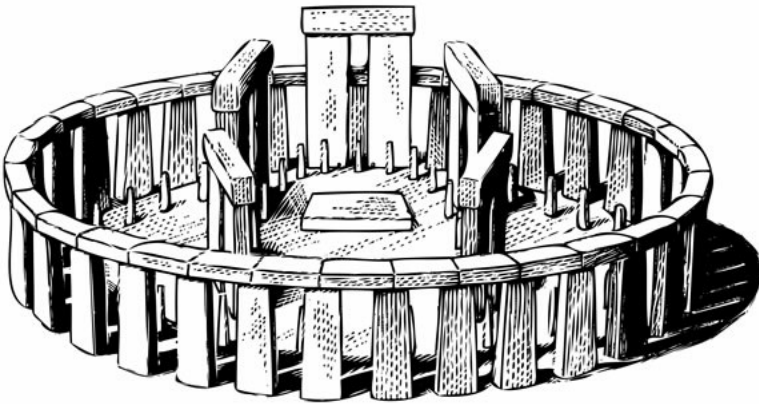
A brief history of time

The very first clocks which were used by early humans were provided by Nature herself. It was clear that the rising and setting of the Sun occurred at regular intervals of one day (we now know this is due to the Earth's rotation on its axis). This regular marking of time provided an easy way to measure periods of time of significant length. The early Egyptians, for example, used the shadows of obelisks as clocks. The passage of the Sun across the sky during the day can also be subdivided into smaller time periods using sundials.

Another celestial clock was provided by the phases of the Moon. The proportion of the Moon illuminated by the Sun varies as the Moon orbits the Earth. The proportion of the Moon which appears to be illuminated when viewed from the Earth varies from 0% (new moon) to 100% (full moon). In between these two extremes we observe the characteristic crescent shapes of the Moon. As the Moon orbits the Earth once every 29.5 days, this regular cycle of lunar phases gave birth to another form of measurement of time: the month.

Finally, the orbiting of the Earth around the Sun — which provides us with the seasons — gave early humans the largest period by which time could be measured: the year. Most famously, the prehistoric standing stones at Stonehenge identify the exact time of the summer and winter solstices. It is easy to forget that one of the functions of Stonehenge was to be one of the earliest clocks.

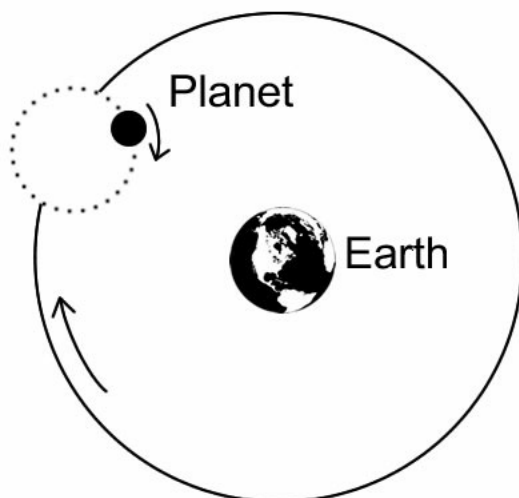
Observe the similarity of the structure of Stonehenge to a clock face:



Ancient Greek astronomers observed the movement of the celestial bodies and tried to model the orbits of the planets using geometry. The Greek image of geometric perfection was the circle, so it was believed the planets should orbit in perfect circles. The Greeks, therefore, modelled the orbits of the planets by a series of concentric rotating transparent spheres, each planet being attached to one transparent sphere. As the spheres rotated, so the planets were observed to move. At the centre of the series of spheres lay the Earth, which was considered to be the centre of the universe. This was, therefore, a *geocentric* model.

However, detailed astronomical observations, such as those obtained by Hipparchus, showed that this geocentric model could not be accurate. The orbits of the planets were more complicated than the motions of concentric spheres. While the Moon, Sun, and stars moved in predictable trajectories, sometimes the planets would appear to reverse their direction in the night sky (so-called *retrograde* motion). In fact, the word "planet" is derived from the Greek word for "wandering star". In order to account for retrograde motion, the astronomer Ptolemy introduced the idea of *epicycles*.

For a planet, an epicycle was a smaller orbit contained within its usual orbit around the Earth. This allowed the planets to sometimes move backwards when viewed from Earth. An example of a planet moving on a epicycle is shown on the following diagram:



This all might appear unnecessarily complicated to our eyes now, but the geocentric model of the universe was generally accepted until the 16th century when the Polish astronomer Nicolaus Copernicus realised that the model could be greatly simplified by placing the Sun at the centre of the Solar System and having the planets (including the Earth) orbit the Sun. This formed the *heliocentric* model.

Copernicus's model was more elegant than the Ptolemaic model. It not only explained the retrograde motions of the planets but it also explained why the Earth experienced the seasons as it orbited the Sun once a year.

In the more general sense, the more recent development of the so-called *Copernican principle* states that no particular point in the universe (not just the Earth) can hold a privileged position in the universe. This heralds a move away from an absolute system of science and cosmology to a science which realises that no observer holds a privileged position, and that the universe is built on relative measures. The repercussions of the Copernican principle are rippling through science to this day, perhaps having its greatest impact in the theory of relativity: if no observer holds a privileged position, then all motion must be described relatively.

If you have read my previous two books you will know I have a firm conviction that the universe is built on fundamental principles — principles which are "obviously correct" and would have to be true in any conceivable universe. The Copernican principle is surely another of these fundamental principles: surely no point — and therefore no observer — holds a privileged position in any conceivable universe. In many ways, as you will see, this is a book which is based on the importance of the Copernican principle and all that it entails. We will encounter the Copernican principle again several times in the later chapters of this book, when it will be shown that it might possibly hold an important key to explaining the nature of time.

These astronomical measurements of time, such as the period of rotation of the Earth, remain extremely accurate measurements of time to this day. In fact, until 1967 the length of the second was defined in terms of the orbital period of the Earth (to be precise, it was defined as a fraction of the time taken for the Earth to orbit the Sun in 1900). However, as society became more complex, more accurate subdivisions of time were required.

In the Middle Ages, slow-burning candles with colour-coded wicks were used to mark time in monasteries. Elaborate water clocks (dripping taps, basically) could be found in wealthy households. However, it was the invention of the mechanical clock which really brought time to the masses. As great cities emerged throughout Europe, together with the rise of commerce and trading, there was a need to find some way to synchronise commercial activities throughout the city. Mechanical clocks were installed in the bell towers at the heart of cities, with the daily activity of the city being based around the various chimes. The first public clock was installed in Orvieto in Italy in 1307, and this innovation spread rapidly throughout the rest of Europe.

But while it was possible to synchronise the activities of a single city by using a bell tower, this was no way to synchronise the activities of multiple cities. Each city could operate to its own local time standard, which might be a completely different standard from that of another city (generally, noon in each city was set to the time when the Sun was at its highest point in that city). This meant even simple activities — such as organising a meeting between citizens of different cities — were fraught with difficulties. This failing became more pronounced with the coming of the industrial revolution.

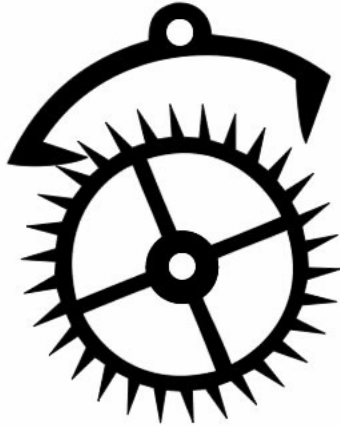
The industrial revolution brought steam-powered railways, which connected many cities in a single network. The emergence of the railways made the introduction of a network-wide time standard essential in order for services to run efficiently (we will see in Chapter Three how this requirement for train synchronisation became a particular interest for a patent clerk working in Zurich).

As an example of the problems which were occurring, in 1841 in England, the Great Western Railway was extended to Bristol. However, passengers arriving at Bristol Temple Meads station were annoyed to find the trains were leaving eleven minutes early. The problem was because the trains were coming from London and were using London time. Bristol is 200 miles west of London so the Bristol sunrise is eleven minutes later than the London sunrise. Hence, Bristol time was eleven minutes behind London time. Some form of national time synchronisation was clearly necessary, requiring the most accurate clocks.

The necessary advance in accuracy had been provided many years earlier by Galileo. Supposedly, Galileo was in Pisa Cathedral when he observed the swinging motion of a large bronze lamp. The ever-inquisitive Galileo timed the swings using his pulse and found that the period of the swings was always the same — no matter how big was the length of the swing. So as the lamp lost energy, and the amplitude of the swing decreased, each swing still took the same amount of time. Galileo showed that the time taken for a complete swing of a weight on a pendulum was independent of both the size of the weight and the length of the swing, and was only dependent on the length of the pendulum (a pendulum one metre long swings once every second — the usual length of the pendulum in a grandfather clock).^[1] This allowed for great accuracy if the length of the pendulum was measured correctly. Previous mechanical clocks were only accurate to about 15 minutes a day. Pendulum clocks were accurate to about 15 seconds a day.

Pendulum clocks remained the most accurate standard for timekeeping for 270 years until the invention of the quartz clock in 1927. The most accurate pendulum clock, used as the US standard time until 1929, utilised a pendulum in a partial vacuum and had an error of only 10 milliseconds per day.

The great innovation of mechanical clocks was the *escapement*: a device which rocked backwards and forwards over a toothed wheel. The escapement allowed for the controlled release of energy at a regular rate. It consists of a toothed wheel with a rocking lever above it. As the lever rocks backwards and forwards, the toothed wheel advances by just one notch. This is responsible for the characteristic clockwork "ticking" sound:



This principle of the "tick" of a clock — the regular marking of small periods of time — is worth examining in detail. In this chapter we have considered a wide range of different types of clocks, from the Sun passing across the sky, to a swinging pendulum, and in the next section we will be considering the world's most accurate clock: the atomic clock. But there is one thing which all these different types of clock have in common, and that is that they all have a "tick". A tick is an oscillation — a recurring event — which must happen at a regular time interval. It is easy to see that a pendulum swings at a regular time interval, but even the Sun passing across the sky represents a "tick" which occurs at a regular time interval: once a day.

Ticks can be counted, and the result displayed on the output of the clock in order to produce a measurement of time.

But why is the regularity of the tick so important? You might feel this is a trivial and obvious question, but it is actually an important question whose answer leads us to an important insight into the nature of space and time.

Firstly, let us consider the implications for the nature of space.

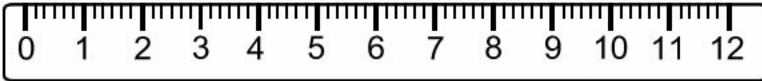
If we perform an experiment, and make a note of the result, and then we move the experimental apparatus six feet to the left and perform the identical experiment again, we find we will get the same result. Likewise, if we measure the width of an object using a ruler, and then move the object twenty feet to the right and measure it again using the same ruler, we find we will get the same measurement for the width of the object. This principle that the laws of Nature work in exactly the same way no matter where the experiment is performed is called *space translation invariance*.

Now consider we perform the same experiment again, but instead of performing the experiment at a different location, we perform the experiment at a different **time**. As long as the experiment is identical, we find we will get the same result. Likewise, if we measure the duration of an event using a clock, and then we perform the identical experiment again at a later date we will find the duration of the event will be exactly the same. This principle that the laws of Nature work exactly the same no matter **when** an experiment is performed is called *time translation invariance*.

Because of space translation invariance, we must ensure that any measuring equipment we use to measure distances (e.g., a ruler) must also possess space translation invariance, i.e., it does not matter if we shift our ruler left or right — it will still give the same measurement. This means that the marks — the "ticks" — on our ruler must all be equally spaced.

And because of time translation invariance, we must ensure that any measuring equipment we use to measure time (e.g., a clock) must also possess time translation invariance, i.e., it does not matter if we perform the experiment sooner or later — the clock will give the same time measurement. So it is vital that the "ticks" of our clock are equally spaced and occur at regular time intervals because of time translation invariance.

If we now consider the regular arrangement of "ticks" on a 12-inch ruler:



and we bend that ruler around in a circle:



It becomes a clock face!

Space translation invariance results in equal ticks along a ruler, and time translation invariance results in equal ticks around the face of a clock.

This is not a trivial result. This similarity gives us the first hint of a deep connection between space and time, a connection which we will be exploring throughout this book.

The world's most accurate clock

Atomic clocks are the most accurate clocks ever built. As we have just discussed, any clock requires some regular oscillation ("ticks") which form its time standard. In an atomic clock, the time standard which is used is the time it takes for an electron to jump between orbits (energy levels) inside an atom. When electrons jump to a lower energy level, they produce electromagnetic radiation. This radiation might be in the microwave, optical, or ultraviolet region. The pattern of frequencies at which energy is emitted is called the *spectrum*. Each chemical element has a characteristic spectrum. For example, we can deduce the component elements of a star merely by looking at its light spectrum.

For a particular element, one of the frequencies in its spectrum can be selected as the "tick" of an atomic clock. As an example, one of the frequencies of the element caesium is frequently used in atomic clocks (remember, the atomic clock used in the Hafele-Keating aeroplane experiment was based on caesium). This "ticking" forms a particularly reliable time standard. Since 1967, the International System of Units (SI) has defined the second to be 9,192,631,770 ticks of a caesium atom (superseding the previous definition based on the orbit of the Earth around the Sun).

The most accurate atomic clocks in existence could have been used to measure the age of the universe to an accuracy of one second.

An interesting thought now might occur to us: we measure the accuracy of a clock by comparing its measurement with a more accurate clock. But atomic clocks are the most accurate clocks in existence. How can we possibly measure the accuracy of the world's most accurate clock? After all, we cannot determine its accuracy by comparing it with any other clock which is more accurate — no such clock exists!

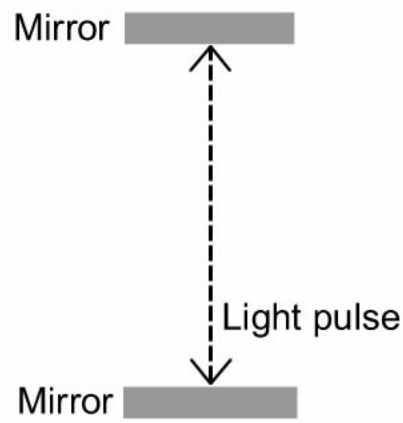
Dr. Stefan Droste of the Max Planck Institute of Quantum Optics is part of a team which is developing a highly-accurate atomic clock in the optical range of frequencies (most atomic clocks use lower microwave frequencies). As Dr. Droste explains: "Time, as we know it, is based on caesium atomic clocks. These kinds of clocks have accuracies to the order of 1×10^{15} . The confidence in the time that clocks show is increased by comparing hundreds of clocks around the world with one another, and this is important since with only one single clock, you cannot know whether your clock is showing the correct time or not." [\[2\]](#)

So the answer as to how you measure the accuracy of the world's most accurate clock is that you build another clock — or a series of clocks — exactly like the first clock. You then run all of these clocks for a period of time and, at the end of that period, you see if the time measured by the clocks has varied from clock to clock. Though the variation will be small, it will not be zero — it can be measured. And that variation gives you a value for the accuracy of that particular type of clock over time.

This is essentially what Hafele and Keating did when they flew four atomic clocks around the world rather than just a single clock. By using multiple clocks it is possible to obtain a value for variation of accuracy in the experiment.

No atomic clock will ever be 100% accurate: there will always be some drift. The only truly accurate measure of time can be produced by a clock whose "tick" is based on the speed of light. Such a clock is called a *light clock*, and Einstein considered such a clock as the basis for his groundbreaking 1905 paper on special relativity.

The light clock is simply composed of two perfect mirrors which face each other, with a pulse of light bouncing between the two mirrors:



Each time the pulse bounces between the two mirrors represents one "tick" of the light clock. Unfortunately, no practical light clock has ever been built. If such a clock could ever be perfectly manufactured, it would instantly be recognised as the most accurate clock in existence. This is because the accuracy of that clock would be entirely based on the speed of light, and the speed of light is a fundamental physical constant the value of which is known not to vary with time.

However, the question then arises: how do we measure the accuracy of the light clock? How can we be absolutely certain that its accuracy does not drift over time? There would be no point using any other type of clock — a caesium atomic clock, for example — to measure its accuracy as no other clock could be as accurate as the light clock. The light clock, therefore, represents a time standard which can be unmatched by any other type of clock. The light clock is the clock by which all other clocks are judged.

Effectively, this means that all other clocks — every atomic clock, the clock by the side of your bed, your wristwatch — are subservient to the light clock. It is the light clock which decides if your wristwatch is running slow — there is no better standard than the light clock.

So instead of time defining the behaviour of a clock, the light clock essentially defines time!

This raises an interesting point because, as we shall see later in this book, the behaviour of a light clock is subtly different for a moving observer. So if a light clock effectively defines time, then **time itself must be modified for a moving observer!** This is precisely what Hafele and Keating confirmed in their round-the-world experiment. We will be returning to consider this point in detail later in the book.

But what is so special about the speed of light?

2

THE SPEED OF LIGHT

The next two chapters are going to describe a single, long journey. It is a journey which will commence at the very start of science. It is a journey which will take four hundred years and involve several of the greatest physicists in history. It is a journey which will end with an experiment which, if correctly analysed, will change everything you ever believed about reality.

However, every journey begins with a first step ...

The Galilean transformation

Galileo Galilei was born in Pisa in 1564. His father was a famous musician, and this highly-cultured family environment provided Galileo with the perfect opportunity to explore his talents. He was taught at the University of Pisa where he became fascinated by physics and mathematics.

In 1609, Galileo was in Venice when he heard of a new invention which allowed distant objects to appear as though they were close. Galileo managed to improve on the design of the invention and invited a group of merchants to climb St. Mark's bell tower for a demonstration. When Galileo unveiled his telescope, the merchants were delighted as it allowed them to spot trading ships arriving over the horizon forty miles away. As Venice was such a commercial hub at the time, this gave them a considerable advantage over their rivals.

The scene is shown below in a fresco by Bertini:



Galileo made a significant amount of money from the telescope, and continued to invent throughout his life. But Galileo's greatest contribution to the world of science was his *scientific method*. Before the scientific method was introduced, the proclamations of ancient philosophers such as Aristotle were accepted without question as representing the absolute truth about Nature. Galileo was one of the first scientists to challenge the wisdom of the ancients. Galileo's introduction of the scientific method allowed Nature to speak for itself.

Aristotle was no experimenter, and he relied too much on his preconceptions. Famously, Aristotle once proclaimed that women have fewer teeth than men. Because no one thought to check this proclamation of Aristotle, for a thousand years everyone believed that women have fewer teeth (women and men, of course, actually have the same number of teeth).

Aristotle's poor method of investigation was described by Bertrand Russell: "Aristotle maintained that women have fewer teeth than men. Although he was twice married, it never occurred to him to verify this statement by examining his wives' mouths."

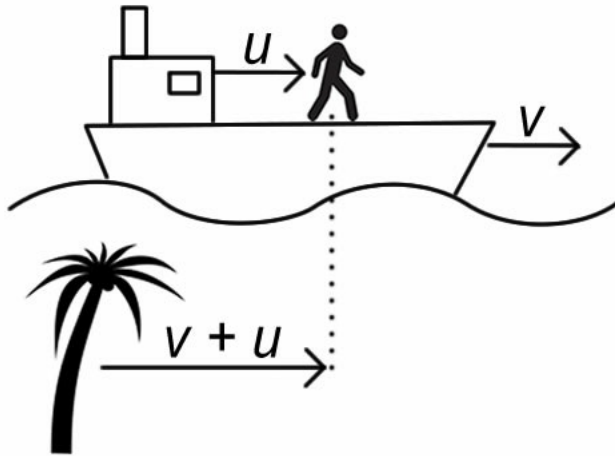
Galileo's scientific method replaced these dubious proclamations. Firstly, according to the scientific method, a hypothesis is proposed about some testable aspect of the natural world. Secondly, that hypothesis is checked through observation and experiment. Based on the result of the experiment, the hypothesis is either supported or rejected. Galileo performed many such experiments using apparatus such as wooden wedges and balls for testing his theories of motion. For introducing the world to the scientific method, Galileo is often referred to as the father of modern science.

However, Galileo got into trouble when he turned his telescope toward a wider horizon. The discovery of the four moons orbiting Jupiter — Io, Europa, Ganymede, and Callisto — suggested that the Earth was not the centre of the universe about which all celestial bodies orbited. By challenging the geocentric model of the Solar System, Galileo found himself accused of heresy and was placed under house arrest for the rest of his life.

It was while under house arrest that Galileo published his final book entitled *Discourse on Two New Sciences* (the two sciences being mechanics and the strength of materials). The book was the culmination of Galileo's work over

the preceding forty years. We are going to be considering two of the principles of motion described in the book. The first principle we will consider deals with the addition of velocities.

As Galileo was living in a world in which the ship was the dominant form of transport, he devised a maritime-themed explanation of his principle. Consider the following diagram. Imagine a ship is moving at a speed of v , and a man is walking on the ship at a speed of u (relative to the ship). Then from the shore (denoted by the palm tree) the speed of the walking man will be measured to be the sum of v and u :



This addition of velocities is called the *Galilean transformation*.

This principle is every bit as simple and intuitive as it might appear at first glance, but it took the innovative mind of Galileo to publish the principle for the first time. What is important to note is that when an object is emitted by a source — for example, a man firing an arrow from a bow — you have to add the velocity of the source to find the final velocity of the object. This might seem trivial to our eyes, but it represented a great insight in the 17th century.

The second principle of Galileo we will consider is the principle of *Galilean relativity*. Put simply, Galileo stated that if you were travelling in a straight line at a constant speed you would feel as if you were stationary. To be more precise, there would be no experiment you could perform which could reveal if you were either stationary or moving at a constant velocity. For example, if you are sitting in an aeroplane and you throw a ball straight up in the air, the ball will come straight back down into your hand. Even though the aeroplane is moving extremely fast, the ball will not rush to the back of the plane. So to all intents and purposes it feels as if you are stationary. Hence, Galilean relativity states that the laws of motion are the same for any observer in uniform motion.

We will be returning to consider this principle of Galilean relativity in the next chapter when we consider how Einstein imagined running alongside a ray of light.

Measuring the speed of light

Galileo performed an experiment for determining the speed of light by having two observers with lanterns face each other over a great distance. The lanterns had shutters which could be quickly opened and closed. When one of the observers saw a flash of light from the distant lantern, he had to reply by quickly flashing his own lantern. This rate of flashing of lanterns could be timed and, when combined with the distance between the two lanterns, it should have been possible to calculate a value for the speed of light.

However, when Galileo performed the experiment he found the time taken for the light to travel over a mile distance was virtually instantaneous. If the speed of light was not actually instantaneous then it certainly had to be extremely fast.

In 1676 the Danish astronomer Ole Romer showed that light does not travel instantaneously but instead has a finite speed. He obtained his measurement by observing the eclipses of Io — one of the moons of Jupiter. He noted that the time of the eclipse became earlier as Earth approached Jupiter, and became later as Earth moved away. Romer explained the difference in the eclipse timings as being due to the additional time which light took to reach the Earth. Romer presented his result to the French Academy of Sciences, announcing that the speed of light was

220,000 kilometres per second (this is actually 26% less than the true value which we now know is 299,792 kilometres per second).

In 1850, the French physicist Leon Foucault bounced a beam of light off a rotating mirror to a distant fixed mirror. When the beam of light reflected back to the rotating mirror, the mirror had rotated by a certain known amount. Hence, the light came off at a slightly different angle. From knowing the speed of rotation of the mirror and the angle at which the light was reflected, Foucault measured the speed of light to be 299,796 kilometres per second, which is just 0.001% greater than the actual value.

Maxwell's equations

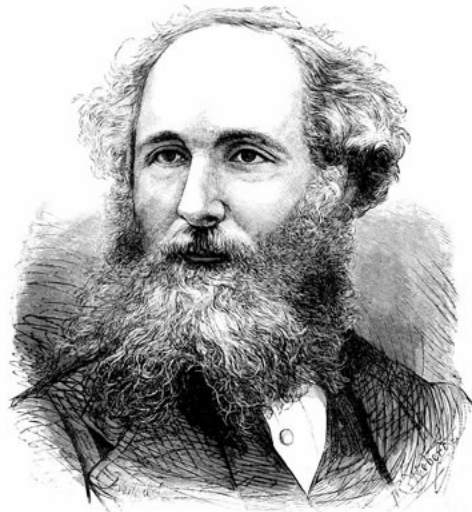
Our journey now moves in a surprising direction, to consider the science of electricity and magnetism: *electromagnetism*.

Michael Faraday was the self-taught son of a blacksmith, but became an experimental physicist of the highest order. In 1831 in London, Faraday demonstrated to the Royal Society that a magnet moving through a coil of wire produces an electric current in that wire. This was the discovery of *electromagnetic induction*, and it is the same principle which allows modern power stations to produce electricity. The principle that a changing magnetic field produces a changing electric field is called *Faraday's law*.

Faraday's result was the inverse of an earlier result which was obtained by the French physicist Andre-Marie Ampere. Ampere showed that an electric current through a wire created a magnetic field. This became known as *Ampere's law*.

But it took a great mathematical physicist to combine these two results of Faraday and Ampere, thus revealing the remarkable underlying significance.

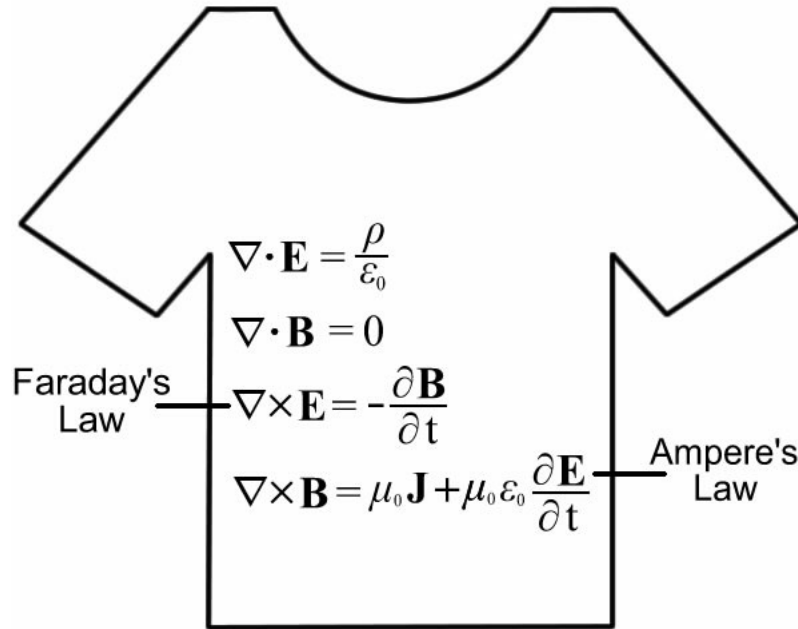
At the end of the 20th century, *Physics World* magazine conducted a poll of 100 leading physicists to discover who was considered to be the greatest physicist of all time. There was no surprise when Albert Einstein and Isaac Newton topped the poll, but in third place came a physicist who is largely unknown to the general public. His name was James Clerk Maxwell, and there is no doubt as to the esteem he is held in by physicists. According to Max Planck: "He achieved greatness unequalled." According to Einstein: "The work of James Clerk Maxwell changed the world forever."



James Clerk Maxwell was born in 1831. Maxwell regularly attended lectures at London's Royal Institution where he came into contact with Michael Faraday. Faraday had great experimental technique, but weak mathematical skills. Maxwell was able to use his own considerable mathematical skills to cast Faraday's Law into mathematical form, and to combine it with the result of Ampere. As a result of this, Maxwell produced four equations which described the laws of electromagnetism. The four equations — known as *Maxwell's equations* — were to have a tremendous impact on science and technology. In fact, they went a long way toward shaping the 20th century. The

equations allowed the development of power generation, electric motors, radio communication, television, computers, and many more new technologies which emerged in the 20th century. According to Richard Feynman: "From a long view of the history of mankind — seen from, say, ten thousand years from now — there can be little doubt that the most significant event of the nineteenth century will be judged as Maxwell's discovery of the laws of electrodynamics. The American Civil War will pale into provincial insignificance in comparison with this important scientific event of the same decade."

However, rather ironically, most people are probably now best-acquainted with Maxwell's four revolutionary equations because they often feature on a popular T-shirt design:



Maxwell's four equations describe the symmetry between electricity and magnetism, and they reveal some very interesting principles. Let us now consider the four equations.

The four equations can be best understood if we split the four equations into two groups, with each group containing two equations. The first group contains the first two equations shown on the T-shirt:

$$\text{a) } \nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}$$

$$\text{b) } \nabla \cdot \mathbf{B} = 0$$

What do these first two equations tell us? Well, these two equations are very similar, and they describe the amount of a field — electric or magnetic — which is emitted by a source. We can imagine a field as being an invisible entity which spreads through space. As an example, an electrically-charged particle such as an electron creates an electric field around itself. The electric field is invisible, and spreads throughout space. The field becomes stronger at distances nearer the electron, and weaker at distances farther from the electron. We can therefore consider the electron as being the "source" of the field.

On this basis, the first of the two equations — equation A in the previous diagram — says something quite simple. It simply says that the amount of electric field (signified by \mathbf{E} on the left-hand side of the first equation) coming out of a volume of space is proportional to the amount of electric charge contained within that volume (the amount of electric charge being signified by ρ on the right-hand side of the first equation). This makes a lot of sense: if we consider electric charge to be the "source" of the electric field, then the amount of electric field is proportional to the amount of electric charge.

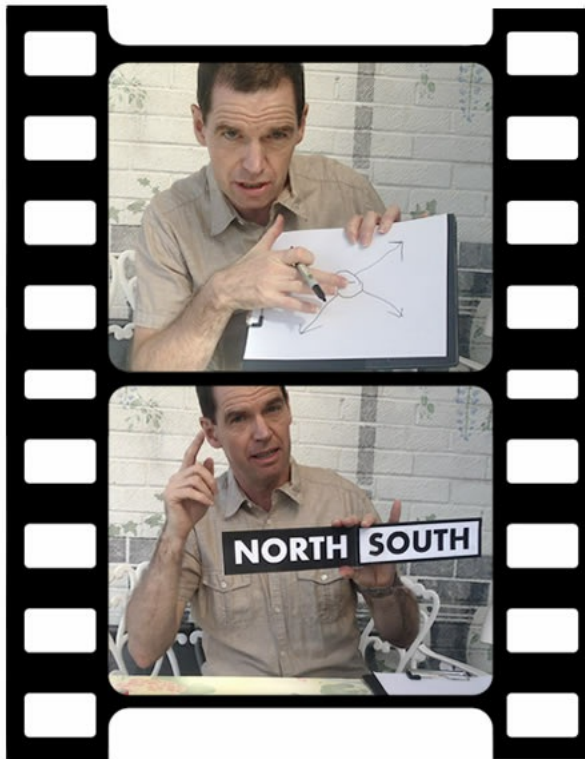
The second of the two equations deals with the magnetic field — not the electric field. It says something rather similar to the first equation — but not quite identical. It simply says that the amount of magnetic field (signified by \mathbf{B} on the left-hand side of the second equation) coming out of a volume of space is equal to zero. So this is a rather different result to the first equation. If electricity and magnetism are so similar, then why should the total amount of magnetic field leaving a volume of space always be equal to zero?

The answer to this question is fascinating, and it is explained in a short video which I have recorded specially for this book. The video shows me explaining the solution by cutting-up an extremely large bar magnet — for reasons which are explained in the video.

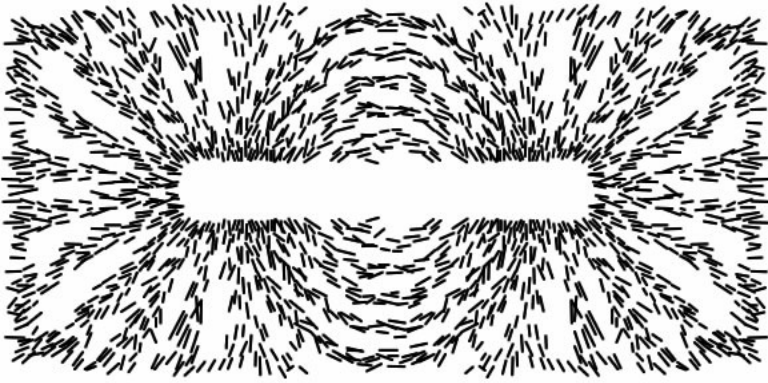
I can recommend you watch the video available on YouTube at the following link:

<http://tinyurl.com/maxwellmagnet>

Here are some stills from the video:



I don't want to give away the plot of the video, but I can say that the video explains the answer to the question by considering the magnetic field lines around a bar magnet. It is easy to see the magnetic field around a magnet if you place the magnet under a sheet of paper and sprinkle iron filings over the paper:



As shown in the previous diagram, the magnetic field lines will loop from one end of the magnet (the north pole of the magnet) to the other end of the magnet (the south pole of the magnet). Therefore, if you have a magnet in a volume of space, any magnetic field leaving that volume of space will loop around and come back to the magnet again: what goes out, must come back. Hence, the net amount of magnetic field leaving a volume of space must be zero — and that explains the result described by Maxwell's second equation. So, in that respect, there is a clear difference between electric charge/field and magnetic charge/field.

But for the purposes of this book, and their relevance in calculating the speed of light, we are only interested in the second pair of Maxwell's equations:

$$\text{c) } \nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

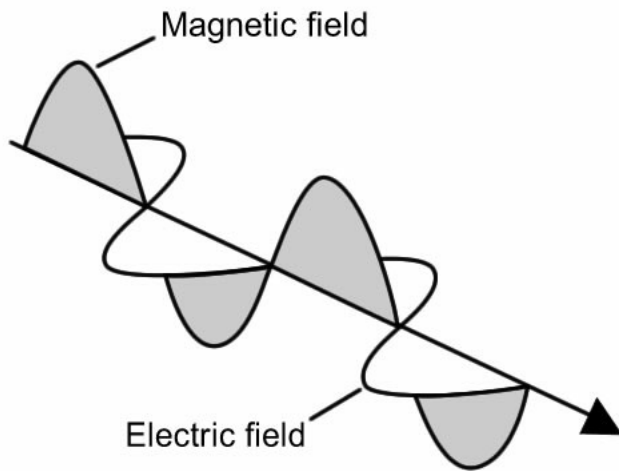
$$\text{d) } \nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}$$

These last two of Maxwell's equations represent Faraday's law and Maxwell's form of Ampere's law. The equation for Faraday's law (equation C in the previous diagram) states how the electric field, \mathbf{E} , is generated by a changing magnetic field, \mathbf{B} . And the equation for Ampere's law (equation D in the previous diagram) states the inverse: how the magnetic field, \mathbf{B} , is generated by a changing electric field, \mathbf{E} .

Maxwell's great stroke of genius was to realise that these two equations had the same form as the equation for a wave travelling through space. To see this, remember once again that the equations give us the following symmetrical results:

1. A changing magnetic field creates an electric field.
2. A changing electric field creates a magnetic field.

Hence, the magnetic field can generate the electric field, and the electric field can generate the magnetic field, and so on forever. The result is a self-sustaining wave of alternating electric and magnetic fields called an *electromagnetic wave*:



Maxwell realised that, according to his equations, the speed of the resultant wave could be determined by two electric and magnetic constants which had been determined by experiment. Hence, the speed of the wave, c , is given by:

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

where the magnetic constant, μ_0 , has a numeric value of $1.25663706 \times 10^{-6}$, and the electric constant, ϵ_0 , has a numeric value of $8.85418782 \times 10^{-12}$. If you substitute these numeric values into the above formula (try this at home with your calculator), you will find you get a value for c of approximately 299,796,000 m/s. Incredibly, Maxwell realised that this was exactly the same speed as Leon Foucault had measured for the speed of light! So Maxwell made the inspired leap to deduce from this that light was a form of electromagnetic wave.

Visible light is not the only form of electromagnetic radiation. Depending on the wavelength, other types of electromagnetic radiation include radio waves, microwaves, infrared, ultraviolet, X-rays, and gamma rays. By discovering the fundamental form of all these different types of electromagnetic radiation, Maxwell brought about the development of radio and television, as well as many other modern technologies. According to Carl Sagan: "Maxwell's equations have had a greater impact on human history than any ten presidents."

But Maxwell's equations predicted some surprising properties of electromagnetic waves. Firstly, the equations as printed on the T-shirt in the earlier diagram are the equations for radiation through a vacuum containing no electric charges or electric currents (if electric charges or currents are present then the equations become more complicated). This is fine for our purposes as we are interested in the speed of light in a vacuum. However, this confused physicists at the time. All known waves up to that time were a form of disturbance in some underlying medium. For example, sound waves were a disturbance in air, and sea waves were a disturbance in water. But Maxwell's equations seemed to indicate that electromagnetic waves could travel through a vacuum containing no medium which could carry the waves. All experiments to detect an underlying substance — called the *ether* — drew a blank.

We now know that the ether does not exist, and electromagnetic waves can, indeed, travel through a total vacuum. After all, how else could light reach us from the stars across the intergalactic void?

It is interesting, at this point, to digress slightly and tell the story of what happened when I gave this book to a friend of mine for proof-reading. He took great exception to my description of the self-sustaining wave travelling through space, with the electric and magnetic fields oscillating off each other. His objection was based on the fact that it sounded like a form of perpetual motion and, as he stated with great certainty, there was no such thing as perpetual motion. Well, I had to break the bad news to my friend that this was, indeed, a form of perpetual motion and it is the reason why light from the stars can reach us across billions of light years. Indeed, if the light was not

intercepted by us it would continue on its merry way across the universe. So this is most certainly a form of perpetual motion — we do not see light slowing down! We do not see light running out of energy and coming to a stop. So the next time a man down the pub tells you that perpetual motion is impossible, just ask him when was the last time he saw a ray of light coming to a halt?

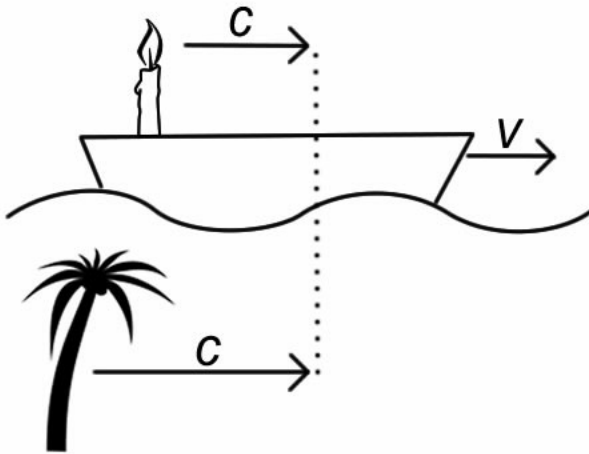
In fact, one of the themes of this book, which we examine in detail in the later chapters, is that if we are to achieve a fuller understanding of time then we will have to overcome our in-built bias against the principle of perpetual motion. As we will find, perpetual motion is all around us.

But, to return to the surprising properties of electromagnetic waves, let us consider again the formula for the speed of the wave:

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

What is so truly astonishing about this result is that **it contains no term representing the speed of the source!** Remember back to our discussion of Galileo's principle of addition of velocities earlier in this chapter. It was explained how the velocity of the source would always have to be added to the velocity of an object to calculate the final velocity. However, Maxwell's formula for the speed of light does not say that the speed of the source has to be added. It is as if every observer would measure the same speed of light — regardless of the motion of that observer.

To show how bizarre this result really is, let us replace the man walking on the ship with a ray of light being emitted from a candle on the ship:



On the basis of Galileo's principle for the addition of velocities, we might expect the observer on the shore to measure a greater value for the speed of the ray of light than the ship-borne observer (the speed of light measured by the observer on the shore would have the speed of the ship added to it). However, as shown on the diagram, the result of Maxwell would appear to indicate that the observer on the ship and the observer on the shore would both measure the same value for the speed of the light emitted by the candle (i.e., the observer on the shore does not have to add the speed of the ship).

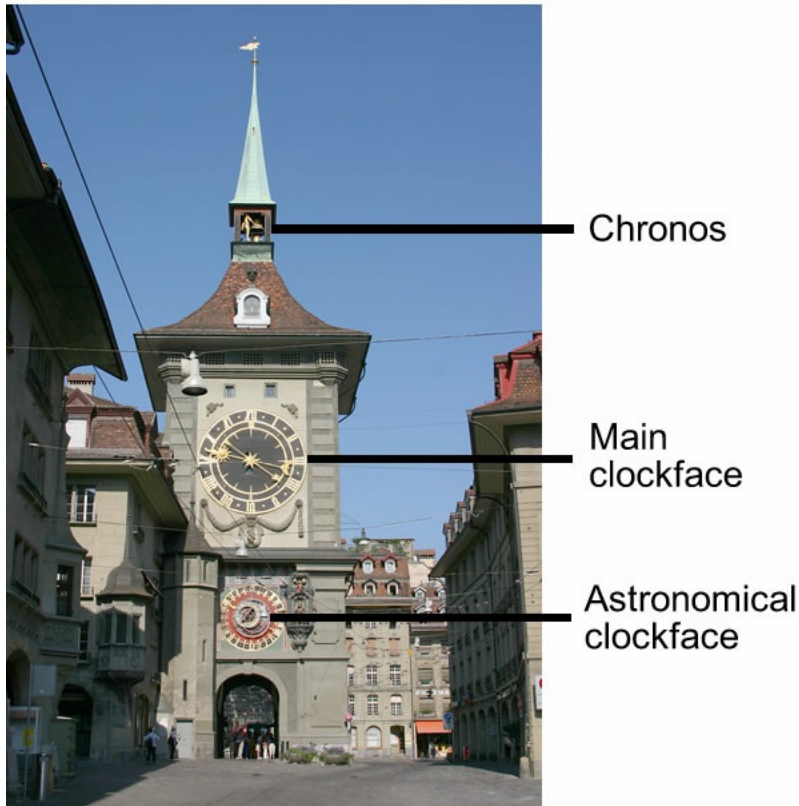
This result seems to contradict everything we intuitively understand about motion. But what are its full implications for reality?

3

SYNCHRONICITY

The date: June 1902.

Albert Einstein has moved to Bern having just accepted a job at the patent office. Together with his wife and young son he is living in an apartment at No. 49 Kramgasse (see <http://tinyurl.com/einsteinhouse> — the house is now preserved as a museum). Every morning when he left his apartment to go to work he would have turned left and walked past the world-famous clock tower at the end of his street.



As shown on the previous image, the clock tower displays a welter of temporal information. Underneath the main clock is an astronomical clock which displays the phases of the Moon. It also has a model of the Sun which moves around the dial to indicate the current time of sunrise and sunset. Every hour, a clockwork-powered automaton emerges at the top of the tower to strike the bell. This is the gilded figure of Chronos, the Greek god of time.

In 1902, the clock tower played a particularly important role as it was used as the official time keeper for the new railway station. Effectively, it supplied the official time standard for the city of Bern. Other cities were not necessarily synchronised with the time of Bern, so as trains passed the station at speed they would synchronise their clocks with the time seen on the clock tower.

As Einstein took his desk as a Technical Expert Class 3 at the patent office, he would use his considerable technical ability to consider the virtues and originality of the day's various patent applications. According to Walter Isaacson in his biography of Einstein, these patent applications included "dozens of new methods for synchronising clocks and coordinating time through signals sent at the speed of light."

From the complex and fascinating clock tower he passed each morning, to the various ingenious patent

applications he dealt with in his job, Einstein was surrounded by stimulating aspects of time and synchronisation.

Einstein was also well-informed about the latest developments in physics. When he was an undergraduate at the Zurich Polytechnic he became increasingly frustrated that the latest results about electromagnetism proposed by James Clerk Maxwell were not studied as part of the curriculum. This was because, since the age of 16, Einstein had imagined riding alongside a beam of light. What would you see? Would the light appear to be stationary? As we have seen, the latest result of Maxwell seemed to indicate that, no, the light would not appear to be stationary — you would still measure the same speed of light.

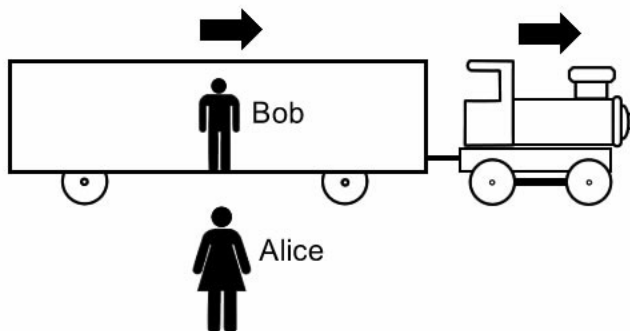
Einstein accepted the result of Maxwell — no matter how bizarre it seemed. If you remember back to the discussion of Galilean relativity in the previous chapter, you will remember how Galileo stated that the laws of motion were the same for all observers in uniform motion. By accepting that the speed of light was the same for all observers in uniform motion, Einstein extended Galilean relativity to cover all of the laws of physics — including the laws of electromagnetism. This became the *principle of relativity*: **the laws of physics are the same for all observers in uniform motion.**

I think the reason this principle might seem fairly reasonable to our eyes is because it seems a logical extension of the Copernican principle which was considered in Chapter One. The Copernican principle states that no point — and no observer — in the universe holds a privileged position. It certainly seems reasonable to assume that the laws of physics apply equally to all observers — the universe is a very equitable place.

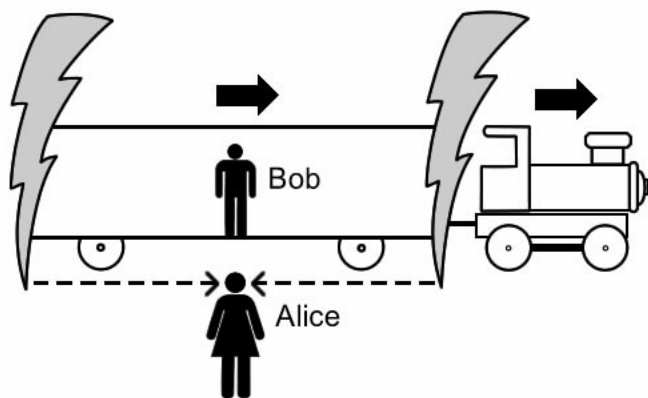
As part of Einstein's job at the patent office was to analyse patent applications to determine if they would be successful in the real world, a desk-bound Einstein would have had to construct imaginary "thought experiments" in his head to examine their potential. Einstein now applied this technique to analysing the implications of this observer-independent speed of light.

The thought experiment which will now be described is a mainstay of popular science books. We will be considering the experiment in more detail than usual as I believe most descriptions of the experiment do not describe it in sufficient detail. As a result, the essential extraordinary conclusion of the experiment is often missed.

We will consider a train travelling along a track at a constant speed. The train has a single carriage. Inside the carriage is Bob, who is standing in the middle of the carriage. Outside the carriage is Alice, who is standing on the station platform watching the train as it rushes by:



Next, something remarkable happens. At the brief moment when Bob is directly in front of Alice, Alice sees two bolts of lightning hit the track at the same time at precisely the position of the front and back of the carriage. The bolts conveniently leave marks on the track (so the positions can be found later), and they also leave marks on the front and back of the carriage:



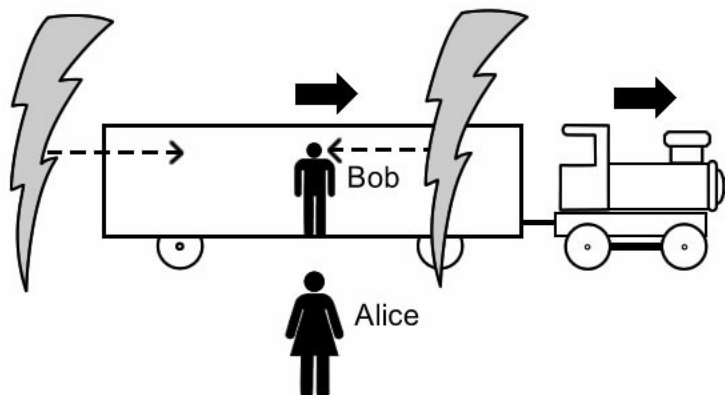
Alice assumes the lightning bolts have hit the track at exactly the same time because she sees the light from the bolts reaching her at the same time (see the dashed lines on the previous diagram). But, from this observation, can Alice necessarily be certain that the lightning bolts actually hit the track at the same time? Alice realises that there are two factors which could have influenced this result and caused the light from the two bolts to reach her at the same time — even if the bolts did not hit the track simultaneously. Firstly, the distance from her position to each of the two lightning bolts was maybe not equal. So, to check this, Alice measures the distance between her position and the two marks on the railway tracks which were left by the two bolts. Alice finds the distance to each of the two marks is exactly the same. So that part of the experiment is satisfactory.

Secondly, Alice realises that maybe the speed of the light was not the same from each of the two bolts. Any inequality in the speed could have resulted in the light from the two lightning bolts reaching her at the same time — even if the bolts did not hit the ground simultaneously. However, Alice had installed equipment to measure the speed of light from each of the two bolts. Alice finds that, just as James Clerk Maxwell predicted, the speed of light was exactly the same from each of the two bolts.

So Alice is left with a surefire conclusion, a logical certainty: the two bolts really hit the ground simultaneously. The distance was the same, the speed of light was the same, and the light from both bolts reached her at the same time. It is therefore an absolute fact: both lightning bolts hit the ground at the same time.

Now let us turn our attention to Bob who is riding on the train. As the train continues its progress down the track at a constant speed, Alice observes Bob's situation. Bob continues to get closer to the point where one of the lightning bolts hit the track by the front of the carriage. Hence, he moves closer to the light coming from that point in front of him. In the process, he moves further away from the point on the track behind him where the other lightning bolt hit the track.

So in the next diagram we see the train which has moved to the right, and so Bob has moved closer to the lightning bolt near the front of the train:



Hence, the light from the lightning bolt in front of Bob reaches Bob first. Alice and Bob both agree on this fact.

So the light rays from the two bolts do not reach Bob simultaneously. But, from this, should Bob conclude that the lightning bolts did not strike the ground simultaneously? Of course not. Bob is no fool. Bob suspects this is merely an observational anomaly. He realises the train is moving. He realises the movement of the train is taking him nearer to the position of the front lightning bolt. Surely that is the only reason that light from the front lightning bolt reached him first. Bob realises that there is only one way to calculate if the lightning bolts really hit the ground simultaneously, and that is to perform a few measurements.

So firstly, just like Alice did, Bob measures the distances. Remember that the two lightning bolts conveniently left marks at the front and the back of the carriage. So Bob measures the distances from his standing position to the front and the back of the carriage and he finds both distances are the same. So that is certainly not the reason why light from the front bolt reached him first.

Bob is not too surprised about that, because Bob really suspects that it is the apparent speed of the light which is the culprit. After all, he knows he is on a moving train. His movement toward the position of the front lightning bolt would have surely resulted in a greater effective speed of light from that bolt. Fortunately, just like Alice, Bob had some accurate equipment installed for measuring the speed of light from both lightning bolts.

However, when Bob measures the speed of light from both bolts **he finds the speed is the exactly same!** This seems bizarre, but it is precisely in accordance with the prediction of James Clerk Maxwell who stated that all observers will measure the same speed of light. So Bob is left with something of a mystery, and he examines the evidence:

1. The distance to each source of light at the front and the back of the carriage is exactly the same.
2. The speed of light from each light source to Bob is exactly the same.
3. The light rays did not reach Bob simultaneously.

Bob is clearly left with only one logical conclusion: **the lightning bolts did NOT hit the ground simultaneously!**

This is the only conclusion available to Bob. It is simply a fact that the lightning bolts did not hit the ground at the same time. This is a statement of reality.

However, Alice was equally certain that the lightning bolts DID hit the ground at the same time. She performed exactly the same accurate measurements as Bob. For Alice, there is no doubt: it is simply a fact that the lightning bolts DID hit the ground simultaneously.

So who is right? Alice or Bob? The extraordinary truth is that they are both right — after all, they both proved their cases beyond logical doubt. As Sherlock Holmes said: "When you have eliminated the impossible, all that remains, however improbable, must be the truth." The only conclusion which is left to us is that **reality itself is different for both Alice and Bob!** In Alice's version of reality, the lightning bolts hit the ground simultaneously. In Bob's version of reality, the lightning bolts did not hit the ground simultaneously. Reality is a relative concept for the two observers. This extraordinary outcome of the experiment is called *relativity of simultaneity*.

This fundamental difference in the reality of two observers who are moving relative to each other is described by Heinz Pagels in his book *The Cosmic Code*: "Even after taking into account their relative motion and the finite speed of light they cannot agree which event 'really' took place first."

The relativity of simultaneity thought experiment which has just been described is often mistakenly presented as nothing more than an experiment in signalling, or time synchronisation. Worst of all, it is frequently presented as explaining what people "see", the observers seeing the light signals as simultaneous or not. But the experiment is not at all about seeing light signals. In fact, it is really nothing to do with light at all. What it reveals is something far more extraordinary, far more profound. It is not about what is **seen**, it is about what is **measured**. This is not about synchronisation — this is about the whole of reality. It shows that merely by moving relative to each other, two observers inhabit different realities. It is as if they inhabit two different universes.

And the events which occur in the experiment need not just be lightning bolts hitting a railway track, or lights flashing in a railway carriage. They could be a gunshot, or a star exploding, or the outbreak of war, or the assassination of a president. All aspects of reality are affected by this outcome.

The effect is imperceptible at speeds far less than the speed of light, but it is real nonetheless. If I am moving relative to you, then my reality is different to your reality.

In his book *The Emperor's New Mind*, Roger Penrose emphasizes this point by considering two people passing each other on the street at low speed. Because of the relativity of simultaneity, they will both have different conceptions of what is happening "now". While this effect is small, the effect increases with distance (as we shall

discover in the next chapter). If they consider what is happening at, say, intergalactic distances then the effect is very marked. Penrose considers one person walking in the direction of the Andromeda galaxy, while one person walks in the other direction. The person walking towards Andromeda will consider his "now" moment on Andromeda to be hours or days ahead of the other person. Penrose then considers a potential invasion of Earth by aliens living on Andromeda: "Even with quite slow relative velocities, significant differences in time-ordering will occur for events at great distances. Imagine two people walking slowly past each other in the street. The events in the Andromeda galaxy (the closest large galaxy to our own Milky Way) judged by the two people to be simultaneous with the moment that they pass one another could amount to a difference of several days. For one of the people, the space fleet launched with the intent to wipe out life on the planet Earth is already on its way; while for the other, the very decision about whether or not to launch that fleet has not yet even been made!"

This effect has been called the *Andromeda Paradox*. [3]

Of course, what is happening "right now" in a galaxy 2.5 million light-years from Earth is not of particular relevance as, even if the decision to launch the space fleet is made right now, it would still take millions of years for the fleet to reach Earth. We are in no immediate danger of alien invasion.

And so we come to the end of the long journey of the last two chapters. It is a journey which started 400 years ago in renaissance Italy at the dawn of modern science when Galileo proposed the principle of addition of velocities, and introduced the modern experimental method. It is a journey which required the mathematical prowess of James Clerk Maxwell who revealed the astonishing true nature of light. And it is a journey which has ended with the genius of Einstein whose thought experiment involving the speed of light revealed the true astonishing implications for reality.

4

SPACETIME

When the Black Death struck England in the year 1665 it must have seemed like the end of the world. The bubonic plague, carried by fleas on rats, had already killed a third of Europe's population. Once you were infected, the extremities of your body turned black (hence "Black Death"), and death almost surely resulted within four days.

The closure of Cambridge University during the plague forced a 23-year-old Isaac Newton to take refuge at his home in Woolsthorpe in Lincolnshire. It was while Newton was in forced isolation that he set his mind to produce his greatest work, the *Principia*, which laid down the basis of classical mechanics and Newtonian gravity, results still very much in use to this day. Indeed, it was by using only an understanding of Newtonian mechanics and gravity that NASA put the first man on the Moon in 1969.

The following image shows Isaac Newton as painted by William Blake in 1795:



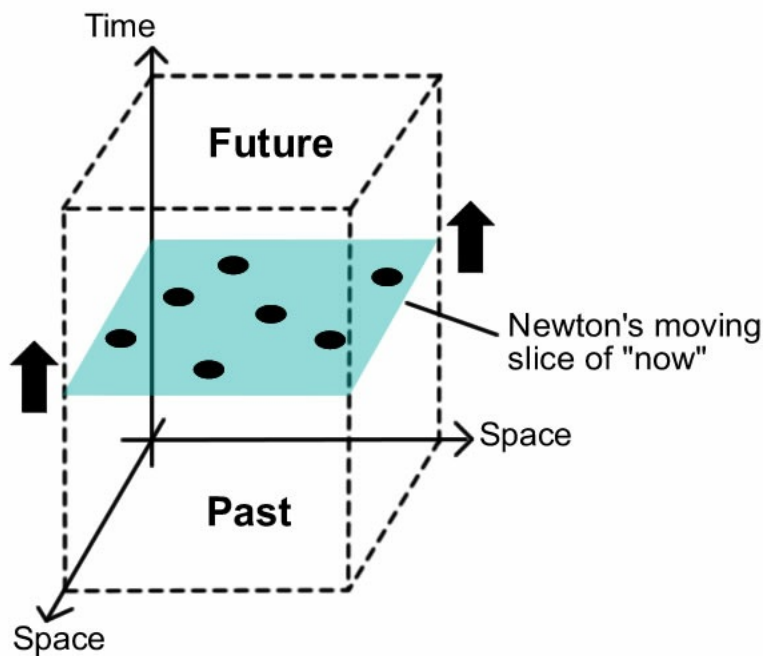
In order to arrive at his laws of motion, Newton had to employ a precise definition of time. In the *Scholium* (introduction) to the *Principia*, Newton stated: "Absolute, true, and mathematical time, of itself and from its own nature, flows equably without relation to anything external."

So Newton believed in *absolute time*, which always operated as a background on which all objects changed. It was as if all objects danced to a single clock which controlled the entire universe. If no objects existed in the universe, this ultimate clock would still exist counting down its absolute time.

Newton had similar views on space. Newton believed that, even if all the matter was removed from the universe, there would still be the "box" of space by which all position could be measured. This was *absolute space*.

The proposal of absolute time and space was so important and successful for Newton's theories of mechanics because it created a pre-existing framework within which objects could move, and those movements could be analysed and predicted by Newton's laws of motion.

According to absolute time, we could imagine the current state of reality in the universe as being all those events that are "real" (i.e., currently happening) at the moment we snap our fingers. That might include the boy falling off his bike down the road, and a star exploding in the Andromeda Galaxy. All of these events taken together would represent the current state of the universe. And this current "now" moment would be determined by Newton's absolute "clock of the universe" — all objects in the universe would agree on the current absolute time:



Hence, we could represent the current "now" moment as being a single slice out of all time. In the previous diagram, the current "now" moment is indicated by the shaded slice. This "now" slice moves upwards in the time direction from the past to the future (only two dimensions of space are shown on the diagram instead of the usual three dimensions).

The slice represents all the events in the current universe (the events are denoted by the black circles). Only the events included in the "now" slice are "real" — they are the only events currently happening. The events of the past have already happened and are no longer real. The events of the future have not yet happened and are therefore not yet real. As the "now" slice moves upwards along the time axis at a speed determined by Newton's absolute clock, it turns the unreal future events into real current events, and those real current events are turned into unreal past events.

However, remember back to our discussion of Einstein's thought experiment in the last chapter. We discovered that Alice and Bob — who were moving relative to each other — could not agree on whether events occurred simultaneously. In other words, they disagreed about the reality (whether or not an event was happening) of certain events. If two observers cannot agree on the reality of events, then this poses a problem for Newton's view of the universe. Newton's view was based on a slice of events which were definitely real: only the events on the slice were real. But Alice and Bob can apparently not agree which events should be on the slice — they cannot agree which events are real. An event cannot be both real and unreal at the same time. How can this problem with Newton's view of the universe be resolved?

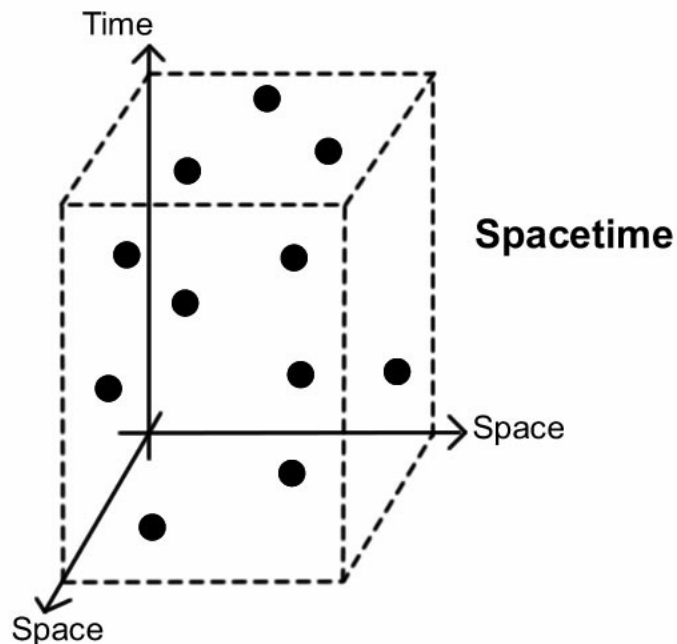
The resolution to this problem came from an unlikely source. In 1895, the English writer Herbert George Wells (better known as H.G. Wells) considered the possibility of treating time as a fourth dimension, and creating a machine which allowed the operator to move freely in that fourth dimension. After all, in our daily lives we can move in the three spatial dimensions — left/right, up/down, forward/backward — as we wish. Might it not be possible to imagine freedom to move in a fourth dimension as well? Wells' book *The Time Machine* based on this principle became the first book to popularise the concept of time travel and introduced the notion of time as a fourth dimension to the general public. We are now quite used to the idea of seeing time travel in popular fiction, so it is hard to imagine what an impact this idea must have had when presented to the public for the first time.

The following extract is H.G. Wells' description of time from *The Time Machine*. It is quite remarkable considering this was written twenty years before Einstein's great insight: [\[4\]](#)

"Clearly", the Time Traveller proceeded, "any real body must have extension in four dimensions: It must have length, breadth, thickness, and — duration. But we incline to overlook this fact. There are really four dimensions, three of which we call the three planes of space, and a fourth, time. There is no difference between time and any of the three dimensions of space except that our consciousness moves along it."

In truth, the idea of a fourth spatial dimension was tremendously fashionable toward the end of the 19th century. This was largely due to the efforts of popular writers such as Charles Hinton who took the latest mathematical ideas about geometry in higher-dimensional spaces and made them accessible to the general public. Another book of the time, *Flatland: A Romance of Many Dimensions* by Edwin Abbott Abbott, continued the popular trend of the time by considering how travel in extra spatial dimensions could allow liberation from conventional restraints. This idea of a liberating fourth dimension was adopted by modern artists who moved away from the restrictive one-point perspective system which portrayed the world as three-dimensional. This is especially noticeable in the perspective-free paintings of the cubists such as Pablo Picasso.

It was during this period, in this liberated environment, that Einstein's former mathematics teacher at the Zurich Polytechnic, Hermann Minkowski, took an interest in Einstein's work on relativity. Minkowski was impressed with Einstein's progress — and more than a little surprised: "It came as a tremendous surprise, for in his student days Einstein had been a lazy dog. He had never bothered about mathematics at all." Minkowski realised that an elegant explanation of Einstein's result could be provided if time was considered as a fourth dimension — just as H.G. Wells had earlier suggested. Instead of there being a single "now" slice of reality across the entire universe — as Newton had suggested — we had to consider all of time and space existing as one huge block-like structure. This is called *spacetime*.



In the previous diagram, Newton's "now" slice of time has vanished, and all the events (the black circles) are now portrayed as being "real".

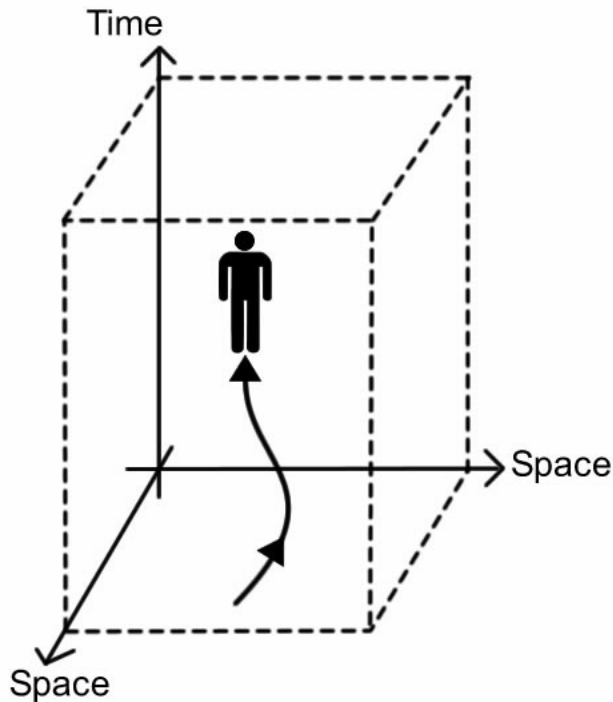
In principle, this presented the opportunity for time travel: if all times existed, and time was just another dimension, we could travel back to those times. This could not possibly have been the case in Newton's universe in which only the present moment was real.

It might at first appear strange to treat time as another dimension. Perhaps it helps to realise that we always give the position of events in terms of four dimensions: three dimensions of space and one of time. For example, we might arrange a meeting at the corner of two streets (providing the value of the spatial dimensions) at a certain time (providing the value of the time dimension). So events are inevitably defined in terms of four dimensions. You have been doing this all your life perhaps without realising it.

This approach, of treating space and time as dimensions of spacetime, starts to reveal the very close connection between space and time. For example, when we look at the stars we are essentially looking back in time. This is because we are looking at the stars as they were many years ago: the distances to the stars are so great that their light takes many years to reach us. Other profound connections between space and time will be considered in later chapters.

As we move around in space, we are inexorably moving forward in time. Hence, as we progress through our lives

we plot a path through spacetime which is called a *world line*. In the next diagram, the world line of Bob is denoted by the curved, directional line:

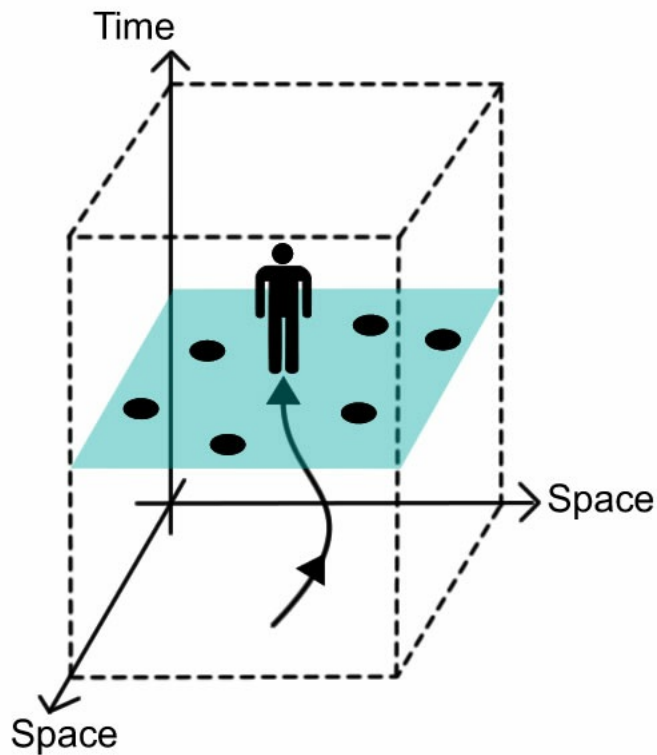


Every object moves forward in time, so every object has a world line. We might perceive an object at its single position "right now", but physics tells us that a more accurate representation of an object is as a world line through spacetime. This principle even applies to elementary particles which are portrayed in *Feynman diagrams* as lines rather than point particles.

This is one of the most important points of this book, as we shall see in later chapters. It is crucial to understanding the nature of time. Objects are not really points in space — they are truly lines in spacetime. Indeed, we ourselves exist as lines through spacetime, as if we are "stretched-out". Every atom and particle in our body exists as a line in spacetime — we just don't perceive it that way (for reasons we will discover in the next chapter).

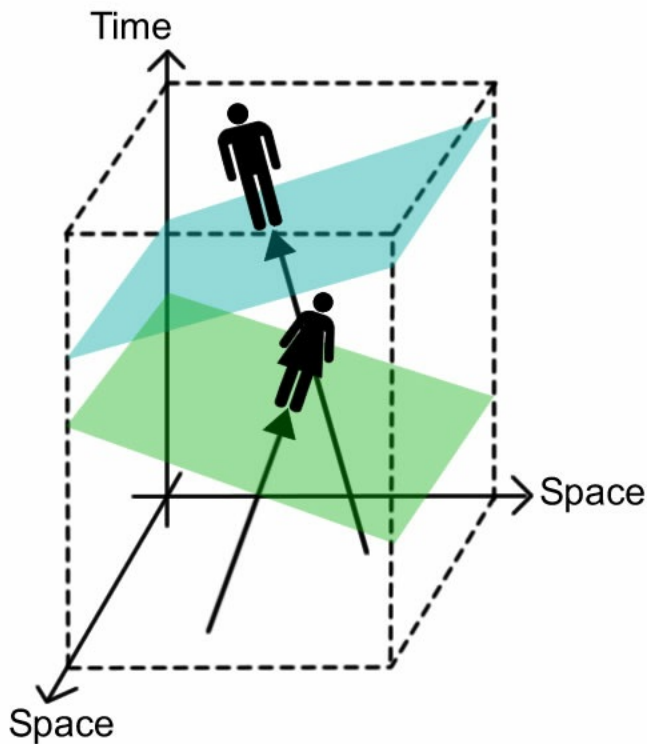
At each point of the world line of an observer, there will be an associated plane — a slice of spacetime — which represents all the events which that observer considers "real" at that particular point in time. This is called the *plane of simultaneity* of the observer.

The plane of simultaneity of Bob is shown in the following diagram by the shaded plane. Note that, at any point along Bob's world line, **the plane of simultaneity is always perpendicular to Bob's world line**. It is a cross-section of spacetime at a particular time. It represents all the events that are real to Bob when Bob clicks his fingers "right now":



This resembles Newton's "now" slice of space, but it differs in the crucial fact that **this plane is defined solely in terms of a particular observer** — unlike Newton's slice of absolute time, it does not apply to all observers. That is where Newton went wrong: he took a result which applied only to himself, and assumed it applied to all observers. He believed that the time when he "clicked his fingers" represented the same absolute time for all observers in the universe. That is not the case. Newton's model of absolute time was a flawed concept.

If we have two observers — Alice and Bob — moving relative to each other (as in the train example in the previous chapter) their world lines through spacetime will be at angles to each other. However, their individual planes of simultaneity will always be perpendicular to their world lines. This is shown in the following diagram (showing Bob and Alice's separate planes of simultaneity):



As a result of these angled planes of simultaneity, Alice and Bob do not agree as to which events are real and which are unreal (which events are currently happening, which events are yet to happen, and which events have already happened). This explains how, in a spacetime in which all events are real, Alice and Bob only experience a "slice" of real events at any moment along their world lines.

The difference in the angles of their planes of simultaneity also explains how Alice and Bob can have vastly different experiences as to which events are real at great distances. This is due to their angled planes of simultaneity diverging greatly over vast distances (this is the reason for the Andromeda Galaxy paradox discussed in the previous chapter).

But to suggest that all events in the universe are "real" all the time sounds like crazy talk! Indeed, there remains some physicists who would not agree — even though the principle has a firm basis in special relativity. Is there any additional evidence that this is the case?

The block universe

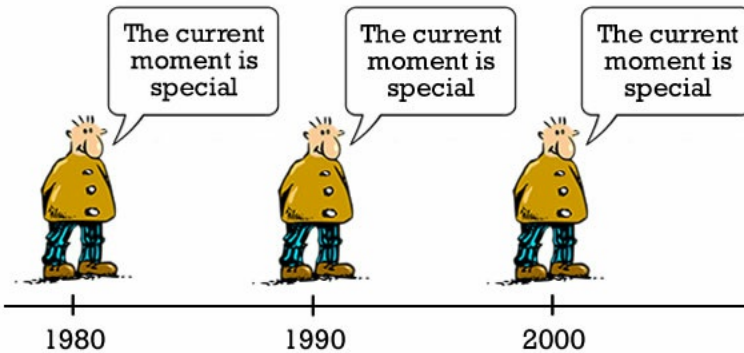
While many readers of popular science books may be well aware of the concept of time as a fourth dimension, they perhaps still imagine the movement of a "now" moment which moves through the spacetime structure turning the future into the past. These readers are perhaps less aware of the other main conclusion of Einstein's thought experiment, which is, as we have seen, that all events — and therefore all times — are equally real. There is therefore no special "now" moment. As Brian Greene notes in his book *The Fabric of the Cosmos*: "A less than widely appreciated implication of Einstein's work is that special relativity really treats all times equally."

What this implies is truly quite staggering. It suggests that all times are real, every point of our life has the same level of reality. The time when you fell off a bike when you were a child is just as real as the current moment. And the moment of your birth is just as real as the moment of your death. In fact, all times really exist — the whole block of spacetime from the start of the universe to the end of the universe exists as one unchanging block. This is called the *block universe* model.

I considered the block universe model in depth in my first book, and I do not want to repeat myself, but it has to be mentioned here as it appears to be one of the few vitally-important genuine insights we can obtain about the

nature of time.

But, you might argue, you feel as though there is a moving "now" moment. Surely time is moving? Surely "now" is a special moment? Well, yes, you do feel a moving "now", but that is precisely how you have felt at every other moment of your life:



Time is not actually moving — there are just multiple copies of you stretched-out through spacetime. The moving "now" slice is just an illusion of human perception (which we will consider in the next chapter).

In the previous section I asked the question as to whether any additional evidence existed to back up the conclusion of special relativity that all times exist. And, indeed, it seems basic logic can prove the existence of the block universe model. This is because we can easily recognise that the concept of a moving "now" is logically inconsistent. Put simply, it makes no sense to ask the question: "How fast does time flow?" When we generally talk of the speed of moving objects, we give an answer which represents the change in position of the object **with respect to time**. However, when we talk about a moving "now" moment we are talking about the movement of time itself, and it makes no sense to talk about the speed at which time itself moves **with respect to itself**. To say that time moves at a rate of one second per second is absurd. The only logical conclusion is that time does not flow — all times are real.

So not only does special relativity tell us that we live in a block universe, basic logic tells us that it is undoubtedly the case.

The block universe in literature

If "killing your own grandfather" paradoxes are a favourite cliché of schlocky science fiction, then a more accurate and sophisticated model of time incorporating the block universe model can be found in more intelligent sci-fi literature. These thoughtful portrayals of the block universe present time as an unchanging, pre-existing block structure which can be accessed by beings possessing extraordinary powers.

As an example, Alan Moore's magnificent *Watchmen* graphic novel includes the character known as Doctor Manhattan. Doctor Manhattan is created when the physicist Dr. Jonathan Osterman is accidentally disintegrated when he is trapped in an Intrinsic Field Subtractor (the "intrinsic field" apparently being the force which holds all matter together). His body slowly reassembles itself into something greater: a blue-skinned super-being with control over matter at a subatomic level. Osterman is pressed into service by the U.S. government which gives him the name Doctor Manhattan (named after the Manhattan Project).

Doctor Manhattan is an almost omnipotent figure, and possesses the ability to perceive all times at once. It is as if Doctor Manhattan exists "outside the universe" and is in possession of a godlike overview of the entire block universe structure. As Doctor Manhattan explains: "There is no future. There is no past. Do you see? Time is simultaneous, an intricately structured jewel that humans insist on viewing one edge at a time, when the whole design is visible in every facet."

While Doctor Manhattan's character might appear rather distant and otherworldly, his realisation and description of the block universe is instructive and carries a message for all of us. All times exist equally — this is what science and logic tells us. Try and see the "whole design visible in every facet" rather than concentrating on "viewing one edge at a time" (i.e., the "now" moment). As you can tell, Alan Moore writes the Doctor Manhattan passages in *Watchmen* quite beautifully and poetically.

As another example of the use of the block universe model in quality literature, in 1969 the science fiction author Kurt Vonnegut released his most famous novel, *Slaughterhouse-Five*, now considered one of the finest novels of the twentieth century. *Slaughterhouse-Five* is the story of Billy Pilgrim who is abducted by aliens from the planet Tralfamadore. The aliens are friendly, and can see in four dimensions (i.e., including the time dimension). Hence, the aliens possess a similar godlike overview of spacetime to that enjoyed by Doctor Manhattan. The Tralfamadoreans see it as their duty to teach Earthlings about the true nature of time. As Billy Pilgrim recalls: "The most important thing I learned on Tralfamadore was that when a person dies he only **appears** to die. He is still very much alive in the past, so it is very silly for people to cry at his funeral. All moments, past, present, and future, always have existed, always will exist. The Tralfamadoreans can look at all the different moments just the way we can look at a stretch of the Rocky Mountains, for instance. They can see how permanent all the moments are, and they can look at any moment that interests them. It is just an illusion we have here on Earth that one moment follows another one, like beads on a string, and that once a moment is gone it is gone forever."

The Tralfamadoreans were able to see the true nature of objects (and people) stretched-out as world lines in spacetime, a continued existence from baby to old age: "Tralfamadoreans don't see human beings as two-legged creatures, either. They see them as great millipedes — with babies' legs at one end and old people's legs at the other."

As I said earlier in the chapter, this is an absolutely crucial point in this book: we do not exist as points in time, we are "stretched-out" as world lines from birth to death — like a millipede. This is the reality of our existence in spacetime. We will be seeing in later chapters why this is so important.

The Ulysses Pact

The implications of the block universe model really seem quite staggering. It states that you exist at all times: the past and the future are just as real as the current moment. So the question arises: how should you live your life in a block universe? Does an understanding of the block universe give you an advantage over other people (who don't read quality popular science books)? Should you behave differently?

Firstly, death should hold less fear. The block universe states that you exist at all times in your life, that you are alive at all times. True, the block universe model implies that the circumstance and time of your death has already been decided, but it also states that the moment of your death has no more importance than any other time of your life. You will remain alive at other times! This is no crank theory — this is an underappreciated implication of orthodox physics.

Einstein took comfort from this knowledge when his friend Michele Besso died. Einstein wrote a letter of consolation to Besso's family in which he stated: "Now he has departed from this strange world a little ahead of me. That means nothing. People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion."

Michael Lockwood considers this principle in his book *The Labyrinth of Time*. He tries to console those who may have lost loved ones: "Einstein evidently believed that the spacetime view, when taken fully to heart, can provide comfort to the bereaved. A person who is not living **now**, but did or will live at other times, exists in just as substantial a sense as someone who does not live **here**, but only in some other **place**. Einstein is urging us to regard those living in times past, like those living in foreign parts, as equally **out there** in spacetime, enjoying the same flesh-and-blood existence as ourselves."

If all times are equally real, then this implies that those happy moments you have in your past are just as real as the current moment. That should be reassuring. It also suggests that we might live happier and more content lives if we lower the importance we give to the current moment. Downgrade the "now". Realise that the current moment is no more real than the past moments in your life. We are inundated with advertising slogans which try to persuade us to increase the importance we assign to the current moment: "Live for the day!" "Buy now, pay later!" Instead, resist these temptations. Do not "live for the day", live for all times. Realise that you exist at all times. Save for the future. Appreciate the past as being as real as the current moment.

It is, of course, easier said than done to apply less importance to the current moment. This is because our brain tends to place greater emphasis on obtaining immediate reward, rather than deferring that instant gratification in the hope of obtaining a greater reward at a later date. The neuroscientist David Eagleman considers this tendency in his book *The Brain*.

As an example, Eagleman considers the plight of American homebuyers who bought their homes before the financial crash of 2008. The homebuyers were attracted to the low interest rates over a trial period, without considering the possibility that those rates would rise significantly when the trial period ended. As Eagleman

explains: "What did this disaster have to do with competing networks in the brain? These subprime loans allowed people to obtain a nice house now, with the high rates deferred until later. As such, the offer perfectly appealed to the neural networks that desire instant gratification — that is, those networks that want things now. Because the seduction of the immediate satisfaction pulls so strongly on our decision making, the housing bubble can be understood not simply as an economic phenomenon, but also as a neural one."

Eagleman continues to explain the brain's attraction to the "now": "To the brain, the future can only ever be a pale shadow of the now. The power of now explains why people make decisions that feel good in the moment but have lousy consequences in the future: people who take a drink or a drug hit even though they know they shouldn't; athletes who take anabolic steroids even though it may shave years off their lives; married partners who give in to an available affair."

But, as it has just been explained, if we want to live successfully in a block universe then it is vital to realise that we exist at all times, and we should lower the importance we give to the current moment. In effect, that means we need to overcome our brain's natural desire for instant gratification. One method we might use to achieve that is described by David Eagleman and is called a *Ulysses Pact*.

In standard legal affairs, it is common to form a contract between two people which binds the actions of those people at a later date. A Ulysses Pact (which is also known as a *Ulysses Contract*) works on a very similar principle, but the two people which are bound by the contract are rather unusual: the contract is drawn-up between yourself ... and a future version of yourself.

The Ulysses Pact is named after Ulysses, the hero from ancient Greek literature (who was originally named Odysseus). On his way home after triumphing in the Trojan War, Ulysses realised his ship would be passing by the island where the Sirens lived. The Sirens were women who sang songs of such beauty that any sailor became instantly entranced, with the result that their ship became wrecked on the rocks. In order to resist the spell of the Sirens, Ulysses ordered his men to lash him to the mast of the ship so he would be unable to interfere with the ship's steering. In that way, Ulysses was restricting the behaviour of his future self.

In general, the goal of a Ulysses Pact is to bind your future self so that your future self will behave in some admirable manner. As an example, if you require extra motivation to go to the gym at a later date, you might arrange in advance for a friend to meet you there. The behaviour of your future self then becomes bound by the contract. As another example of a Ulysses Pact which I have found useful, I always end my books with a "Coming Soon" page which includes a picture of the cover of my intended next book (before I have written it) and its proposed title. I then feel obliged to write that book. It's a bind, but it works!

It is as if you are creating a legal contract between two people, but one of the two people is your future self. This, then, resembles the suggestion of the block universe model that there are multiple copies of yourself existing at all times. As David Eagleman says: "To make better decisions, it's important not only to know yourself, but **all your selves.**"

5

THE ARROW OF TIME

As we have just discussed, the block universe model suggests that all of spacetime exists as an unchanging block, with no special "now" moment. But, if that is the case, then why do we feel as though there **is** a "now" moment, which gives the current moment priority over the past and the future? In fact, not only do we feel a "now" moment, but we feel movement of that now moment from what we call "the past" to what we call "the future". So this seems to indicate a directionality in time. What is the origin of this directionality?

This directionality — this so-called *arrow of time* — is not just limited to our internal perception of the motion of time. External physical processes also exhibit a directionality in time. For example, we might see an egg breaking (in the forward time direction), but we never see a broken egg reforming itself. These considerations might seem trivial, but they pose serious questions for physics. This is because the laws of physics — certainly Newtonian mechanics — are *time symmetrical*, i.e., they work the same in the backward time direction as they do in the forward time direction. Consider, for example, shooting a movie of two balls colliding, with the first ball stopping and the second ball moving off at speed. If you played the movie backwards, the events would still make sense according to the laws of physics. This time, though, the second ball would come in reverse, strike the stationary first ball, and the first ball would then move off in reverse. Everything would happen perfectly in reverse, and it would look as though it was happening in the forward time direction.

So if the laws of physics are time-symmetrical, why do so many processes exhibit an arrow of time in the forward time direction?

Let us first consider the psychological aspects of this question.

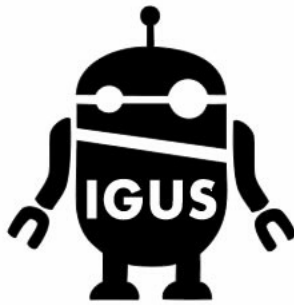
The feeling of "now"

In the discussion of the block universe in the previous chapter, it was described how all times are equally real and there is, therefore, no special "now" pointer which moves through time at a certain speed and determines the current moment. Even though we derived this result in a logical manner, there still lingers a considerable amount of resistance to this model. The main reason I feel that many people have such a problem accepting the block universe model is not through any rational scientific basis, but because they instinctively feel a special "now" moment. This feeling is so utterly entrenched into our lives and psyche that it is an incredibly hard habit to break.

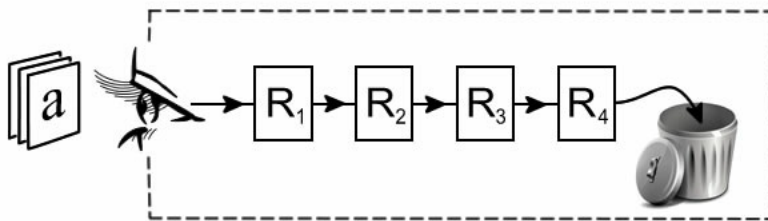
However, there is no place in physics for feelings. Physics is based on measurement and cold equations. Is it possible to produce any hard numerical measurement of this supposed "moving now"? No, of course it isn't — for the reason presented in the previous chapter: it simply makes no logical sense to try and measure how fast time flows. People might say with complete certainty that they feel the movement of a "now" pointer, but you will note that they never say precisely how fast it moves!

So why do we feel this motion of time, this so-called *psychological arrow of time*? The physicist James Hartle believes the answer does not lie with physics at all, but instead purely lies in human biology. Hartle has considered how the human mind processes information, specifically considering the mechanism of human memory.^[5] Hartle realised that a computer model of human memory could be constructed. The resultant model applied not only to humans, but also to processing units with computer memory such as robots. These generalised robots were given the name IGUS (Information Gathering and Utilizing Systems).

Here is a cute example of an IGUS. We'll be seeing him again later:



Hartle realised that the memory of an IGUS could be modelled as a series of computer registers:



In the preceding diagram, the IGUS mechanism is contained within the dashed rectangle. The ever-changing information about the outside world is denoted by a pack of cards (shown on the left of the diagram), with the top card changing with time. The latest information about the external world — the top card on the pack — is captured by the electronic eye of the IGUS. That information is stored in its first memory register, R_1 . As time passes, that information in register R_1 gets shuffled back further in memory into register R_2 , and the new latest information is captured into R_1 . So as each new piece of information comes in, the information which is already held in memory gets shuffled further and further back in the memory registers. Eventually, the information is shuffled out of the bank of registers completely, into the waste bin, and the information is lost ("forgotten").

Now, the important point here is that our brains **could** assign equal priority to each of these memory registers. It could say the contents of R_2 are just as important as the contents of R_1 , or it could even say that the contents of R_4 are **more** important than the contents of R_1 ! But that is not what happens in practice. In fact, any creature whose brain worked on the principle that the contents of R_4 were more important than the contents of R_1 would be quickly killed off through evolution. This is because such a creature would be perpetually living in the past. It would be acting according to the state of the universe a few seconds ago. Hartle gives the example of a frog trying to use its sticky tongue to catch a fly on a leaf. If the frog is operating based on the contents of R_4 then it will be considering the state of the universe a few seconds ago. By the time the frog sticks its tongue out to catch the fly, the fly will have long since flown.

So, instead, our brains assign greater importance to the contents of memory register R_1 . Evolution has shown that this is the most efficient way to catch flies. The brain still retains the contents of memory registers R_2 to R_4 , but it makes their contents appear "foggy" to us, to make it clear that these contents should not be regarded as being as important as the contents of R_1 . Hence, we call the contents of R_2 to R_4 "memories".

The brain retains the contents of R_2 to R_4 , and makes their contents available to us, because memories are useful for evolutionary purposes. But the brain emphasizes the importance of the contents of R_1 . If the brain really wanted to, it could raise the importance of the contents of R_2 to R_4 to the same level of importance as the contents of R_1 . Our memories would then be perceived as being just as real as the current moment. We would then be truly like the Tralfamadorians from *Slaughterhouse-Five*, viewing all past moments in time as being as equally real as the current moment.

How extraordinary! And perfectly legitimate within the laws of physics.

So the feeling of a special "now" moment is purely a construction of biology. Do not be fooled — this has nothing

to do with physics. Physics states that all times are equally real.

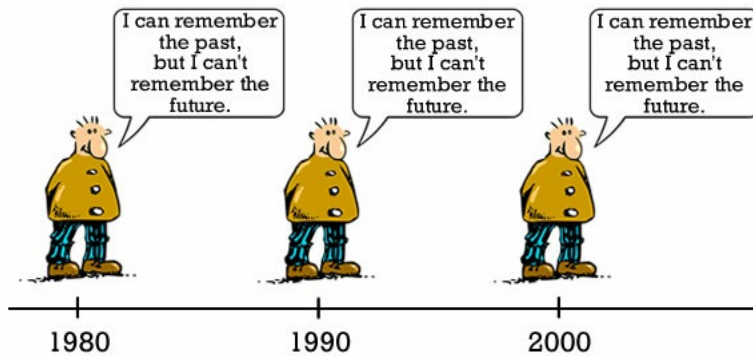
But it is interesting that this is how an IGUS (such as ourselves) can generate a "now" moment from the static block universe structure: it is purely an illusion of human perception.

This is why we do not see objects as continuous world lines in spacetime (like the Tralfamadorians). We only ever regard the true state of the universe as being the information which resides in the latest register R_1 . So we only ever see a cross-section of spacetime at one point "right now". In this respect, human perception fools us — it does not provide us with an accurate view of reality. As I stressed in the previous chapter, it is vital to understand that the correct view of reality is that objects exist as stretched-out world lines in spacetime.

The moving "now"

So, given that the universe has a static block universe structure, why does an IGUS feel the movement of this "now" moment? In other words, what is the reason for the psychological arrow of time? To answer this, you will notice that there is a clear directionality in the way the captured information passes through the IGUS memory registers: the information always passes from left to right, from register R_1 to register R_4 . It is always one-way traffic. This directionality results in an asymmetry in our memory: we can remember the past, but we cannot remember the future. This asymmetry is the reason we feel movement: we feel the past is somewhere "we have been" and the future is somewhere "we are going".

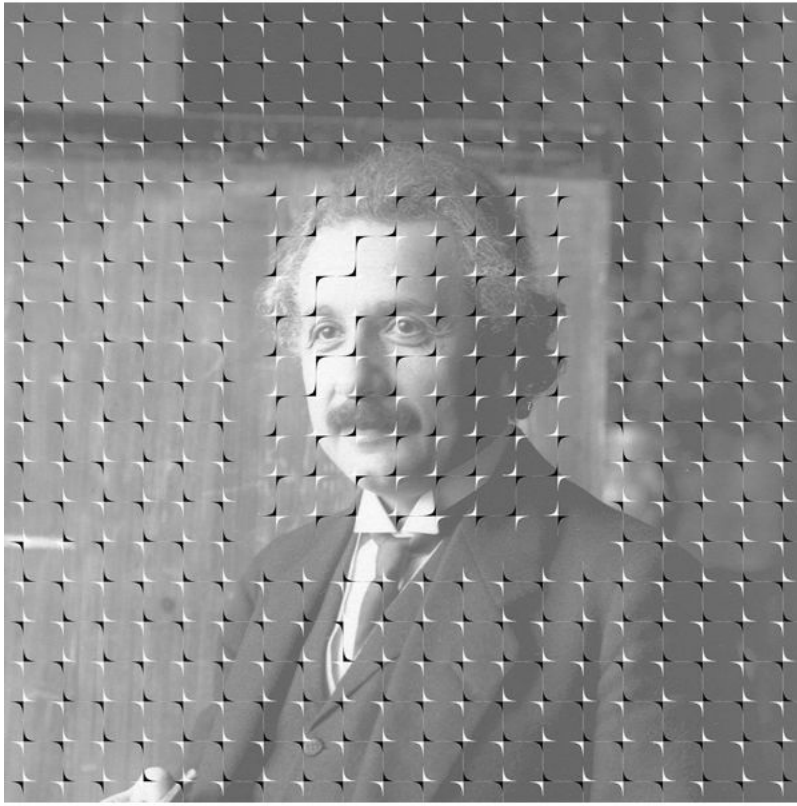
If we return to consider our cartoon character who lives in the block universe, we find that at each point in his existence he is able to remember his past, but is unable to remember his future:



So this asymmetry results in our cartoon character feeling a form of motion in time, directed from the past to the future. However, due to his existence at all times in the block universe model, there is no actual motion at all. The universe is a static block of spacetime.

This sensation of a "moving now" explains how humans can observe motion in an otherwise completely static block universe structure. The storage registers of our memory hold past states of our environment. As the data shuffles through our memory registers, we can compare the past state of the environment with the current observed state. Any change in the state of our environment would be interpreted as "motion" of the objects in the environment. So, even in a completely static block universe structure, human beings can obtain an impression of motion. There are probably good evolutionary reasons why we have developed a memory which works in this manner: it is undoubtedly a huge evolutionary advantage to be able to detect objects in motion. This is the reason why a tiger creeps slowly through the African Savannah when it is tracking its prey — it is because the visual system of a gazelle is attuned to detecting motion.

So what science and logic seems to be telling us is that the sensation we have of movement through time is nothing more than an illusion generated by our brains! You might find this very hard to accept, after all, surely our brains never fool us into believing that something which is static appears to be moving? Well, if you think that is the case, consider the following optical illusion:



You should be able to see motion in the image (Einstein's head moves).

So the brain clearly has a tendency to give an impression of movement in a situation which is completely static. There is much in physics which is counter-intuitive, and placing too much credence on the evidence of our own eyes — and our "feelings" — can hinder our progress to uncover the truth. We have to be careful only to analyse the available data, and not impose our own preconceptions on the result.

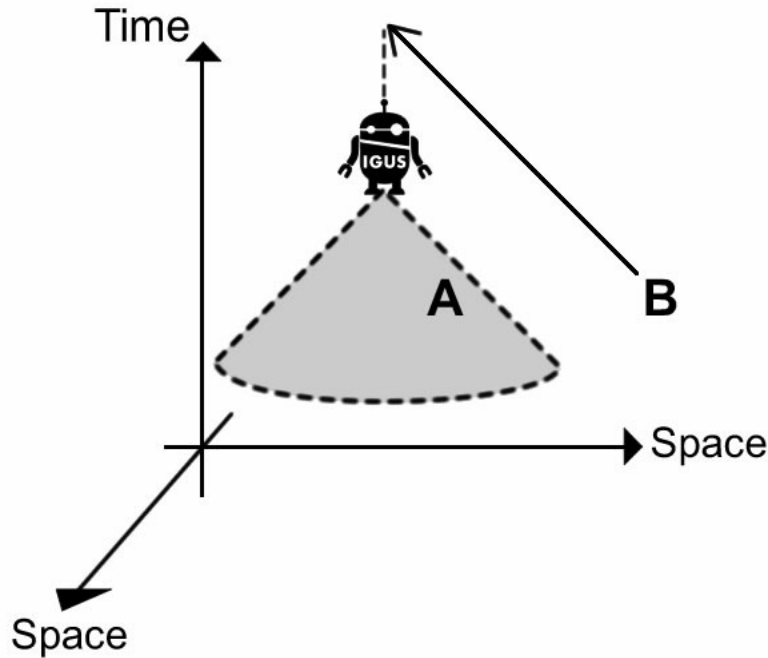
Why can't we remember the future?

So, as has just been described, the underlying reason as to why we experience a moving "now" moment is due to an asymmetry in our memory: we can remember the past, but we cannot remember the future. This asymmetry generates a feeling of movement: we feel the past is somewhere "we have been" and the future is somewhere "we are going". So, as we continue our analysis, it seems essential to try to understand the root cause of this asymmetry, which is: why can't we remember the future?

It might be imagined that the answer to this question is irretrievably locked in the maze of neurons in our head. The answer would appear to be a very personal matter, the result of individual brain chemistry. However, once again James Hartle's IGUS model casts light on the mystery by considering the laws of physics.

Any event which occurs in spacetime has a *light cone* associated with it. In this example, we will be considering the light cone for past events (there is also a corresponding light cone for future events). The past light cone contains every event which might possibly cause a particular event. Basically, the past event must have occurred close enough to the future event so that light had enough time to reach the future event. This allows the past event to have been the cause of the future event.

The past light cone for an IGUS is shown in grey in the following diagram:



The IGUS lies at the apex of the cone. Two events, A and B, are shown on the diagram. As can be seen, event A lies within the past light cone of the IGUS. This means that light (and, hence, information) from the event has had sufficient time to reach the IGUS. As far as the IGUS is concerned, event A is an event in its past. The IGUS possesses information about the event.

However, it can be seen that event B lies outside the past light cone of the IGUS. This means that light (and information) from event B has not had enough time to reach the IGUS. Light from event B will only reach the IGUS after some additional time has passed (see how the arrow from event B intersects the IGUS world line some time in the future of the IGUS). Hence, event B can be considered to lie in the future of the IGUS. As far as the IGUS is concerned, event B is a future event.

So why is the IGUS unable to remember the future? Well, James Hartle makes the rather obvious and brilliant insight that "One reason the robot doesn't remember the future is that it receives no information about it." There has been enough time for information from event A (the past event) to reach the IGUS, so information about that event has been captured into the memory registers of the IGUS. However, there has not been enough time for information from event B (the future event) to reach the IGUS. Information from event B has therefore not been stored in the IGUS memory registers. Whereas the IGUS can remember event A (the past event), it is unable to remember event B (the future event). **The IGUS is therefore unable to remember the future.**

So, far from being a matter of personal brain physiology, we discover that the reason we cannot remember the future is purely due to the physics of the external universe: we cannot remember the future because we have received no information from the future. And this is an important message: the boundary between the internal processes of our minds and the external processes of the universe is a very blurred boundary. Human beings are not the isolated entities we often imagine we are.

The thermodynamic arrow of time

This behaviour of light which has just been described — always travelling from the past to the future — appears to represent another directionality in time, another arrow of time. This behaviour is actually called the *radiative arrow of time*. There are in fact many different "arrows of time". For example:

- We have already discussed the *psychological arrow of time*, and examined why we feel the motion of time

from the past into the future.

- We have also considered the *radiative arrow of time*, and seen its importance in generating the psychological arrow of time.
- There is also a *quantum mechanical arrow of time*. If you read my first book, *Hidden In Plain Sight*, you will know that before we measure a property of a particle, the particle behaves as though it has **all** possible property values. However, when we measure the actual property of the particle, there is an apparent "quantum jump" to a particular value. This quantum jump always happens in the forward time direction.
- Another arrow of time is the *thermodynamic arrow of time*. Heat will always flow from a warm body to a cold body.

Interestingly, these seemingly unrelated arrows of time all have several features in common. Firstly, all of these arrows of time represent an **irreversible** process. In the psychological arrow of time, we feel movement in the forward time direction, but we cannot reverse our motion to feel as if we are travelling in the reverse time direction. In the radiative arrow of time, light travels in all directions away from a source and scatters randomly off objects, but scattered light is never observed converging back towards a source. In the quantum mechanical arrow of time, quantum jumps happen in the forward time direction, but can never happen in the reverse time direction. And in the thermodynamic arrow of time, heat flows from hot to cold, but the reverse process is never observed (the heat of a body at constant temperature does not spontaneously move to one corner of the body for no reason).

The second similarity between all of these arrows of time is that all of these irreversible processes happen in the same forward time direction.

So, these similarities lead us to quite an intriguing thought: might it be possible that all of these arrows of time have the same underlying cause? That would explain the similarities. In fact, it is indeed now the case that physicists believe that all of these arrows of time have the same cause. And, perhaps surprisingly, the underlying cause is believed to be the principle behind the thermodynamic arrow of time.

Thermodynamics is the theory of heat and motion ("thermo" + "dynamics"). Heat always flows from a hot substance to a cold substance, and this motion can be tapped — just like the motion of water can be tapped to drive a water wheel. This motion provides the energy for steam engines, for example. And it was during the era of the steam engine that the science of thermodynamics first appeared.

So why does heat always flow from hot to cold? Well, what is really happening is that the heat is moving from being concentrated to being dispersed. If you have two objects — one hot and one cold — and you connect them to form a single system, the eventual result will be a single system at the same temperature. In other words, heat has flowed from the hot object to the cold object in order to equalise the temperature of the two objects.

In 1865, the German physicist Rudolf Clausius observed this flow of heat and tried to express the motion in mathematical terms. He arrived at the following inequality:

$$\frac{dS}{dt} > 0$$

This inequality says that the rate of change of a measurable property, S , in a thermodynamic process is always greater than 0. In other words, the value of S always increases. Clausius gave a name to this peculiar property, S : he called it *entropy*. The inequality therefore states that the value of entropy always increases with time. This forms the *second law of thermodynamics*.

So at last this equation gives us a clear mathematical formulation for an arrow of time: it is the arrow of time captured in an equation! We are not talking about a subjective psychological arrow of time here — this is a measurable physical quantity which always increases with time.

However, despite the success of the laws of thermodynamics, in the middle of the 19th century no one quite understood what entropy was, or why it should always increase. In order to make sense of entropy, another conceptual leap was required. That leap was the acceptance of the existence of atoms.

At the time, the existence of atoms was still in doubt. However, if we consider objects to be made of atoms then

we can realise that heat is simply the random motion of atoms. The spread of heat through an object is then the spreading of this random atomic motion through the object.

The great Austrian physicist, Ludwig Boltzmann, realised that if we consider our world as being made up of atoms, we could obtain an understanding of entropy, and why it must always increase. If we have a system made up of atoms, we could consider those atoms to be in either an ordered state, or a totally random disordered state (this is not something you could do if you considered objects to be a continuous solid). Entropy could then be regarded as the amount of disorder, or randomness, of the atoms in a system. For example, if heat energy was in a very ordered state, confined to a few atoms vibrating at the edge of an object, that heat energy would tend to spread through the whole object. In other words, order would be lost: disorder increases. In the final state, all the atoms in the object would be randomly vibrating, so the whole object would be the same temperature, with no trace left of that initial ordered state. This would be a state of maximum disorder, maximum entropy.

Boltzmann produced an equation which allowed you to assign a value to entropy — the amount of disorder:

$$S = k \log W$$

This is Boltzmann's famous equation, engraved on his tombstone in Vienna.

The value for the W term in the equation is produced by examining a system and calculating how disordered is its current state. For example, a pack of 52 playing cards could be randomly shuffled into a huge number of different sequences. If, however, you found the pack perfectly ordered in sequence, ace to king in all four suits, then this would represent a very special, ordered state. And that sequence would represent a very small proportion of all the possible sequences. Hence, the W value would be very small for that perfect sequence — giving a very small entropy value in Boltzmann's formula.

In the case of maximum entropy, the pack would be completely disordered, and the W value would then be equal to the total number of possible sequences of the cards: a huge number.

So, by considering Boltzmann's formula, why should entropy always increase? Well, a system will have many more disordered states rather than ordered states. Consider the pack of playing cards again. If the entire pack of cards was ordered in sequence, that represents a very special, ordered state with low entropy. However, a pack of cards has many more disordered states. If the ordered pack was then randomly shuffled, it would most likely move to one of the disordered states — it would be highly unlikely to move to the ordered state. Because systems have many more disordered states than ordered states, a system which changes state randomly will tend to move to a more disordered state.

So this explains the thermodynamic arrow of time. It explains why an area of heat (random atomic motion) spreads, and never shrinks. And this principle — that disorder will spread — applies to all dynamic systems. It explains why we might see a china cup breaking into hundreds of disordered pieces, but we never see broken china pieces spontaneously reforming to form a cup. To quote Jim Al-Khalili from his BBC TV programme *Order And Disorder*: "Boltzmann's equation contains within it the mortality of everything, from a china jug, to a human life, to the universe itself."

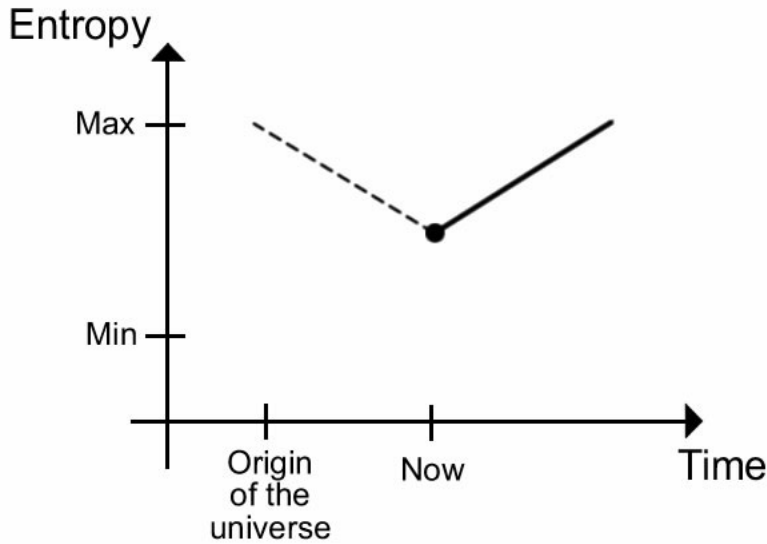
Loschmidt's paradox

However, we are not out of the woods yet. There is still a problem with our proposed solution to the thermodynamic arrow of time. If you remember back to the start of this chapter, it was described how the laws of physics are fundamentally time-symmetrical, i.e., they work the same in the backward time direction as in the forward time direction. So the laws of physics do not favour any direction of time — forward or backward. And, surprisingly, when we consider Boltzmann's solution we also find that no direction of time is preferred. Boltzmann's solution just says "a system that changes randomly will tend to become more disordered." But, if you consider the backward time direction, systems change just as much in the backward time direction as they do in the forward time direction. Again, no particular direction of time is preferred.

So change of entropy is fundamentally time-symmetrical. I do not think this point is widely appreciated.

Hence, it appears that we should find entropy increasing in the reverse time direction just as much as we observe entropy increasing in the forward time direction. This argument is called *Loschmidt's paradox*, named after Josef Loschmidt who was Ludwig Boltzmann's teacher.

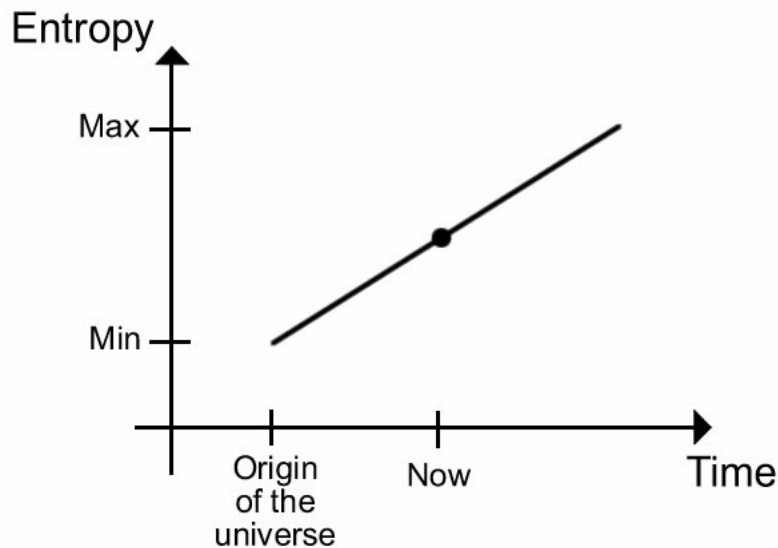
Now let us apply Loschmidt's paradox to the whole universe. As change of entropy is fundamentally time symmetrical then that suggests that we should see entropy increasing as we look back in time from our current moment. This increase of entropy into the past is indicated by the dashed line in the following diagram:



Note the symmetry of the "V" shape. This is due to change of entropy being fundamentally time-symmetrical. However, this is, of course, not what we observe. Objects tend to have lower entropy in the past — not higher entropy as this diagram suggests. Consider a rusting old car, which will continue rusting into the future (i.e., increasing its entropy). However, if we look into the past we will find a sparkly new car with lower entropy. So as we look into the past we find objects with lower entropy — not higher entropy.

So why do objects have lower entropy in the past? This is due to the very special state of the universe when it was created. The universe was created with incredibly low entropy, and all the objects contained within the universe have been essentially falling apart ever since!

The following diagram shows the incorrect dashed line removed, and replaced with a line revealing the extremely low entropy at the origin of the universe. It shows the entropy value steadily increasing throughout the lifetime of the universe:



So why was entropy so incredibly low at the origin of the universe? We are not yet certain as to why that was the case, but a possible solution may be found from an unlikely source ...

Entropy and biology

There was a story in the news recently of a remarkable young girl from Montana called Gabby Williams. Gabby is 8 years old, but resembles a baby. The rate at which she is ageing has slowed to a snail's pace. Gabby is not the only person with this condition: there is a 29-year-old man from Florida who has the body of a 10-year-old, and a 31-year-old Brazilian woman has the body of a 2-year-old. This condition is so rare that doctors do not even have a name for it.

These remarkable people have come to the attention of a medical researcher called Dr. Richard Walker, now retired but currently based in St. Petersburg. Dr. Walker believes these people could hold the secret to immortality within their genetic structure. He refers to the process of ageing as "developmental inertia" (which is a very interesting term with particular relevance to physics — as we shall see later). Walker believes that it might be possible to identify an "off switch" for developmental inertia, and thus avoid the ageing process altogether.

However, if Dr. Walker is to achieve immortality he will have to overcome a fundamental biological limit. It appears that a human cell can only divide about 50 times. This limit on cell division is called the *Hayflick limit*. At the end of each strand of DNA there is a repeated sequence of molecules which act to stop the DNA from fraying — much like the piece of plastic on the end of shoelaces. With each cell division, this piece of "plastic" DNA shortens. So this behaves like a molecular clock, with each cell having a self destruct mechanism which is designed to limit life span. When the clock expires, the cell undergoes programmed cell death. The Hayflick limit is different for other animals: if you are lucky enough to be a Galapagos turtle your cells can divide about 110 times.

If Dr. Walker is right, it might be possible to circumvent the Hayflick limit. He realises that this would not necessarily lead to eternal life: he admits that a serious accident or disease is still going to kill you. However, if you can avoid getting run over by a car, or contracting ebola, it would appear that Dr. Walker does indeed suggest that living forever is a real medical possibility.

However, as Dr. Walker appears to have a preference for adopting physics terms in his research, perhaps someone might introduce him to the concept of what we might call "developmental entropy". Fundamentally, a human being represents a physical system which is inevitably prone to increasing entropy. In this respect, a human is no different from a rusting car, or a breaking egg. A human has to follow the unidirectional arrow of time from cradle to grave, as there is simply no way of circumventing the second law of thermodynamics. And the second law of thermodynamics certainly applies to cell division.

A mature human is made up of several trillion cells. When these cells become old and require replacing (e.g., skin

cells are constantly being shed), new cells can be produced by *mitosis*. Mitosis is cell division: one old cell can produce two identical daughter cells. It is essential that the DNA in the original cell is precisely copied to the two new daughter cells. However, during this copying of the DNA, it is possible for errors to creep into the copied DNA, and these errors can accumulate over time. Imagine taking a photocopy of an image, and then photocopying that photocopy, and then repeating the process many times. Eventually, you will find many errors creeping into your photocopied image so that it no longer resembles the original image.

Unfortunately, these accumulated errors in the DNA can produce cancerous cells. Cancer is generally described as the result of accumulated DNA errors, and the role of carcinogens (cancer-causing chemicals) is often listed as the main cause. However, we can clearly also view the accumulation of DNA errors as an inevitable result of increasing entropy. This explains why cancer is predominantly a disease of old age. As the cancer researcher Robert Weinberg explains: "Cancer is an inevitability the moment you create complex multicellular organisms and give the individual cells the license to proliferate. It is simply a consequence of increasing entropy, increasing disorder. If we lived long enough, sooner or later we would all get cancer." [6]

Interestingly, though, it appears that a certain strain of cancer can avoid the seeming inevitability of entropic damage. In Baltimore in 1951 some cancerous cells were removed (without permission) from a tumour in Henrietta Lacks. Scientists were stunned to discover that these cells were apparently immortal. Whereas normal human cells could survive for only a few days, these cells (known as HeLa, after the initial letters of Henrietta Lacks' name) could survive and replicate without limit. These immortal cells have been grown and distributed around the world, and have been used in countless experiments. Henrietta Lacks left a tremendous legacy to the medical world, and has undoubtedly saved many lives. In many laboratories around the world, Henrietta Lacks continues to live.

So how can HeLa cells be immortal? How can they avoid inevitable damage due to increasing entropy and damaged DNA during replication? Well, the truth is that even HeLa cells are subject to increasing entropy. Cell division in HeLa continues to damage the DNA and produce mutations, which results in new strains. It appears that absolutely nothing can escape the degradation due to the second law of thermodynamics.

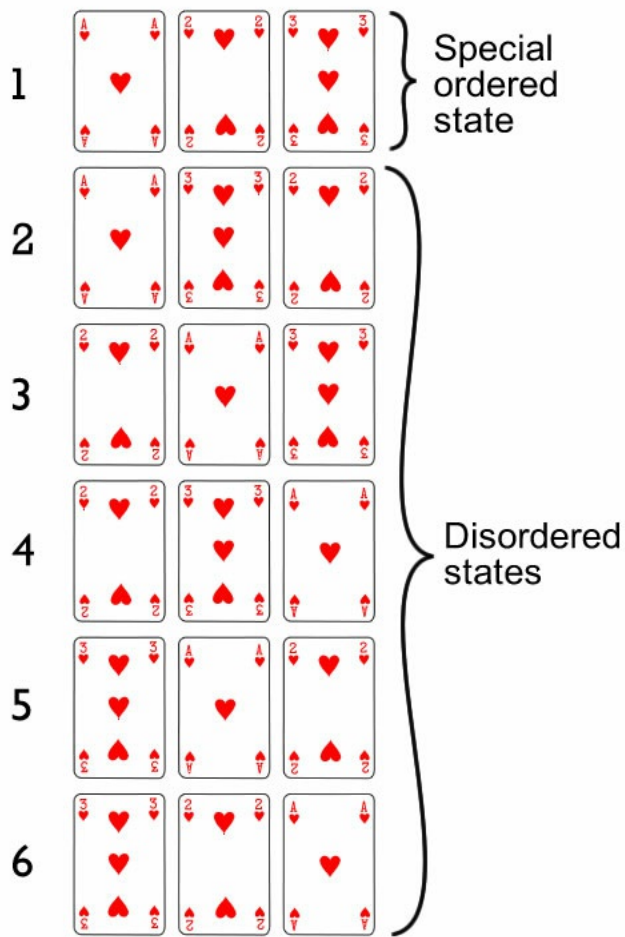
However, there is one example in which it might appear that life provides an exception to the inevitability of increasing entropy. Life has the ability to give birth to new life. And that new life, that new baby, appears perfect and untainted. So how can this apparent circumvention of the second law of thermodynamics be explained?

I do not believe the solution to this question which is generally presented is the correct solution. The usual explanation is that the second law only applies to closed systems, and a human being is not a closed system. A human interacts with its environment: it eats food, it expels waste. The food has grown under the Sun — itself a source of low entropy energy — and the expelled waste has high entropy. So the total entropy of a human system can be reduced through interaction with the environment.

However, as I say, I do not believe this is actually the correct explanation of how entropy is apparently massively reduced during the birth of a new human baby. In order to discover the correct solution, we need to consider *degrees of freedom*.

The number of degrees of freedom of a system is how many independent distinguishing values it possesses which are allowed to vary. That statement is not as complicated as it might sound. Once again, consider a pack of 52 playing cards which has been randomly shuffled. How do we identify one particular ordering of that pack of cards from the random ordering of a different pack of cards? Well, firstly, the two packs might have a different card as the top card in the pack. If the packs have a different top card, then that would certainly allow us to distinguish between the orderings of the two packs. However, if the two top cards are the same for both packs, we would then consider the second card in the packs. Basically, as I am sure you can see, there will be 52 different positions in the pack which will allow us to distinguish between the orderings of the two packs. We could therefore say that each pack has 52 degrees of freedom.

Now let us consider a pack consisting of only three cards: the ace, two, and three of hearts. This pack, therefore, has only 3 degrees of freedom, compared with the 52 degrees of freedom the pack had before. How many different random orderings of this three card pack are now possible? You can see from the following diagram that there are now only six possible different orderings:



One of the orderings — ordering number one at the top of the diagram — is the special, ordered state. But there are now only five other possible disordered states. This is a far fewer number of disordered states than was the case with the 52 card pack. This means the maximum W term (the number of possible disordered states) in Boltzmann's formula for entropy is smaller, and so maximum entropy is reduced.

Now let us return to consider the birth of a human baby. How is it possible that two, wrinkly, middle-aged, entropy-rich parents can create such perfect low-entropy offspring? Well, the degrees of freedom available for describing a baby are far fewer than those available for describing an adult human. Put simply, babies all tend to look quite similar to each other. They have fewer distinguishing features. It is not even possible to determine the sex of a baby from facial appearances.

The available degrees of freedom for describing the few cells of an embryo are even fewer. And — as with our three card pack of cards — fewer degrees of freedom means maximum entropy is reduced. Basically, it becomes impossible to produce a baby with high-entropy distinguishing features, such as wrinkles, or a moustache (unless you are very unlucky). Your baby is going to look pretty much like everyone else's baby. This explains how an ageing couple can produce perfect, low-entropy offspring.

The low entropy of the early universe is often presented as one of the great mysteries in physics. However, perhaps a simple comparison to a newborn baby can cast a light on this mystery.

Let us consider the universe and evaluate how many degrees of freedom it has. In how many ways could we distinguish between one state of the universe and a different state of the universe? Clearly, the number of different values needed to describe a universe is going to be an astronomically huge number. Hence, we could say that the universe has a staggeringly huge number of degrees of freedom.

But what about the first few seconds after the Big Bang? How many degrees of freedom would the universe have

had then? It is likely that the universe would have had far fewer degrees of freedom. The universe was much smoother, being composed of pure energy, with the elementary particles yet to emerge. This embryonic universe resembled a smooth blob, marred only by tiny quantum fluctuations, with few distinguishing features: a true baby universe.

We normally associate a smooth distribution with high entropy, but this is not the case if the smoothness is an inevitable consequence of few degrees of freedom — as is the case with a baby. All babies are smooth, but all babies have low entropy.

So this reduction in the degrees of freedom provides a reason as to why entropy was so low in the early universe. As Roger Penrose explains in his book *The Road to Reality*: "There is a common view that the entropy increase in the second law is somehow just a necessary consequence of the expansion of the universe ... There are comparatively few degrees of freedom available to the universe when it is 'small', providing some kind of low ceiling to possible entropy values, and more available degrees of freedom when the universe gets larger, giving a higher 'ceiling', thereby allowing higher entropies."

As the elementary particles emerged, the maximum possible entropy massively increased. The particles became free to interact via **all** the fundamental forces. One millisecond after the birth of the universe, the strong nuclear force acted to clump quarks together to form protons and neutrons. Gravity acted to clump all particles to form stars and galaxies. Distinguishing features emerged within the universe. But the underlying reason for the low entropy at the very start of the universe was surely the very few available degrees of freedom.

Just as with the universe, a newborn baby is relatively smooth and featureless. However, as the baby matures, it develops its distinguishing characteristics. The baby develops more degrees of freedom. It develops clearer facial definition, it grows tall or short, it develops wrinkles.

All these characteristics are what help to distinguish us from each other. Society views wrinkles negatively, but it is experience which gives us depth and makes us interesting. And so it is with the universe. The universe was born smooth and perfect, but it only became interesting when the wrinkles (stars, planets, life) started appearing. We become more interesting as we age for precisely the same reason that the universe became more interesting.

Unfortunately, the second law suggests the entropy of the universe will continue to increase until it reaches a maximum value of disorder. At that point, all the atoms of the universe will be in a random state, so the universe will all be a constant temperature. At this point, the universe has run down. Nothing will happen in the universe. This fate of the universe has been given the name *heat death*.

To quote Jim Al-Khalili from *Order And Disorder*: "The process of change and degradation is unavoidable. The Second Law says the universe itself must one day reach a point of maximum entropy, maximum disorder. The universe itself must one day die."

Our journey through life matches the journey of the universe. We inhabit a universe which was born as a perfect baby, has its most interesting years during the time it ages and becomes wrinkly, before dying of old age.

In this chapter we have seen it is impossible to define boundaries between ourselves and the external universe. We are all part of the one universe. So, in that sense, the universe is truly a living entity.

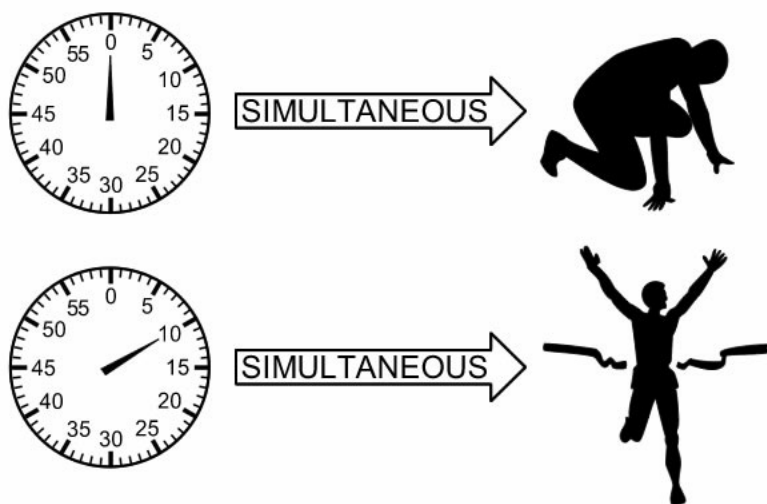


6

TIME AND RELATIVITY

If you remember back to Chapter Three you will recall a lengthy explanation of simultaneity: when events happen at the same time. It was explained how vital simultaneity was in shaping reality for different observers. In this chapter, I want to return to the subject of simultaneity and show how it is completely central to the topic of time.

If we think deeply about time and simultaneity, we can realise that all measurements of time are measurements of simultaneous events. For example, imagine I time a sprinter over a 100m race, and at the end of the race my stopwatch tells me 10 seconds have elapsed. What has actually happened in terms of time? Actually, all that has happened is that two pairs of simultaneous events have occurred. The first pair of simultaneous events was my stopwatch pointing to zero, and the race starting. The second pair of simultaneous events was the winning runner crossing the line and my stopwatch pointing to 10 seconds.



From the existence of these simultaneous events, we deduce something like: "The race took ten seconds", or "ten seconds of time passed". So we make it sound as if time is moving, or passing by, but really all we have is the existence of these two pairs of simultaneous events. There is nothing moving or dynamic here — there is just the existence of events.

Of course, you might want to sub-divide the race into smaller time intervals ("ticks") such as hundredths of seconds. But the same argument applies — you just end up with more simultaneous events. It is very much like frames of a movie: each frame of the movie represents a series of simultaneous events. If you have a sufficiently high frame rate then the scene appears to move. But all that really exists is a sequence of simultaneous events in each frame. All that really exists is the movie reel.

Einstein was well aware of this fact as he explained in his groundbreaking 1905 special relativity paper: "We have to take into account that all our judgements in which time plays a part are always judgements of simultaneous events. If, for instance, I say: 'That train arrives here at 7 o'clock', I mean something like this: 'The pointing of the small hand of my watch to 7 and the arrival of the train are simultaneous events.'"

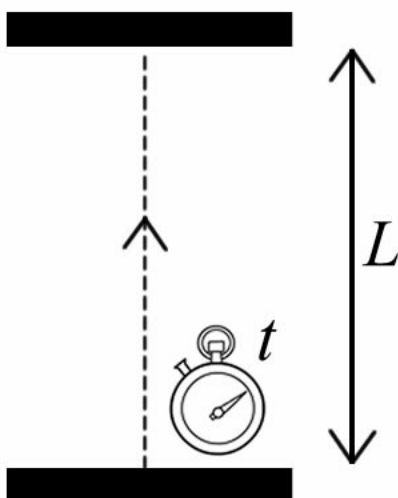
So time itself is defined by simultaneous events. But, crucially, this means that anything that can affect the simultaneity of events can therefore affect time itself. Remembering back to our discussion of simultaneity involving Einstein's thought experiment about the moving train, it is clear just what can affect the simultaneity of events: motion! It was the motion of the train relative to the observer standing on the platform which affected which events Bob and Alice considered to be simultaneous.

So if simultaneity is affected by relative motion, then time itself must be affected by relative motion (remember: time itself is defined by simultaneous events). In that case, how might it be possible to generate quantitative

equations to reveal precisely how much the passing of time is modified for moving observers? To calculate this, we will now follow Einstein's workings by using only high-school mathematics (this adds weight to my contention that, as we get to the most fundamental levels of Nature, the mathematics should become simpler — not more complex).

In order to generate his equation, Einstein considered the light clock which we first encountered in Chapter One. This consists of a ray of light bouncing between two mirrors which are a distance L apart (see the following diagram). This light clock was placed on a train travelling at a constant velocity. The clock was oriented so that the direction the light travels was perpendicular to the direction of motion of the train.

Bob is once again travelling on the train, and his job is to measure the time taken for the ray of light to travel between the two mirrors. This time — according to Bob — was measured as t :

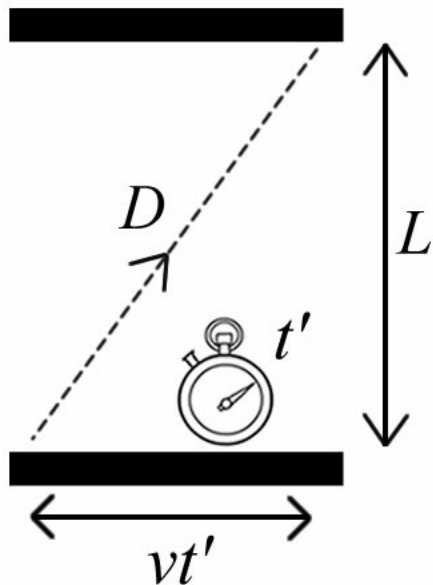


Then from distance = speed \times time we get:

$$L = ct$$

However, to Alice — who sees the train moving — it appears the ray of light has to travel a greater distance. This is due to the additional velocity of the train making the light travel in a longer, angled path (see the following diagram). Alice on the platform measures this new time for the light to travel between the two mirrors to be t' .

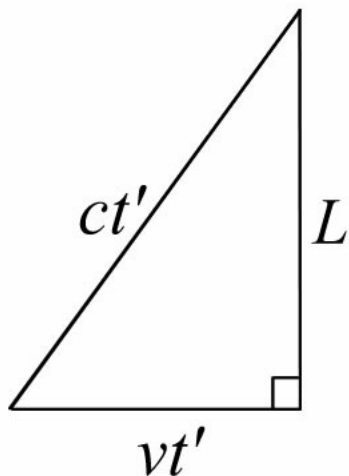
If the speed of the train is v , then the train travels a distance vt' in this time:



Referring to this second diagram, we see that the distance the light now has to travel (according to Alice) is D . Now, remember that all observers will measure the same value for the speed of light. So, according to Alice, the distance D is (from distance = speed \times time):

$$D = ct'$$

If we consider the path of the light as forming the hypotenuse of a right-angled triangle:



We can then apply Pythagoras's theorem to this triangle (you will remember that Pythagoras's theorem says that the square on the side of the hypotenuse is equal to the sum of the squares on the other two sides). So:

$$(ct')^2 = L^2 + (vt')^2$$

From the earlier equation, we know that:

$$L = ct$$

So substituting this value for L into the previous equation gives:

$$(ct')^2 = (ct)^2 + (vt')^2$$

Which gives:

$$c^2 t'^2 = c^2 t^2 + v^2 t'^2$$

Rearranging to get all the t and t' values on different sides:

$$c^2 t^2 = t'^2 (c^2 - v^2)$$

Dividing all terms by c^2 gives:

$$t^2 = t'^2 \left(1 - \frac{v^2}{c^2} \right)$$

Finally, taking the square root of both sides gives:

$$t = t' \sqrt{1 - \frac{v^2}{c^2}}$$

So here we have our final equation describing the phenomenon of time dilation. It shows that the rate that time passes for Bob on the train, t , is less than the rate that time passes for Alice on the platform, t' .

We can see from the equation that the rate at which time slows down for Bob on the train is given by:

$$\sqrt{1 - \frac{v^2}{c^2}}$$

So, if the train is travelling at 80% of the speed of light (it's an unusually fast train), we find time on the train slows down by a rate of:

$$\sqrt{1 - 0.8^2} = \sqrt{0.36} = 0.6$$

Which means that time for Bob on the train will pass at only 60% of the rate that time passes Alice on the platform.

Alice will actually age faster than Bob!

Interestingly, the formula for time dilation seems to indicate that the speed of light represents an ultimate speed limit for all objects in the universe (in the formula, if v was greater than c then we would have to take the square root of a negative number — and you can't do that). But why should the speed of light represent the ultimate speed limit? We will be returning to this question later.

The twin paradox

This principle of time dilation does seem to raise something of a puzzle. Consider a thought experiment involving two twins. One twin stays on Earth while the other twin gets in a spaceship and travels away at a speed close to the speed of light. When the spaceship turns around and returns to Earth, the twin who was in the spaceship finds that he has aged less than the twin who has remained on Earth. This is precisely in accordance with the expected time dilation.

However, the puzzle arises because surely all motion is relative. If that is the case it is just as valid for the twin on the spaceship to consider himself stationary, and the twin back on Earth to be moving at close to the speed of light. This principle of relative motion was expressed by Einstein who, when travelling by train from London to Oxford, asked the ticket inspector: "Does Oxford stop at this train?" Einstein was considering the train to be stationary, and the town to be moving.

So, if the twin on the spaceship considers himself to be stationary, surely he would expect the twin back on Earth to be the one who ages less? After all, it is now the twin on Earth who is doing the travelling.

This apparent paradox is called the *twin paradox*.

The resolution of the paradox comes from realising that the experiences of the two twins are not identical. To be precise, the twin on the spaceship experiences acceleration when he takes off, when he turns around, and when he returns to Earth. He would experience inertial forces due to this acceleration (we will be considering inertial forces in the next chapter). However, the twin who remains on Earth experiences no such acceleration.

Once it is realised that the situation is not symmetrical, the formula for time dilation produces the correct non symmetrical result for the ageing of the twins. [\[7\]](#)

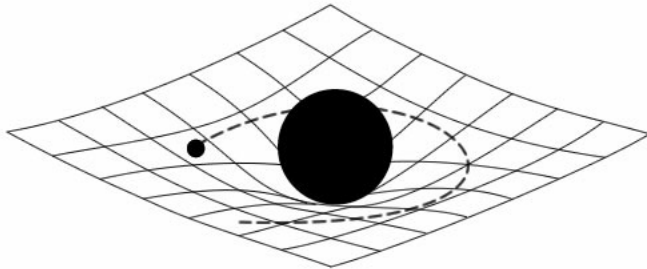
Gravitational time dilation

In this section we will consider a different type of time dilation predicted by relativity: the slowing of time in a strong gravitational field.

In 1915, Einstein published his revolutionary theory of general relativity. General relativity explained the force of

gravity in terms of the curvature of space (or, more precisely, the curvature of spacetime). An object attempting to travel in a straight line in curved space would follow a curved path, and that deflection is interpreted as being due to gravity.

In a famous example, a large mass is placed in the middle of a rubber sheet, deforming the sheet in the same way that mass is known to curve spacetime:



A smaller mass will then appear to orbit the large mass in a circular path, although the smaller mass is really just trying to follow a straight line across a surface which is curved. As Einstein explained: "When a blind beetle crawls over the surface of a curved branch, it doesn't notice that the track it has covered is indeed curved. I was lucky enough to notice what the beetle didn't notice."

Because general relativity predicts the curving of space — the fundamental underlying structure of the universe — it predicts everything will be affected by gravity: even light. In the most extreme example, light is unable to escape from the intense gravitational field of a black hole. This is not due to "light slowing down" due to gravity — after all, light always travels at the speed of light. No, the light is trapped due to the extreme curvature of space at the black hole. Essentially, light would have to travel an infinite distance (due to the curvature of space) in order to escape from a black hole.

So the effect of a strong gravitational field is to curve space so that light has to travel a longer distance between two points than normal (just as a curved road between two points is longer than a straight route). However, we know that all observers have to measure the same speed of light. Therefore, if an observer is measuring the same speed for a light ray — even though it is having to travel a longer distance — then there is only one conclusion we can make: the observer's measuring clock must be running slow (we would obviously usually expect light to take a longer time to travel a greater distance). Hence, a clock runs slower in strong gravity.

This slowing of time in a strong gravitational field is called *gravitational time dilation*.

Hence, gravitational time dilation predicts that time will run faster at higher altitude (further away from the Earth's gravitational pull). With that thought in mind, let us return to the experiment we considered in Chapter One: the experiment in which Joe Hafele and Richard Keating flew four atomic clocks around the world. Because of the cruising altitude of the Boeing 747, gravitational time dilation predicted that the clocks would run slightly faster than clocks which remained at the U.S. Naval Observatory. The results were found to precisely match the predictions of general relativity, and were of similar magnitude to the additional time dilation predicted by special relativity (due to the speed of the aircraft).

Another example of gravitational time dilation is experienced by GPS (Global Positioning System) satellites. GPS satellites orbit 12,500 miles above the Earth's surface, hence our clocks on the surface of the Earth run slightly slower. The clock on the GPS satellite is therefore set to run 45 microseconds per day slower than usual in order to remain synchronized with clocks on Earth. Because of the nanosecond accuracy required by GPS, if this effect was not taken into account, positional errors would accumulate at the rate of ten kilometres per day.

Time travel

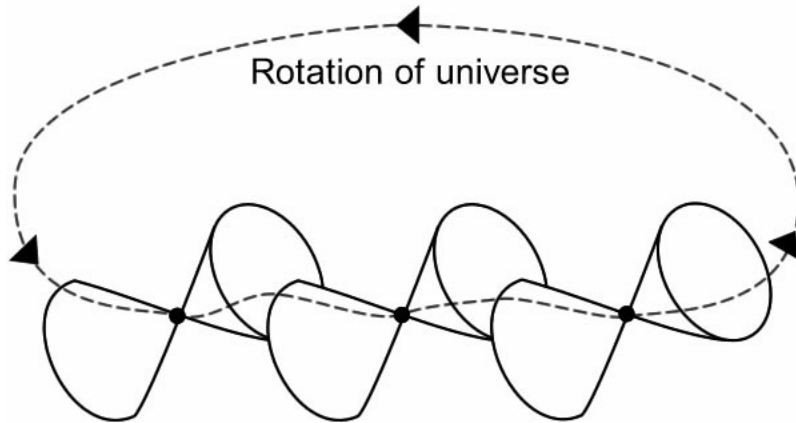
The equations of general relativity describe how spacetime can be curved by the presence of mass. The equations are complex, but precise solutions to the equations have been found for idealised situations in which simplifying assumptions can be made. When Einstein was working in the Institute for Advanced Study in Princeton in the 1940s, one of his colleagues — and best friends — was the great mathematical logician Kurt Gödel (we will be

meeting Gödel again in my next book, *Hidden In Plain Sight 4*). It was Gödel who discovered a solution to the equations of general relativity which first revealed the possibility of time travel to the past.

Gödel's solution was based on the phenomenon of *frame-dragging*. Frame-dragging occurs when a large mass rotates. In that case, general relativity predicts that spacetime in the immediate vicinity of the mass will be dragged around in a circle.

Gödel considered the frame-dragging which would occur in the hypothetical situation of the whole universe rotating. In that case, all of the spacetime in the universe would be dragged around, much like the rotational mixing of a sticky substance in a food mixing bowl. In that case, the future could be bent around so that it connected to the past. By travelling far enough into the future along your timeline, it would then be possible to travel to the past.

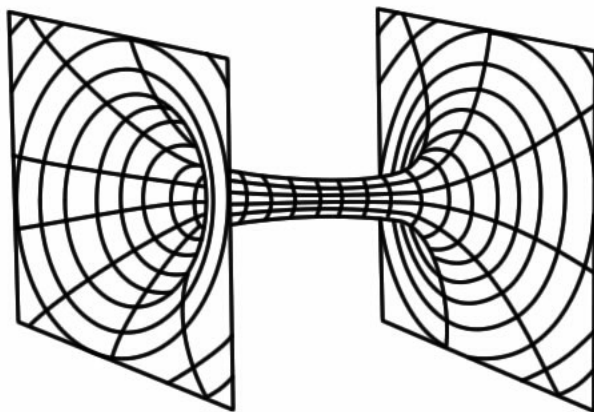
The following diagram (based on a diagram from Paul Nahin's book *Time Machines*) shows how future light cones would be tipped over by frame-dragging, so that the future can point into the past:



It is possible to use the frame-dragging phenomenon to design a time machine. In 1974, the American physicist Frank Tipler published quite specific design details for a time machine.^[8] No one had ever published such a paper in a prestigious physics journal before. Tipler's time machine proposal required a long, very dense cylinder rotating with a surface speed of at least half the speed of light. The resultant frame-dragging around the cylinder would result in a similar time loop to the one generated in Gödel's universe. As Tipler says at the end of his paper: "In short, general relativity suggests that if we construct a sufficiently large rotating cylinder, we create a time machine."

No one disputes Tipler's claim — it really is a blueprint for a time machine.

Another time machine proposal comes from a solution to the general relativity equations by Albert Einstein and Nathan Rosen. Their solution resembled a tube effectively providing a shortcut between two regions of spacetime. This was called the *Einstein-Rosen bridge*, though John Wheeler popularised the name *wormhole*:



By creating a shortcut in spacetime, wormholes raise the possibility of travelling great distances in space in a very short time. This possibility was explored in Carl Sagan's novel *Contact* (and later film of the same name). In the

book, a radio telescope in New Mexico receives a coded transmission from extraterrestrial beings. The decoded message forms instructions to build a vehicle which is used to transport five passengers through a wormhole to a planet near the distant star Vega — in merely a few seconds. After spending several hours on the alien planet, the travellers return to Earth to discover that only a few seconds have elapsed on Earth since their voyage began.

This plot hints that wormholes can also be used for travelling in time as well as space. Indeed, assuming that it is possible to create a traversable wormhole, it would be a fairly straightforward procedure to turn that wormhole into a time machine. The following procedure was described by Kip Thorne in his book *Black Holes and Time Warps*. A wormhole has two mouths and there is no obvious connection in space between the two mouths: if I step through one mouth of the wormhole, I immediately emerge out of the other mouth. With no obvious connection between the two mouths, the two mouths can be moved quite independently of one another. To turn our wormhole into a time machine, one mouth must be kept on Earth, while the other mouth is sent away on a spaceship at a speed approaching the speed of light (this is treating the wormhole mouth very much like one of the twins in the previous thought experiment). Time dilation ensures that time passes more slowly for the wormhole mouth travelling on the spaceship. So when the spaceship returns to Earth, if you walked through the wormhole on the spaceship, you would return to an earlier time.

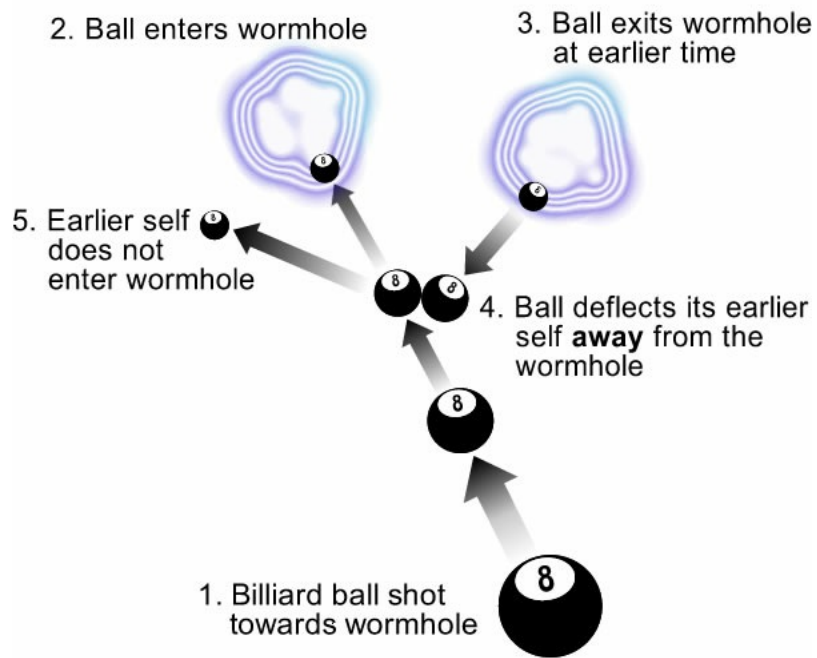
All these time machine proposals raise problems as they introduce the possibility of changing the past. If it is possible to change the past then that could potentially lead to the *grandfather paradox*. The grandfather paradox considers the possibility that you use a time machine to travel back in time to kill your own grandfather before you are conceived. However, if as a result of you murdering your grandfather, you are not conceived then you would not have been able to travel back in time. Hence, this results in a paradoxical situation.

From the point of view of this book, the ability to change the past poses a particular problem. All through this book, the block universe structure has been presented as a static, unchanging block of spacetime. There is no possibility of altering any aspect of the structure — it is as if it is carved in stone. However, if it is possible to travel back in time to change the past then this appears to disprove the whole block universe argument.

Fortunately, as we shall now see, the solution to the grandfather paradox also solves the apparent problem with the block universe model.

Another form of the grandfather paradox was proposed in 1990 by Joe Polchinski, then a professor of physics at the University of Texas. What was ideal about Polchinski's paradox was that it avoided any questions about human free will (would you really be able to kill your own grandfather?). Hence, the paradox could now be analysed purely from a physics viewpoint.

The reason Polchinski's paradox did not involve human free will was because it did not involve humans. Instead, it involved billiard balls. The paradox considered a billiard ball rolling along a billiard table and entering a wormhole mouth at the far end of the table. It is then possible for that billiard ball to travel back in time and emerge out of the second wormhole mouth. Polchinski's paradox considered the situation in which the second wormhole mouth was also positioned on the billiard table. What would happen if, when the billiard ball travels back in time and emerges out of the second wormhole mouth, it collides with its earlier self and deflects its earlier self away from the wormhole? It would appear the ball is prevented from entering the wormhole in the first place. This would result in a paradox very similar to the grandfather paradox. If the billiard ball is prevented from ever entering the wormhole because it is deflected, then it cannot emerge from the second wormhole mouth and deflect itself.



It would appear that this scenario would raise a clear paradox. It would also not be reconcilable with the block universe model. It would appear that such a scenario could not occur in reality. Does this mean wormholes cannot exist? Or that the block universe model is wrong?

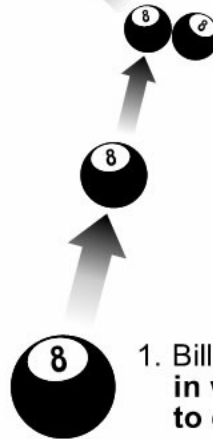
Fortunately, it has been realised that it is possible to travel back to the past — and even affect past events — without introducing paradoxes. Consider the previous billiard ball example again. When the ball travels back to the past and emerges from the wormhole, it is possible that it deflects its earlier self **into** the wormhole, instead of **away** from it:

2. Ball enters wormhole

3. Ball exits wormhole at earlier time



4. Ball deflects its earlier self **into** the wormhole



1. Billiard ball shot **in wrong direction to enter wormhole**

There is now no paradox in this result. It is also a situation which can exist in a block universe: the past is affected, but events which have already occurred (i.e., set in stone in the block universe) have not been altered.

This principle in time travel — that only situations can occur which do not result in paradoxes — is called the *Novikov self-consistency principle*.

7

INERTIA

In this chapter we will be considering motion. There is an inextricable link between time and motion. Motion is defined as the variation in position of an object at different times. So without time, there can be no motion. It could also be argued that without motion, there can be no time. As Richard Wolfson describes in his book *Simply Einstein: Relativity Demystified*: "The study of motion is profound, for several reasons. First, motion is the source of all change. Imagine a world without motion: Earth stops rotating, so it's perpetual daytime. Atoms cease moving, so there's no chemistry — no release of energy. Nothing evolves, transforms, mutates, develops, or otherwise changes. What does it mean to move? It means getting from one place to another, and doing so in some time. Whatever else motion means, it involves passing through time and through space. **So motion holds the key to understanding time and space.**"

In this chapter we will be paying attention to a particular kind of motion called *inertial motion*. Inertial motion is the motion of an object which is not being acted-on by any force. The resultant inertial motion is actually very mysterious. For example, if you were travelling at constant velocity on a very smooth train, you could consider yourself to be in inertial motion. As a result, as long as the train is smooth enough, you would not feel as if you were travelling at all! So this clearly raises some fascinating and important questions about the nature of motion, and what it means to be "moving".

Inertial motion seems to be telling us something very profound about the nature of time and space. In the next chapter, it will become clear as to why inertial motion is so important for our understanding of time.

Perpetual motion

The Greek philosopher, Aristotle, wondered if there was a "natural state" of motion. As Richard Wolfson again explains, the natural state of motion would be a state which requires "no explanation — a state that an object naturally assumes unless something is explicitly done to it, like pushing or pulling it." To this end, Aristotle considered moving objects, such as a block of wood being pushed along a table, and saw that all such moving objects eventually came to a halt. Hence, Aristotle believed that any moving object would eventually slow down and come to a halt — unless it was acted upon by a constant force to keep it in motion.

From this observation, Aristotle believed he could deduce the natural state of motion. As Aristotle observed that it required a force to maintain an object in motion, he believed the natural state of motion was to be stationary. A stationary object is to be expected — it requires no explanation. Whereas if you see a moving object, you could reasonably seek an explanation, an answer to the question "What is making it move?"

Aristotle's argument regarding the natural state of motion was convincing, and remained dominant until Galileo performed his experiments of motion. According to Galileo: "Ignorato moto, ignorator natura", a Latin phrase which translates to "He who fails to understand motion, fails to understand Nature." We considered the principle of Galilean relativity in Chapter Two. It is Galilean relativity which introduced the world to the principle of inertial motion.

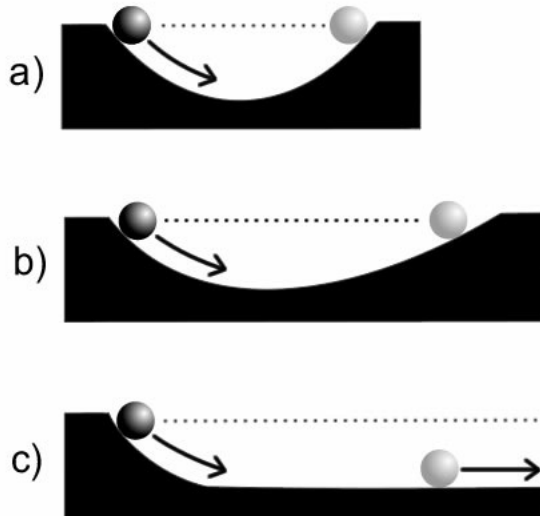
If you remember, Galilean relativity states that the laws of motion are the same for all observers who are moving at a constant velocity. There is no experiment you could perform to determine if you were stationary or moving at constant velocity.

It is this movement at constant velocity which is inertial motion. If it is impossible to distinguish between being stationary and being in inertial motion, then clearly an observer moving with inertial motion will feel stationary (otherwise it would be possible to detect the motion). So Galilean relativity reveals that an observer moving at constant velocity (inertial motion) will feel stationary.

It is the principle of Galilean relativity which is the reason why the geocentric model of the universe proved dominant for so long (rather than the heliocentric model being adopted). This is because the early astronomers were fooled by the undetectable inertial motion of the Earth. Because the Earth orbits the Sun at a constant, smooth velocity, and because the astronomers moved at the same rate as the Earth, they were fundamentally unable to detect its motion: they felt stationary. Indeed, the notion that the Earth orbits the sun would have appeared an absurd

suggestion to them. [9]

Galileo then considered Aristotle's concept of a natural state of motion. If you remember, Aristotle believed that the natural state of motion was to be stationary, as a moving object would tend to become stationary. However, Galileo performed an ingenious series of experiments which led him to a different conclusion. These experiments of Galileo are illustrated by the following diagrams:



As shown in Figure a), Galileo rolled a ball down a slope and discovered it rose to the same height up an opposite slope. As shown in Figure b), if Galileo increased the distance between the slopes, the ball still rose to the same height up the opposite slope — but it obviously had to travel further. As shown in Figure c), Galileo then reasoned that if there was no opposite slope, the ball would travel forever as it would be forever unable to reach the initial height up the slope.

Galileo's conclusion was remarkable. It suggested that an object moving horizontally in a straight line would continue indefinitely. At this point, you might raise an objection. Surely motion cannot continue indefinitely without continually providing some energy to the system? In raising this objection, maybe your instincts have been biased by some of the crazy designs for perpetual motion machines which are all doomed to failure.



It is certainly true that it is not possible to build a practical perpetual motion machine. Such a device would crank round a few times before seizing to a halt. The reason why all these machines fail is because they do not take into account the force of friction. Friction converts kinetic energy into heat energy which is radiated from the system. This loss of energy results in the inevitable slowing of the system.

However, if it could be possible to eliminate the force of friction from the system then the motion of the machine would indeed continue forever — as predicted by Galileo. For example, flywheels have been built which float on superconducting magnets (virtually frictionless) and are sealed in a vacuum to eliminate air resistance. These flywheels will keep spinning for a period (the so-called zero-load rundown time) of many years. If such a device could ever be made completely friction-free then it would, indeed, be a perpetual motion machine. In fact, electric currents (the flow of electrons) in superconducting materials can continue in motion indefinitely — a form of perpetual motion which is already with us.

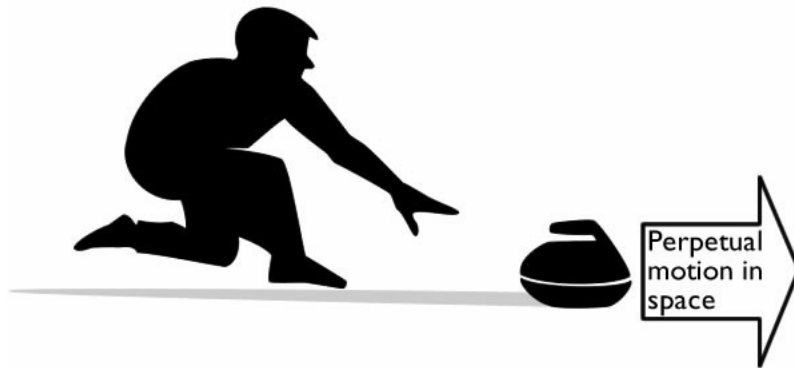
The notion of perpetual motion might seem very wrong and alien to us. Our worldview has been so shaped by all the tales of doomed perpetual motion machines that we instinctively discard any notion that perpetual motion — of any kind — might be possible. On the basis of this discussion, however, we find that **perpetual motion is not only possible, it is natural.**

Earlier in this section we considered Aristotle's argument that the natural state of motion was to be stationary — as it required no explanation. Now, however, we see that Galileo proved Aristotle to be wrong. As Richard Wolfson states in his book *Simply Einstein*, Galileo showed that "motion itself needs no cause or explanation ... motion is natural." According to Galileo, the natural state of motion is no longer being stationary — the natural state is motion at a constant speed in a straight line, in other words the natural state of motion is inertial motion. This is a hugely important result, and we will return to it later in this book:

The natural state of motion is not being stationary, it is constant velocity in a straight line (inertial motion).

This principle is called *inertia*. The discovery of inertia was Galileo's greatest contribution to physics.

You have probably seen the Olympic sport of curling, in which a granite stone is sent sliding across ice. The stone travels at low speed, but the almost frictionless ice ensures the stone hardly slows down at all. This is an excellent example of inertia. If we could imagine a perfectly frictionless form of ice then it is clear that the stone would travel at its low speed forever:



Galileo died in 1642, the same year that Isaac Newton was born. When Newton started as a student in Trinity College in Cambridge University he found that the curriculum was still dominated by the thinkings of Aristotle. Newton introduced the college to the new developments of Copernicus and Galileo.

Newton accepted Galileo's conclusions about the laws of motion, and built on them himself to produce his three laws of motion which form the basis of classical mechanics:

1. Every object in a state of uniform motion tends to remain in that state of motion (or remain at rest) unless an external force is applied to it.
2. Forces act to accelerate objects. The acceleration is proportional to the force which is applied, and inversely proportional to the mass of the object: $F=m \times a$
3. For every action there is an equal and opposite reaction.

Newton's first law of motion is just a restatement of Galileo's concept of inertia, and so the first law is often called the "law of inertia". The word "inertia" comes from the Greek word for "laziness", and we can see where this comes from. The definition of inertia is that an object likes to continue in its state of motion — be that moving or remaining stationary — unless a force acts on it.

Newton's three laws of motion defined our conception of mechanics for the next three hundred years.

Inertial mass and gravitational mass

Einstein's great talent was for identifying a simple, unifying link between two seemingly distinct effects. This talent was clearly shown when he realised that the force due to gravity was indistinguishable from the force due to acceleration. This led to the theory of general relativity (for details, see my previous book). This realisation allowed Einstein to unify two properties which, for centuries, had been considered to be distinct: inertial mass and gravitational mass.

The *inertial mass* of an object determines its resistance to acceleration, i.e., its inertia. Newton's second law of motion says that the acceleration experienced by an object is inversely proportional to the inertial mass of that object.

It might seem strange to us now, but after Newton published his laws of motion and his law of gravitation, it was considered that the inertial mass of an object might well be different from the mass of the object which attracted other objects: the *gravitational mass*. After all, the two effects — acceleration and gravity — were considered to be completely distinct effects. There was no obvious reason why the object might not behave differently when subjected to the two different forces.

Of course, when Einstein realised that the force due to gravity was completely equivalent to the force experienced during acceleration this removed the centuries-long distinction between gravitational mass and inertial mass. An object is now considered to have just one single value for its mass, and this is used for calculations of both acceleration and gravity.

However, experiments have continued to test if any difference between gravitational and inertial mass can be

detected. In 1885, the Hungarian physicist Roland Eötvös (pronounced "urt-vursch") proposed the most famous of these experiments, an experiment which is now known simply as the Eötvös experiment. The experiment uses a balance (called a *torsion balance*) on which masses are dangled on a piece of string which can rotate. The outward force on the masses (due to centrifugal force) would be dependent on the inertial mass. The downward force on the masses is dependent on the gravitational mass. The masses are carefully selected so that the string will not rotate if the inertial mass is precisely equal to the gravitational mass so that the effects cancel each other. The torsion balance at the University of Washington is so sensitive that it can tell if it has rained recently as the extra water in the soil has an increased gravitational pull on their equipment.

But there is a simpler way to test if inertial mass is equal to gravitational mass. Newton's laws of motion only deal with inertial mass, the second law stating that a force applied to an object will produce an acceleration according to $F=m_i \times a$, where m_i is the inertial mass. On the surface of the Earth, for a falling object, we can equate this force to the force of gravity:

$$m_i a = \frac{GMm_g}{R^2}$$

Where m_g is the gravitational mass, M is the mass of the Earth, and R is the radius of the Earth. If inertial mass equals gravitational mass then $m_i = m_g$, and the two terms cancel from the equation. We are left with a formula for the acceleration due to gravity on the surface of the Earth:

$$a = \frac{GM}{R^2}$$

There is no term in this formula which is dependent on the mass of the falling object — the only mass featured in this equation is the mass of the Earth. So this indicates that — if inertial mass really is equal to gravitational mass — all masses will fall at the same rate (just as Galileo demonstrated on the Leaning Tower of Pisa centuries ago).

So it is possible to test the equivalence of inertial and gravitational mass just by checking if all masses fall at the same rate, and this test can be performed with great accuracy. The Center of Applied Space Technology and Microgravity (ZARM) in the University of Bremen is dominated by a 146-metre-tall drop tower which provides 9.3 seconds of free-fall during which experiments can be performed. Many different fields of research use the weightless environment. Various masses have been dropped to see if they all fall at the same rate, and no discrepancy has been found:



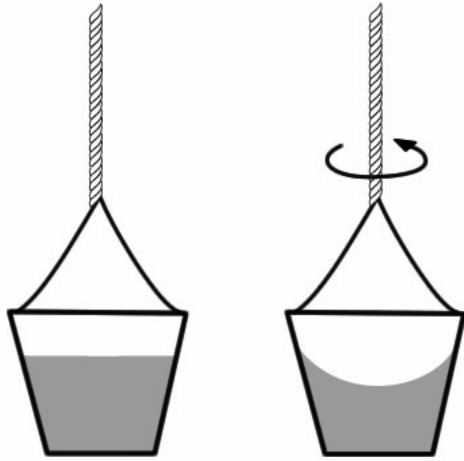
In all these experiments, the inertial mass and the gravitational mass of various elements has been found to be identical to 13 decimal places. Almost certainly, no difference will ever be found.

Inertial forces

Consider a question, the answer of which might appear quite obvious at first glance, but is not as simple as it might appear. The question is: how do you determine that an object is moving? If you look out of your window, for example, you might see a bird flying past. It would appear easy to tell that the bird is moving. But why should the bird not consider itself to be stationary, and it is you who are moving? In other words, if motion is relative, how is it possible to tell what is stationary and what is moving?

In this case of the bird, it would appear that it is possible to tell that the bird is moving relative to the trees and buildings around it. In other words, both the bird and the observer could agree that the bird is moving relative to its **immediate environment**. So motion relative to the immediate environment would appear to be a way to definitively determine if an object is moving.

However, Newton raised an objection to this apparent importance of the immediate environment. He described an experiment in which a bucket containing water was spun at speed at the end of a rope. The water starts to spin within the bucket:



If all motion was relative, then we would be justified in considering the water to be stationary and the rest of the universe revolving around the water. However, the water does not behave as if it is stationary — the water surface becomes concave and climbs up the sides of the bucket (see the second bucket in the previous diagram). Somehow Nature can tell that the water is moving.

From our previous discussion about the bird outside your window, we can see that the obvious way to determine that the water is moving is to consider its motion relative to its immediate environment. However, the immediate environment of the water is the sides of the bucket, and the water is not moving at all relative to the sides of the bucket (the water is rotating at the same speed as the bucket). So the principle of using the immediate environment to determine the relative motion of an object is not applicable in all cases.

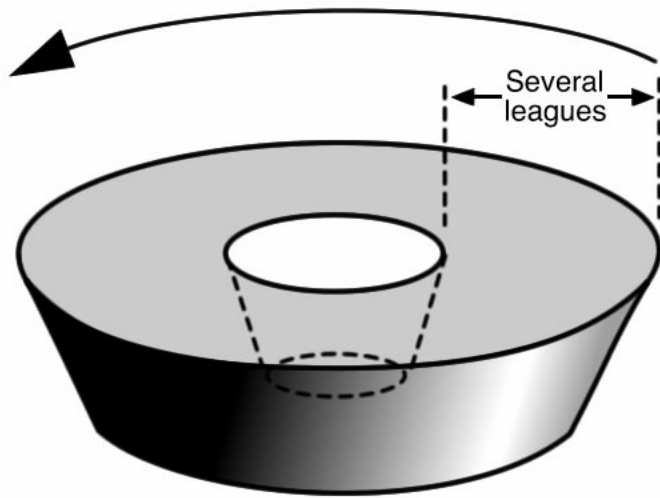
Newton took this result as being evidence for absolute space. According to Newton, absolute space permeates the universe and provides an absolute reference for motion. Nature can determine that the water is rotating relative to absolute space, and this is the reason the water rises up the sides of the bucket.

Newton's bucket argument was so convincing that absolute space was accepted as the true model of space for 200 years, until an alternative was provided by the Austrian physicist Ernst Mach in the late 19th century.

In his career, Mach contributed much to physics. You will recall the speed of supersonic aircraft being referred to as "Mach 1", "Mach 2". Those terms are named after Ernst Mach whose experiments in supersonic velocity included the definition of the *Mach number* — the ratio of a projectile's velocity to the speed of sound. But it is Mach's insights into the nature of space — and the cause of inertial forces — which interests us here.

Mach considered the conclusions Newton drew from his bucket experiment and decided Newton was too quick to disregard the effect of the environment. True, the water was not rotating with respect to the immediate environment, but there were many more objects in the environment than just the bucket. For example, there is the planet Earth, or the planets, or the fixed stars in the sky. And these distant objects would possess vastly more mass than the sides of the bucket. Maybe they were more influential? Maybe Nature could detect that the water was rotating relative to this more distant, hugely more massive environment?

So Mach considered the situation in which the sides of the bucket were much larger, more distant, possessing hugely more mass:



What would happen now when this massive bucket rotates with the water? As Mach wrote in *The Science of Mechanics* (1883): "No one is competent to say how the experiment would turn out if the sides of the vessel increased in thickness and mass until they were ultimately several leagues thick."

It is now believed that, if the sides of Mach's bucket really were sufficiently huge, spacetime would be dragged around inside the bucket at the same angular velocity as the water. As a result, the water inside the bucket would, indeed, **not** rise up the walls of the bucket. This is the frame-dragging effect (a phenomenon described in the previous chapter on time machines). NASA's Gravity Probe B satellite was sent into orbit in 2004 to see if it could detect frame-dragging of spacetime by the rotation of the Earth. The experimental equipment consisted of four extremely sensitive gyroscopes — the most perfectly spherical manmade objects ever created. Essentially, the Earth performed the role of Mach's huge bucket, and the four gyroscopes on the satellite performed the role of the water in the bucket, detecting any evidence of frame-dragging. In 2011 it was announced that the experiment had successfully measured frame-dragging due to the rotation of the Earth — the first time the effect had been detected.

So Mach believed that motion of an object could be defined relative to all the other masses in the universe, and this was the cause of inertia — the reason you feel a force when you are accelerated. Nature can detect the change in your velocity relative to all the other objects in the universe. As Mach was quoted as saying: "When the subway jerks, it's the fixed stars that throw you down."

Einstein was heavily influenced by the work of Mach. As with Mach, Einstein was also not convinced by Newton's concept of absolute space. However, this idea of Mach's — of the fixed stars billions of miles away having an instantaneous effect on your velocity — sounded far too much like Newton's instantaneous action-at-a-distance theory of gravity.

So Einstein proposed a gravitational field which spread throughout space. This gravitational field controlled the motion of masses. An object in free-fall would follow the field lines of this gravitational field. If an object was accelerated, it would cross the field lines of the gravitational field (essentially the definition of acceleration — a deviation from free-fall motion). Nature could then determine an object was being accelerated.

This, then, provides an explanation for the inertial force you experience when you are accelerated. The physicist John Stachel has coined the term *inertio-gravitational field* for this reason. Just as Einstein revealed the equivalence between gravity and acceleration, and the equivalence between inertial mass and gravitational mass, so the term "inertio-gravitational field" stresses that just the one field is responsible for both inertial and gravitational forces.

John Woodward, in a paper entitled *What is the Cause of Inertia?*, is in no doubt: "What is the cause of inertia? Gravity." [\[10\]](#)

Imagine you are a Grand Prix motor racing driver driving at speed around a tight corner. Your car — and your body in the cockpit — changes direction around the corner, and therefore it is deviating from the normal free-fall direction of travelling in a straight line. This means the car is crossing inertio-gravitational field lines: it is accelerating. However, your head is sticking out of the cockpit and wants to continue in free-fall inertial motion in a straight line down the road. The stress this causes in your body — as if your head is being pulled off — is the inertial force felt during acceleration.

The force the driver feels is often described in terms of *g-force*, maybe 3g, 4g, or 5g. A force of 1g is defined as being equal to the force due to the force of gravity, so the concept of g-force again reveals the link between gravity and inertia.

So the sideways force you feel as you drive around a corner at speed is actually the force of horizontal gravity!

But what determines the shape of the inertio-gravitational field? The curvature of the gravitational field is inevitably determined by all the other masses in the universe. After all, the distant stars may be billions of light-years away, but we are still affected by their gravity — as weak as it may be. All the masses in the universe are inevitably affected by the gravitational pull of all the other masses in the universe. So the strength and direction of the gravitational field at any point is determined by the distribution of masses in the rest of the universe.

In this way, general relativity is very much Machian in nature. In the absence of absolute space, the inertial forces you feel are inevitably controlled by the position and distribution of the fixed stars because these celestial bodies determine the shape of the inertio-gravitational field throughout the universe. Of course, the greatest influence on the gravitational field in our immediate vicinity is provided by the planet Earth. And the resultant force of gravity we feel directed towards the centre of this planet is usually the greatest inertial force we experience.

Unless you are a Grand Prix driver.

8

THE UNIVERSAL SPEED

In the course of the previous chapters, we have gained a working understanding of the phenomenon of time dilation. In Chapter Six we derived the formula to determine how time slows down for a moving object. This was based on the principle of relativity, the principle that all the laws of physics should be the same for all observers. In turn, that implies that the measured speed of light should be the same for all observers. We have noted that this reminds us of the Copernican principle: no observer holds a privileged position in the universe. No observer is special — all observers are equal. This seems very much like a fundamental principle which would necessarily be true.

However, there are several indications that we have not yet got to the bottom of the mystery of relativity. Specifically, the centrality of the speed of light in all this seems rather puzzling. Why should electromagnetic radiation (light) play a role in determining the passage of time? Why does the speed of light appear to represent an absolute speed limit for all objects in the universe? Is there perhaps some deeper principle at play here which we need to uncover?

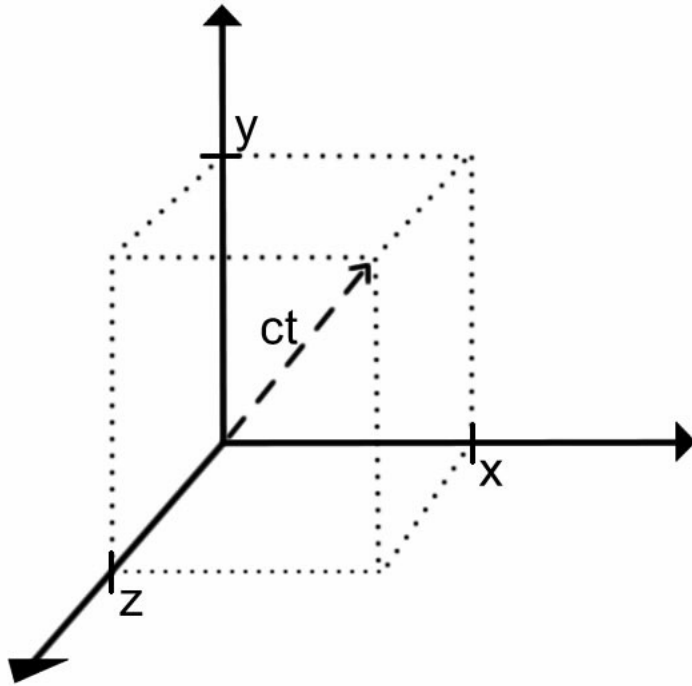
In this chapter, we start to get some answers ...

The first thing we need to consider is how we might go about creating a mathematical model of spacetime. If we manage to create a mathematical model then we can analyse it and hopefully gain a deeper understanding of its properties.

But how on earth are we to combine measures of space and measures of time in order to create a model of a combined "spacetime"? To quote Brian Cox and Jeff Forshaw from their book *Why Does $E=mc^2$* : "If distance in space is measured in meters and distance in time in seconds, how can we even begin to contemplate combining the two. It is like adding apples and oranges, because they are not the same type of quantity."

The one piece of absolutely vital information we can use is that all observers — no matter how they are moving — must measure the same value for the speed of light. So, as speed represents a connection between distance and time, this could potentially provide the means for combining space and time into spacetime.

Imagine there is a flash of light at the origin of our coordinate system. In the following diagram, the path of light is shown by the dashed arrow coming from the origin.



The sphere of light in three-dimensional space will expand outwards and, after a period of time t , will have a radius of ct . Considering the diagram, and using Pythagoras's theorem extended to three dimensions, we get:

$$x^2 + y^2 + z^2 = (ct)^2$$

which gives:

$$x^2 + y^2 + z^2 - (ct)^2 = 0$$

The expression on the left hand side of this equation is very important. Because all observers will agree on the measured speed of light, all observers will agree on the value of this expression. Also, we see the expression combines measurements of both space and time. So this is a combination of space and time on which all observers can agree. The square root of the value of this expression is given the name *spacetime distance* (or the *spacetime interval*), though this "distance" value actually combines both space and time.

Now, this is where things start to get really interesting. Because, as described in the previous chapter, every observer in inertial motion considers himself to be perfectly stationary — it is all the other objects which are moving relative to you. Essentially, in the previous diagram, this means you are permanently placing yourself at the origin of the coordinate system and everything else in the universe is defined relative to your position. In the previous formula for spacetime distance, this means that your values for x , y , and z are all zero (because you do not move relative to yourself). But, if you consider the formula for spacetime distance, you will see that if x , y , and z are all set to zero then the value of the distance in spacetime does not become zero — it becomes equal to ct .

What does this mean? It means that even if you are perfectly stationary, the spacetime distance you travel is equal to ct , which is the speed of light multiplied by time. This can only mean one thing: even when you feel stationary,

you are moving in spacetime at the speed of light! In fact, in the next section we shall see that everything moves through spacetime at the speed of light.

At last, this is a remarkable result which seems to reveal a deep truth about the nature of time. As Brian Cox and Jeff Forshaw say in their book *Why Does $E=mc^2$* : "The statement that everything moves at the same speed through spacetime sounds rather profound."

Why can't you travel faster than light?

It might seem surprising to hear that all objects move through spacetime at the speed of light. After all, we obviously see various objects (cars, birds, etc.) moving around us at different speeds. However, crucially, note that these objects are moving at different speeds in **space** — not in **spacetime**. Once time is taken into account, and we consider the combined speed of these objects in a spacetime composed of both space **and** time, then we find that everything is moving at the same speed. As Brian Greene explains in his book *The Fabric of the Cosmos*: "The combined speed of any object's motion through space and its motion through time is always precisely equal to the speed of light."

How can this be? How can considering time as well as space make all the difference? Well, it is because of time dilation: an object which is moving relative to an observer will experience less time. So, to put it simply, **an object which is moving faster through space will move slower in time**. If an object is moving at a fixed speed — the speed of light — in spacetime then this effect is inevitable. After all, there is only enough speed to go round. If an object uses up the majority of its speed to travel through space, then it has less speed left over to travel through time.

As Brian Cox and Jeff Forshaw explain: "This newfound way of thinking about how things move through spacetime can help us get a different handle on why moving clocks run slow. In this spacetime way of thinking, a moving clock uses up some of its fixed quota of spacetime speed because of its motion through space and that leaves less for its motion through time."

So the principle that everything travels at the same speed in spacetime predicts time dilation: a reduction in measured time for a moving object. And if we calculate the amount of time dilation predicted by this principle we find it is exactly the same amount predicted by special relativity. However, this new, simple principle is surely the true principle which lies behind relativity.

This principle is explained in the following YouTube video *Why can't you go faster than light?* by Prof. Don Lincoln from Fermilab:

<http://tinyurl.com/lightlimit>

If the previous link is broken, then the following link should always work:

<http://tinyurl.com/lightlimit2>

At the start of this chapter, a couple of relativity-related questions were posed. It was wondered why electromagnetic radiation (light) should play a role in determining the passage of time. Also, it was wondered why the speed of light should appear to represent an absolute speed limit for all objects in the universe. It was suggested that there was maybe a more fundamental principle that we were missing that might provide the answers.

Well, now we have our more fundamental principle, and now we have our answers. **Everything** moves at the same speed in spacetime — not just light. There is nothing special about light. Light does not play a central role in determining the passage of time.

So why does light feature in most descriptions of special relativity? This is because light is unusual in that it has no mass. This means that light is free to travel at the maximum speed through space (mass normally acts to restrict speed through space). Hence, all of light's speed through spacetime is directed through space, and none of its speed is directed through time. As a result, light does not experience the passing of time.

This means that light's speed through spacetime is very obvious to our eyes — it is the same as its speed through space. So out of all the objects in the universe, only light appears to be travelling at this magical universal speed. Whereas, in fact, everything is travelling at this universal speed — in spacetime.

So the speed of light is not a universal speed limit at all, it is just the speed that everything is moving — in spacetime.

With this insight, I would suggest we no longer refer to objects travelling at the speed of light but instead we should refer to the *universal speed* — the speed at which everything travels in spacetime.

But, of course, this is not the whole story. The truth is surely that the true fundamental principle behind relativity is the Copernican principle. In spacetime, no point is preferred, no observer is special, and all observers move at the same speed in spacetime. Every object is treated exactly the same. Every object moves at exactly the same speed.

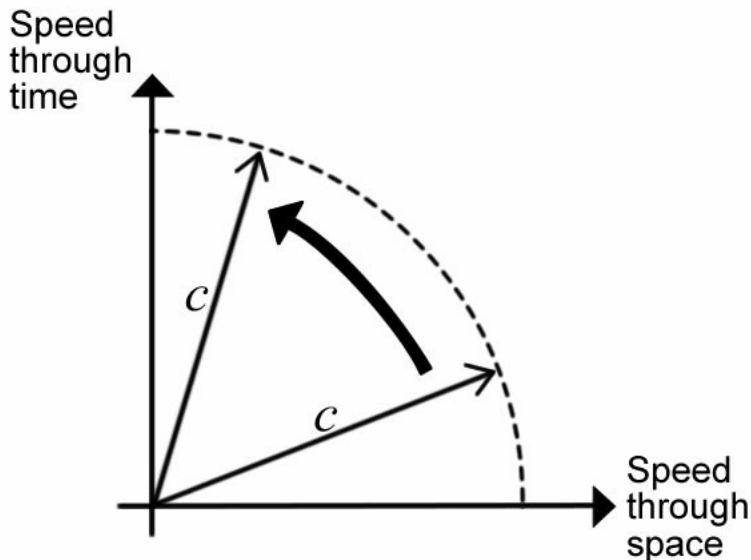
In human society, rich people can move faster by buying expensive cars and planes. However, physics recognises no such inequality. In physics, everyone — and every object — is equal. Everyone is treated the same. The laws of physics are the same for everyone. Everyone ages the same as entropy takes its toll equally. Under the laws of physics, everyone moves at the same speed in spacetime. You cannot buy a faster car to drive through spacetime more quickly. This is the true essence of the egalitarian Copernican principle.

The world of physics is a more equal world.

Sliding through time

Let us now consider an object which slows down as it travels through space. Its motion in spacetime is shown in the following diagram.

Initially, the object's speed arrow in spacetime is pointing to the right, showing that most of its speed is through space. However, as the object slows, its speed arrow in spacetime rotates anticlockwise so that less of its speed is through space, and most of its speed is through time:

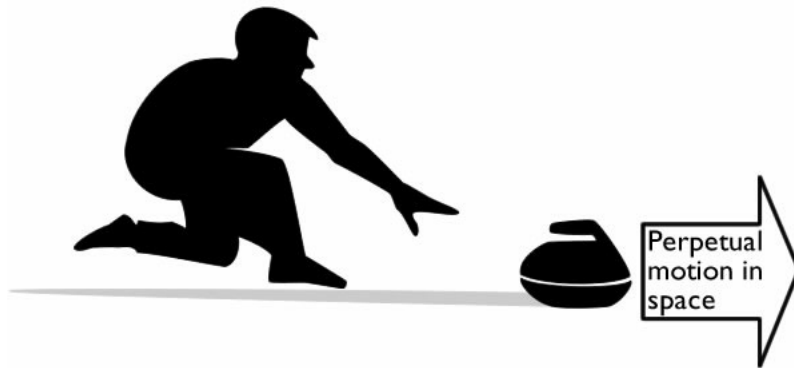


So as you see objects slowing down or speeding up, what is actually happening is that their speed arrow in spacetime is rotating. But the actual speed of the object through spacetime is unaffected (the length of the speed arrow remains unchanged).

Now, this is interesting. Perhaps we can obtain further insights from this approach.

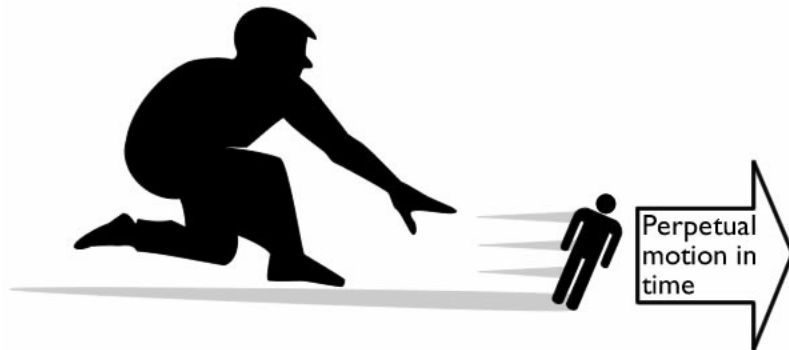
The principle that all objects move at the same, constant speed in spacetime is interesting. If they are moving at the same constant speed — never slowing down — then this sounds very much like a form of perpetual motion. Even when objects appear to be slowing down, all that is really happening is that their speed arrow is rotating in spacetime. And where have we heard about perpetual motion before? Well, in the last chapter on inertia it was revealed that the natural state of motion is perpetual motion. We now see this is true: the natural state of motion is perpetual motion in spacetime.

In the previous chapter, the example was presented of curling: if the ice was completely frictionless then the stone would continue its perpetual motion forever.



However, as the stone eventually slows (due to friction) its speed arrow rotates in the anticlockwise direction. Eventually, the stone appears to stop. However, the magnitude of the speed arrow in spacetime is unaffected, and the stone therefore continues to move **in time** at the universal speed. So what has really happened is that the inertial, perpetual motion of the stone in space has rotated to become inertial, perpetual motion in time.

So this gives us a tremendous insight. The motion we feel in time — the passage of time — is caused by our inertial motion in time! The principle which is causing our motion in time is the same principle which ensures the curling stone slides forever across frictionless ice. It is as if we are sliding through time!



Just as the perpetual motion of the curling stone across the frictionless ice is natural motion which requires no additional source of power, so our perpetual motion through time requires no additional power. It is the natural state of motion.

TIME AND ENERGY

Throughout this book, it has been found that by considering the motion of objects we have obtained insights into the nature of time. From considering curling stones on ice, to trains on railway tracks, we have discovered the similarity — and symmetry — between motion in space and motion in time. In this chapter we are going to consider two more related properties of objects in motion: their energy and momentum. We will see if these properties can provide further insights into the nature of time.

It was Rene Descartes and Isaac Newton who first identified the property of momentum of a moving object. Momentum is the property you get when you multiply the mass of an object with its velocity. For example, a heavy lorry moving fast would have a lot of momentum. So the formula for momentum is mass multiplied by velocity: mv .

Momentum does not just have a numerical value, it always has an associated direction. Essentially, this means that momentum is always represented by an arrow (an arrow has both a magnitude (length) and a direction). The correct technical term for such an arrow is a *vector*. Momentum is a vector quantity.

Perhaps the most interesting feature of momentum is that it is always conserved, which means the total momentum of a closed system does not change with time. In collisions, momentum can be transferred from one object to another, but if you add up all the momentum of all the objects you will find the total momentum before the collision is equal to the total momentum after the collision.

This principle that momentum is always conserved leads us to think that momentum represents some important underlying feature of Nature. We will see later just how important this is.

Momentum is even conserved in situations in which all the objects are initially stationary — such as an explosion. Imagine a stick of dynamite standing in a stationary position on a table. Nothing is moving, so the total momentum of that system is zero. When the dynamite explodes, fragments will shoot out at great speed to the left and right, and up and down. So it might appear that momentum is not conserved here because a stationary situation has transformed into a situation with a great deal of motion. However, remember that momentum is a vector quantity: it is represented by arrows. The momentum of a fragment which shoots out to the left can be represented by a vector of a certain length pointing to the left. Similarly, the momentum of a fragment which shoots out to the right can be represented by a vector of a certain length pointing to the right. If we add a vector pointing to the left with a vector pointing to the right then they cancel each other out and the sum total is zero. So if we correctly consider all the momentum of all the exploding fragments as vectors shooting out in all directions, we will find the sum total is again zero. So total momentum is conserved even in the case of an explosion.

But, here is an interesting thought. Imagine a car driving along a road at a constant speed. It clearly has momentum. It also clearly has an amount of kinetic energy, the energy associated with movement. We could tie a rope to the back of the car and, as the car pulls on the rope, it could make a windmill spin. So we could use the energy of the car to do work. This all makes sense and probably fits with your intuitive notion of momentum and energy.

However, as we discussed in the second chapter, we also know that all motion has to be relative — there is no such thing as absolute motion in the universe. With this in mind, imagine you are driving alongside the first car, and you choose a constant speed which precisely matches the speed of the first car. Now, as you look across to the first car, it no longer appears to be moving: it appears stationary. In fact, as far as you are concerned, the first car **is** stationary. With no observer having precedence in the universe, your viewpoint is just as valid as the viewpoint of any other observer. So, as far as you are concerned, the first car now has no momentum, and it has no kinetic energy. For example, if you have a windmill on your car, you could no longer use the energy of the first car to turn the blades of your windmill — the attached rope would be slack.

So this reveals that the momentum and kinetic energy of an object are completely observer-dependent, which might come as something of a surprise (it is something they don't tell you in school!). This also seems to point to a possible connection between momentum and energy, which we will discover shortly.

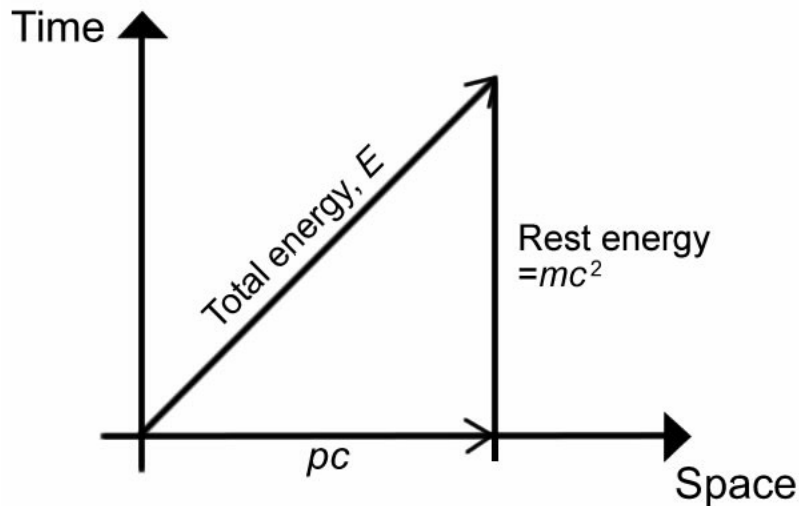
However, as we discussed in the previous chapter, everything travels at a constant speed in spacetime: the speed of light. Motion in space is really just a shadow of true motion in spacetime. So this observer-dependent impression of the momentum and energy of the car in space is not the whole story. To see the whole story we have to consider the motion of the car in spacetime — not just in space.

Once again, imagine you are driving alongside the first car, and you are driving at precisely the same constant speed as the first car. As you look across, the first car appears stationary. In fact, in your frame of reference, the first car **is** stationary. But, as we discussed in the previous chapter, we know that everything moves at the speed of light in spacetime. So what has effectively happened here is that — as far as you are concerned — the spacetime velocity vector of the car has rotated so that it no longer points in space, but now points only in time. In other words, the first car — which you see as stationary — must now be moving at the speed of light through time. This provides us with a general result: **a stationary object moves through time at the speed of light**. The only reason the object appears stationary to our eyes is because we are travelling through time at exactly the same speed!

But momentum is associated with motion (remember: momentum is mass multiplied by velocity). Admittedly, momentum is usually only associated with motion through space. However, in our new spacetime model, we might now reasonably ask what is the momentum of the car through time. The answer, fairly obviously, is that momentum is the mass of the object multiplied by its speed through time. So for a stationary object, momentum through time is given by the mass of the object multiplied by the speed of light: mc .

Now, this is interesting. The momentum through time of a stationary object is mc . What other property of a stationary object do we know? Well, Einstein showed in his famous equation $E=mc^2$ that the total energy of a stationary object (its *rest energy*) is equal to mc^2 . This indicates that if we consider the momentum of an object through time, and multiply that value by the speed of light, we obtain the total energy of that object. This seems to indicate that **we can consider energy to be momentum in the time direction**.

We can show this relationship between momentum and energy in a spacetime diagram. The following diagram takes into account an object's motion in both space and time. It has just been explained how we can consider energy to be momentum in the time direction, so the rest energy of a stationary object (mc^2) is drawn in the vertical direction. Momentum in space is drawn in the horizontal direction:



The total energy of a moving object is a combination of that object's motion through space (its momentum) and its motion through time (its rest energy). On the diagram, you can see that this total energy, E , is a combination of those two types of motion, and is shown by the diagonal arrow. It is clear that we can calculate the length of the arrow from Pythagoras:

$$E^2 = (mc^2)^2 + (pc)^2$$

This is a hugely-important equation called the *energy-momentum relation*. It reveals the relationship between energy, mass, and momentum, and it applies to absolutely everything in the universe, from a car driving along a road to the energy and momentum of light itself.

Let us consider some examples of the use of this equation. Firstly, if we consider a stationary object which has

mass — for example, a block of wood on a table — that object has no momentum in space so $p=0$ in this case, and the equation reduces to $E=mc^2$, the famous formula for the energy of a stationary object. So that is correct.

Let us now consider the other extreme, an object which is moving at the maximum speed through space: the speed of light. So what moves at the speed of light? The answer is in the question: light moves at the speed of light. Let us consider the particles which make up light which are photons. Photons are massless, which is the reason light can travel vast distances from the stars. So, for a single photon, $m=0$ in the equation, and the equation then reduces to $E=pc$, which is known to be the correct relationship between energy and momentum for a photon (yes, even though photons are massless they still have energy and momentum).

So the energy-momentum relation is correct for the two extremes, and for everything else in between.

Why does $E=mc^2$?

Let us now consider what we have discovered about the nature of energy, and, in particular, what we have discovered about $E=mc^2$.

$E=mc^2$ is perhaps the most famous equation in physics. As the amount of mass in this formula is multiplied by the incredibly huge value of the square of the speed of light, this formula reveals that a small amount of mass can be converted to a tremendous amount of energy. This is the principle behind nuclear power and nuclear weapons. As Andrew Steane says in his book *The Wonderful World of Relativity*: "This means that the total daily energy production of all the power stations in the world could in principle be obtained from just 14 kilograms of raw material."

How are we to make sense of this formula indicating that there is an equivalence between mass and energy? Some puzzling questions might include "How can an amount of mass at rest contain such a huge amount of energy?", and "Why does the speed of light feature so prominently in an equation linking mass and energy?"

Well, armed with the insights we have gained so far, we can now provide answers to these questions.

In the previous chapter it was shown that all objects travel at the speed of light in spacetime. This principle implies that all the spacetime speed of a stationary object must be directed through time: a stationary object moves through time at the speed of light.

So this, then, provides the answer to the mystery of $E=mc^2$. A stationary object is, in fact, far from stationary: it is speeding through time at the speed of light. It is this tremendous momentum in the time direction that results in a mass at apparent rest containing a huge amount of energy. As Richard Feynman said, this is "an energy that a particle possesses from its mere existence." [\[11\]](#)

And this reveals the secret as to why the speed of light appears in the famous equation linking mass with energy.

So, by considering all objects as moving at the speed of light through spacetime, we are shedding light on numerous mysteries. As Carl Brannen has said: "Various odd attributes of the theory of relativity, such as the huge amount of energy present in matter, and the impossibility of matter exceeding the speed of light, become natural consequences of a universal speed for all matter and energy." [\[12\]](#)

The antimatter connection

It is clear that there is an important connection between time and energy. Let us now further examine that connection by considering a few very simple thought experiments. These will reveal remarkable and simple logical connections between time, electric charge, energy, and the remarkable substance known as antimatter. Even though it might appear that the concepts of time, charge, energy, and antimatter are very complicated, the extraordinary simplicity of the following thought experiments will show that the connection is actually surprisingly simple and logical.

Firstly, let us consider two electrically-charged particles: a proton (which is positively charged) and an electron (which is negatively charged). The rule is that opposite charges attract, so in the following diagram we see motion of the electron towards the proton:



Now let us imagine exactly the same situation but with the direction of time being reversed (for example, we might have recorded a video of the previous example and are now playing the video in reverse):



As you can see in the previous diagram, with time being reversed, we see the motion in the opposite direction: we will now observe the electron moving away from the proton. Where there used to be an attraction, there is now a repulsion.

This might appear to be trivial and obvious because it is so simple, but actually it reveals a very fundamental symmetry between time and electric charge: it reveals that if we reverse the direction of time — and also reverse the electric charge of a particle — then the situation will be unchanged. [13]

So if we reverse the direction of time, we can apparently change a negatively-charged electron into a positively-charged electron. And that is very interesting, because we know that a positively-charged electron already exists and has been detected in experiments: it is called a *positron*. A positron is an example of *antimatter*. It is believed that every particle has a corresponding antiparticle which has opposite charge. The antiparticle is then an example of antimatter.

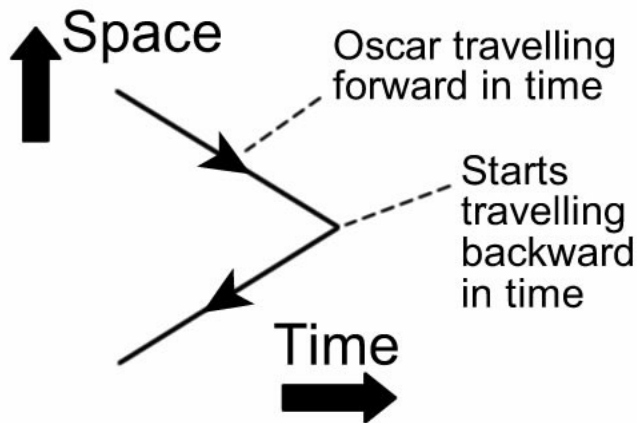
This principle (of reversed time producing antimatter) is described by Lisa Randall in her book *Warped Passages*: "Imagine a movie of a current of negatively-charged electrons travelling from one point to another. Now imagine running the movie in reverse. Negative charge would then travel backwards, or equivalently (so far as charge is concerned), positive charge would travel forwards. A current of positrons, the positively-charged antiparticles of electrons, produces this positively-charged forward-travelling current and therefore acts like a time-reversed electron current."

Antimatter is used as a common theme in science fiction, but it is most certainly a real substance and is even produced naturally in radioactive decay (a banana will produce one positron every 75 minutes or so). However, antimatter is very rare — and for good reason: when antimatter comes in to contact with normal matter they destroy each other, releasing a tremendous amount of energy in the form of gamma rays (high-energy light). In fact, antimatter releases more explosive energy than anything else in existence (an antimatter bomb would be 1,000 times more powerful than the atomic bombs dropped on Hiroshima and Nagasaki).

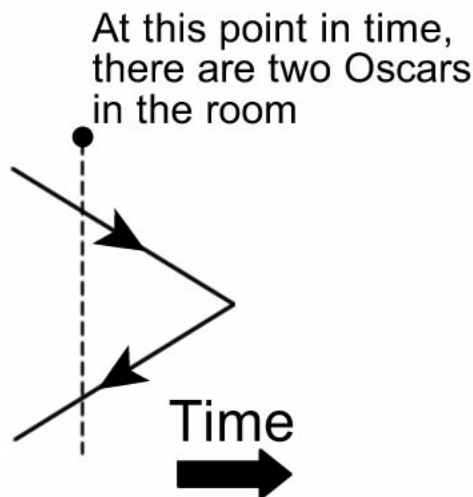
Now let us perform another simple thought experiment, which will reveal another highly-surprising connection between antimatter and reversed time. In this experiment we will discover just why matter and antimatter annihilate each other.

The following example is taken from a 1962 paper in the *Journal of Philosophy* written by the American philosopher Hilary Putnam.[14] The paper considers the strange adventures of a time traveller called Oscar Smith.

Let us examine the situation in more detail. The following diagram is a spacetime diagram showing the path of Oscar in space and time. We can see Oscar travelling forward in time, as he walks across the room. At a certain point, he starts travelling backward in time (the hands on his watch start to turn in reverse, for example) as he continues to walk across the room:



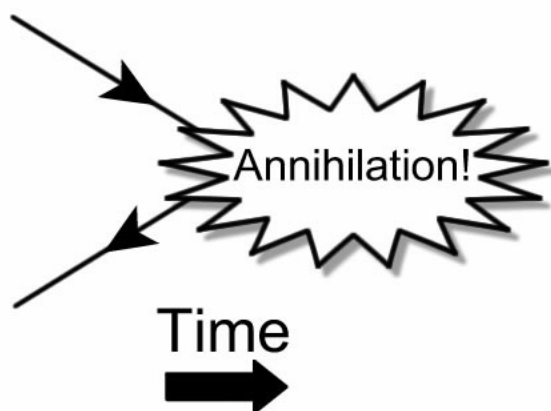
If we are an external observer, what would we see? Well, clearly — and remarkably — there would be a point in time (shown by the dotted line in the following diagram) when we observe two Oscars in the room! One of the Oscars would be travelling forward in time, and in a different position in the room we would observe the second Oscar travelling backward in time:



It is crucial to note that although there are two Oscars in the room at that point in time, they are in fact both the same man!

Now, we know from our previous analysis that a particle which is travelling backward in time is the antimatter equivalent of that same particle travelling forward in time. So can we consider the second Oscar — travelling backward in time — to be the antimatter equivalent of the first Oscar who is travelling in the forward time direction? Let us continue our analysis to see if this is the case.

What else do we observe in the room? Well, as time progresses, we observe the two Oscars moving closer together (the second Oscar moving backward in time, walking in reverse toward the first Oscar). You will then see from the spacetime diagram that when the two Oscars eventually meet, they do not appear to exist on the spacetime diagram after that point in time. It is as though they both vanish into thin air!



As Hilary Putnam says in his paper: "When the two systems merge, they are both annihilated".

So this does, indeed, resemble the behaviour of antimatter. Remember that when antimatter comes into contact with normal matter they both annihilate each other and cease to exist.

So, rather wonderfully, purely by considering two simple thought experiments we have managed to discover a connection between antimatter and reversed time, and we have found a simple explanation for the apparent annihilation of antimatter and normal matter. And I can assure you that this all represents orthodox scientific thinking (treating antimatter as the time-reversed equivalent of normal matter was first suggested by the great physicists John Wheeler and Richard Feynman).

It might be imagined that the connection between an exotic material such as antimatter and the direction of time, and the reason why antimatter annihilates normal matter would be an incredibly complex question. However, as we have seen, we can deduce the connection from some incredibly simple reasoning. I think this lends weight to my belief that — as we get to the lowest, fundamental levels of physics — we find physics gets simpler, not more complicated.

These insights into the behaviour of antimatter and time are intriguing. But what can they tell us about the existence of the universe itself?

The dawn of time

Fourteen billion years ago, the explosion of the Big Bang saw the universe expand from a point of extremely high density and pressure. All the material of the universe came into existence at this point. It is believed that matter and antimatter were created in perfect balance.

In our discussion of the arrow of time in Chapter Five, it was explained how the laws of physics work the same in the backward time direction as in the forward time direction: there is perfect symmetry along the time axis. If we are considering antimatter to be the time-reversed equivalent of normal matter then it is clear why matter and antimatter were created in perfect balance: there is a perfect symmetry in time.

However, we know that if matter and antimatter come into contact then they annihilate each other and all that is left is radiation. So why didn't the matter and antimatter present in the earliest moments in the life of the universe simply annihilate each other, just leaving us with a universe made of light?

Well, there was indeed a huge annihilation of matter by antimatter. But it does appear that there was a very slight imbalance in the annihilation process leaving us with a universe with a slight surplus of matter. No one knows why this slight imbalance occurs, but Einstein summed up the process: "For every one billion particles of antimatter there were one billion and one particles of matter. And when the mutual annihilation was complete, one billionth remained — and that is our present universe."

So, to sum up, it is clear that time plays an integral role in the existence of the universe. It appears that our universe needs time in order that a perfect balance can exist between the positive and the negative. We should be very glad that such a balance can exist, because it appears to be the reason that our universe can exist at all.

But we should also be glad that there was the slightest imbalance in the process of antimatter/matter annihilation, for if that imbalance had not been present then there would be no matter in our universe. And we would not exist.

It appears that balance in our universe is vital for its existence, but it is the slight imbalances that make it such an interesting place to live.

FURTHER READING

Introducing Time by Craig Callender and Ralph Edney

An excellent illustrated book about the physics and philosophy of time.

Simply Einstein by Richard Wolfson

The best introduction to relativity.

Time Machines by Paul J. Nahin

A comprehensive compendium of time machines in science fiction, which also includes a surprisingly strong technical section.

The Feynman Lectures on Physics by Richard Feynman

<http://www.feynmanlectures.caltech.edu/>

Released online for the first time. Volume One is relevant to the material this book.

The Reference Frame by Luboš Motl

<http://motls.blogspot.com>

High-level analysis of the latest physics developments written by a divisive character.

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Einstein optical illusion based on an original idea by Akiyoshi Kitaoka.

Photograph of Drop Tower Bremen is courtesy of ZARM, University of Bremen.

NOTES

[1] The period of the swing is actually only accurate if the amplitude of the swing is not too large. The shorter the swing, the greater the accuracy of the clock.

[2] Ben Majoy, *Redefining Time*, <http://www.vice.com/read/time-redefined>

[3] http://en.wikipedia.org/wiki/Rietdijk-Putnam_argument As the talk page states: "The Andromeda Paradox is a form of the argument in which two people at the same place and instant have two different universes attached to them."

[4] In his 1913 novel *The World Set Free*, H.G. Wells also uncannily anticipated the development of nuclear power and nuclear weapons, a novel which even influenced the American atomic bomb programme.

[5] James Hartle, *The Physics of 'Now'*, <http://arxiv.org/abs/gr-qc/0403001>

[6] George Johnson, *Unearthing Prehistoric Tumors, and Debate*, New York Times, December 27th 2010.

[7] Note that, contrary to what many popular science books state, it is not necessary to use general relativity in this situation involving acceleration. Special relativity is sufficient. General relativity would only need to be used if the spacetime was curved.

[8] Frank Tipler, *Rotating Cylinders and the Possibility of Global Causality Violation*, <http://tinyurl.com/tiplercylinder>

[9] Actually, a rotating object is not travelling at constant velocity, but is continuously accelerating towards the centre of rotation. The Earth's rotation has the effect of slightly reducing the pull of gravity, but this was undetectable to the early astronomers.

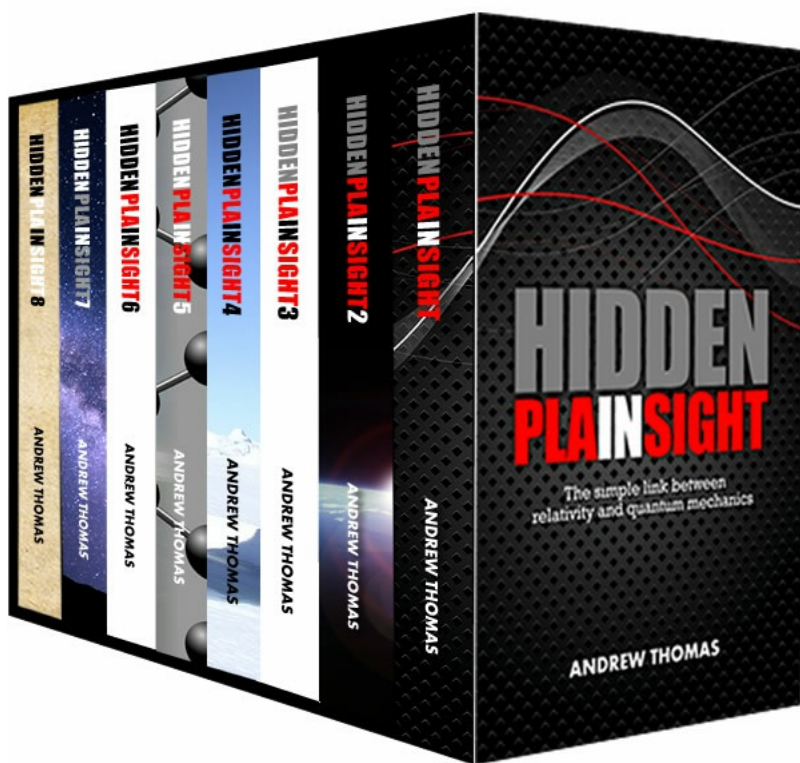
[10] John Woodward, *What is the Cause of Inertia?*, <http://tinyurl.com/inertiapaper>

[11] Richard Feynman, *The Character of Physical Law*

[12] Carl Brannen, *The Proper Time Geometry*, http://brannenworks.com/a_ptg.pdf

[13] The full symmetry is called *CPT symmetry*, meaning that the situation will be changed if the charge (C), parity (P), and time (T) are all reversed.

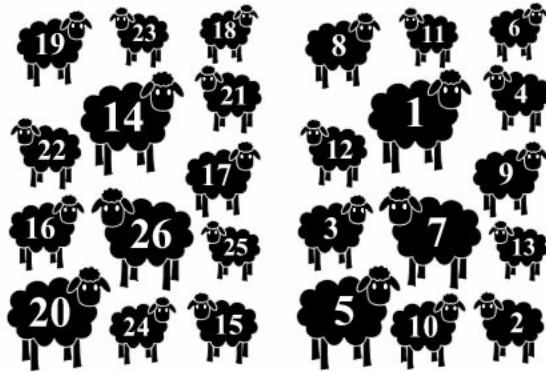
[14] Hilary Putnam, *It Ain't Necessarily So*, <http://tinyurl.com/putnamtimetravel>



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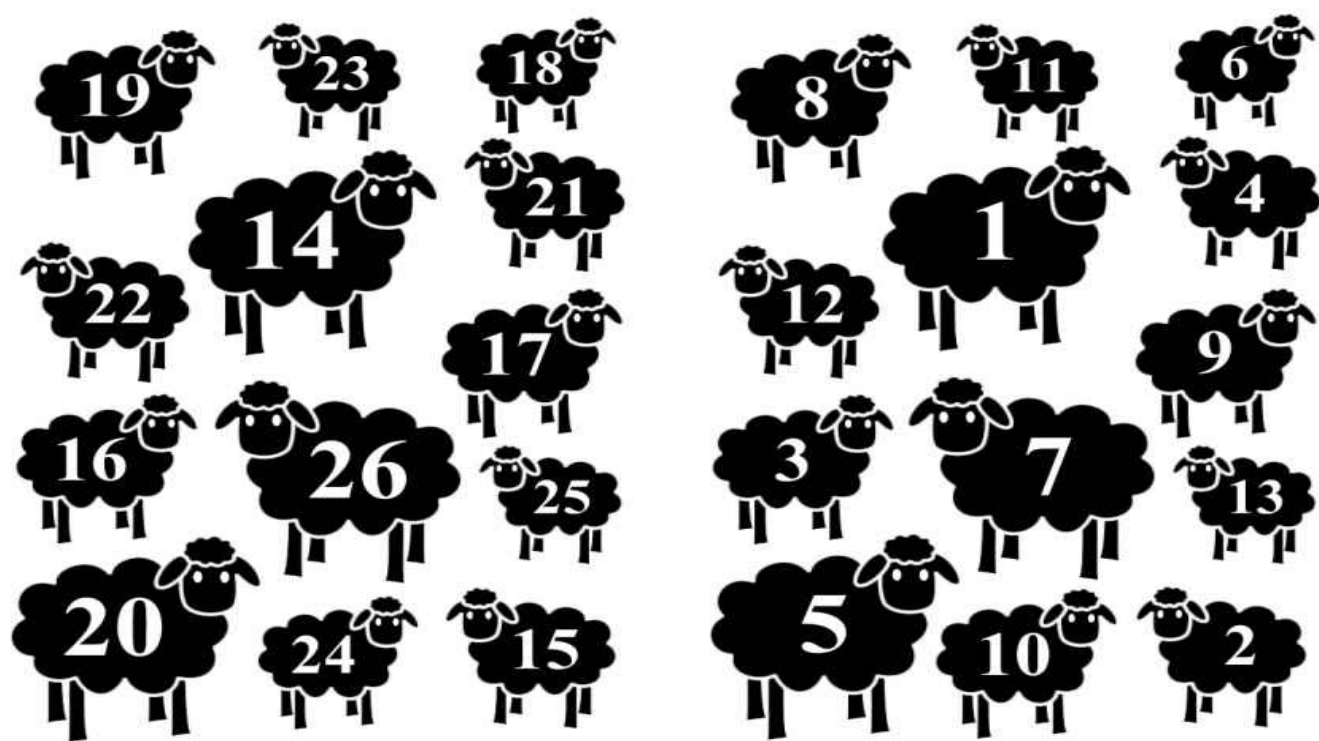
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ANDREW THOMAS

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The Uncertain Universe

Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

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The Uncertain Universe

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CONTENTS

1) LAS VEGAS

The clockwork universe
"What hath God wrought?"

2) THE UNCERTAIN QUANTUM

The uncertainty principle
Schrödinger's waves

3) COPENHAGEN

Einstein's box
Is the Moon there when no one is looking at it?
The EPR paradox
Bell's theorem
Fundamental uncertainty

4) VIENNA

The certainty of mathematics
The Barber of Seville
Principia Mathematica
Gödel's incompleteness theorem
The uncertain century

5) THE COASTLINE OF BRITAIN

The butterfly effect
Strange attractors
Fractals
The Mandelbrot set
Fractal dimensions
At the mercy of chaos

6) HOLLYWOOD

The Matrix
Simulacron-3
The Thirteenth Floor

7) LEVELS OF INFINITY

[Counting to infinity](#)

[The number larger than infinity](#)

[Levels of infinity](#)

[Cantor, Gödel, ... and Turing](#)

[The only certainty is uncertainty](#)

"Uncertainty is the only certainty there is,
and knowing how to live with insecurity
is the only security."

— John Allen Paulos

1

LAS VEGAS

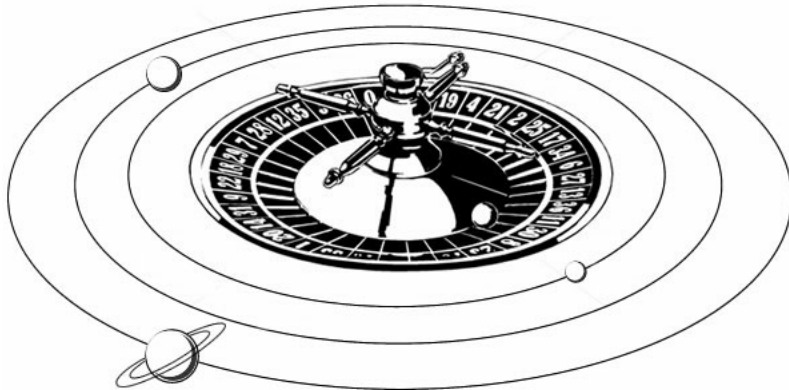
It is the summer of 1975 in Portland, Oregon.

Straight-A physics student Norman Packard is wondering how he might make some easy money over the summer months. With this in mind, he has started reading a book called *Beat The Dealer* written by Edward Thorp. The book details how it can be possible to win at blackjack by counting the cards which have already been played. If enough cards can be remembered, it is possible to gain a small percentage advantage over the house. Packard has an excellent head for numbers, however, when he tried the card-counting method in a casino he found the results to be disappointing — leading eventually to losses.

Feeling despondent over his failure, Packard turned his attention to other games and had a brainwave: he could use his knowledge of physics to win at roulette. Specifically, he knew that the roulette wheel and ball had to move according to Newton's three laws of motion and his law of universal gravitation. If it was possible to measure the speed at which the ball was thrown and the speed at which the wheel was spun then it should be possible to predict the outcome.

Indeed, in his book *The Newtonian Casino*, Thomas Bass describes how a roulette wheel resembles the motion of planets under gravity: "The game of roulette, with a ball revolving around a spinning disk, resembles a model universe governed by the laws of Newtonian mechanics. Planetary ball circles solar disk until gravity sucks it out of orbit and pulls it down to stasis."

The following diagram shows the planets orbiting a spinning roulette wheel:



The first step was to determine the feasibility of the project. Was there enough predictability in the spin of a roulette wheel?

In order to determine this, Packard decided to measure the speed of the ball when it was thrown around the wheel. If there was too much unpredictable variation in the speed of the ball, the plan was not going to work. Packard went to real gaming tables in Las Vegas and clicked a hidden microphone in his hand each time the ball completed one revolution of the wheel. On returning to his hotel room, Packard played back the tape and measured the time between the clicks. In this way, Packard could determine not only the velocity of the ball, but could also calculate the amount the velocity decreased between each revolution. Crucially, Packard discovered that the deceleration of the ball was consistent: "As soon as you realise that there is this layer of predictability in the dynamics of the wheel and the ball then that opens the door to having the possibility to beat the game."

At this point, Packard knew the potential was there. But he also knew that a lot of work was required if he was to beat the casino. Packard called on the help of his best friend from childhood, Doyne Farmer, who was now a physics undergraduate at University of California, Santa Cruz. He managed to sell his idea to Farmer by emphasizing the intellectual aspects of the project. According to Packard: "I was interested in the intellectual interest of conquering

randomness, or understanding exactly what were the limits of randomness and predictability."

However, there was also another — less worthy — motivation: "It seemed like a great idea to rip off casinos, who get so much pleasure out of ripping off everyone else."

While the prediction of the particular winning number would be beyond their capabilities, Packard and Farmer aimed to predict the area of the wheel in which the ball would land. They divided the wheel into eight areas called *octants*, each octant containing about five numbers. Ironically, a great advantage was provided by the random arrangement of the numbers on the wheel. If the numbers in a particular octant on the wheel are considered, those numbers appear to be in a completely random arrangement when laid-out on the betting table. This meant it was going to be harder to detect their method.

First, Farmer went to the main supplier of roulette wheels in Nevada and obtained a casino-grade roulette wheel. It cost \$1,500 which represented the life savings of the two undergraduates. They arranged for the wheel to be shipped to Portland. However, at this point the FBI became suspicious and interviewed Farmer about his motives.

Farmer tried to convince the FBI that he collected roulette wheels, and he had no interest in using it for gambling. Instead, Farmer protested that this type of table — inlaid with twelve kinds of African wood — was merely a collector's item. Surprisingly, the FBI bought his story. However, unwilling to risk transporting the wheel again, Packard and Farmer based their experiment in Santa Cruz.

In order to accurately track the movement of the ball, a high-speed camera was rigged over the wheel. The forces acting on the moving ball could then be determined. As Farmer explained: "Roulette is a physical system, and if you can measure the initial position and velocity of the ball, and you know the forces acting on it, you should be able to predict what is going to happen." Analysis of the movie footage allowed them to accurately measure the ball's velocity and deceleration. The effect of friction and drag on the ball had to be determined. They could also measure *scatter* and *bounce*. Scatter occurred when the ball hit the diamonds on the sloping sides of the wheel, and bounce occurred when the ball hopped from cup-to-cup before finally coming to rest. The final program included a set of equations which resembled the equations used by NASA for landing spacecraft on the Moon.

But how could complex calculations be performed in the middle of a busy casino? Obviously, they had to be discreet. A small computer was required.^[1] For \$250 they obtained via mail order a development kit incorporating an 8-bit 6502 microprocessor, which was the same processor used by Apple computers at the time. The computer had access to 5K of RAM, while the program was squeezed into 4K of ROM. The computer was small enough to be hidden under one armpit, with the battery pack hidden under the other armpit. The computer was attached to a microswitch embedded in the sole of the shoe which allowed for data input. This switch was activated by the movement of the big toe.

The result of the calculation was transmitted to the player via three vibrating buzzers attached to the chest. In binary, the three vibrators could encode a digit from 1 to 8, (001, 010, 011, etc.), thus indicating on which octant the bet should be placed.

The first stage was to calculate some parameters which were specific to the table, such as the tilt of the table, and the rate at which the central rotor decelerated. Once this information was obtained, the only other variables depended on the particular croupier working that day. This included the speed at which the croupier threw the ball, and the speed at which the croupier spun the rotor. This information could be obtained by standing next to the table and capturing the data. When a point on the wheel passed, the microswitch in the shoe was clicked. By comparing two successive clicks, the speed of the rotor could be calculated. Similarly, two clicks were made when the ball passed, providing the speed at which the croupier threw the ball.

Once the wheel was spun, there was a window of just fifteen seconds to enter the data and make the calculation: two clicks for the wheel, and two clicks for the ball. After that fifteen seconds, the bet had to be made.

Taking the equipment to Las Vegas, the team favoured the older, faded casinos on Fremont Street such as the Golden Nugget, the Mint, and the Horseshoe Club. These were the first casinos to emerge in Las Vegas in the 1930s, before a New York gangster by the name of Bugsy Siegel built the Flamingo club. That was the start of the modern mega-casinos, now strung-out down the main Strip.



While clearly the computerized system was not completely accurate every time, over a period of time the system provided a big statistical advantage. For every dollar bet, \$1.44 was won.

However, this success was bound to draw the attention of the casino security. The increased tension caused the player to sweat excessively, and the increased conductivity resulted in the player receiving occasional electric shocks from the chest mechanism — which resulted in visible spasms. Bear in mind, though, that in the mid 1970s the personal computer was unheard of, and no one would have suspected that a player might be wearing such high-technology. Also, the team agreed never to win more than a few hundred dollars in any given session. For these reasons, the team managed to avoid detection.

One of the most successful evenings came at the Circus Circus casino. The casino's attractions included a flying trapeze over the main floor, and slot machines on a merry-go-round. On that night, a particularly predictable croupier spun the ball in a regular fashion, and the computer worked like a dream: "The predictions were right on target. Playing quarters, we recouped our losses and stacked several hundred dollars in chips in front of us. There was a gut rush of excitement in seeing everything fall into place. After all the time spent testing and troubleshooting it, the computer was finally up and running perfectly. I no longer had the slightest doubt. From that session, I knew the game of roulette had been beaten."

Overall, the team estimate they made about \$10,000. It was not a large sum — certainly not as large as they could have made. This is because the motivation of the team was the intellectual challenge of the scientific project, to see if it was possible for physics to beat the system. And in that sense, they were completely successful.

And afterwards in the bar, in celebratory mood, the team raised a toast ... to Sir Isaac Newton.

Doyme Farmer is now a professor and a specialist in probability theory at the Santa Fe Institute. Norman Packard now lives in Italy, researching and developing forms of artificial life.

In 1985 the law was changed in Nevada to make it a crime, punishable by up to ten years in prison, to use a computing device in a casino capable of predicting the outcome of a game.

The clockwork universe

The method of Packard and Farmer was successful because Newton's three laws of motion and his law of universal gravitation are completely *deterministic*: there is no mention of chance. Given the state of a system — the position and velocity of all its parts — its movement from that point on is, according to Newton, completely predictable and determined.

As the project team described in the book *The Newtonian Casino*: "Our basic idea was to determine the initial position and velocity for the ball and rotor. We then hoped to predict the final position of the ball in much the same way that a planet's later position around the Sun is predicted from initial conditions."

On this basis, the 18th century French mathematician and philosopher the Marquis de Laplace realised that, if complete knowledge was obtained of the position and velocities of all the objects in the universe, then the future could be forever predicted. The universe — and the future — would be completely determined: "We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which, at any given moment, knew all of the forces that animate Nature and the mutual positions of the beings that compose it, if this intellect were vast enough to submit the data to analysis, could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom. For such an intellect nothing could be uncertain and the future, just like the past, would be present before its eyes."

This view became known as the *clockwork universe*. The image of the clockwork universe became the dominant model in physics for 200 years after Newton, and also influenced other areas of society. As Michael Mosley said in the BBC series *The Story of Science*: "The way that Newton had shown that a few universal laws could explain so much of the physical world inspired other intellectuals to look for universal laws that could explain human behaviour, politics, even history. Newton became a hero to revolutionaries who dreamt of utopian societies founded on reason."

The founding fathers of America decided that the laws and political institutions of their new country would be based on science and rational thought. There would be no place for monarchs and traditions. As Edward Dolnick says in his book *The Clockwork Universe*: "As they spelled out the design of America's political institutions, the founders clung to the model of a smooth-running, self-regulating universe. In the eyes of the men who made America, the checks and balances that ensured political stability were directly analogous to the natural pushes and pulls that kept the Solar System in balance." As Woodrow Wilson later wrote: "The Constitution of the United States has been made under the dominion of the Newtonian theory."

Thomas Jefferson installed a portrait of Isaac Newton in a place of honour in his home at Monticello, while Benjamin Franklin's favourite portrait (by the Scottish artist David Martin) showed him reading in front of a bust of Newton:



So, if the clockwork universe model suggests that the future is completely determined by the past, where does probability creep into the equation? If all events are determined with certainty, why are there casinos, and betting shops, and roulette wheels? The answer is that, in this situation, probability arises purely due to **ignorance**. Yes, if we were a super-being with complete knowledge of the position and velocity of every atom in the roulette wheel and the spinning ball, then the clockwork universe suggests we could predict the outcome with certainty. But we inevitably do not have complete knowledge. We only have limited knowledge. And it is as a result of this inevitable ignorance that we cannot predict the outcome of all events with certainty.

The clockwork universe was perhaps a reassuring concept. A universe without surprises, a universe in which progress was assured, a universe in which knowledge could increase without bound.

As we shall see, it was also proved to be completely wrong.

"What hath God wrought?"

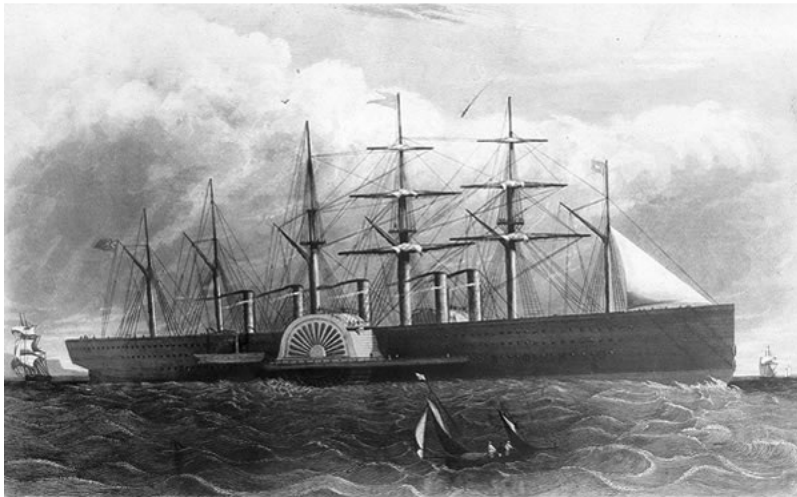
The mid 19th century was a time of great confidence and certainty. Newtonian mechanics had brought the industrial revolution, and Britain and the United States had ridden the wave of the industrial revolution to become the two most powerful nations on Earth.

The industrial revolution was powered by steam. The steam engine powered manufacturing industry, and the steam train spanned continents. However, the steamship still took ten days to connect Britain and America, and this represented the fastest possible communication across the Atlantic. As a result, a group of the greatest scientific minds determined to reduce communication times by physically linking the two continents by a telegraph cable.

In 1844, the American inventor Samuel Morse transmitted the first message on the electronic telegraph. The message travelled down wires 38 miles connecting Washington and Baltimore. Considering this achievement took place during a period of such confidence and certainty, Morse's first message was ominously prophetic. The message simply read: "What hath God wrought?"

The scientific advisor of the transatlantic cable project was the Belfast-born William Thomson, who was known as one of the finest physicists of the age. Thomson had entered the University of Glasgow at the age of ten, and within two years he was publishing scientific papers. He became a professor of natural philosophy by the age of 22, and went on to make important contributions in the field of thermodynamics, playing an important role in establishing physics as a modern scientific discipline.

Thomson designed the transatlantic telegraph cable, improving the core of the electric cable and its insulation. The cable was planned to be laid from the iron steamship the *Great Eastern*. At 692 feet, this was the largest ship ever built, itself a symbol of the confidence and certainty of the era.



In 1866, the cable successfully linked Britain and America for the first time. *The Times* called the feat "The most wonderful achievement of this victorious century". For his role in this triumph, Queen Victoria knighted William Thomson who later became the first British scientist to enter the House of Lords where he became Lord Kelvin.

It was during this period that Lord Kelvin issued a famous quote which reflected the confidence and certainty of this period: "There is nothing new to be discovered in physics now. All that remains is more and more precise measurement."

This view of Lord Kelvin was certainly not isolated.^[2] In 1894, the American physicist Albert Michelson said: "The most important and fundamental laws and facts of physical science have all been discovered. Our future discoveries must be looked for in the sixth place of decimals."

However, Lord Kelvin's pronouncement could not have been more inaccurate. In the following twenty years — the first two decades of the 20th century — science was rocked to the core as the old certainties were swept away.

2

THE UNCERTAIN QUANTUM

Lord Kelvin must have been aware at the time of his pronouncement that there were three major mysteries involving radiation which still required an explanation. In this chapter, we will examine those three mysteries of radiation.

Firstly, if you take a metal bar (for example) and heat it to over 500 degrees Celsius, it will emit electromagnetic radiation: it will begin to glow. It will first become red hot, then it will become white hot. So there is a relationship between the temperature of the bar and the frequency of the emitted radiation (this is how potters used to determine the temperature of their kilns). At lower temperatures, radiation of a lower frequency is emitted (red visible light), whereas at higher temperatures, higher-frequency radiation of a brilliant blue-white colour is emitted.

However, when physicists tried to describe the relationship between temperature and frequency, they found a problem. The classical model agreed well at low frequencies, but it predicted ever-increasing emitted energy at high frequencies (ultraviolet and higher). This was because the model predicted that the power of the radiation was proportional to the square of the frequency of that radiation. Hence, as progressively higher frequencies were considered, the power of the radiation was predicted to rise to an infinitely large amount. This was known as the *ultraviolet catastrophe*.

At the turn of the 20th century, the German physicist Max Planck cast a new light on the mystery. However, things might have turned out differently. When he was 16 years old, Planck had been told by the physicist Philipp von Jolly that he should not study physics because "in this field, almost everything is already discovered, and all that remains is to fill a few unimportant holes." This revealed that the certainty of Lord Kelvin was also shared by other physicists. Planck replied that he did not want to discover anything new, he merely wanted to obtain a greater understanding of what was already known.

In order to solve the ultraviolet catastrophe, Planck took the radical step of suggesting that the emitted radiation was composed of tiny, indivisible packets of energy, with each packet being called a *quantum*. The energy of each packet was proportional to the frequency of the radiation:

$$e = hf$$

Where e is the energy of the emitted quantum, f is the frequency of the radiation, and h is Planck's constant. Planck's constant is equal to 0.000000000000000000000000006626, a very small number which has a huge importance. It appears in many important equations in physics.

This result indicated that the amount of energy emitted at a certain frequency was proportional to the number of packets of energy being emitted with that frequency.

Using this method, Planck was able to explain why the energy of the emitted radiation did not increase to infinity at higher frequencies: it would take too much energy to make a single quantum at those high frequencies. Hence, at high frequencies, there were simply fewer packets of energy being emitted.

On the 14th December 1900, Planck told his son that he may have made a discovery as important as those of Newton. Later that day, he presented his result to the Berlin Physical Society.

Quantum theory had been born.

However, Planck, like most physicists, believed the physical world was a continuum, with matter being composed of a smooth, continuous substance. This latest result of Planck, however, seemed to suggest that energy could be formed of discrete, discontinuous chunks. Planck was a conservative scientist who was not motivated to further consider the physical significance of his discovery. That would require a different experiment, and a scientist much more ready to consider revolutionary ideas. We have to move on to consider the second major mystery involving radiation: the *photoelectric effect*.

In 1899, the German physicist Philipp Lenard shone a bright light onto metal and discovered that the metal ejected electrons. According to the classical viewpoint, it would be expected that the ejected electrons would have

more energy if the light was brighter. However, this was not what was discovered. Instead, it was found that the energy of the ejected electrons was entirely independent of the intensity of the light. In fact, even very low intensity light was capable of ejecting electrons. Instead, the energy of the electrons was proportional to the frequency (i.e., the colour) of the incident light. For example, blue light (high frequency) ejects more energetic electrons than red light (low frequency).

This was a tremendous puzzle which could not be explained by the classical model. How could low intensity light be capable of ejecting electrons? Well, in his *annus mirabilis* ("miracle year") of 1905, Albert Einstein proposed a solution.

Einstein proposed that light was composed of packets of energy, with each packet having an energy equal to Planck's constant multiplied by the frequency of the light:

$$e = hf$$

Hence, this is precisely the same formula discovered five years earlier by Max Planck. This formula now made sense of the photoelectric effect. Low intensity light would be composed of few packets of energy, but the energy of each individual packet was only dependent on the frequency of the light. Hence, even a single packet of light could potentially eject an electron from metal, the energy of the light transferring to the kinetic energy of the electron. This explained how even low intensity light could eject electrons.

High intensity light was composed of many more of these packets of energy, but the energy of each individual packet remained only proportional to the colour of the light. Hence, increasing the brightness of the light did not increase the energy of the ejected electrons: you had to alter the colour of the light to do that.

So, while Max Planck could not understand the physical significance of his earlier result, Einstein's explanation of the photoelectric effect made the meaning clear: light energy really **was** quantized into discrete packets. Each packet of light energy was called a *photon*.

At first, there was considerable resistance to Einstein's theory of light particles. Planck, in particular, could not accept Einstein's theory. In 1913, Planck (and other supporters) wrote a letter of recommendation for Einstein's membership to the Prussian Academy of Sciences. The letter was full of praise, however, Planck included the following passage: "In sum, one can hardly say that there is not one among the great problems, in which modern physics is so rich, to which Einstein has not made a remarkable contribution. That he may have missed the target in his speculations, as, for example, in his hypothesis of the light quanta, cannot really be held too much against him, for it is not possible to introduce really new ideas even in the exact sciences without taking a risk."

However, the existence of the photon was soon experimentally confirmed, and Einstein received his only Nobel prize in 1921 for his discovery of the light quantum.

The third major mystery involving radiation considered the nature of the light emitted from different materials. When a substance is heated, it emits a light with a characteristic colour. For example, when salt (sodium chloride) is heated in a flame, it glows with a yellow colour. This explains the common yellow colour of sodium street lighting. Every chemical element has a different associated colour. If the light from a pure element is passed through a prism, the prism splits the light into its various constituent colours. This spread of colours is called a *spectrum*.

For white light, a rainbow effect is produced as white light contains all colours. However, each particular chemical element has a different spectrum, and it was found that the spectrum contains very sharp peaks in intensity at different light wavelengths. This means the spectrum contains very distinct bright coloured lines. It is as if each element has an identifying barcode. Hydrogen, for example, has four distinct lines in its spectrum. By analysing the light from stars in this manner, it is possible to identify the chemical composition of those stars.

These lines in the spectra of elements were surely revealing something important about the structure of atoms, but the mechanism by which these lines were produced was a mystery.

The stage was set for the entrance of a young Danish physicist who has been called the father of quantum physics: Niels Bohr. Bohr was undoubtedly the most important figure in the development of quantum theory. Bohr worked throughout his life to achieve the greatest understanding of quantum behaviour.

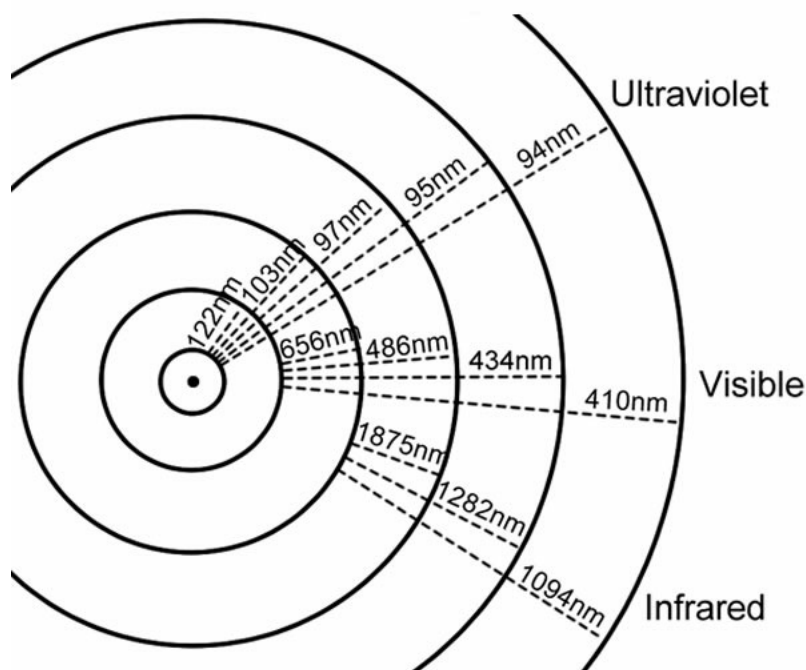
Bohr arrived at Manchester University in 1912 to work with Ernest Rutherford, who had just revealed crucial details of the structure of the atom. Rutherford had revealed that the atom consisted of a positively-charged nucleus — only one ten-thousandth the size of the whole atom — surrounded by a cloud of orbiting electrons. For obvious reasons, this was called the *planetary model* of the atom.

However, there were problems with the planetary model. According to classical physics, the orbiting electrons

should radiate energy before eventually spiralling into the nucleus (as an analogy, the Moon is losing energy and is therefore slowing down as it orbits the Earth). Bohr considered the previous discovery of Einstein — that light energy was quantized — to suggest that the energy of electrons in their orbits was quantized. This would mean that the electrons could only occupy special orbits with clearly defined energy levels. Hence, there could be no continuous drift towards the nucleus.

Bohr then realised that this could also provide an explanation for the spectral lines. Electrons which were orbiting further away from the nucleus would have higher energy than electrons orbiting nearer the nucleus. When an electron jumped (a *quantum jump*) from a higher orbit to a lower orbit, it would release a photon. Because of the law of conservation of energy, the energy of the photon would be equal to the energy lost by the electron. Hence, electron jumps between certain clearly defined orbits would result in a photon being emitted with a particular colour. This would explain the sharp lines in the spectrum.

The following diagram shows how electrons can jump between different energy levels in the hydrogen atom. The larger the jump, the greater the energy released, and so higher frequency light is produced. The diagram shows the frequency of the light produced for each quantum jump. This explains the four distinct lines in the visible spectrum of hydrogen.



In his final interview, Bohr expressed the difficulties he had faced in trying to determine the structure of the atom merely by considering its colour spectrum: "Just as if you have the wing of a butterfly, then certainly it is very regular with the colours and so on, but nobody thought that one could get the basis of biology from the colouring of the wing of a butterfly."

So all three mysteries associated with radiation could be solved by the realisation that energy can be quantised into packets. But what really made the new quantum theory so devastating was that it introduced uncertainty to science.

The uncertainty principle

In Germany, the young physicist Werner Heisenberg was working to develop a more detailed picture of quantum behaviour. He decided to ignore the classical model of the atom — the planetary model — thus ignoring anything that could not be directly observed. Instead, Heisenberg only considered the features that could be directly observed

and measured: the properties of the light emitted by the electrons as they jumped between two energy levels.

But there were many different orbits available for electrons to jump between. For example, an electron might jump from energy level E_3 to energy level E_1 , or from energy level E_5 to energy level E_2 . What was the best way to denote and analyse all these possible combinations?

When Heisenberg had an attack of hay fever, he retreated to Heligoland, a tiny pollen-free island off the German coast. It was in this distraction-free environment that Heisenberg made his great breakthrough. He plotted all the observed values in the form of a rectangular grid, known as a *matrix*.

In the following matrix, the energy emitted when an electron jumps from energy level E_2 to energy level E_1 is denoted by E_{21} , and so on. This single matrix, therefore, contains information about all the possible quantum jumps:

$$\begin{bmatrix} E_{11} & E_{12} & E_{13} & E_{14} & \dots \\ E_{21} & E_{22} & E_{23} & E_{24} & \dots \\ E_{31} & E_{32} & E_{33} & E_{34} & \dots \end{bmatrix}$$

Heisenberg realised that a matrix operation could be used to extract the quantum properties — such as the position or momentum — of a particle. If, for example, the position of a particle was to be calculated, a particular matrix for quantum position would be used. If momentum was to be extracted, then a different matrix would be used. [3]

However, Heisenberg realised that if matrices ("matrices" is the plural of "matrix") have to be used to determine quantum mechanical behaviour, then that would introduce a remarkable side-effect. This is because in order to extract a particular property of a particle (position or momentum), matrix multiplication would have to be used. And matrix multiplication behaves very differently from conventional multiplication.

In order to see why this is the case, let us consider a simple example. Here is an example of a matrix composed of two rows and two columns:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix}$$

We might ask how matrix multiplication (the multiplication of two matrices) might be achieved. For example, how could we multiply the following two matrices:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix}$$

We can multiply these two matrices by the following sequence of steps:

First, consider the first row of the first matrix and the first column of the second matrix (shown in the two dashed ellipses in the following diagram). Take the first number in the first row of the first matrix (which is 2) and multiply it by the first number in the first column of the second matrix (which is 5). This gives us our first intermediate result of 10 (we must remember this). Then take the second number in the first row of the first matrix (which is 4) and multiply it by the second number in the first column of the second matrix (which is 1). This gives us our second intermediate result of 4.

We add our two intermediate results (10 and 4) together to get the answer 14, and that number goes in the first position in our result matrix:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & \\ & \end{bmatrix}$$

To get our next entry in our answer matrix, once again we have to consider the first row of our first matrix, but now we consider the second column of the second matrix. We perform a similar series of steps to the first case, this time we need to calculate $(2 \times 6) + (4 \times 5)$ to give an answer of 32:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & 32 \\ & \end{bmatrix}$$

We continue in a similar fashion until we have filled all the positions in our result matrix. So here is the answer of our matrix multiplication:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & 32 \\ 38 & 57 \end{bmatrix}$$

You might want to check the steps yourself to make sure it is the correct answer. $(7 \times 5) + (3 \times 1) = 38$ and $(7 \times 6) + (3 \times 5) = 57$.

So matrix multiplication is fairly straightforward. But Heisenberg realised that if matrices have to be used to determine quantum mechanical behaviour, then that would introduce a remarkable side-effect. And that is because matrix multiplication is *noncommutative*.

Conventional multiplication is commutative in that it does not matter in which order the numbers are multiplied, the answer will be the same. For example, 7×5 will give the same result as 5×7 . However, matrix multiplication is noncommutative in that the ordering does matter. If the ordering of the matrices is reversed, the answer will be different.

In order to see this, here is the previous matrix multiplication with the two matrices in reverse order:

$$\begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} \times \begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} = \begin{bmatrix} 52 & 38 \\ 37 & 19 \end{bmatrix}$$

You will see that the final result matrix is different. You can run through the steps of the calculation yourself if you wish. Clearly, matrix multiplication is noncommutative: the ordering does matter.

Heisenberg realised that the noncommutative properties of matrix mechanics had startling consequences for quantum behaviour. It suggested that if the position of a particle was measured, and then the momentum of the particle was measured, a different result would be obtained than if the momentum had been measured first. The ordering of the measurements mattered. It was as if the measurement of the position of the particle irretrievably "poisoned" the following momentum measurement. The only way to obtain an accurate measure of the particle's momentum would be to measure its momentum first. But that seemed to imply that it was not possible to accurately know **both** a particle's position **and** momentum!

Heisenberg tried to make sense of this startling result by realising that, in order to measure some aspect of a system, we inevitably alter the system being measured in some small way. Our measurement can, therefore, never precisely reflect the true state of the system being measured. For example, if we test the air pressure of a tyre using a gauge, some air has to inevitably leak out of the tyre — thus reducing the pressure. Or, in the case of a particle, we can precisely measure its position by projecting it as a point onto a screen. But that inevitably reduces the particle's velocity to zero — so we cannot obtain a momentum measurement.

This startling result became known as the *Heisenberg uncertainty principle*. For the first time, it appeared that there were fundamental limits on human knowledge about the universe. At a stroke, the idea of the clockwork universe proposed by the Marquis de Laplace was erased: it could never be possible to obtain complete information about the position and velocity of all the particles in the universe, so it could never be possible to predict with certainty the future of the universe.

As Heisenberg said: "When we know the present precisely, we can predict the future' is as assumption — not the correct conclusion. Even in principle we cannot know the present in all detail."

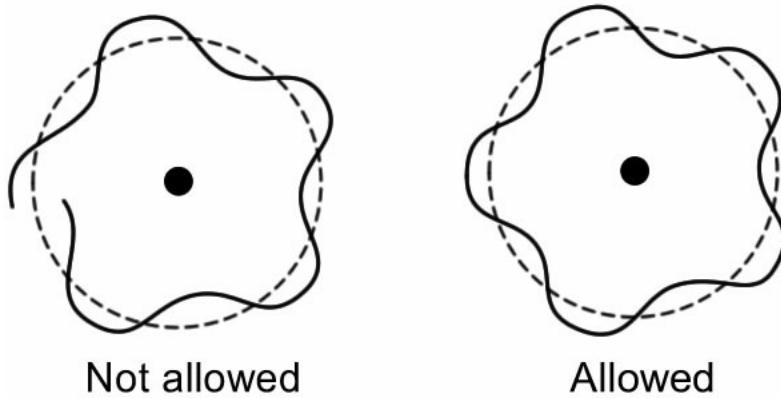
There was a limit on human knowledge. The old certainties were starting to unravel. From now on, the only certainty was uncertainty.

Schrödinger's waves

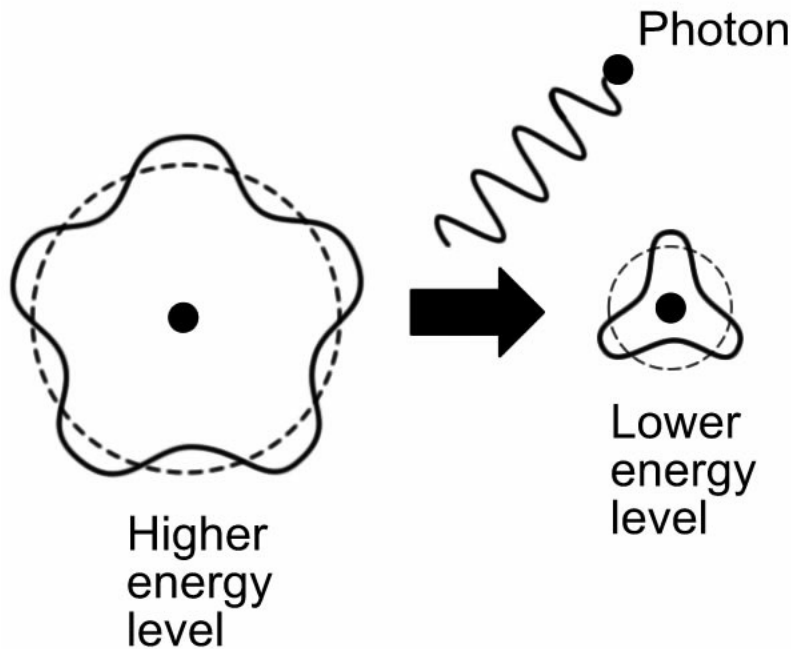
The development of Heisenberg's *matrix mechanics* was the first time that quantum theory represented a complete description of the quantum behaviour of a particle: the quantum equivalent of Newton's laws of mechanics. This complete theory became known as *quantum mechanics*.

However, matrix mechanics was difficult to use — most physicists had never used matrices before — and difficult to visualise. Adoption of the new technique was slow. So when Erwin Schrödinger presented a new method which substituted the use of waves instead of matrices the method swiftly proved popular (most physicists were familiar with waves, and the model was much easier to visualise). Schrödinger's method became known as *wave mechanics*. [4]

Remember that Bohr had shown that electrons could only occupy special orbits with clearly defined energy levels. Hence, there could be no continuous drift towards the nucleus. Schrödinger used a mathematical model of a wave as a tool for determining these allowed orbits of electrons. An electron orbit was modelled as a wave around the nucleus. An orbit was only allowed if a whole number of wavelengths fitted around the orbit:



This explained why only certain orbits with quantised energy levels were allowed. When an electron emitted a photon, it could move to a lower, allowed orbit:



This mathematical wave proposed by Schrödinger was called a *wavefunction*. But what did the wavefunction actually represent? Should it only be considered a mathematical tool which could be used for calculating the properties of particles, or did it actually represent some underlying physical wave which had not yet been detected?

The situation was made more complicated by the fact that the values of the wavefunction were *complex numbers*, meaning they had a "real" part and an "imaginary" part. Imaginary numbers are based on the square root of -1. As no real number squared can result in -1, this explained why these numbers were considered "imaginary". Only if the value was squared did the imaginary part disappear (if you square the square root of -1 then you are left with -1, which is a real number).

So the square of the value of the wavefunction represented something "real", something that could be measured in a laboratory. But what did the value represent? It was the German physicist Max Born who provided the incredible answer: the value of the square of the wavefunction represented the **probability** that the electron is found at a particular location. If the value of the wavefunction was larger at a particular location, there was more chance of finding the electron there when an attempt was made to measure its position. Crucially, before the measurement was made, it was simply impossible to obtain a more accurate fix on the electron's position. Before the measurement was taken, it was not possible to use more accurate equipment, or more precise mathematics, to precisely pin down the position of the electron. Before measurement, all that could be known was possibilities.

So this is what the great edifice of physics was finally reduced to: at the most fundamental level, it was only possible to talk about the probability of a particular event occurring. It was not possible to achieve greater certainty. The physicist was reduced to talking about likelihoods and chance, like a common gambling bookmaker.

Max Born's revelation of a fundamentally probabilistic universe meant the end of determinism. In a Newtonian deterministic universe, one event causes another in an entirely predictable manner. Quantum mechanics, however, revealed that the outcome of an event could only be considered in terms of probabilities.

In Chapter One we considered how probability — in a deterministic universe — was merely a product of ignorance. However, quantum probability was revealed to be a fundamental probability which was not a result of ignorance. As Manjit Kumar says in his book *Quantum*: "Quantum probability was not the classical probability of ignorance that could in theory be eliminated. It was an inherent feature of atomic reality. For example, the fact that it was impossible to predict when an individual atom would decay in a radioactive sample, amid the certainty that one would do so, was not due to a lack of knowledge but was the result of the probabilistic nature of the quantum rules that dictate radioactive decay."

Probability which is a result of ignorance can be eliminated. Quantum probability — which lies at the heart of all reality — was here to stay.

3

COPENHAGEN

Ernest Solvay was a Belgian industrialist and philanthropist who had made his fortune from developing a process for manufacturing sodium carbonate. The patents from the process provided Solvay with great wealth, and he used this money to fund a series of physics conferences in Brussels which attracted the greatest minds of the day.

Since the end of the First World War, Germany had been isolated and scientific conferences had excluded German scientists. However, in 1927 the king of Belgium announced that German scientists could be invited to the Solvay conference: "Seven years after the war the feelings which they aroused should be gradually damped down, a better understanding between peoples was absolutely necessary for the future, and science could help to bring this about."

The resulting 1927 conference entered the annals of physics legend by attracting 29 of the greatest physicists of all time, including 17 Nobel Prize winners. Among those attending the conference were Niels Bohr, Werner Heisenberg, Erwin Schrödinger, Max Born, Max Planck, and Albert Einstein.

The fortuitous timing of the 1927 Solvay event meant it occurred at precisely the time when the philosophical argument over the interpretation of quantum mechanics was at its height. In particular, the debates between the two geniuses of Bohr and Einstein are considered some of the most creative and ingenious in scientific history. According to the physicist John Wheeler: "In all the history of human thought, there is no greater dialogue than that which took place over the years between Niels Bohr and Albert Einstein about the meaning of the quantum." The philosopher C.P. Snow went deeper: "No more profound intellectual debate has ever been conducted."

On one side of the debate, Niels Bohr believed quantum mechanics provided a complete description of Nature at the microscopic level, in which case Nature was fundamentally governed by probabilistic processes. On the other side of the debate, Einstein believed that the current quantum theory was merely a temporary contrivance which would be replaced when a deterministic theory was uncovered.

In order to understand Bohr's viewpoint, let us return to the problem of quantum jumps of electrons orbiting the nucleus. When Ernest Rutherford first saw Bohr's revolutionary ideas about the quantum structure of the atom, he immediately raised a question: when does an electron know when to jump, and how does it decide where to jump? Reasonably enough, Rutherford wanted to know what underlying process controlled the quantum jumping: "Bohr's answer was remarkable. Bohr suggested that the whole process was fundamentally random, and could only be considered by statistical methods: every change in the state of an atom should be regarded as an individual process, incapable of more detailed description. We are here so far removed from a causal description that an atom may in general even be said to possess a free choice between various possible transitions."

If Bohr was correct, the implications were staggering: there was no "causal" description of the process, nothing should be considered as causing the quantum jumps. It was only ever possible to talk about the probability of an event occurring. This would imply that Nature, at its root, was random, and no deeper explanation could ever be produced.

Einstein, however, was far from convinced by this explanation. According to Einstein: "I find the idea quite intolerable that an electron exposed to radiation should choose **of its own free will**, not only its moment to jump off, but also its direction. In that case, I would rather be a cobbler, or even an employee in a gaming-house, than a physicist."

Einstein remained convinced that there had to be some underlying deterministic mechanism — hidden from our eyes — which was responsible for determining the timing and direction of the quantum jumps. In this respect, Einstein considered the current theory of quantum mechanics to be incomplete, merely a stop-gap until a more complete theory came along.

When Einstein arrived at the 1927 Solvay Conference he was initially reluctant to contribute his opinion, stating that he did not feel sufficiently knowledgeable about the latest developments in quantum mechanics. However, Einstein's diffidence disappeared when Heisenberg and Born issued a provocative joint statement: "We consider quantum mechanics to be a closed theory, whose fundamental physical and mathematical assumptions are no longer susceptible of any modification." Essentially, Heisenberg and Born were suggesting that quantum mechanics should be considered to be the final theory, and that the fundamental probabilistic nature of reality just had to be accepted. It was almost as if they were goading Einstein into making a response. In one of his most famous quotes, Einstein

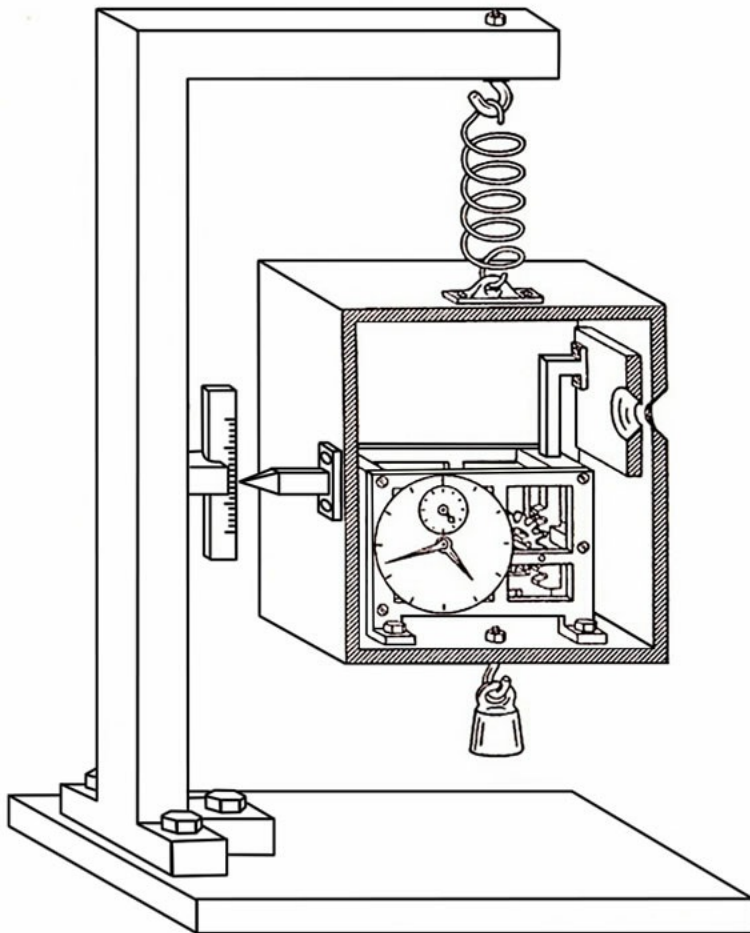
replied: "God does not play dice with the universe".

From now on, Einstein would no longer be silent about quantum mechanics.

Einstein's box

During the day, the conference was conducted at the Solvay International Institute for Physics in Brussels. However, all of the participants at the conference were staying at the Hotel Metropole, and it was in the dining room of the hotel that most of the heated discussion occurred. Each morning, Einstein would arrive for breakfast armed with a new thought experiment which he believed revealed a flaw in the uncertainty principle. Einstein and Bohr would continue their discussions as they walked to the institute, and during breaks in the conference. Usually by dinner back in the Metropole, Bohr would reveal a flaw in Einstein's argument, thus saving the uncertainty principle and the prevailing interpretation of quantum mechanics.

However, one of Einstein's thought experiments was so ingenious that Bohr was stunned when he heard of it. Einstein asked Bohr to consider a box with a hole in its side (see the following superbly detailed diagram, actually drawn by Bohr himself). The hole has a shutter which can be opened or closed by a clock mechanism inside the box. The clock inside the box is synchronised with a clock outside the box in the laboratory. The top surface of the box is attached to a spring, and a scale at the side of the box means it is possible to determine the weight of the box.



At the start of the experiment, the box is weighed. At a certain point in time, the clock in the box opens the shutter and a photon of light escapes. After this point, if the box is weighed again then it is possible to determine the mass of the photon. Then, from Einstein's own equation, $E=mc^2$, it is possible to determine the energy of the emitted

photon. The time at which the photon was emitted is also known because it is the time at which the shutter opened. It therefore appears possible to know the energy of the photon and the time at which it escaped. But according to the uncertainty principle this should not be possible as time and energy are a pair of properties with a relation similar to position and momentum: the more accurately you know the time, the less accurately you should be able to know the energy. According to the uncertainty principle, you should never be able to know both time and energy with perfect accuracy.

This came as a tremendous shock to Bohr. Einstein's box seemed to undermine the uncertainty principle, and hence the whole edifice of quantum mechanics. As far as Bohr was concerned, it would be "the end of physics" if Einstein was correct.

As Einstein and Bohr walked back to the Hotel Metropole that evening, there was a spring in Einstein's step and a broad grin on his face as he felt he had at last defeated the uncertainty principle. Bohr, however, looked flustered as he struggled to keep up with the confident Einstein.



That evening it was noted that Bohr looked like "a dog who has received a thrashing". Bohr spent a sleepless night going over the experiment time and time again in his head. It was not until the early hours that Bohr believed he had found the flaw in Einstein's reasoning, and he managed to grab just a few hours sleep before confronting Einstein over breakfast.

Bohr realised that Einstein — in his rush to overthrow quantum mechanics — had forgotten the implications of Einstein's own theory of general relativity. General relativity predicted that a clock in a stronger gravitational field would run slower than a clock in a weaker gravitational field. Bohr realised that when the photon was emitted from the box, the spring attached to the top of the box would lift the box slightly higher in the Earth's gravitational field. This would result in the clock inside the box no longer being perfectly synchronised with the clock in the laboratory. Hence, it was no longer possible to obtain the time measurement with perfect accuracy. The uncertainty principle was saved.

When Bohr told Einstein of this solution to the problem over breakfast, it was Einstein's turn to look stunned. Once again, he had failed in his attempt to overthrow quantum mechanics.

From now on, Einstein gave up attacking the uncertainty principle as the weak spot of quantum mechanics. Instead, he turned his attention to the quantum model of reality itself, because it was here that quantum mechanics predicted some very strange things indeed.

Is the Moon there when no one is looking at it?

According to the interpretation of Niels Bohr, the uncertainty principle had revealed that it was no longer possible to consider the result of a scientific observation without also considering the effect of that observation on the object

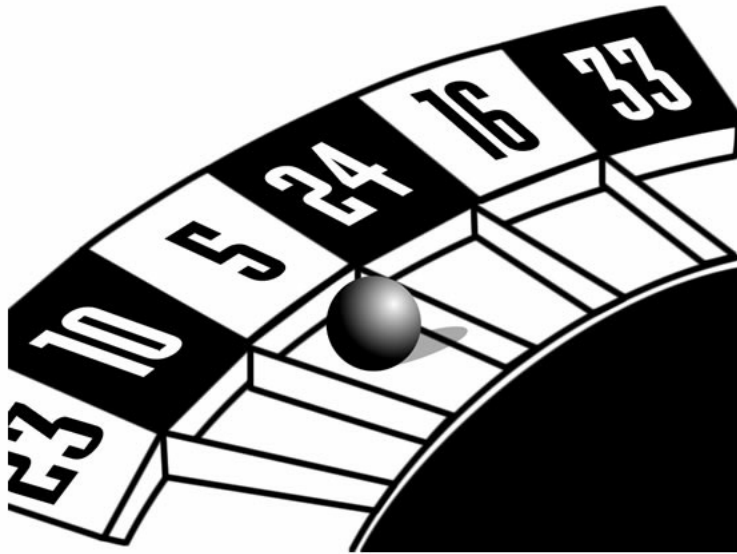
being observed. In other words, it was no longer possible to draw a clear boundary between the observer and the object being observed: the effect of the observer became all-important.

With this in mind, Bohr argued that, before an observation or measurement was made, it was scientifically meaningless to talk about the properties of a particle. Bohr said: "It is wrong to think that the task of physics is to find out how Nature is. Physics concerns what we can say about Nature." In other words, it is only our observations which are real. It is meaningless to talk about objective reality in the absence of observation.

Before observation, Bohr insisted, all that existed was the wavefunction (which we considered in the previous chapter). The wavefunction was a mathematical tool for determining probabilities. The wavefunction represented a *superposition* of all possible states which would be possible after measurement. For example, the wavefunction can represent all the possible positions in which an electron might be discovered after a measurement is taken. After the measurement is taken, the wavefunction "collapses" so that only a single value is measured for the location of the electron. [5]

This interpretation of quantum mechanics became known as the *Copenhagen interpretation* (because Niels Bohr's institute of physics was in Copenhagen).

If you read my first book, you will know that this is, yet again, another example of the universe acting like a roulette wheel. Before observation, the state of the system must be considered as being in a superposition state: it acts as though it possesses a combination of all possible property values. The state of the system could then be represented by a roulette ball spinning around the wheel, possessing all possible values. But when an observation is taken, it is as if the roulette ball stops spinning and has to occupy a single value. It is at this stage that probability enters into quantum mechanics: you cannot predict where the ball will stop, you cannot predict what property value you will measure.



So we see that quantum theory cannot correctly predict the outcome of any single experiment! It can only provide the possibility of a particular outcome. This might seem a huge drawback of quantum mechanics. However, knowing the possibility of particular outcomes is an important tool if multiple measurements are made. In this sense, quantum mechanics is a statistical theory: it provides you with the probabilities of a certain result if multiple observations are taken.

It is frequently said that the Copenhagen interpretation implies that the act of observation somehow "creates reality", the motivation for this belief being Niels Bohr's assertion that it is scientifically meaningless to talk about the properties of a particle before observation. For Einstein, this belief was anathema. Einstein believed there had to be an objective reality in the absence of observation. In another famous quote Einstein said "I like to think that the Moon is there even if I am not looking at it."

Unfortunately, this frequently-repeated quote of Einstein has been partly responsible for the production of a number of pseudo-scientific books (and even movies) suggesting that quantum reality is somehow conjured into existence by human observation, or human consciousness. This is surely a complete fallacy, and is based on a lack

of understanding of the principles of quantum mechanics. As the physicist Carver Mead has said: "That is probably the biggest misconception that has come out of the Copenhagen view. The idea that the (human) observation of some event makes it somehow more 'real' became entrenched in the philosophy of quantum mechanics. Even the slightest reflection will show how silly it is. An observer is an assembly of atoms. What is different about the observer's atoms from those of any other object? What if the data are taken by computer? Do the events not happen until the scientist gets home from vacation and looks at the printout? It is ludicrous!"

In order to correctly understand the effect of observation at the quantum level, it must be realised that observation can never be responsible for making an object "real", for somehow conjuring it into existence. However, it is the case that the act of observation can have the effect of modifying some properties of an observed object. These properties of a particle — such as spin and location — which are subject to the quantum superposition principle are called *dynamic properties*. But a particle also possesses properties which are fixed and are not subject to the principles of quantum mechanics, such as a particle's electric charge. These properties are called *static properties*. The existence of static, unchanging properties whose values are known prior to observation indicates that the particle does, indeed, exist prior to observation. So quantum mechanics states that the Moon does indeed exist even if no one is looking at it.

So now in order to understand the intended meaning of the earlier Einstein quote, let us consider the quote in its entirety: "I think that a particle must have a separate reality independent of the measurements. That is, an electron has spin, location and so forth even when it is not being measured. I like to think the Moon is there even if I am not looking at it."

So we see from this full quote that Einstein was actually referring to certain **properties** of a particle, in particular its spin and location. He was not referring to the entire **existence** of the particle. So Einstein was merely suggesting that the Moon might be **located** somewhere else if he was not looking at it — he was not suggesting the Moon did not exist at all if he was not looking at it! Unfortunately, the latter part of the quote has been taken out of context and used to launch a pseudo-science industry.

Indeed, we should perhaps not find it too surprising that the act of observation can be responsible for modifying some properties of a particle. Our discussion of the uncertainty principle in the previous chapter considered the measurement of air pressure in a tyre using a gauge, a process which inevitably resulted in some air leaking out of the tyre — thus reducing the pressure. Hence, observation inevitably modifies the object being observed.

In that case, it would appear to be rather meaningless to talk about values of certain properties of a particle before observation. After all, the only way to measure the property value is to perform the observation — and the observation must inevitably alter the value of the property.

So to talk of a certain objective reality before observation clearly appears rather meaningless. Certainly, as we move down to the smallest quantum level, it should probably not be considered surprising that the effect of the observation on the object under observation would become very significant indeed.

So if it is clear that the act of observation inevitably affects the object under observation, this means that the observed object should never be considered as an isolated object. Instead, the observer and the observed object should be considered to be a single, combined system. An object cannot produce a property value without an observer, and an observer cannot produce a property value without an object to observe. It is only by considering a combined system that a property value can be produced.

So, if it requires a combined system to produce a property value, it makes no sense to talk of the property value of a single isolated object. Einstein insisted that there was an "objective reality" in the absence of observation. But if it requires the presence of an observer to **create** the property value, then it really makes no sense to talk of the objective reality of a single, isolated object. It is the combination of observer and observed object which generates reality.

However, Einstein continued to insist that there must be a fixed objective reality in the absence of observation. And, in 1935 Einstein showed he had one more trick up his sleeve, a trick which would shake quantum mechanics — and Niels Bohr — to the core.

The EPR paradox

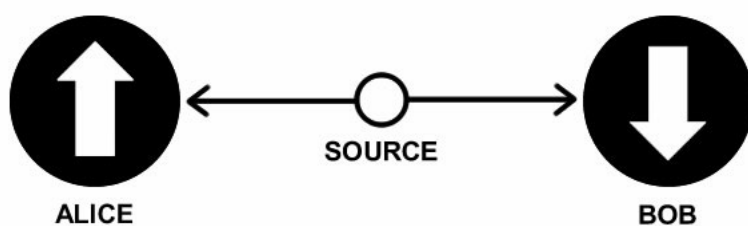
In 1935, Einstein teamed-up with Nathan Rosen and Boris Podolsky to produce a landmark paper which came to be known as the EPR paper (after the initials of Einstein, Podolsky, and Rosen). The EPR paradox was another attempt by Einstein to show that quantum mechanics could not be a complete description of the workings of Nature.

The basis of the EPR paradox rested on the principle of entanglement. It is possible, under certain circumstances, for the properties of a particle to become correlated with the properties of another particle (i.e., the property values

of one particle are dependent on the property values of another particle). For example, an electron has a property called spin, which, if we measure it, we might find the spin to be either upward ("spin up") or downward ("spin down"). When we perform a measurement of electron spin in a particular direction (e.g., the vertical direction), we will only find one of these two states because spin is quantized into one of these two discrete states: it is like a roulette wheel with only two slots into which the ball can drop.

For example, it is possible to produce a pair of electrons using a method which ensures that each electron must have opposite spin to the other electron, i.e., if one electron is "spin down" then the other electron must be "spin up" (this is due to the law of conservation of angular momentum: total angular momentum of the system before the electrons are emitted must equal the total angular momentum of the system after the electrons are emitted). This pair of electrons are then said to be entangled: the property values of one electron is dependent on the property values of the other electron.

So if two people each receive one of the entangled electrons and perform a measurement of spin, they will find that the other person's electron has opposite spin. The following diagram shows two experimenters — Alice and Bob — each receiving one electron from a pair of entangled electrons, and, after measuring the spin, they discover it to have opposite spin to their partner's electron:



But, in the EPR paradox, Einstein realised that quantum mechanics predicted a problem with this picture. According to quantum mechanics, before the spin of an electron is measured that spin value is supposed to be in a multi-valued superposition state: a combination of all possible values, both "spin up" **and** "spin down". This is like the ball spinning around the roulette wheel, with **both** spin values being possible before the measurement is taken. Only after a measurement is taken does the electron possess a definite spin value (either "spin up" **or** "spin down"). So, for example, when Alice measures the spin of her electron and finds it to be "spin up", her electron is no longer in a multi-valued superposition state. It is as if the ball has stopped spinning around the roulette wheel and has dropped into a particular slot: the "spin up" slot.

But as soon as Alice's electron takes a definite value, this means that Bob's electron must also have a definite value — the opposite value: "spin down". So Alice measuring her electron and finding a definite spin value also has the effect of taking Bob's electron out of its superposition state and forcing it to take a definite spin value. It is as if Alice's measurement has an instantaneous effect on Bob's electron.

Einstein realised that quantum mechanics insisted that this effect of one particle onto the other particle must be instantaneous — even if the particles are separated by quite a distance. And here Einstein believed he had found a flaw in quantum mechanics, because Einstein's own theory of special relativity prohibited any such influence over distance acting faster than the speed of light. According to relativity, it was simply not possible for this instantaneous effect predicted by quantum mechanics.

This principle — that an object should only be influenced by its immediate surroundings, and cannot be influenced by some instantaneous effect from a distant object — is called *locality*.

As we have seen, Einstein had created several thought experiments before with the aim of revealing inconsistencies in the Copenhagen interpretation of quantum mechanics. However, each time Niels Bohr had been able to find a flaw in Einstein's argument, thus saving the day for quantum mechanics. This time, however, the situation was different. With the EPR paradox, Einstein had revealed a gaping hole in the Copenhagen interpretation.

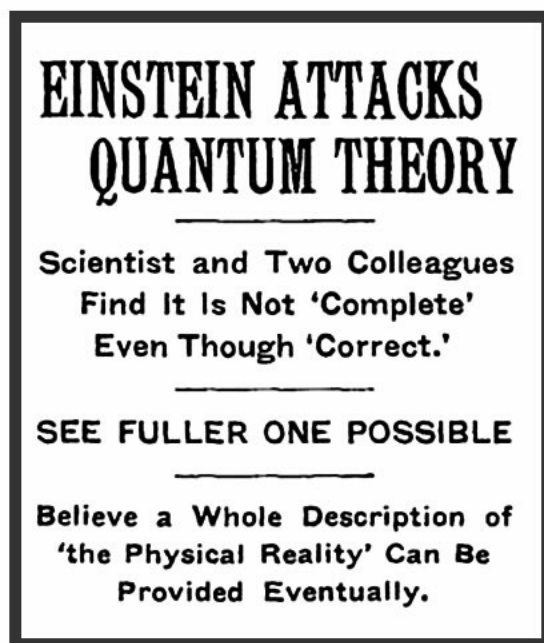
According to one of Bohr's colleagues: "The EPR onslaught came down upon us as a bolt from the blue. Its effect on Bohr was remarkable." Bohr abandoned all other work to try to find a solution to the paradox. Bohr worked day and night, becoming increasingly frustrated as he realised the subtlety of Einstein's argument. After six weeks, he presented his solution, but it was less than convincing. Bohr stated that the pair of entangled particles should not be considered separately, but should be considered as forming a single entangled system — even though the two particles might be separated by a considerable distance. Essentially, Bohr was stating that there **was** some form of instantaneous communication between the particles. However, the restriction that nothing can travel faster than light

was not broken because it was impossible to send information via this method: the outcome of the particle spin measurements was always random. As Brian Greene said: "Special relativity survived by the skin of its teeth."

Einstein was not satisfied with Bohr's reply, and had no time for this suggestion of instantaneous influences over great distances. Famously, Einstein said: "Physics should represent reality in time and space, free from spooky action at a distance."

Instead, Einstein believed that the answer to the paradox lay in the fact that the particles contained certain property values all along, but these values were hidden from our eyes (so-called *hidden variables*). So when Alice measures her electron and finds it is "spin up", there is no problem with Bob's measurement as Bob's particle knew it was "spin down" all along. In this way, no instantaneous action at a distance is required. The principle of locality would be preserved, but it would mean that the particles contained more information than quantum mechanics said they possessed.

If Einstein was correct, it would mean that quantum mechanics was not a "complete" description of reality. This announcement of Einstein made headlines around the world, such as this one from the *New York Times* on May 4th 1935:



Unfortunately, there seemed to be no way to distinguish between the viewpoints of Einstein and Bohr. Who was correct?

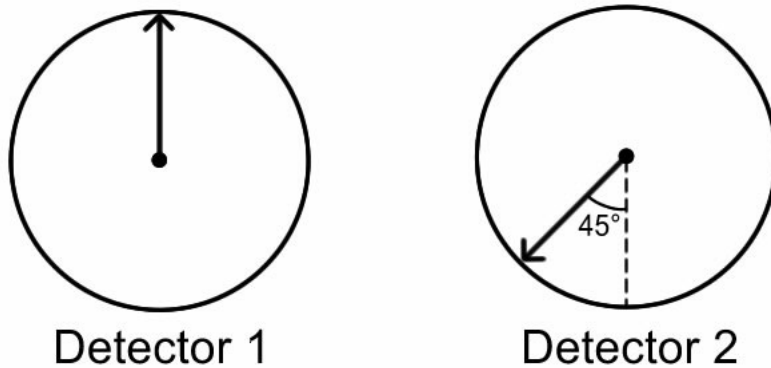
Bell's theorem

In the decades which followed, the theory of quantum mechanics brought one success after another, and it assumed its position as one of the bedrock theories in physics. Applications of quantum mechanics included semiconductors (leading to the computer age), and lasers (which introduced CDs and DVDs). For most physicists, the successes of quantum mechanics meant they were more than happy to use the basic equations to produce results, without spending too much time wondering about the philosophical interpretations. The discussions between Bohr and Einstein over EPR were largely forgotten.

However, in the 1960s, an Irish physicist by the name of John Bell became fascinated by the EPR paradox and decided to see if it was possible to design an experiment which could distinguish between the viewpoints of Einstein and Bohr. Instinctively, Bell felt that Einstein must be right — that there was an objective reality even in the absence of observation. Bell believed that the properties of particles had to have fixed values — even before those property values were measured. In an effort to prove Einstein correct, John Bell proposed an ingenious experiment.

As in the case of the EPR paradox, Bell's experiment required two experimenters to measure the spin value of two entangled particles. As with EPR, if one experimenter measures "spin up" then the other experimenter has to measure "spin down". According to the Copenhagen interpretation, after the spin of the first particle is measured, it is as if quantum entanglement works over a great distance to "pull" the spin of the second particle into the precisely opposite alignment. It does not matter how the spins of the particles were aligned before observation: after observation quantum mechanics "pulls" the spin of the second particle to point in precisely the opposite direction to the measured spin of the first particle.

Bell's brilliant innovation was to consider the situation when one of the detectors was not precisely aligned either up or down. What if the second detector is aligned at a 45° angle?



In that case, there would not be such a precise correlation between the results of the two experimenters. But the "pulling" effect of quantum mechanics (via quantum entanglement) ensures that there is still a surprisingly high level of correlation between the two results. In fact, according to quantum mechanics, the level of agreement between the two experimenters is predicted to be:

$$\frac{1}{2}(1 + \cos \theta)$$

where θ is the angle by which the second detector is offset. So for an offset angle of 45°, this formula predicts a level of agreement between the two experimenters of approximately 85% (if you want to check the maths, you can enter the 45° value into the previous formula to check you get 85%).

But what happens if quantum mechanics is incorrect? What if Einstein was right, and the particle spins have fixed values before observation?

In that case, there is no quantum manipulation at a distance, and the level of correlation between the two experimenters simply falls off linearly as the offset angle increases. An offset angle of 45° represents a quarter of the distance from 0° (100% correlation) to 180° (0% correlation). So, as there is a linear relation, an offset angle of 45° represents 75% correlation.

So, in the case of fixed spin values (i.e., the situation preferred by Einstein), we find there should be only a 75% probability of agreement between the two experimenters.

To sum up, if quantum mechanics is correct, we should expect an 85% level of correlation between the two experimenters. But if quantum mechanics is incorrect — and Einstein is right — we should expect to find a level of correlation no higher than 75%.

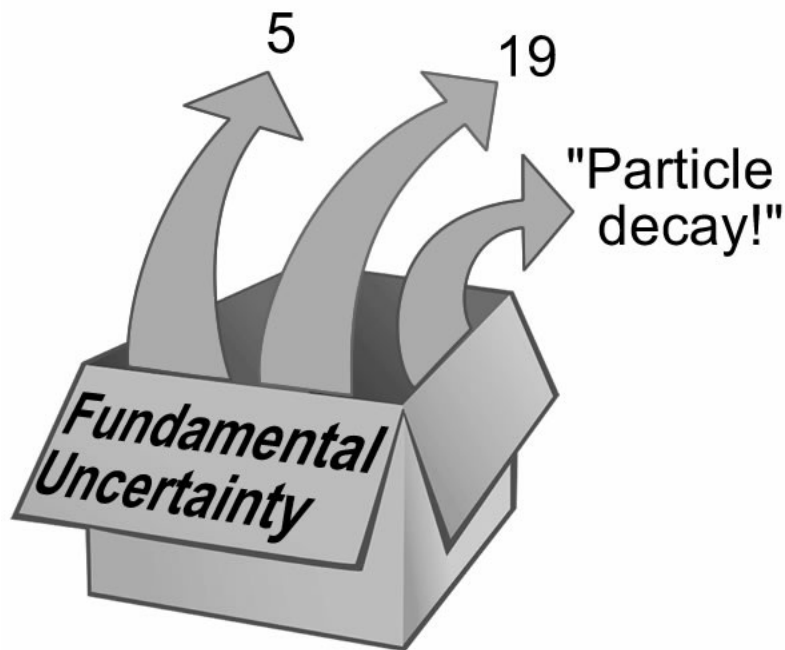
So it was in the early 1970s that several groups of experimenters started to test the level of correlation in entangled particles. When the results were analysed, the result was startling. It was shown that the level of correlation was, indeed, 85% — the value predicted by quantum mechanics. This was a higher value than the value which should have been possible (75%) if the particles had fixed property values. This meant that Bohr was right all along and Einstein was wrong: particles could not have fixed property values. There had to be some form of faster-than-light spooky signalling, the effect of which was to increase the correlation between the particles. This was an

astonishing result, which *Physics World* magazine called "the most profound discovery of science."

Unfortunately, John Bell died suddenly of a stroke in 1990. In that same year he had been nominated for a Nobel Prize for his discovery. Bell would probably have won the prize, but it is never awarded posthumously (which hardly sounds fair). However, for his work in revealing the true extraordinary nature of quantum mechanics, Bell is recognised as one of the greatest physicists of the 20th century.

Fundamental uncertainty

We will end this chapter with a discussion of a very important concept, a concept which will be repeated throughout this book. It is the concept of *fundamental uncertainty*. We encountered fundamental uncertainty earlier in this chapter with our discussion of the quantum roulette wheel. It was explained how the process of making a quantum measurement is like playing a game of roulette. However, there is fundamentally no way of determining where the ball will stop, no way of calculating the value in advance. We might illustrate fundamental uncertainty using the roulette wheel analogy, or we might simply express it by using a box which produces random numbers. There is no way of determining which number will be produced by the box, no cause we can detect, no hidden mechanism we can investigate, and there is no pattern to the numbers.



Essentially, this is "God playing dice".

The diagram also shows a command being issued for a particle to decay. Again, there is fundamentally no way to determine when this command will be issued: the timing is completely random.

However, this type of behaviour — this fundamental uncertainty — seems very alien to us. There is nothing in our human-level macroscopic world which behaves in this way. We only ever encounter outcomes which are clearly defined, effects uniquely determined by their causes. In our macroscopic world we are always able to dig deeper to find the cause of any observed behaviour. But at the lowest quantum level, this option of digging deeper is not available to us. It is called fundamental uncertainty because "fundamental" implies that there is no deeper layer.

And it is because this behaviour seems so alien to us that the possibility of this behaviour receives so much resistance, so much hostility. It is as if there is an inflexibility to accept that such behaviour could exist, as if people cannot "get their heads round it". As we have seen, even the great Albert Einstein seemed to have an inflexible resistance to the concept, a resistance which was to damage the remainder of his career.

It is perhaps the hardest task in physics — and the most important skill — to have a flexible mind capable of accepting ideas which appear counter-intuitive or which do not agree with everyday experience, such as the concept

of fundamental uncertainty. However, the skill is to only consider experimental data, the results of experiments, and **listen to Nature talking.**

So remember the name: fundamental uncertainty. It is a crucial concept which will crop up again in this book.

But why should Nature be behaving in such an unusual manner? Why do the laws of quantum mechanics work this way? It is interesting to present some speculation about why this might be the case.

In my first book, I asked the question as to why the laws of Nature take the form they do. It is a question which has been asked many times before, probably most famously when Einstein said: "What I am really interested in is whether God could have made the world in a different way; that is, whether the necessity of logical simplicity leaves any freedom at all." Do the laws of Nature arise from logical necessity? In other words, is it at all possible that the laws of Nature could have taken a different form? If that is not the case, if the laws could not have been any other way, then we would appear to have found a solution to our question of why the laws take the form they do.

Perhaps we can find an answer from the most remarkable moment in the history of the universe: the moment of the Big Bang, approximately 13.7 billion years ago. Our theories are not yet capable of predicting what precisely happened in the earliest moments of the existence of the universe, in the so-called *Planck epoch*, from 0 up to 10^{-27} seconds. However, if we wind the clock back, it is believed that the universe was compressed to a size smaller than an atomic nucleus, an incredibly hot and dense point. The condition of the universe at this moment is called the *boundary condition*. In order to be topical, I can quote Stephen Hawking's character at the end of the recently-released movie *The Theory of Everything*: "There ought to be something very special about the boundary conditions of the universe". Surely we can learn a lot from this condition.

If you read my first book, you will know that we should not treat the event of the Big Bang as the reason the universe exists (all times are equally real in a block universe: the last moments of the universe are just as real as the first moments). However, the very peculiar situation of the Planck epoch poses a tremendous challenge for classical deterministic physics. According to determinism, every effect has a clearly-defined unique cause. But if the universe did not exist before the Big Bang, then how can determinism link cause and effect over the period? Also, how can the classical law of conservation of energy possibly handle a situation in which no energy (before the Big Bang) is transformed into a great deal of energy (after the Big Bang)? Classical deterministic physics is inflexible in these matters. Determinism inevitably breaks down.

But if determinism breaks down, then indeterminism (in the form of quantum mechanics) is perfectly capable of stepping up to the mark. Quantum indeterminism breaks the strict laws of cause-and-effect. And, according to the uncertainty principle, it is even possible that a small amount of energy can spontaneously appear from empty space in a so-called quantum fluctuation, but only for a very short time. In fact, if you had to design a theory aimed at coping with the craziness of the earliest moments of the universe, you could not do much better than "anything goes" quantum mechanics.

So maybe at the lowest levels of reality there must be indeterminism and uncertainty, otherwise there could be no way that the universe could exist. Maybe every conceivable universe has to be fundamentally non-deterministic at its base level? Maybe this makes indeterminism and uncertainty a logical necessity in the laws of Nature.

We shall return to consider this point later in the book.

4

VIENNA

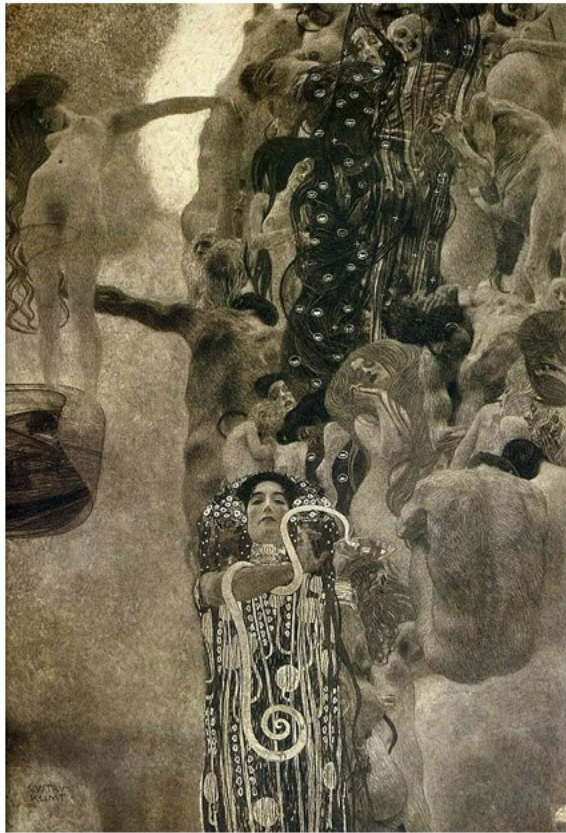
At the start of the 20th century, the city of Vienna was the capital of the Austro-Hungarian empire, a city of two million souls, and one of the most important centres of culture and philosophy in the world. The Austro-Hungarian empire consisted of 15 nations, and the citizens of those nations created a cultural melting-pot in Vienna. The city was a centre of the modernist movement, buzzing with the new ideas of psychoanalyst Sigmund Freud and philosopher Ludwig Wittgenstein who both chose to make the city their home. The centres of intellectual debate were the Viennese coffee houses, where arguments raged through the day. The clientele of the coffee houses included Adolf Hitler, Joseph Stalin, Leon Trotsky, and Sigmund Freud who were all living in the city within a few miles of each other. [6]

According to Professor Dave Cliff on his BBC TV programme *The Joy of Logic*: "Despite its grace and gentility, Vienna can lay justifiable claim — perhaps more than any other city — to be the birthplace of the modern. For it was here in art, design, philosophy, science, and psychology, that people most boldly challenged the tired conventions and assumptions of the 19th century."

I am the proud possessor of a postcard from Vienna dated 1904. It is a beautiful thing. The picture on the card gives a good impression of what street life must have been like in that era:



About this time, the University of Vienna commissioned a series of paintings for the ceiling of its great hall. The paintings were intended to celebrate the great recent technological and scientific advances, and the seemingly endless increase in knowledge. The artist they commissioned was Gustav Klimt. However, when Klimt presented his finished paintings to the professors of the university, they were shocked. Instead of a series of optimistic visions, Klimt presented a pessimistic, dark, hopeless view of naked men and women drifting aimlessly in voids.



This was certainly not what the professors wanted. The paintings seemed to challenge their view of a brave new world in which human knowledge would continue to boundlessly increase. Klimt's paintings were instantly rejected.

According to Professor Dave Cliff: "Klimt's paintings seemed to reject the fashionable notion that science and mathematics would provide us with complete knowledge founded on **absolute provable truth**." The emphasis on provable truth is important, because, as we shall see, it was the concept of provable mathematical truth which would later be severely challenged by one of the students of the University of Vienna.

The certainty of mathematics

What do we mean when we say a statement is "true" or "false"? Well, the statement might refer to some factual aspect of the material world, e.g., "The cat is on the mat". That statement could be evaluated as being either true or false by inspecting the mat and determining if the cat is sitting on it. In the field of logic, we would call a statement such as "the cat is on the mat" a *proposition*. A proposition is a statement which can be either true or false.

The rules of logic allows us to use reasoning to combine propositions. For example, we could combine the proposition "all men are mortal" with the proposition "Socrates is a man" to derive the proposition "Socrates is mortal". We can then say that we have used the rules of logic to **prove** that Socrates is mortal, and the steps we used to prove that proposition would be called a *proof*.

In mathematics, if a proposition is true and it is particularly useful or important, then it is called a *theorem*. Not only is a mathematical theorem true, but it will be true under all circumstances, in any conceivable world. This differs from a proposition about the material world. Propositions about the material world such as "the cat is on the mat" could conceivably be either true or false. We could certainly imagine an alternative world in which the other outcome is true (i.e., "the cat is **not** on the mat"). In mathematics, however, there is no uncertainty: a true proposition (theorem) would have to be true in any possible world.

So a mathematical proof is a valuable thing. It seems to reveal some insight into "the way things have to be". In his book *The Study of Mathematics*, Bertrand Russell said: "Mathematics takes us into the region of absolute

necessity, to which not only the actual world, but every possible world, must conform."

Let us consider an example of a theorem from geometry (geometry being a branch of mathematics). The Pythagorean theorem ("On a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides") has at least 370 known proofs. However, only one proof would be required to establish the truth of the theorem.

And because mathematical proof reveals an insight into "the way things have to be" we realise that the Pythagorean theorem would have to be true in any possible world we could imagine. For example, aliens on other planets would at some stage of their technological evolution undoubtedly independently discover their own version of the Pythagorean theorem. The great mathematician Carl Friedrich Gauss suggested that the diagram of the Pythagorean theorem should be drawn on the Siberian tundra so that Martian observers would recognise that there was intelligent life on Earth. The outlines of the shapes were to be ten-mile-wide strips of pine forest. The interiors of the shapes were to be giant fields of yellow wheat.

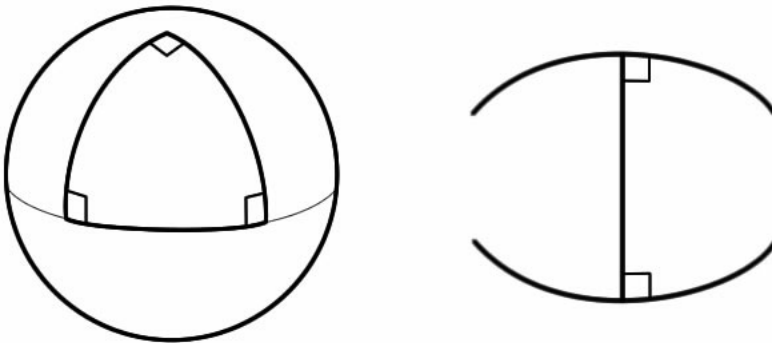
We can feel certain about the universal truth of mathematical theorems because they are derived — in a sequence of logical steps — from simple *axioms*. Axioms can be considered the foundation stones of mathematics. They are simple propositions which are considered as being "obviously true". For example, the axioms of classical geometry were defined by the Greek mathematician Euclid. These five axioms are:

1. It is possible to draw a straight line from any point to any other point.
2. It is possible to extend a straight line indefinitely.
3. It is possible to draw a circle with any centre and any radius.
4. All right angles are equal to one another.
5. Parallel lines never meet — no matter how long they are.

Though these axioms might appear trivially simple, all of classical geometry (including the Pythagorean theorem) can be derived by logical reasoning (building up) from these five axioms. In fact, it is the simplicity of the axioms which gives them their strength: the truth of these axioms appears intuitively obvious. And it is the obvious truth of its axioms which provides mathematics with its universal certainty.

However, it was known that the last of Euclid's five axioms — the *parallel postulate* — was not quite as intuitively obvious as the other four axioms. Attempts to prove the parallel postulate from the other four axioms failed. Did the parallel postulate necessarily have to be true?

Euclidean geometry is also called *plane geometry* because it assumes that the geometry is being constructed on a flat surface. However, in the 19th century it was realised that geometry could also be performed on curved surfaces, e.g., the surface of a sphere. In that case, the parallel postulate does not hold: parallel lines can eventually meet. Lines which are parallel on one part of the sphere might converge to a point. As an example, the north-south lines of longitude on the surface of the Earth are parallel at the Equator but converge to a point at the North and South Poles.



The resultant form of geometry — which can deal with curved surfaces — is called *non-Euclidean geometry*. In the early years of the 20th century, the real-world application of non-Euclidean geometry was revealed when Einstein's theory of general relativity showed that space itself had curvature, so only a non-Euclidean geometry

could correctly describe space.

So the introduction of non-Euclidean geometry showed that our certainty of mathematics is only as secure as our certainty of the axioms on which mathematics is based. Suddenly, mathematics seemed less than secure. As John Barrow says in his book *Pi in the Sky*: "The discovery that Euclidean geometry was not a unique, inevitable, and absolute truth about the world came therefore as a stunning blow. Its impact was far-reaching and irreversible. It undermined absolutist views about human knowledge across a vast spectrum of human thinking. Prior to the coming of non-Euclidean geometry, there was a unity, a confidence, and a certainty to our knowledge of the world. Afterwards, the one unassailable truth about the nature of the physical world had been eroded and so, along with it, had centuries of confidence in the existence and knowability of unassailable truths about the universe. How are the mighty fallen."

The Barber of Seville

In the early years of the 20th century, there was a great deal of interest in a number of logical paradoxes which threatened to undermine the foundations of mathematics. As an example, Epimenides — a Greek philosopher of the sixth century — once said: "All Cretans are liars". This might appear rather a racist comment, however, it should be mentioned that Epimenides was from Crete himself. So what are we to make of Epimenides' statement? If all Cretans really are liars, then Epimenides is a liar himself. In which case, we should not believe his statement. Therefore, Epimenides might be a truthful Cretan. In which case, all Cretans are liars, etc.

The liar's paradox also featured in a 1967 episode of *Star Trek* (<http://tinyurl.com/liarsparadox>). Captain Kirk and the crew manage to defeat an android simply by telling it "I am lying". The android finds this so illogical (if he is lying, then he must be telling the truth) that its circuits blow and smoke pours out of its head.

The liar's paradox is not written in the language of mathematics, it is written in English which is a language not notable for its logical consistency. Hence, this paradox is considered to be nothing more than a linguistic oddity, and not a threat to mathematics. However, other paradoxes were discovered which were phrased in the language of mathematics, and these paradoxes posed more serious problems. One of these paradoxes is known as the paradox of the Barber of Seville: "A man of Seville is shaved by the Barber of Seville if and only if the man does not shave himself. Does the Barber shave himself?"

This paradox is slightly more complex than the previous liar's paradox. It refers to the mathematical structure known as a *set*, which is a collection of objects. The paradox considers the set of all men who do not shave themselves (and are therefore shaved by the barber):



Should the barber be in the set? In other words, does the barber shave himself? If we assume the barber does **not** shave himself, then we should put him in the set. But if we put him in the set, then the barber **should** shave himself

because the barber shaves all the men in the set.

So if the barber shaves himself, then he does not shave himself. But if the barber does **not** shave himself, then he **does** shave himself.

Hence, this is another paradox. But unlike the previous liar's paradox — which was expressed in the English language — sets are mathematical structures which can be expressed mathematically. So the tale of the Barber of Seville represents a true mathematical paradox.

This paradox was discovered by the English philosopher and logician Bertrand Russell in 1903, and it is called *Russell's paradox*. Russell was so disturbed by mathematical paradoxes that he embarked on a project aimed at restoring perfect certainty to mathematics.

Russell started writing a book. A very, very, long book.

Principia Mathematica

Although mathematicians believed they were completely rigorous in their approach, Russell realised that this was not the case. Often, mathematicians used terms which had not been rigorously defined, or used reasoning — perhaps unconsciously — which was logically inconsistent. Russell decided that what was needed was to derive all of mathematics using pure logic. Nothing would be left to chance. There would be no room for differing interpretations, or human emotion. Essentially, the whole process could be performed by a computer, relentlessly building-up endless theorems and printing out the results.

However, as there was a shortage of computers in the first decade of the 20th century, the task fell solely on the shoulders of Russell and his occasional collaborator Alfred Whitehead. After 360 pages of writing, their first major result was definitively proved: $1+1=2$

It might seem rather excessive to spend such a long time to prove such an apparently trivial result, but it revealed Russell's determination to build mathematics on a solid logical foundation and thereby eliminate all paradoxes and contradictions.

After almost ten years of work, the first volume of Russell's magnum opus *Principia Mathematica* was released in 1910. The book was so large that Russell and Whitehead had to transport the book to their publisher's office in a wheelbarrow. Two further volumes followed in 1912 and 1913.

Unfortunately, the writing of the *Principia* required an almost obsessive approach, with no room for creativity or inspiration. Russell remarked that the mental effort had irretrievably drained his mental abilities. Talking of his experience, Russell said: "The effort was so severe that at the end we both turned aside from mathematical logic with a kind of nausea."

Russell was not the only one working to eliminate uncertainty from mathematics. At the start of the 20th century, the German mathematician David Hilbert was regarded as being the greatest mathematician in the world. According to John Barrow in his book about the history of mathematics, *Pi in the Sky*: "There is virtually no part of mathematics to which he did not make profound original contributions." In 1895, Hilbert became a professor of mathematics at the University of Göttingen where he was to spend his entire career. During his time there, the University of Göttingen became the world's leading centre of mathematics.

Here is a photograph of David Hilbert:



In 1900, at the International Congress of Mathematicians in Paris, Hilbert presented a list of 23 unsolved problems in mathematics which he considered to be the most important questions of the time. The list proved to be remarkably prescient and influential, and the attempts to solve the 23 problems were to dominate 20th century mathematics.

However, the true motivation behind Hilbert's set of problems was an attempt to place the science of mathematics on a surer footing. Remember, at the time, in the early 20th century, the whole edifice of mathematics appeared to be threatened by the presence of paradoxes — statements which can be both true and false at the same time. This appeared to undermine the status of mathematics as the source of all truth. According to Hilbert: "The present state of affairs is intolerable. Just think, the definitions and deductive methods which everyone learns, teaches and uses in mathematics, the paragon of truth and certitude, lead to absurdities! If mathematical thinking is defective, where are we to find truth and certitude?"

The second of Hilbert's 23 problems proved to be particularly interesting from the point-of-view of uncertainty. Hilbert challenged mathematicians to prove that mathematics was *complete*, in other words, **they had to prove that there were no true theorems in mathematics which could not be proved to be true**. This is the definition of mathematical completeness. If there was any statement which was true — but could not be proved to be true using mathematics — then that would appear to seriously limit the ability of mathematics to reveal truths about the world.

However, Hilbert's program to ensure the certainty and completeness of mathematics was about to be derailed in spectacular fashion.

Gödel's incompleteness theorem

Let us now return to Vienna. We have read how the paintings of Gustav Klimt "seemed to reject the fashionable notion that science and mathematics would provide us with complete knowledge founded on **absolute provable truth**." Indeed, one of the students in the University of Vienna at that time presented the greatest challenge to the notion of provable truth.

Kurt Gödel became interested in mathematical logic while studying as an undergraduate at the university. One year after completing his doctorate, in 1931 while he was still living in Vienna, he published the work for which he is most famous. Indeed, it is the work which sent shockwaves throughout mathematics and many other fields far removed from mathematical logic. Gödel solved Hilbert's second problem by showing that some mathematical statements exist which are true, but which cannot be proved to be true. This meant that mathematics was not *complete*: there are some things you cannot prove using mathematics. This effectively proved the death knell of David Hilbert's program to eliminate uncertainty from mathematics.

This result is known as *Gödel's incompleteness theorem*.

So, how did Gödel arrive at his result? The method was actually very similar to the liar's paradox which we considered earlier. If you remember, the liar's paradox essentially consisted of the English language sentence "This sentence is false". If the sentence is false, then the sentence must be true. But if the sentence is true, then the

sentence must be false. Hence the contradiction.

However, as was explained in the discussion about the liar's paradox, English is a language with poorly-defined rules, and it is not a mathematical language. As such, no sentence phrased in English can pose a threat to mathematics. I can basically say whatever I like in English. If I say "Mathematics is flawed" then that poses no actual threat to mathematics.

But Gödel's brilliant stroke of genius was to show how any statement could be converted into a mathematical statement. He achieved this translation by using a code. The code converted a statement into a single whole number (usually a very large whole number). The whole number is called the *Gödel number*. The code worked on the basis that any number can be calculated by multiplying prime numbers together in one — **and only one** — way. For example, $51 = 3 \times 17$. Because there is only one way of calculating a number in this manner, that meant that there is a one-to-one relationship between a string of prime numbers and a unique Gödel number. If each prime number is then taken as representing a symbol in a statement, then this allows a statement to be converted into a Gödel number.

This conversion meant that any statement **about** mathematics could then be imported **into** mathematics. Most importantly, this allowed a mathematical statement to refer to itself. This is how Gödel achieved that ...

Gödel considered the liar's paradox, and wondered if it had a corresponding equivalent in mathematics. But instead of considering the statement "This sentence is false", Gödel considered the statement "This statement cannot be proved to be true". More precisely, Gödel considered the statement "The statement with Gödel number x cannot be proved to be true". What Gödel then did was to encode **that entire statement** into a Gödel number, and replace the letter x in the statement with that Gödel number. In that way, the statement forms a strange kind of loop, looping back to refer to itself. And the end result is that the final statement refers to itself and so does, indeed, end up representing the statement "This statement cannot be proved to be true".

Let us now consider that statement "This statement cannot be proved to be true". If that statement is false, then we **can** prove it to be true — a contradiction. But if the statement is true, then we have a true statement which we cannot prove!

So either way — if the statement is true or the statement is false — mathematics is in trouble. By converting the statement into a mathematical form using his coding approach, Gödel revealed that a statement could exist which was either a contradiction (a paradox), or else there existed a true statement which could never be proved to be true.

Essentially, Gödel's result showed that all the work done by Russell and Whitehead in their *Principia Mathematica* was doomed. It was simply never possible to prove all theorems by building up from axioms — the method proposed by Russell and Whitehead. *Principia Mathematica* aimed to create a mathematics which was perfectly consistent and complete. It now emerged that all that work was for nothing. Gödel had showed that there could never be **complete** certainty in mathematics, because mathematics itself was not complete.

In his book *Impossibility*, John Barrow presents a very nice analogy to incompleteness: "If all truths in a logical system can be deduced from its axioms, it is called **complete**. As an illustration, consider a board game like chess or Go. Incompleteness would mean that there were configurations of pieces on the board that could not have been reached from the starting layout by following the rules of the game."

Douglas Hofstadter wrote an extraordinary Pulitzer Prize-winning book about the incompleteness theorem entitled *Gödel, Escher, Bach*. In an extract from that book, Hofstadter describes the impact of the incompleteness theorem on the general public: "Modern readers may not be as nonplussed by this as readers of 1931 were, since in the interim our culture has absorbed Gödel's theorem, along with the conceptual revolutions of relativity and quantum mechanics, and their philosophically disorienting messages have reached the public, even if cushioned by several layers of translation (and usually obfuscation). There is a general mood of expectation, these days, of 'limitative' results — but back in 1931, this came as a bolt from the blue."

Towards the end of his life, Gödel unfortunately became quite paranoid. In 1947, Gödel applied for American citizenship to join his good friend Einstein in Princeton. Einstein was to appear at the hearing as a character witness for Gödel.

On the night before the hearing, Gödel became quite distressed when he believed he had found a logical loophole in the constitution which would enable a dictatorship to be created in America. Einstein only just managed to calm him down enough in order to appear at the hearing, and he told Gödel not to mention the loophole under any circumstance.

The next day, the hearing seemed to go smoothly. The judge was impressed by Einstein's testimony as character witness. In summing up, the judge turned to Gödel and noted that, up to this point, Gödel had held German citizenship. The judge noted that Germany had been under an evil dictatorship, something that was "simply not possible in America". On hearing the word "dictatorship", Gödel burst into life and started explaining to the judge why he has wrong and, what, what was more, "I can prove it!". It took the efforts of both Einstein and the judge to

calm Gödel down, and he was eventually awarded American citizenship, joining Einstein at the Institute for Advanced Study.

The uncertain century

In Chapter One, it was described how the end of the 19th century was a period of great achievement, and there was great optimism and certainty about continued progress in science. However, once the 20th century arrived, discoveries in science and mathematics (quantum mechanics and Gödel's theorem) seemed to undermine this certainty, and it is uncanny how this loss of confidence seemed to mirror a loss of direction in other areas of human endeavour.

We might regard David Hilbert's effort to formalise mathematics as a last-gasp attempt to ensure certainty and stability in a world on the brink of chaos. As David Leavitt says (in his biography of Alan Turing): "It is hard not to read into Hilbert's program an attempt, through mathematics, to ward off the coming nightmare, just as it is hard not to read into Kurt Gödel's subsequent derailing of that program both the death knell of prewar idealism and the advent of a bloody, off-kilter epoch in which the prevailing metaphors would be of chaos and night, not order and morning. Hilbert hoped to establish once and for all the security of the mathematical landscape (and by extension, the security of Europe)."

However, it was those other citizens of Vienna — Hitler and Stalin — who were to have the greatest influence on the 20th century. Once aimed solely at the good of mankind, science was turned to the creation of weapons. During the First World War, the Jewish director of Berlin's Institute for Chemistry, Fritz Haber, turned his attention to the creation of chemical weapons. He developed a mathematical formula — known as *Haber's law* — which gave the relationship between the concentration of a poisonous gas and how long the gas had to be breathed to achieve death.

Haber was awarded the Nobel Prize for Chemistry in 1918.

Progress in science and technology was being warped so that it was no longer the servant of humanity. Instead, science became the enemy of millions. Haber became the first director of the corporation which produced the poisonous gas Zyklon B, later responsible for the deaths of millions in the gas chambers during the Second World War.

Meanwhile, in America, the greatest physics project of all time — which at its peak was greater than the entire American automobile industry — was devoted not to the benefit of mankind but to the development of the ultimate weapon of mass destruction: the atomic bomb.

Finally, in Chapter One it was described how the iron steamship the Great Eastern was built in the 19th century and became the largest passenger ship ever built. The ship laid the first telegraph cable across the Atlantic, and became a symbol of the confidence and certainty of the era. However, the record of the largest passenger ship was beaten early in the 20th century by a steamship whose selling-point was certainty: the perfect certainty of safety and security.

That ship was the Titanic.

Welcome to the uncertain century.

5

THE COASTLINE OF BRITAIN

In 1961, Edward Lorenz was a mathematician and meteorologist working at MIT. He was attempting to use a computer for the first time as a tool for long-range weather prediction. In theory, the computer seemed an ideal tool for weather forecasting, capable of performing endless repetitive calculations, applying Newton's deterministic laws of motion to millions of small pockets of air. In this way, it was supposed that the weather could be predicted in much the same way as the motion of the planets could be predicted with great accuracy.

In order to create his simulation of the movement of air in the atmosphere, Lorenz had constructed a simple model based on *convection*. Convection occurs when a volume of air is heated from below. As far as the weather is concerned, this is the situation when the Sun heats the ground and the air immediately above the ground becomes warm. Warm air is less dense than cold air, so this warm air rises to the higher levels of the atmosphere where it cools. This cooled air then descends again to replace the newly-warmed air at ground level. Hence, over time a circular convection current is formed.

Lorenz used three simple equations to model this convection current. While Lorenz's equations predicted that the system would always tend to form a simple circular current, they also revealed that this stability was deceptive. The equations also showed that sometimes — in a completely unpredictable way — the direction of circulation could slow down and then reverse.

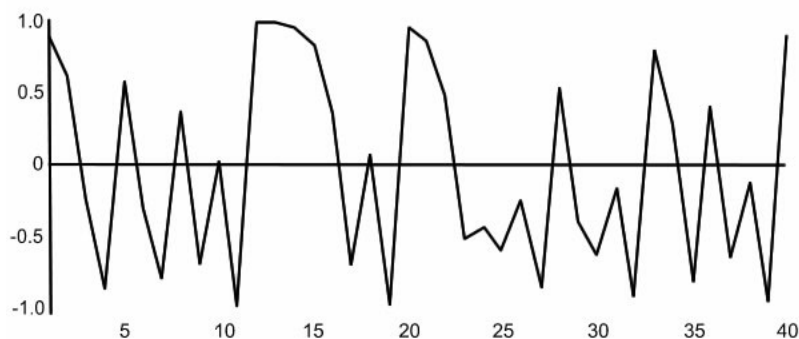
This was a remarkable discovery. It had always been assumed that complex or unpredictable behaviour could only arise from a complicated system. You would certainly not expect random behaviour to be generated by a simple deterministic equation (an equation is deterministic as you can be completely certain of the output of the equation for a particular input). However, Lorenz's discovery showed that very simple equations can generate behaviour which appears random.

In order to illustrate this principle, Professor Ian Stewart in his book *Does God Play Dice?* presents a very simple mathematical expression: $2x^2-1$. We will discover how a simple expression such as this can produce complex behaviour which appears random.

Pick a fractional value between 0 and 1 and substitute that value for x in the expression (use your calculator — there should be an x^2 button on your calculator which makes the calculation of $2x^2-1$ a simple process). As an example, we will start with the value 0.9. You will calculate the result of the expression as being 0.62. This then becomes your new value of x . So repeat the process, this time substituting your new value of 0.62 for x in the expression. You will find you get -0.2312. Repeat this process several times and you will get the following sequence:

0.9
0.62
-0.2312
-0.8930931
0.5952306
-0.2914009
-0.8301709
0.3783676
-0.7136758
0.0186665
-0.9993031
0.9972134

Here is a plot of the sequence extended to 40 numbers:



The values and the plot appears completely random! This is bizarre: a simple, deterministic equation has generated behaviour which appears completely random. Certainly, if you encountered this sort of behaviour in Nature then you would probably assume that there was some complex mechanism underlying it, such as the interactions of a large population of animals. You would not imagine that such randomness could be generated by something as simple as $2x^2-1$.

But still, at least this appears like a predictable process. We have a simple equation, and as long as we know the starting value we should be able to plot the rest of the sequence with perfect accuracy. If the weather really does behave like this, then it appears we have discovered the secret of accurate long-term weather forecasting!

However, one day when he was comparing two plots of output data which were supposedly generated by the same input data, Lorenz got a shock. The two plots were very similar at first, but diverged after a few values until the two graphs became completely different. Lorenz was baffled. These plots were not hand drawn, they were computer-generated so there should be no room for error. If you give a computer the same data, and perform the same calculation repeatedly you should always get the same result. Computers are entirely predictable. This result seemed to challenge everything we know about how computers function.

Because of the predictable behaviour of computers, Lorenz immediately suspected his input data had to be different in the two circumstances. When he examined the second sequence he saw he had set the value at the start of the sequence to be 0.506. He had copied this value from the first sequence. However, when he examined the first sequence he found the values there actually had six decimal places: 0.506127. In order to save time, Lorenz had not bothered to copy all the decimal places — he did not think they were important.

Lorenz was surely justified in thinking these extra numbers — just one part in a thousand — were not important. You would certainly not expect small features like a tiny gust of wind to be able to have a huge effect on the large-scale weather pattern. But this appeared to be the case. Lorenz looked at the two graphs and, almost immediately, knew his quest to predict the weather was doomed to failure.

The butterfly effect

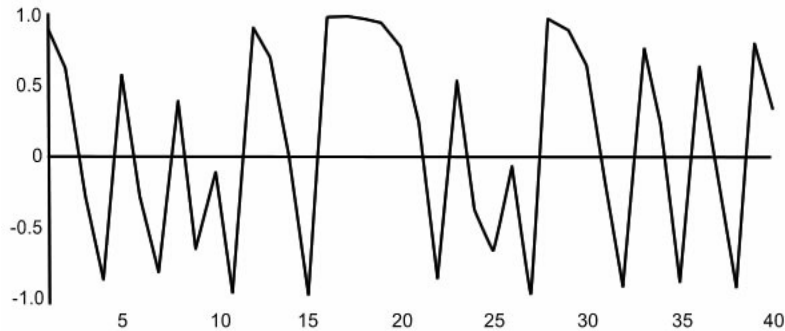
In order to duplicate Lorenz's discovery, let us return to our simple expression $2x^2-1$. Our first graph of values was generated from a starting value of 0.9. This time let us start with a very slightly different value of 0.9001. You might not imagine such a tiny difference — just one part in a thousand, as with Lorenz's experiment — would have much effect. In fact, you might expect this tiny variation to be barely visible on a graph.

As before, you might like to calculate some of the values using your calculator, this time starting with 0.9001. I have calculated the first twelve numbers for you, but you might like to check:

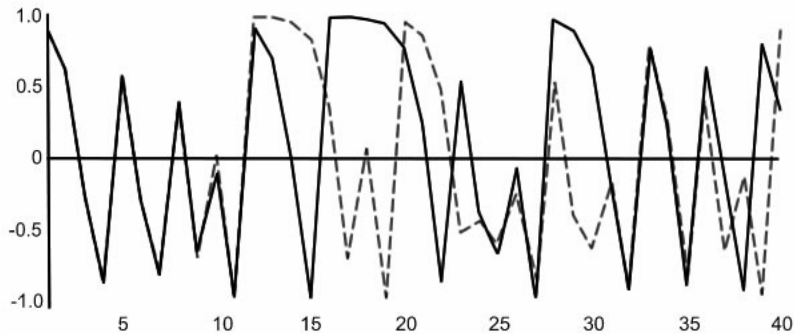
0.9001
 0.62036
 -0.2303068
 -0.8939174
 0.5981768
 -0.2843688
 -0.8382687
 0.405389

-0.6713194
-0.0986603
-0.9805322
0.9228871

And here is a plot of the sequence again extended to 40 numbers:



The graph appears very similar to the first graph (which was calculated starting with the value 0.9), but let us superimpose the first graph over the top of this second graph (the first graph is shown by the dotted line):



At the start, you will see that the two graphs are in very close agreement. However, after approximately ten points the two graphs start to diverge. After fifteen points the two graphs look completely different — despite starting with almost identical values.

This extreme sensitivity to initial conditions is a property of all deterministic systems which behave in this chaotic manner. This behaviour is called *chaos*.

Returning to Edward Lorenz's attempt to predict the weather, we find that if we knew the precise position and velocity of every tiny pocket of air at any one time, then we could produce long-term weather forecasts of perfect accuracy. However, for all practical purposes, it is simply impossible to obtain this perfect knowledge. We would have to know the value of all variables with perfect accuracy, to an effectively infinite number of decimal places. As we have seen in our experiment with $2x^2-1$, any slight error — no matter how small — would be magnified over time to produce huge later errors in our forecasts.

Even the tiniest fluttering of a butterfly's wings would affect the state of the current weather by a small amount, and that effect would become magnified over time. Lorenz called this principle the *butterfly effect*, the principle that a butterfly flapping its wings in China could potentially cause a hurricane next month in New York.

Lorenz was well aware of the implications of this discovery for long-range weather forecasting: "When our results concerning the instability of nonperiodic flow are applied to the atmosphere, which is ostensibly nonperiodic, they indicate that prediction of the sufficiently distant future is impossible by any method, unless the present conditions are known exactly. In view of the inevitable inaccuracy and incompleteness of weather observations, precise very-long-range forecasting would seem to be non-existent."

In Chapter Two we considered the uncertainty due to quantum mechanics and found that — at the very base of

Nature — there was a fundamental uncertainty. Randomness seems built into the very fabric of Nature at a low level. However, the uncertainty we encounter due to chaos is a very different kind of uncertainty.

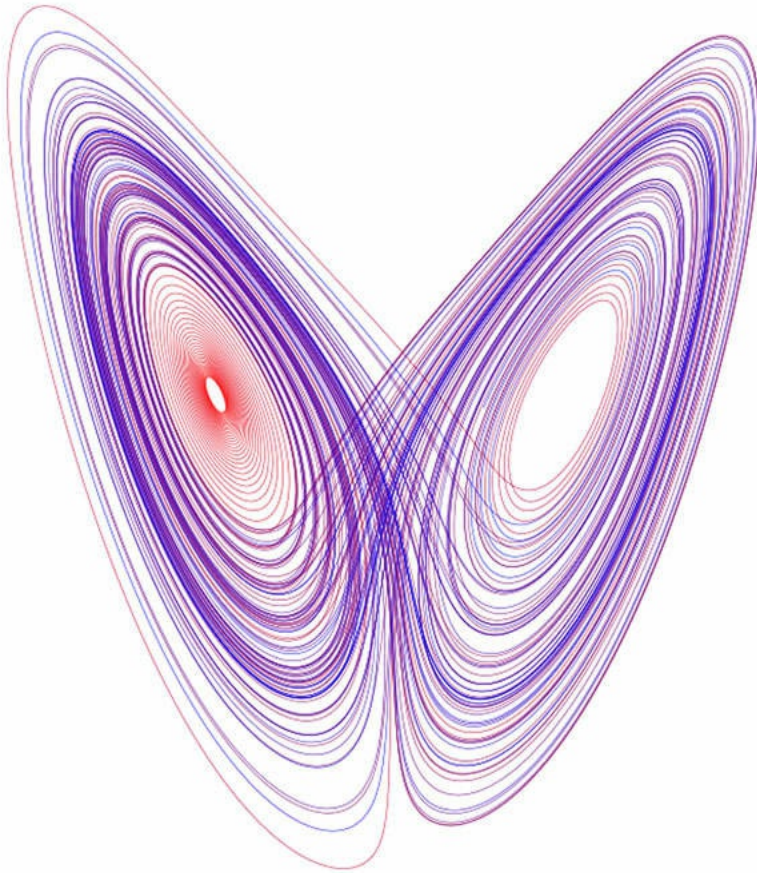
The processes which produce chaos are completely deterministic (unlike the case with quantum mechanics). Every pocket of air in the atmosphere moves in a perfectly deterministic manner according to Newtonian laws. **There is no randomness in this situation**, there is only the illusion of randomness. Chaos is produced by simple deterministic equations creating behaviour that appears random. From the point of view of this book, we have found another source of uncertainty, but this uncertainty is generated by a very unlikely source: determinism.

What is more, while the fundamental uncertainty of quantum mechanics only becomes significant at very small scales (for example, attempting to determine the velocity and momentum of a particle), we encounter the uncertainty of chaos at the far larger human-scale. Every time you feel turbulence in an airplane, or watch a flag flapping in the breeze, or simply look at the clouds drifting across the sky, you encounter the uncertainty of chaos. As James Gleick says in his book *Chaos*: "Twentieth-century science will be remembered for just three things: relativity, quantum mechanics, and chaos. Of the three, the revolution in chaos applies to the universe we see and touch, to objects at human scale."

Strange attractors

Lorenz's three simple equations had just three variables — x , y , and z — which denoted the current state of the system at any particular time, plus two fixed parameters: σ (which represented the viscosity of the fluid) and ρ (which represented the temperature difference between the top and bottom of the volume of air). These fixed parameters would be set to particular values before the simulation was run in order to obtain an interesting output.

In order to examine how the convection system developed over time, Lorenz took the x , y , and z values (which represented the state of the system at any particular time) and plotted a single point in a three-dimensional space, the coordinate of the point being the value (x, y, z) . As the system developed over time, this single point moved in the three-dimensional space and plotted a curve. The resulting diagram is shown below (although it is a two-dimensional diagram, it is actually a rendering of a three-dimensional plot):



This method — by which the state of a system is represented by a single point moving in a multi-dimensional space — is a common approach in physics and engineering. The space is called a *phase space*.

This diagram is the most famous diagram in the history of chaos research, appearing in Lorenz's groundbreaking 1962 paper on chaos.^[7] You can clearly see the diagram has two lobes. Depending on which lobe the point is currently orbiting, this determines whether the convection current is circulating clockwise or anticlockwise. If the point switches to orbiting the opposite lobe, then that represents a reversal in the direction of the convection current. These type of diagrams, which show the evolution of the state of a chaotic system over time, are called *strange attractors*. Strange attractors are objects which live in phase space. This particular diagram is called the *Lorenz attractor*.

These diagrams are called "attractors" because whatever random state a system might be in initially, the effect of chaos will always be to drag the state of that system towards the attractor. For example, in the case of a volume of air being heated from below, no matter what random configuration the air molecules are in initially, the effect of chaos is to create circular convection currents. Thus the state of the system is dragged towards the Lorenz attractor as if experiencing a "strange attraction". Hence, ironically, chaos operates to create structure, and that structure is the strange attractor.

The most important feature of the Lorenz attractor diagram is that the point never writes over the same point twice — the point continually writes a new curve through space, showing that the system is never in the same state twice. Hence, the system never repeats — it continually creates new convection patterns in a completely unpredictable way.

Strange attractors are therefore infinitely detailed: no matter how much you zoom in on them, you will always find more detail. This infinite detailing causes the extreme sensitivity to initial conditions in chaotic systems: even the slightest difference in position, the slightest movement from one pixel to the next, can have a huge effect on the later state of the system. Even the tiniest fluttering of a butterfly's wings can move the point on the attractor which represents the current weather — thus modifying the long-term behaviour of the weather.

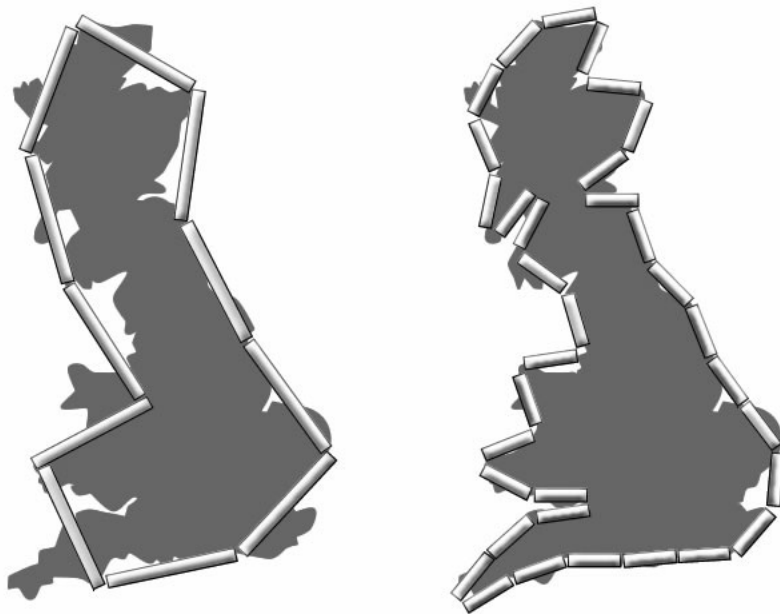
Structures which have this kind of infinite detail are called *fractals*. According to Ian Stewart: "It is now customary to define a strange attractor to be one that is fractal." Fractals are the geometry of chaos, and they are found throughout Nature.

Fractals

The French mathematician Benoit Mandelbrot was a scientific maverick who discovered the geometry of chaos, a geometry which we encounter throughout the natural world.

In 1960, Mandelbrot was working in the Thomas J. Watson Research Center, the pure research wing of IBM which was located 38 miles north of New York City. The scientists were effectively sheltered there, able to pursue whichever obscure research topic took their interest. IBM's philosophy was that if they got enough highly-intelligent people together in a single location then surely some great ideas would emerge which would benefit the company. Five Nobel Prize winners were to come out of the facility.

Legend has it that Mandelbrot became interested in unconventional forms of geometry when he wanted to obtain a value for the length of the coastline of Britain. On examining several encyclopedias, he found they all gave different values for the length. Mandelbrot realised that there was no single correct value for the length: it depended on how the length was measured. To be precise, it depended on the length of your measuring rod. If you imagine a giant measuring rod several miles in length, it would not be able to get into all the bays and inlets of the coast. Alternatively, a measuring rod only a few metres in length would be able to do a better job of measuring around all the bays. Hence, the shorter rod would measure a greater length for the coast of Britain than the longer rod.



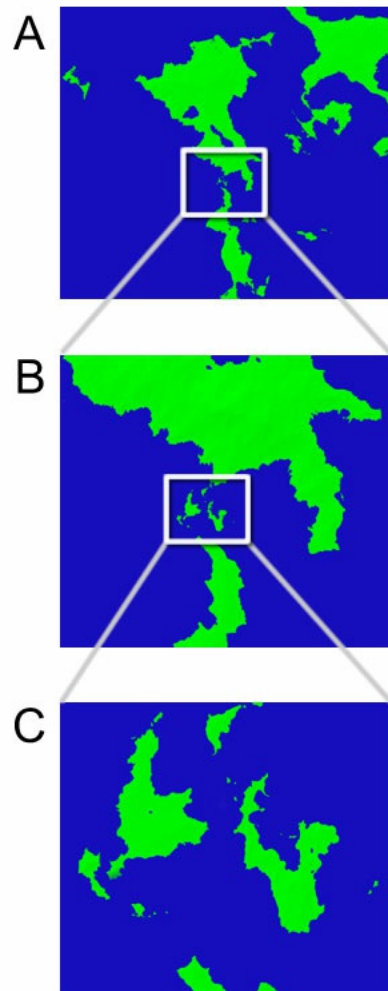
But which measurement should we accept as the accurate measurement of the length of the coast of Britain? You might intuitively accept the longer measurement — obtained with the shorter ruler — as the correct measurement. However, if we further reduce the length of our measuring rod so that it is only a few inches in length, we will find we get an even longer measurement (as we can now get our ruler into the smallest nooks and crannies of the coast). So it appears that the smaller our ruler, the longer our measurement of the length of the coast. So, remarkably, it emerges that there is no "correct" measurement of the length of the coast of Britain: the value is completely dependent on the length of the measuring ruler.

It would appear that — as we zoom into the coastline — we find an ever increasing range of detail. The further we zoom, the more detail we find. And it appears that we could keep zooming into the coastline without limit: our measurement for the length of the coast would just keep getting larger.

In order to see this peculiar property of the coastline, examine the next set of three images. The images show an area of coast at three increasing levels of zoom. A smaller rectangular area of image A is expanded to form the

entirety of image B. Hence, image B is a zoomed version of image A. Similarly, a smaller rectangular area of image B is expanded to form the entirety of image C. Hence, image C is a zoomed version of image B.

If you examine image C you will see that the general characteristics of the coast — with its rocky bays and inlets — looks very much the same as the coast in image A. No matter how far you zoom into a coast, it looks very much the same. We could even imagine zooming down to the level of small rock pools — the basic shapes would still be similar. So the coastline looks similar at small and large scales.



As another similar example, consider a small rock — only a couple of inches high — which might be found on a mountain:



and compare that rock to the mountain on which the rock was found (in this case, Camelback Mountain near Phoenix, Arizona):



The similarity is clear. And you could even zoom further into the small rock and find a miniature rugged landscape which resembles a microscopic mountain range. So there is a similarity across scale between small rocks and large mountains just like there is a similarity of the coastline at small and large scales.

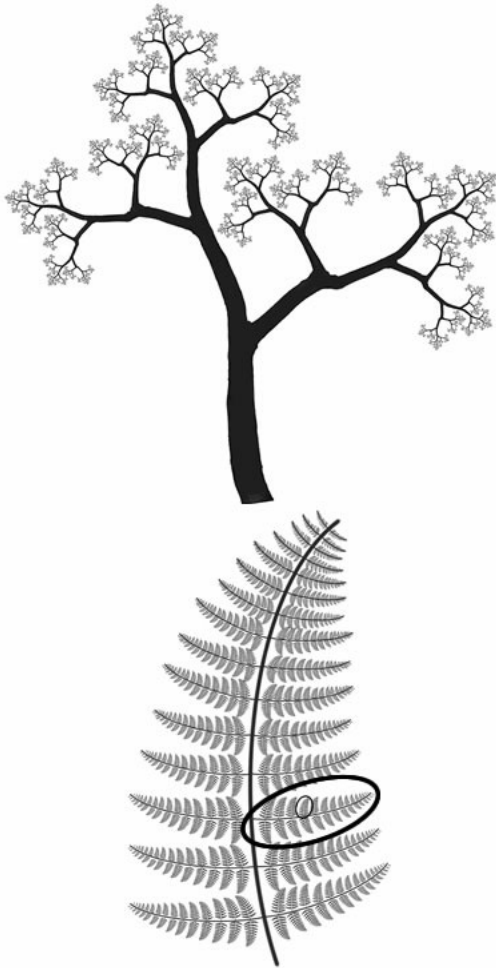
So there can be a similarity between a large object, and the smaller objects which comprise the large object. This is called *self-similarity*, and it is a common property of many natural objects.

Benoit Mandelbrot realised that these objects possessed a symmetry. But this was not the same kind of symmetry seen in normal geometric objects. Conventional symmetry meant an object looked the same when it was reflected in a mirror, or turned upside down. Mandelbrot realised that self-similarity resulted in a symmetry when an object was examined at different scales: if you zoomed into an object, it still looked the same.

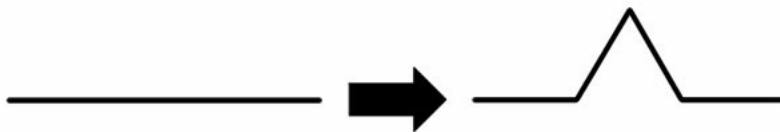
So we have seen that coastlines and rocks have self-similarity, but self-similarity can also be found in living objects. In the following diagram of a tree, you will see that each branch, and each twig, of the tree resembles the tree in its entirety. Hence, if you were to snap off a branch, it would resemble a small tree. And if you snapped a few twigs off that branch, it would again resemble a small tree.

So trees — and many other plants — possess self-similarity in abundance. In the following diagram, an example of a fern leaf is also shown, the leaf being composed of 30 segments. You will see that each of those 30 segments resembles the entire fern leaf. And each of those segments can be further subdivided into 30 sub-segments which

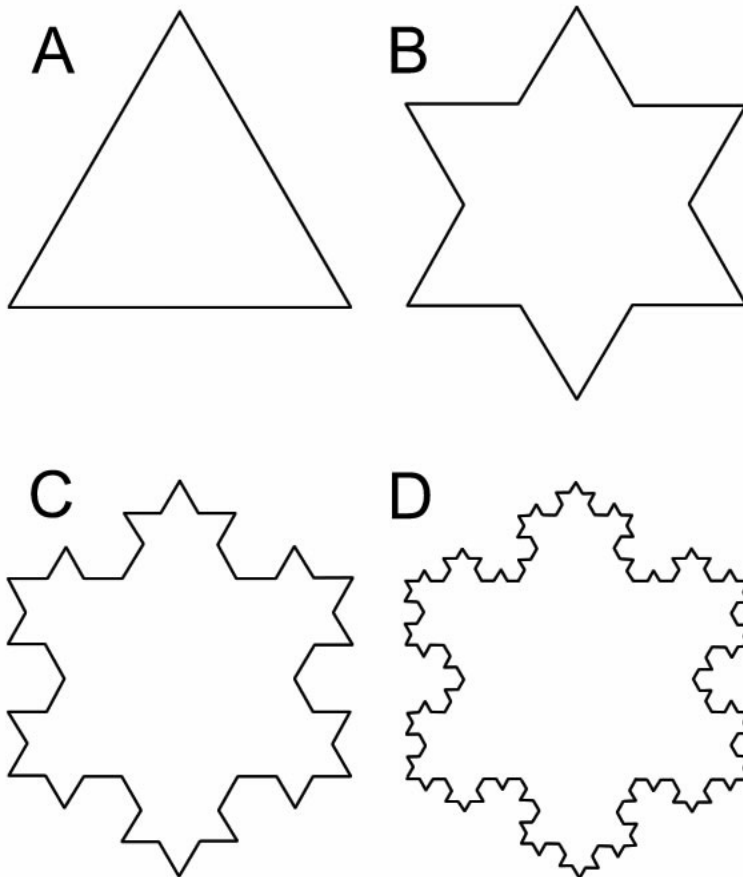
each resemble the entire fern leaf:



In order to see how Nature uses simple mechanisms to produce these strange zoomable structures, consider the following transformation:



What this simple transformation does is replace a straight line with a line with a triangular kink in the middle. In order to see how this transformation can be applied, consider the following four shapes:



Shape A shows a simple triangle. In shape B, we have used the previous transformation to replace each straight line of the triangle with a line with a triangular kink in it. Similarly, to generate shape C we have applied the transformation again to shape B, replacing each of its straight lines with a line with a triangular kink in it. Shape D is generated in a similar manner from shape C. This transformation could be applied repeatedly — continuing to infinity — producing an ever more elaborate final shape. This shape is called the *Koch snowflake*.

We could imagine the jagged edge of the Koch snowflake as representing a coastline: you can keep on zooming forever. So we find that by applying very simple construction rules repeatedly, Nature can produce structures of infinite complexity. Mandelbrot named these structures *fractals*.

As was considered in the previous chapter, classical geometry was defined two thousand years ago by the Greek mathematician Euclid. Euclidean geometry is based on straight lines, and regular geometric shapes such as circles, spheres, triangles, and cones. For most school pupils, this is the only type of geometry they will ever study. However, when we look around and consider the natural world, this is not the geometry we see. As Benoit Mandelbrot said in his book *The Fractal Geometry of Nature*: "Clouds are not spheres, mountains are not cones, coastlines are not circles, and bark is not smooth, nor does lightning travel in a straight line." The true geometry of Nature is fractal geometry, not Euclidean geometry.

Just as chaos results from simple rules which produce endlessly complex behaviour, so fractals result from simple rules which produce endlessly complex structures. Just as chaos is the true language for describing the behaviour of Nature, so fractals are the true language for describing the structure of Nature.

The Mandelbrot set

In discovering how Nature manages to produce these wonderfully intricate fractals, we have seen that simple processes are continuously applied in an iterative manner. In a similar example from mathematics, we might

consider the *Mandelbrot set*, which is an incredibly beautiful, infinitely detailed fractal which is produced by a very simple formula.

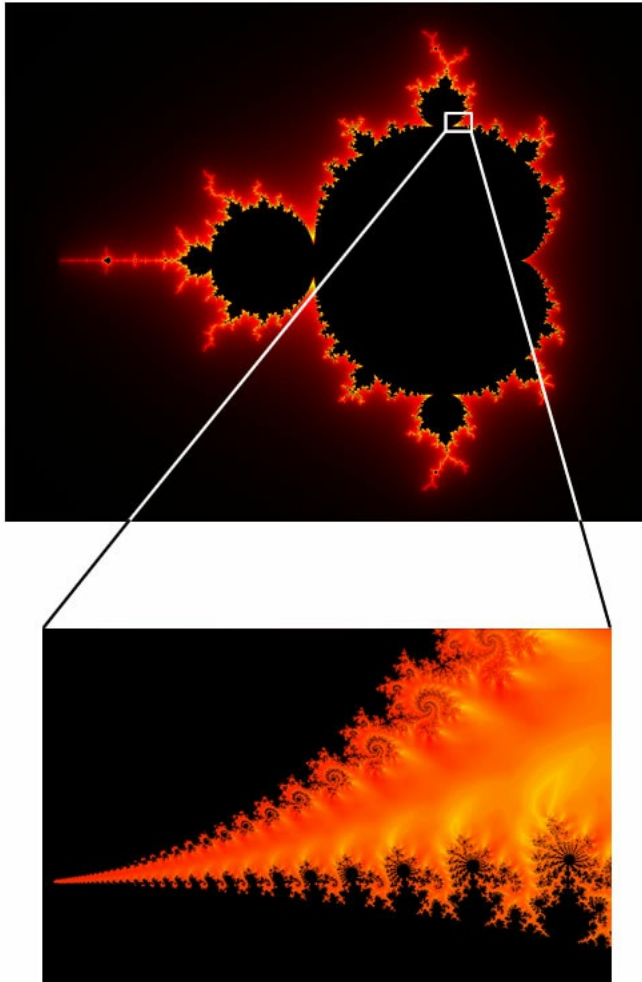
Benoit Mandelbrot discovered the Mandelbrot set by considering complex numbers, which we first encountered in Chapter Two in the discussion of Schrödinger's wavefunction. If you remember, a complex number has two parts: a *real* part (which is a conventional real number) and an *imaginary* part. The imaginary part is based on the square root of -1. This is rather strange because you might realise that the square of no conventional number can be a negative number. So how can -1 have a square root? Well, we don't worry about that — we just symbolise the square root of -1 by the letter *i*. The imaginary part of a complex number then consists of a number multiplying *i*. Hence, an example of a complex number might be: $6 + 3i$.

One of the most useful features of complex numbers is that they can be represented geometrically. It is possible to plot complex numbers on a two-dimensional graph with the real part being plotted along the horizontal *x* axis, and the imaginary part being plotted up the vertical *y* axis. This is called the *complex plane*. Hence, in the complex plane, the real axis is horizontal, and the imaginary axis is vertical.

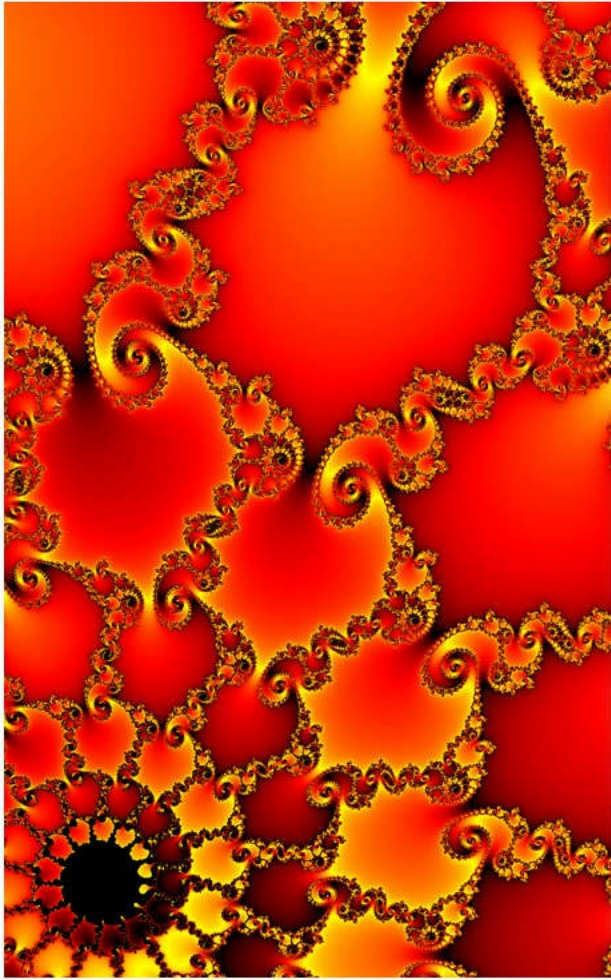
An image of the Mandelbrot set can be produced very simply. Consider a point in the complex plane, and the complex number represented by that point. You then apply a simple iterative process which involves taking the square of the number and adding the original number. You then square the result, and add the original number again. This process is performed several times. If the resultant number stays low (within a certain limit) then the point **is** in the Mandelbrot set, and the associated pixel is coloured black. However, if after a number of iterations the resultant number shoots off to a very large value, the point is **not** in the Mandelbrot set. In that case, instead of colouring the pixel black, the pixel is assigned a colour based on how many iterations were performed.

This can be coded as a very simple computer program (I have done it myself several times). You can also get various apps on your mobile phone and tablet to explore the Mandelbrot set. These allow you to zoom into the image very simply by using two fingers to pinch and zoom. As you zoom into the set, the full beauty of the Mandelbrot set is revealed. I believe the best app on an iOS device is called "Frax". On my Android tablet I used the free "Fractoid" app (very simple to use and well worth getting) to generate the following images of the Mandelbrot set.

The first image shows the full Mandelbrot set, featuring the characteristic large black blobs. You will notice a very small white rectangle has been drawn on the top border of the set. This is magnified in the lower image, so you can see how increasing levels of detail emerge as you zoom in. You will notice how this magnified image resembles the earlier image of a fractal fern, perhaps giving a clue as to how Nature produces fractal structures by repeatedly applying simple iterative processes.



The following two images were obtained using the Fractoid app, zooming in to various areas of the Mandelbrot set. I hope they give you an impression of the beauty of the Mandelbrot set. In the first image you might be able to identify areas which resemble turbulence in a fluid (such as smoke rising):





Fractal dimensions

When we consider a fractal border, such as the Koch snowflake, we find that as we zoom in to the fractal the border gets fractionally longer. This is a similar principle to the idea that if we measure the coastline of Britain with progressively shorter rulers we get an ever increasing value for the length of the coast. The conventional measurement of length clearly has no validity when measuring a fractal coastline, so Mandelbrot realised that another form of measurement was required: the *dimension*.

This is a surprise as we do not usually think of the number of dimensions of an object as a value of measurement. However, a square is a two-dimensional object, and a cube is a three-dimensional object, so the number of dimensions an object possesses is clearly a property of that object — just like its width and height.

Mandelbrot asked a simple question: what is the dimension of a ball of string? The answer is not as obvious as you might assume. From a great distance, the ball appears as a tiny point, and would therefore have zero dimensions. If we move closer to the ball of string, it appears as a sphere and therefore has three dimensions. However, if we actually consider the material of which the ball is made — the string — then we can consider it as only having a length: a one dimensional object. So the number of dimensions of the ball of string is dependent on your point of view, a number from zero to three.

So returning to the theme of this book, once again the old notion of certainty in mathematics has taken a blow. From considering objects as having a clear observer-independent number of dimensions, we now find that the number of dimensions is uncertain — dependent on the observer. Mandelbrot — a mathematician — was even so bold as to suggest a connection with developments about uncertainty in physics: "The notion that a numerical result

should depend on the relation of object to observer is in the spirit of physics in this century and is even an exemplary illustration of it."

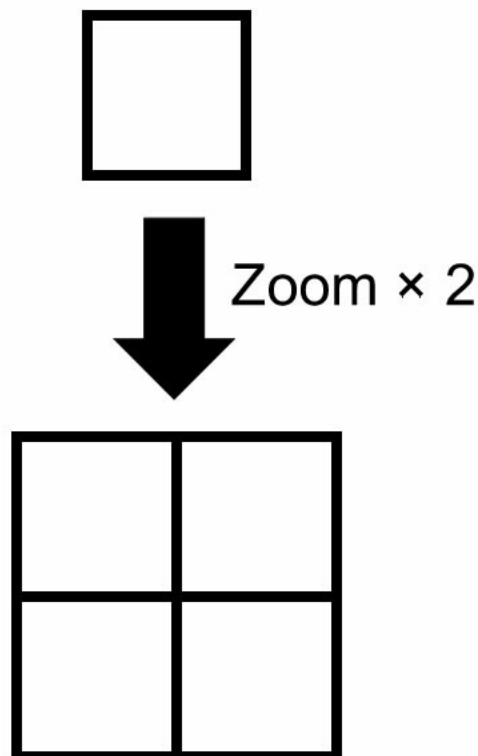
So a ball of string can be considered as having zero dimensions when viewed from far away, or three dimensions when viewed up close. But what about intermediate distances? What about values between zero and three dimensions? Mandelbrot came up with a remarkable new concept: fractional dimensions. He suggested we could consider an object as having 2.7 dimensions, for example, or 1.55 dimensions.

So how do we calculate how many dimensions a fractal has? Mandelbrot realised that the number of dimensions of a self-similar object (such as a fractal) could be calculated by a simple formula:

$$D = \frac{\log(N)}{\log(Z)}$$

where N is the total number of self-similar pieces in the fractal, and Z is the zoom factor. The formula basically reveals how many more self-similar pieces of the fractal do we see as we zoom out (as if we are zooming out of a coastline to reveal more detail).

In order to see how the formula works, let us consider one of the simplest self-similar objects: a square. Yes, surprisingly a square is a self-similar object as it can be divided into a number of smaller squares, each exactly the same shape (but not the same scale) as the larger square. Imagine we zoom out of a square by a factor of two, thus revealing more detail:

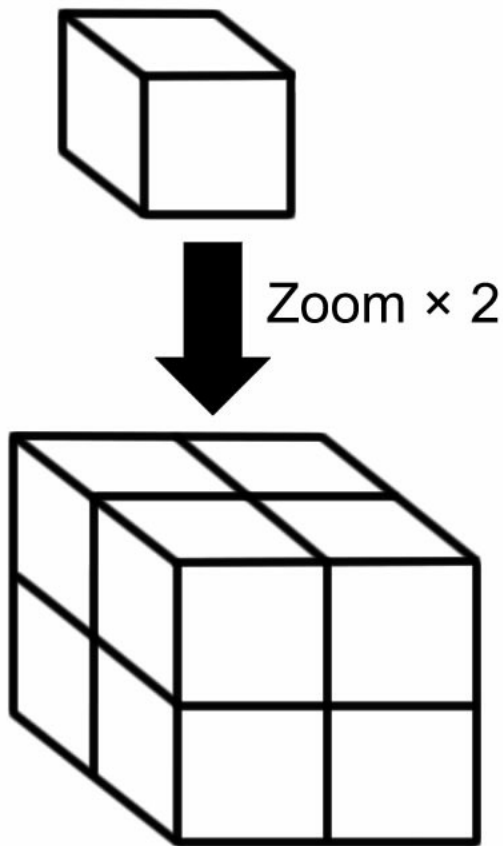


It can be seen that each side of the resultant larger square is twice as long (because of the zoom factor). However, it can also be seen that the larger square actually contains four self-similar smaller squares. So, from Mandelbrot's formula, we can calculate the dimension of the square as:

$$D = \frac{\log(4)}{\log(2)} = 2$$

So the formula states that a square has two dimensions: it is a two-dimensional object, which is the result we would expect.

Now let us use the formula to calculate the number of dimensions of a cube (yes, a cube is also a self-similar object as it is composed of a number of smaller cubes). As before, imagine we zoom out by a factor of two, revealing more detail:



As before, it can be seen that each side of the resultant larger cube is twice as long (because of the zoom factor). However, this time the resultant cube contains eight self-similar smaller cubes. So, according to Mandelbrot's formula, the number of dimensions of a cube is:

$$D = \frac{\log(8)}{\log(2)} = 3$$

So the formula states that a cube has three dimensions: it is a three-dimensional object, which is the result we would expect.

If we repeat this process for a straight line (yes, a line is also a self-similar object as it can be thought of as being composed of many smaller lines) then the formula tells us that a line has one dimension — which is again the value we would expect.

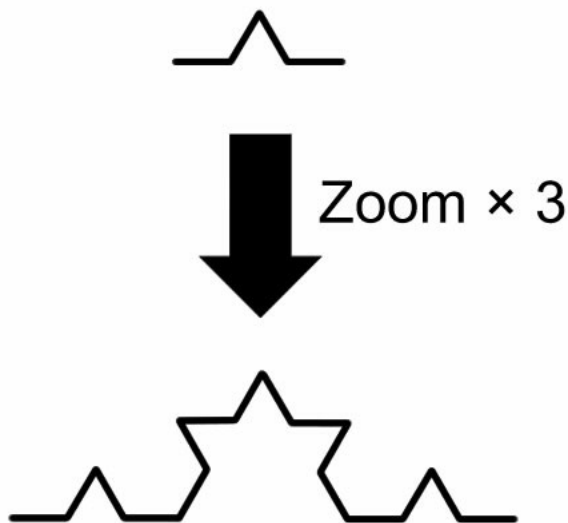
So when we consider the classical Euclidean shapes of the line, the square, and the cube, we find they all have an integer (whole number) dimensionality. But what do we find when we consider the dimensionality of a fractal? As an example, let us calculate the dimensionality of the Koch snowflake fractal which we considered earlier.

Remember how the Koch snowflake fractal was generated by a triangular line with a "kink" in the middle:



This type of kinky line which is used to form a fractal is called a *generator*.

Now let us zoom out of the Koch snowflake fractal in order to see more detail, but this time let us zoom out by a factor of three:



You will see that as we zoom out of the generator, more detail (the "coastline") starts to emerge. However, although we have zoomed-out by a factor of three, you will see that the second zoomed-out image is now composed of four of the initial generator shapes. So, from Mandelbrot's formula, we can calculate the dimension of the Koch snowflake as:

$$D = \frac{\log(4)}{\log(3)} = 1.26$$

So the formula is telling us that the Koch snowflake is an object with 1.26 dimensions!

It might seem bizarre to consider a structure as having 1.26 dimensions. Perhaps think of the Koch snowflake as being "rougher" than a line — which has a dimensionality of one — but not filling the entire two dimensional plane

like a square would do (a square having two dimensions). So, on that basis, we might expect the dimensionality of a Koch snowflake to lie somewhere between 1 and 2.

When Mandelbrot considered the fractal coastline of Great Britain he found it had a dimensionality of approximately 1.24. In contrast, the coastline of South Africa — which is nearly circular — has a dimensionality of approximately one. It is clear that the rougher the fractal shape, the higher its dimensionality.

Mandelbrot was therefore finally able to answer his question "How long is the coastline of Britain?" with an answer presented in the only measure which made sense: the fractal dimension.

As we find fractal structures throughout the natural world here on Earth, we should perhaps not be so surprised to discover that the entire universe itself appears to have a self-similar fractal shape. Stars group together to form galaxies, galaxies group into clusters, and clusters group together into superclusters. There is some symmetry over scale here — just as in a fractal. In fact, the universe has been measured as being fractal on scales up to 350 million light years, with a fractal dimension of 1.2.

At the mercy of chaos

In this chapter we have seen how chaotic behaviour can emerge in simple mathematical systems, and also in natural systems such as the weather. The common theme in these systems is that a simple nonlinear process (as we have seen, the process could be as simple as $2x^2-1$) is iterated several times before the chaos emerges. If we now extend our study to consider human populations, with their complex behaviours and their millions of daily interactions, we should not be surprised to find chaotic behaviour emerging.

It was Benoit Mandelbrot (again) who first detected the signs of mathematical chaos in the behaviour of the stock market. When Mandelbrot was considering the behaviour of cotton prices over the previous century, he recognised a degree of self-similarity: the seemingly random jumps in price over a day resembled the shape of the jumps in price over a year. There was symmetry over scale. There was order within the disorder — the trademark of mathematical chaos.

However, this chaotic jumping of prices was contrary to conventional economics theory. According to orthodox economic theory (which I was taught as an undergraduate many moons ago — and I was dissatisfied with it then), prices should reach a steady equilibrium when supply of a product matches the demand for that product. But if equilibrium is the natural state of affairs, then how come markets are so turbulent?

As Mandelbrot says in his book *The (Mis)Behaviour of Markets*: "To me, all the power and wealth of the New York Stock Exchange or a London currency-dealing room are abstract; they are analogous to physical systems of turbulence in a sunspot or eddies in a river."

In his book, Mandelbrot firstly describes the conventional approach to predicting the behaviour of the financial markets: "There are many ways of handling risk. In the financial markets, the oldest is the simplest: 'fundamental' analysis. If a stock is rising, seek the cause in a study of the company behind it, or of the industry and economy around it. 'Because' is the key word here. The price of a stock, bond, derivative, or currency moves 'because' of some event or fact that more often than not comes from outside the market. World wheat prices rise because a heat wave desiccates Kansas or Ukraine. The dollar sinks because talk of war raises oil prices. Financial newspapers thrive on it; they sell news and rank the importance of all the 'because's. The implicit assumption in all this: if one knows the cause, one can forecast the event and manage the risk. Would it were so simple. In the real world, causes are usually obscure. The precise market mechanism that links news to price, cause to effect, is mysterious and seems inconsistent."

Mandelbrot then goes on to explain why it is simply not possible to find simple causes — the "because's" — of complex market behaviour. He does this by explaining how a financial market is a nonlinear dynamic system which is effectively impossible to model and analyse accurately. Mandelbrot considered the interactions in a simulation of two groups of investors who behave differently: "In computer simulations by economists in Belgium, the two groups start interacting in unexpected ways, and price bubbles and crashes arise spontaneously. The market switches from a well-behaved linear system in which one factor adds predictably to the next, to a chaotic nonlinear system in which factors interact and yield the unexpected."

This switch from linearity to nonlinearity is crucial. A linear system can be broken into individual elements — "black boxes" — and the behaviour of the entire system can be analysed by considering the behaviour of each individual element. This is not possible with a nonlinear system which cannot be broken-down in the same way. Instead, it is only possible to analyse the system as a whole — a far more complex task.

The financial crisis of 2008 (which Mandelbrot considers in later versions of his book) is often blamed on the misselling of subprime mortgages in the United States. However, this implies that we can break down the market

into individual units (one of those units being the selling of mortgages) and place the blame for the crisis on one particular unit — as if the selling of mortgages was the "cause" of the crash. But this is simply not the case in a nonlinear system. A nonlinear system cannot be subdivided. Its individual units cannot be considered in isolation. No single unit can be considered as being the cause of the overall behaviour.

A recent news story was that a 90-year-old famous man had "died from pneumonia". But, of course, he did not die of pneumonia: he died from being 90 years old. When you are 90 years old, even a common cold can kill you. But the true cause of death would not be the cold — it would be your age. To try to isolate one particular cause is to miss the bigger picture, it is to fail to see that the real problem lies with the entire nonlinear system (yes, a human body is another example of a nonlinear system). Once again, individual units cannot be considered in isolation.

As we saw with the weather, a butterfly flapping its wings in China could potentially cause a hurricane next month in New York. So it is in the financial markets: a trader waking up late one morning could cause a crash on Wall Street in three months time. To blame the selling of subprime mortgages is to miss the point: it can never be possible to identify a single cause and try to isolate that cause to eliminate the possibility of market chaos. The possibility of chaos is always latent in the system and can never be eliminated — it is built into the design of the system. It is an inherent property of nonlinear systems.

We have created a monster.

So just as we can never eliminate the possibility of storms from the weather, we can never eliminate the possibility of chaos in our financial markets. All we can do is try to insulate ourselves from the financial storms when they do eventually come. As Mandelbrot says: "For centuries, shipbuilders have put care into the design of their hulls and sails. They know that, in most cases, the sea is moderate. But they also know that typhoons arise and hurricanes happen. They design not just for the 95 percent of sailing days when the weather is clement, but also for the other 5 percent, when storms blow and their skill is tested. The financiers and investors of the world are, at the moment, like mariners who heed no weather warnings."

In this respect, humanity is at the mercy from the nonlinear systems it has created. But the system of financial markets is not the nonlinear system which poses the greatest threat for the stability of humanity. The complex military network around the world poses the greatest threat. When nations arm themselves, they might feel they are acting responsibly as they have created a strong defence against possible aggression. But all they are really doing is adding to the complexity of the existing worldwide military nonlinear system. They are simply making a bad situation worse. The die is cast — even before war breaks out. Mankind is no longer in control of the situation — there is only an illusion of control. The weather might appear calm for an extended period of time, but, from now on, mankind is at the mercy of chaos. And the butterfly effect tells us that there is always the possibility that a tiny disturbance will be responsible for a terrible storm. This principle was illustrated perfectly in Sarajevo in 1914 when a single assassin's bullet killed Archduke Franz Ferdinand of Austria and instigated the tragedy of the First World War.

According to the BBC TV programme about chaos entitled *High Anxieties* (available on YouTube): "When World War One broke out, the world was still determined to believe in a Newtonian world where even the complexities of human affairs **could** be predicted, and the war **would** be over by Christmas. They all wheeled out their artillery confident that reality could be made to follow their plans. After all, the same mathematics which predicted the orbits of the planets also governed the firing of artillery. The mathematics of ballistics told them exactly where the shells would land. The tragedy of the war was that no matter what carnage unfolded, they believed there was not only a science of ballistics, but a science of war: a way of predicting how many men per mile of front would win the objective. They thought if they understood the science of war they could control its outcome — they could simply overpower the chaos. In the end, they weren't fighting each other. Both sides were fighting the chaos of reality. In the end, the chaos defeated them all, and ten million men died."

6

HOLLYWOOD

Hollywood is the town where dreams become reality. We are told that every waitress wants to be an actress, every limo driver has written a screenplay. And dreams become reality in Hollywood movies as well. No one would pay to watch a purely realistic movie of dreary office jobs, or being stuck in interminable traffic jams. So movies portray escapism: an artificial reality, a synthetic universe of musicals, adventure, and imaginative science fiction. The advances in computer-generated imagery (CGI) have made it more cost effective to produce entire alien worlds in a computer rather than construct them in a studio. If you watch a Hollywood movie you know you will be transported into another, better — but completely artificial — universe.

The director James Cameron was well-aware of the importance of creating a convincing artificial world when he created the alien planet Pandora for his movie *Avatar*: "You've got to compete head-on with these other epic works of fantasy and fiction, the Tolkiens, and the Star Wars, and the Star Treks. People want a persistent alternate reality to invest themselves in and they want the detail that makes it rich and worth their time. They want to live somewhere else. Like Pandora."

However, we are not only transported to another world when we enter a movie theatre. Modern consumer society is based on creating artificial reality. Enter a modern shopping mall, which may have a dreary exterior, and you might find yourself entirely enclosed in an artificial retail environment which resembles a glamorous European catwalk. Go to a swimming pool and you might find yourself in a synthetic environment which resembles a tropical island. Go to Las Vegas and you might well find yourself in a simulation of anywhere on Earth. Play an immersive video game and you might well find yourself in a simulation of anywhere in the universe.

In 1981, the French philosopher Jean Baudrillard wrote a short book entitled *Simulacra and Simulation* which explored the idea of modern life being a simulation. Baudrillard picked the particular example of Disneyland as an extreme example of a completely immersive artificial reality. The zero-crime zero-litter policy of Disneyland is an attempt to generate an improved version of reality in much the same way that a Hollywood movie provides escapism. As Baudrillard says: "Disneyland is a perfect model of all the entangled orders of simulacra. It is first of all a play of illusions and phantasms: the Pirates, the Frontier, the Future World, etc. This imaginary world is supposed to ensure the success of the operation. But what attracts the crowds the most is without a doubt the social microcosm, the religious, miniaturized pleasure of real America, of its constraints and joys. One parks outside and stands in line inside, one is altogether abandoned at the exit."

Baudrillard is making the point that visitors to Disneyland mistakenly perceive Main Street in Disneyland as being an accurate — though improved — copy of a Main Street in a real American town outside the gates of Disneyland. Whereas, the truth is that old-fashioned perfect Main Street simply does not exist in modern America. So Disneyland is not a copy of anything: Disneyland is a completely original reality. It is not accurate to call Disneyland an "artificial reality" because that would infer that it was a copy of a reality that actually existed. No, in Disneyland (and in our modern consumer culture) **the simulation has become the reality**. It is literally the American dream. Baudrillard referred to this artificial reality, which has no basis or resemblance to actual reality, as *hyperreality*.

When we watch a Hollywood movie, we become entirely immersed in its alternate reality. We might become so emotionally involved in the movie that we even cry at a sad moment. However, we would rarely cry at the start of the movie — we would only cry near the end of the movie, because it takes a full two hours for us to become emotionally involved to the point at which we care about the characters on the screen. At that point, the artificial reality has become our genuine reality. We might even forget there is a real world outside the movie theatre. As with Disneyland, the simulation has become the reality.

And that is when things become really interesting ...

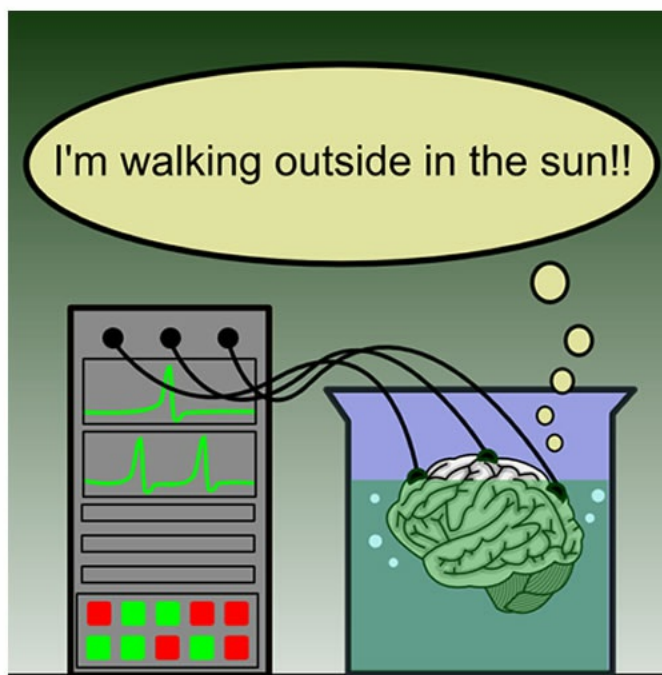
The Matrix

It is rather ironic that it was a Hollywood blockbuster movie which presented the work of Jean Baudrillard to the mass market. *The Matrix* was a science fiction movie released in 1999 which became something of a sensation,

becoming the biggest-selling DVD of all time. About eight minutes into the movie, the character of Keanu Reeves takes a book down from a shelf. The book is hollow. It is a fake book, a simulation. In its hollow compartment it contains some computer disks. The book is none other than Baudrillard's *Simulacra and Simulation*. From this early statement of intent, it is clear this movie is going to be — in the words of the producers — an "intellectual action movie". [8]

In *The Matrix*, Keanu Reeves plays a computer hacker called Neo who is informed that the world in which he lives is unreal — a computer simulation. The illusion is being created by intelligent machines which now rule the Earth. Humans are being kept in a subdued state to provide heat and electrical activity as an energy source for the machines. The humans float in vats, while the illusory Matrix world is transmitted into their brains in order to subdue and pacify them. The simulation, of the world as it existed in 1999, is so accurate that it is indistinguishable from the real thing.

This idea that we might be living in a simulated reality caused quite a stir at the time, though it is far from an original idea. The idea dates back as far as 1641 when the French philosopher René Descartes suggested the possibility that the entire world was merely an illusion created by an evil demon. In that case, Descartes suggested that all sensations might be inserted directly into the mind, and even the human body might be an illusion. In the modern era, a computer-based version of the evil demon was provided by the American philosopher Hilary Putnam. Putnam proposed what is known as the brain-in-a-vat thought experiment. Putnam suggested that an evil mad scientist might have extracted your brain and was keeping it alive in a vat of liquid. All sensory neurons of your brain were connected to an external computer which was supplying an accurate simulation of an external world. The disembodied brain would have no idea of its predicament, and would probably be blissfully happy.



It would appear that there is no way of knowing whether we are brains-in-a-vat or if we are living in the Matrix, with our bodies suspended in fluid, our brains connected to a supercomputer. Might this impose fundamental limitations on our certainty?

However, there are weaknesses in these theories. In an article entitled *Why Make a Matrix? And Why You Might Be In One*, Oxford philosopher Nick Bostrom argues that there would be no obvious motive for an advanced civilisation to imprison our bodies in fluid. In the movie *The Matrix*, the human bodies are used to provide power, but as Bostrom points out: "Human brains may be many things, but efficient batteries they are not." Presumably, the human would have to feed as well, which would entail some form of energy input to the comatose human. The energy which could be generated by the entrapped humans could never be more than the energy supplied to the humans. The scenario might have made more sense if the humans were being used for food (after all, we feed cattle to supply food for ourselves, but we only get back a quarter of the energy present in the food which we feed to the

cattle). But machine overlords would have no reason or desire to eat humans — I presume future computers would not have a digestive system!

And why should the advanced civilisation (or mad scientist) go to all the trouble of generating a simulated reality when the human brains could be kept subdued merely by the use of drugs? Basically, why bother creating the Matrix?

No, the whole brain-in-a-vat scenario in which we are suspended in a gloopy substance appears to make no sense. But there is another form of simulated reality which is more interesting, and which is being taken more seriously by the scientific community.

Simulacron-3

In 1964, the second book by science fiction author Daniel F. Galouye was published. The book was called *Simulacron-3*. It really was quite a remarkably foresighted work, and has been called a "virtual reality novel from a time before virtual reality". Not only was the novel ahead of its time in terms of technology, its style was also highly-influential, being called the first "cyberpunk" novel.

In *Simulacron-3* we meet our main protagonist Douglas Hall who is a computer developer specialising in the construction of simulated computer societies (Hall's field of expertise is described as "simulelectronics"). Individual computer-generated "people" are programmed to model human behaviour. The purpose of these simulations was to discover the behaviour of communities in order to guide government policy, and also to provide feedback to marketers.

Hall describes the computer-generated "people" who populate the simulation: "We can electronically simulate a social environment. We can populate it with subjective analogs — reactional identity units. By manipulating the environment, by prodding the ID units, we can estimate behaviour in hypothetical situations."

Although these ID units behave like humans, we would imagine that they are merely unthinking automatons — just states in computer memory — and are certainly not conscious like you and me. Well, *Simulacron-3* takes this scenario a step further to imagine that these computer generated citizens are, indeed, conscious: "The reaction entities weren't merely ingenious circuits in a simulelectronic complex, but instead were real, living, thinking personalities. They actually existed. In a solipsistic world, perhaps, but never suspecting that their past experiences were synthetic, that their universe wasn't a good, solid, firm, materialistic one."

You might find this a bold assertion — that mere states in a computer can become conscious — but we understand so little about the nature of consciousness that this is certainly not beyond the bounds of possibility. If something acts like a human, maybe it thinks like a human? There is a wonderful quote from one of the characters in *Simulacron-3*: "You can hardly stuff people into machines without starting to wonder about the basic nature of both machines and people."

So here we have an example of a simulated reality which exists merely as states in a computer. People are programmed into existence. Crucially, this is in contrast to the Matrix scenario, or the brain-in-a-vat scenario. In both of those scenarios an actual human brain in suspension is required.

This type of computer-based simulation is very similar to the type of artificial life simulations which are currently very popular such as *The Sims* which is the best-selling PC game of all time. In *The Sims*, virtual people go about their daily activities oblivious to the fact that they are being observed by the game player who retains complete control over the environment. The virtual people have individual personalities and experience desires and fears. There is no obvious goal to the lives of these "people" except to entertain the game player.

Again, as with the case of the brain-in-a-vat thought experiment, this seems to have implications for certainty and uncertainty. As Descartes realised back in the 17th century, if you cannot be certain as to whether or not you are in a simulation, then **you cannot be certain of anything**. This is because you are effectively isolated from reality. Only the simulation programmers would live in the real world: you would be merely living in an illusion of reality. It might appear to you that "the cat is on the mat", but in reality there is no cat and no mat: they would be states in a computer program. This type of general uncertainty — in which you can no longer be certain of anything — is called *Cartesian uncertainty* (called "Cartesian" after "Descartes"). [9]

The Thirteenth Floor

From this discussion, it would appear that the only people who would actually be living in reality — and could

therefore say that "the cat is on the mat" with certainty — would be the simulation programmers. But is that really the case? In order to find out, let us now return to *Simulacron-3*, because the story is about to take a surprising twist.

We left Douglas Hall in charge of development of the total environment simulator called *Simulacron-3*. Expectations were high for the impending launch of this revolutionary product. However, a series of unusual and unnerving incidents makes Hall doubt the reality of his own world. Events reach a startling conclusion when Hall is driving in the desert one night and encounters a most unusual sight: "The road ended a hundred feet away. On each side of the strip, the very earth itself dropped off into an impenetrable barrier of stygian blackness. Out there were no stars, no moonlight — only the nothingness within nothingness that might be found beyond the darkest infinity."

Hall realises that his own universe is nothing more than a simulated reality generated by a computer at a higher level of reality to his own world. The road disappears because it has not yet been generated by the simulating computer (probably for reasons of computational economy). Hence, there are now three levels of reality: the simulated reality generated by Hall's computer, the reality in which Hall find himself, and the highest level of reality which is simulating Hall's world.

But the possible number of levels of reality is clearly not just limited to three levels. In 1999, the movie *The Thirteenth Floor* was released which was based on the novel *Simulacron-3*.[\[10\]](#) The plot of *The Thirteenth Floor* follows the plot of *Simulacron-3* fairly closely, but the number of possible levels of reality is increased from three to thirteen (hence the title).

With so many possible different levels of reality, we might imagine those levels as different floors of a tall building: press a button to get to a higher or lower floor:



It is surely this analogy which lead to the title of the movie *The Thirteenth Floor*.

Of course, the number of possible levels is not limited to thirteen levels: we could consider an infinity of levels. And, I believe, it is this move to consider a possible infinity of levels which is crucial in understanding the true principle behind fundamental uncertainty.

As we shall now see ...

7

LEVELS OF INFINITY

This is the final chapter of this book.

Regular readers of my books will know I like to present some of my own ideas in the final chapter, and this book is no exception.

In this chapter we will be discovering what I feel is the true underlying reason behind all of the uncertainties we have considered in this book, the real reason why uncertainty can never be completely eliminated in our universe.

But we are going to start our discussion in rather a surprising place ...



The location is a mental hospital, in the town of Halle in Germany. The year is 1918. One of the patients in the mental hospital, Georg Cantor, is suffering catastrophic mental and physical collapse. But what was killing Cantor was no usual illness.

Cantor was dying from mathematics.

Counting to infinity

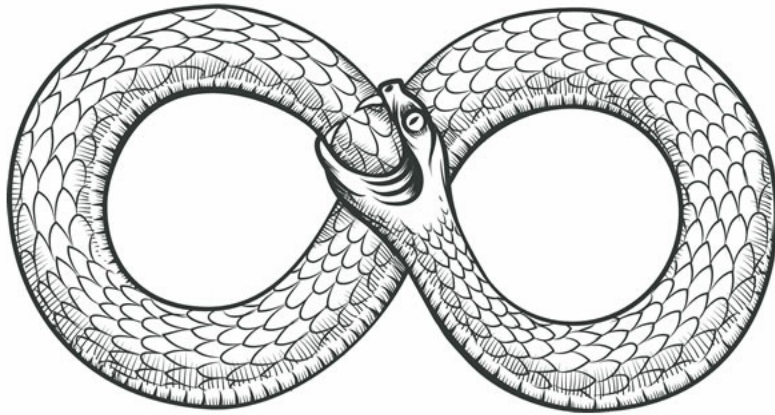
We need to start at the beginning.

Georg Cantor was born in St. Petersburg in 1845. His family moved to Germany when Cantor was eleven. At school, Cantor showed a great talent for mathematics, and he went on to study mathematics at the University of Berlin.

Here is a photograph of Georg Cantor:



In 1874, Cantor published the work for which he is now most famous. Cantor's discovery concerned the mind-blowing concept of infinity. Infinity is a number which has a magnitude which has no end. The symbol for infinity is based on the ancient Egyptian design of the *Ouroboros*, representing a snake eating its own tail:



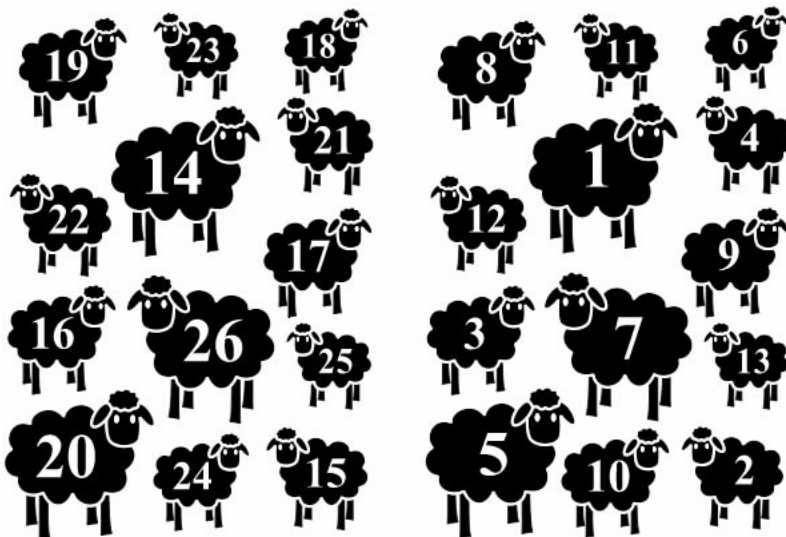
Incredibly, Cantor revealed that there can be infinities of different sizes — which implies that there can be a number larger than infinity!

So how can it be possible to create an infinity of a larger size than another infinity? Indeed, how can it be possible to measure the size of something which is infinite? Cantor realised the answer to these questions lay in the process of **counting**.

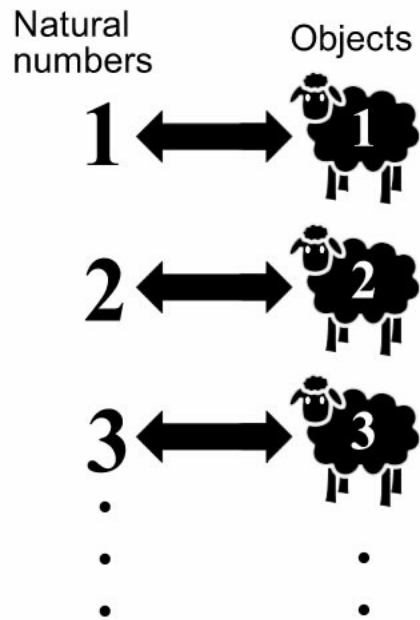
How do we determine the number of objects in a group? The answer is that we have to count the objects. Even if we suspect we have an infinite number of objects, the only way we can determine the number of objects is to count those objects. Counting lies at the heart of determining whether or not we have an infinite number of objects.

But what do we actually do when we count? The act of counting seems so natural, so intuitive, that perhaps we do not even think what we are doing when we count a number of objects. We will have to analyse the process of counting in more detail.

Imagine that you are a shepherd, and you want to determine the number of sheep in your field. Obviously, you need to count those sheep:



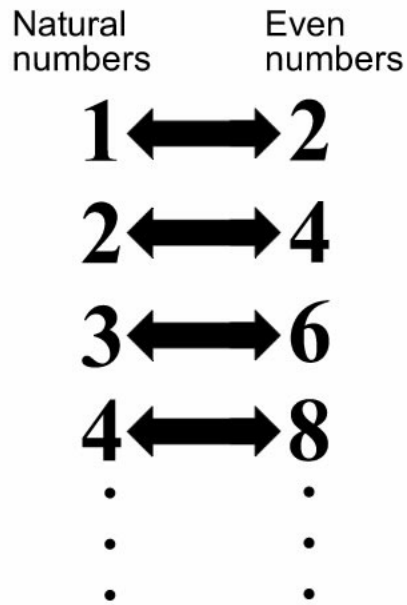
When we count our sheep we might point at the first sheep and say "one", then point to the second sheep and say "two", and so on until we have counted all the sheep. As you can see on the previous diagram, what we are actually doing when we perform this pointing and numbering operation is to create a one-to-one correspondence between each sheep and a unique number (the numbers are shown on the side of the sheep in the previous diagram). So the act of counting in fact involves the pairing of objects and numbers, as shown in the following diagram:



The numbers which are used for counting operations — the positive integers, 1, 2, 3, etc. — are called the *natural numbers*. It is clear that the natural numbers extend to infinity, i.e., the list of natural numbers does not have an end.

Based on this principle of counting, Cantor created a definition of a type of infinity. Cantor defined a *countable infinity* as being an infinity in which there exists a one-to-one correspondence between the list of objects and the natural numbers. According to Cantor's definition, it is clear that if there was an infinity of sheep in a field then that would represent a countable infinity of sheep because it would be possible to create a correspondence between each sheep and a unique natural number (as shown in the previous diagram). In theory, a shepherd could count all the sheep in a countable infinity of sheep (if the shepherd had infinite time).

Now let us consider the infinite list of even numbers: 2, 4, 6, 8, etc. It is easy to count all of those numbers by the usual counting method, i.e., creating a one-to-one correspondence between the even numbers and the list of natural numbers. This is easily done when it is realised that each even number is double the value of a corresponding natural number:

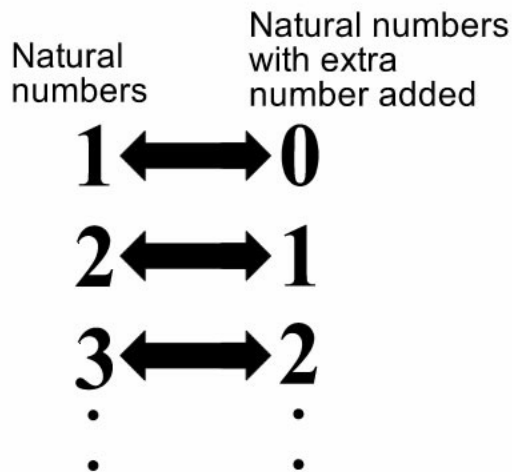


This reveals that the infinite number of even numbers is also a countable infinity — by Cantor's definition (they can be put into a one-to-one correspondence with the natural numbers). Hence, because both of these types of infinity were countable infinities and could be put into a one-to-one correspondence with each other, Cantor stated that they were both the same size of infinity. As an example, if the numbers in these lists were attached to sheep, then both of these infinite lists could be counted by a shepherd in a field — given infinite time.

Other examples of countable infinities include the list of the odd numbers, the list of the squares of the natural numbers, and the list of fractions (with a natural number on the top and bottom of the fraction).

Cantor believed this countable infinity was the most fundamental type of infinity. He named this type of infinity by the first letter of the Hebrew alphabet, \aleph , which is pronounced *aleph*. Cantor also added the subscript zero to the aleph symbol — \aleph_0 — because he believed it represented the smallest type of infinity. Hence, Cantor's countable infinity is called *aleph-zero* or *aleph-nought*.

Now let us consider the situation when we add a number — say the number 0 — to our list of natural numbers. You can see from the following diagram that there will still be a one-to-one correspondence with the list of natural numbers. In other words, both infinities will still be the same size:



It might be naively imagined that by adding a number to an infinite list (as we have just done) would result in a

list with a length larger than infinity. However, we have just shown that the resulting list is the same size as the original list — they are both countable infinities. As John Barrow explains in *The Infinite Book*: "At first you might think that making bigger infinities is child's play. Suppose you have an infinite collection of numbers: 1, 2, 3, ... Just add one more thing to it. Isn't that bigger? Unfortunately not. Adding one or two — or even infinity — to infinity still leaves infinity."

On that basis, here we see the result of adding the number one to our infinite list, expressed as a mathematical equation:

$$\aleph_0 + 1 = \aleph_0$$

According to conventional arithmetic, we are then free to subtract infinity from both sides of that equation, which leaves us with the nonsensical and paradoxical result:

$$1=0$$

Because the application of conventional arithmetic to infinity results in paradoxes such as this, for a long time it was believed that infinity had no place in mathematics. It took the genius of Georg Cantor to realise that infinity could be used in mathematics as long as his new approach to handling infinities — called *transfinite arithmetic* — was used. [\[11\]](#)

The number larger than infinity

Now let us consider how Cantor used his transfinite arithmetic to create a number larger than infinity.

Cantor started by considering the infinite list of the *real numbers*. But what are the "real" numbers? And what is their connection with the "real" world?

Well, so far we have only considered the natural numbers, the positive whole numbers. But the real world of physics is not generally described by discrete numbers. The real world is described by values which are continuous and can take absolutely any value — not just whole numbers. To describe the real world, we will need to consider the "real" numbers. As Roger Penrose says in his book *The Emperor's New Mind*: "Real numbers are called 'real' because they seem to provide the magnitudes needed for the measurement of distance, angle, time, energy, temperature, or of numerous other geometrical and physical quantities."

Instead of discrete whole numbers, the real world is often described by decimal numbers (numbers with decimal points), often with an infinitely long string of decimal places. As an example, the very common value of π which appears often in the real-world (for example, describing circles) is defined by the number three followed by an infinite string of digits after the decimal point:

$$\pi = 3.14159265358979323846 \dots$$

These types of numbers — which can potentially include an infinite string of decimal places — are called the real numbers.

Cantor then asked a rather peculiar question: "How many real numbers are there?" It is clear that there is going to be an infinite list of real numbers, just as there is an infinite list of natural numbers. It might be imagined that the two lists would be the same length, but is that necessarily the case?

To determine if the two lists were the same length, Cantor applied the usual method of counting the elements in the lists, i.e., establishing a one-to-one correspondence with the natural numbers. As an example, let us consider an attempt to count all of the real numbers between 0 and 1. Because real numbers can be specified with infinite precision (an infinite number of digits after the decimal point) there will be an infinite number of real numbers between 0 and 1. So here is an attempt to create a one-to-one correspondence between the natural numbers and the infinite list of all the real numbers between 0 and 1:

Natural numbers		Real numbers
1	↔	0. 2 83634085...
2	↔	0.9 7 4395783...
3	↔	0.32 1 884673...
4	↔	0.675 8 54320...
5	↔	0.1183 3 8438...
6	↔	0.94732 6 113...
⋮		⋮
⋮		⋮
⋮		⋮

At this point, Cantor presented an ingenious method which has become known as the *diagonal slash* method. You will see that the first real number has an ellipse drawn around its first digit after the decimal point, the second real number has an ellipse drawn around its second digit after the decimal point, and so on. We could then take all of the digits with ellipses drawn around them and create a new real number with them in the order in which they appear, which creates the number 0.271836...

Now we get to the clever part of Cantor's method. Let us alter each digit of our new real number by either adding or subtracting one to each digit. Hence, our number 0.271836... might become 0.362927... (you will see that each digit in the new number has been altered from the original number). The crucial result is that this new number we have generated must be different from all of the real numbers in our list because its first digit will differ from the first digit of the first real number in the list, and its second digit will differ from the second digit of the second real number in the list, and so on. In other words, this new real number we have generated cannot appear anywhere in the infinite list of real numbers. So our attempt to construct a list of all the real numbers between 0 and 1 cannot have been complete.

Cantor had shown that the infinite list of real numbers cannot be counted. Amazingly, this result revealed that the number of real numbers is greater than the number of natural numbers — Cantor had discovered a number greater than infinity!

You can see Cantor's diagonal slash method inscribed on the right of his memorial in Halle:



(Unfortunately, you will also see that some wag with a piece of chalk has added that Cantor's equation is equal to 7 — which is most certainly not correct!)

However, the mathematics establishment was highly-resistant to Cantor's ideas about infinity. In particular, Cantor found a determined opponent in Leopold Kronecker, a highly-conservative professor at the University of Berlin which was the centre of mathematics in the mid 19th century. Kronecker believed that only the natural numbers (the positive integers) had a role to play in mathematics — even to the point of attempting to outlaw the use of negative numbers! According to a famous quote by Kronecker: "God created the natural numbers, all else is the work of man".

Kronecker did everything in his power to exclude Cantor's ideas about infinity from mathematics, calling it "mathematical insanity". Cantor slowly became paranoid — but with good reason. Kronecker was highly-influential, and blocked Cantor's ideas from being published in mathematical journals.

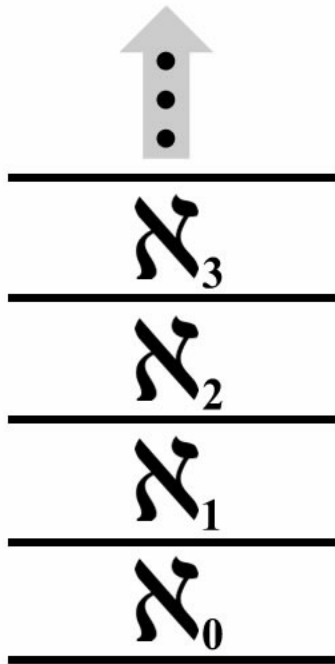
Cantor suffered his first nervous breakdown in the spring of 1884. But this was not entirely due to the persecution of Kronecker. Cantor's mental problems were at least partly due to his continued fascination with infinity, trying to attain an understanding of concepts which perhaps cannot be fully captured by the human mind. John Barrow describes Cantor's struggles in his book about the history of mathematics *Pi in the Sky*: "He retreated from mathematics, recognizing that his intense concentration upon particular mathematical questions was beginning to affect his mental equilibrium."

Cantor suffered a series of breakdowns over the following years, forced to recover in mental hospitals. This resulted in Cantor losing his job at the university. Cantor tragically became a broken man and ended his life in a sanatorium, a decline at least partly due to his obsession with the mind-altering concept of infinity.

Levels of infinity

So Cantor had discovered an infinity larger than aleph-zero. Cantor called this new, larger infinity \aleph_1 (*aleph-one*). But Cantor also showed that the levels of infinity do not stop at that point. Using a generalisation of his diagonal slash method, Cantor showed that there would always be a number which was not contained in any infinite list. In other words, **there is always an infinity greater than any infinity.** [12]

It is now known that there are an infinite number of different types of infinity, with each successive infinity being infinitely larger than the previous type of infinity. This results in a tower of ever larger infinities:



What does this remind you of? Think back to where we have seen a similar image to this before in this book. **This is surely reminiscent of the infinite levels of reality described in the earlier description of the movie *The Thirteenth Floor*:**



Wow — that seems like rather a random connection. But might there be a deep reason behind that connection?

Well, imagine your universe is represented by Cantor's aleph-zero (\aleph_0). Maybe this number could represent the number of particles in the universe, for example. In that case it would represent an infinite number of particles, and so your universe would seem infinite: a never-ending vast expanse, the only thing that could possibly exist. It would

seem impossible to imagine anything could exist beyond infinity, anything beyond that infinite universe.

Now imagine you are an inhabitant of a computer-simulated reality, perhaps at the lowest level of reality in the movie *The Thirteenth Floor*. Again, your universe would appear infinite in expanse, and, again, it would seem impossible to imagine anything could exist beyond your infinite — but simulated — universe.

However, in both cases, there would be a completely different infinite universe above you, in a "higher realm" so to speak. In Cantor's aleph-zero universe, there would be the aleph-one infinitely-large universe immediately above you. And in the simulated universe, there would be an infinitely-large universe immediately above you, a higher-level of reality, occupied by the programmers of the simulation in which you reside.

So there appears to be some intriguing parallels between the two scenarios. This is something we should explore further.

And maybe we might even uncover a link to fundamental uncertainty, the true reason why there will always be fundamental uncertainty in the universe ...

Cantor, Gödel, ... and Turing

In Chapter Four, it was described how, in 1900, David Hilbert listed 23 problems in mathematics which needed to be solved to place mathematics on a surer footing. In a continuation of his program, Hilbert presented three more unsolved problems at an international conference in 1928. The third of these problems is the one which interests us, and it was called the *decision problem*.

If you remember, in Chapter Four it was explained how mathematical statements can be either true or false, and the aim of mathematicians is to prove the truth of statements. Throughout history, mathematicians have used their creativity and instincts to develop ingenious proofs.

David Hilbert wanted to take all the guesswork (and ingenuity and creativity) out of that process of developing proofs. Wouldn't it be great, thought Hilbert, if there existed a step-by-step list of instructions which mathematicians could follow every time they wanted to prove a statement to be true. Mathematics would no longer be reliant on the skills and creativity of mathematicians. That would go a long way to eliminating the uncertainty from mathematics. Could a step-by-step method be developed which could reliably prove all true statements? That was called the "decision problem".

It was the English mathematician Alan Turing who, in 1936, discovered a solution to the decision problem. Roger Penrose provided a clear explanation of Turing's method in his popular book *The Emperor's New Mind*. The following description is based on Penrose's explanation in his book, and even uses the same data.

Remember, we are attempting to find a step-by-step series of instructions — or *algorithm* — which a mathematician could use to solve any problem. Therefore, Alan Turing proposed a very general computing device which could take data as input, and could also take a particular program (algorithm) as input. The computing device could then apply that program to process the input data, producing an output.

We now call Alan Turing's simple computing device a *Turing machine*, and the Turing machine design forms the basis for almost all modern computers. For this reason, Alan Turing is often considered to be the inventor of the modern general-purpose digital computer.

Both the input data and the input program of the Turing machine could take the form of single number. The following diagram shows a table with all possible inputs along the horizontal top line, and all the possible computer programs down the vertical line. The elements of the table then represent the outputs of the particular computer program after processing that particular input:

		Input data									
		0	1	2	3	4	5	6	7	8	...
Computer program number 	0	0	0	0	0	0	0	0	0	0	...
	1	0	0	0	0	0	0	0	0	0	...
	2	1	1	1	1	1	1	1	1	1	...
	3	0	2	0	2	0	2	0	2	0	...
	4	1	1	1	1	1	1	1	1	1	...
	5	0	0	0	0	0	0	0	0	0	...
	6	0	0	1	0	2	0	3	0	4	...
	7	0	1	2	3	4	5	6	7	8	...
	8	0	1	0	0	1	0	0	0	1	...
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	

The horizontal rows then represent all possible *computable sequences*. As Roger Penrose describes, a computable sequence is a sequence whose successive numbers can be produced by a particular computer program. Therefore, every computable sequence of natural numbers must appear somewhere in the table.

Alan Turing then did something inspired: he applied Cantor's diagonal slash method to the numbers in the table. You can see on the previous diagram that a circle has been drawn around all of the diagonal elements. Turing then followed the method of Cantor by modifying each of those diagonal elements. As Roger Penrose explains, this modification method is clearly a computable procedure (it could be performed by a computer), so the effect of this is to produce a new computable sequence. However, crucially, because this new computable sequence has been generated by Cantor's diagonal slash method, **it is bound to be different from every other computable sequence in the table**. But the table was supposed to contain every possible computable sequence. As Roger Penrose states: "This is manifestly a contradiction".

The implication of this contradiction is that our initial premise was incorrect: it is not possible to compute a table of all computable sequences. There are limitations on the abilities of computers: there are some things computers can never compute. These are now called *uncomputable* functions.

So Alan Turing had discovered another limitation on our ability to understand the world, another source of uncertainty. In that respect, Turing's result is really just the computerized equivalent of Gödel's incompleteness theorem. Turing solved the "decision problem" by showing that there could never be a step-by-step algorithm to decide whether every mathematical statement was either true or false. Hence, there are some true statements which can never be shown to be true by any step-by-step method. And that necessarily implies Gödel's incompleteness theorem: there are true statements which can never be proved to be true.

So the uncertainties revealed by Turing and Gödel are equivalent. And the underlying principle seems to be Cantor's diagonal slash method. Roger Penrose considers this in his book, also including Russell's paradox: "These similarities are not accidental. There is a strong thread of historical connection between the three. Turing found his argument after studying the work of Gödel. Gödel himself was well aware of the Russell paradox. All these arguments have their origins in Cantor's 'diagonal slash' method."

It is clear that Cantor's diagonal slash method lies at the heart of uncertainty. In the following final section of this book, let us now explore why that is the case. And, in the process, let us discover why uncertainty is fundamental in the universe.

The only certainty is uncertainty

So far in this chapter, we have discovered a fundamental connection between different types of uncertainty. We have seen how Cantor's diagonal slash method underlies the uncertainties discovered by Gödel and Turing. What is more, earlier in this chapter it was revealed how Cantor's "tower of infinities" resembled the stack of simulated realities in the movie *The Thirteenth Floor*. What is the connection? And what is the significance of Cantor's diagonal slash method?

The solution is perhaps best understood by considering the simulated universes example. In the previous chapter, the simulated universe of *Simulacron-3* was described. If you were living in such a simulated universe, it would be impossible to detect. In other words, there would be a fundamental limitation on your possible knowledge, a restriction in your ability to know all possible truths about your world — which might remind you of the results of Gödel and Turing.

What would be the origin of this limitation on knowledge? Well, in order to discover all the truths about your world, you would use all the tools available to you. You would use your eyes, and observational instruments such as telescopes, and particle accelerators. And you would also use all the computational tools available to you, such as your brain, and computers. But here is where the limitation arises: **all of those tools available to you are components of the universe they are trying to analyse**. A telescope is part of the universe, your eyes are part of the universe, your brain is part of the universe. So you can only use those tools to reveal truths which are **internal** to the universe — you cannot reveal truths **ABOUT** the universe, as though you were external to the universe.

So this is the reason for the uncertainty in a simulated universe: you cannot use the tools inside a simulated universe to reveal truths about the higher-level universe of the simulators. And, at this point, Cantor's diagonal slash argument has its impact. Even though the universe in which you reside is infinite, the diagonal slash argument reveals that there is always the possibility of a higher-level reality above you. In fact, it reveals the possibility of an infinite tower of infinite realities above you.

In fact, no matter which level you find yourself in that tower of simulated universes, you could never be certain that you were the highest level. Even at the level of the supposed simulation programmers there would always be uncertainty as to whether there was a level above.

And, as we have seen, it is the diagonal slash method of Cantor which results in the uncertainties described by Gödel and Turing. The diagonal slash method reveals the existence of uncomputable sequences or unknowable truths — a higher realm of knowledge which is beyond our grasp.

The diagonal slash method introduces fundamental limitations on our knowledge, which leads to fundamental uncertainty.

This principle was a recurring theme of Douglas Hofstadter's book *Gödel, Escher, Bach*. Hofstadter considers the limitations on our knowledge introduced by Gödel, and realises that the only way to obtain knowledge of all truths about our world — or any system in which we were contained — would be to transcend that system: to somehow move outside that system. Hofstadter actually becomes quite metaphysical in style when he talks about this, and introduces concepts from Zen Buddhism: "Zen is a system and cannot be its own metasystem; there is always something outside of Zen, which cannot be fully understood or described within Zen."

It has also been suggested that this principle might place limitations on our ability to understand our brains or consciousness. Catherine Loveday presents this viewpoint in her *Book of the Brain*: "So the human brain is complex — but is it clever enough to understand itself? Philosophers have debated this paradox for centuries, with some claiming that a system can only ever understand another system that is less complex than itself. They argue that human beings will never fully understand their own brains and that to do so is like trying to smell your own nose. As one pharmaceutical worker is memorably quoted as saying: 'If the human brain were simple enough for us to understand, we would be too simple to understand it.'" [\[13\]](#)

In that quote, Catherine Loveday says that the principle behind fundamental uncertainty is like "trying to smell your own nose". That is a perfect example of a fundamental limitation. And limitations introduce uncertainty: what does your nose smell like? You are uncertain. Does it smell bad? You are uncertain about a truth about your system. It might be a true statement that your nose smells bad, but you cannot prove it — just like the uncertainties of Gödel and Turing. I could tell you if your nose smells bad, but I am outside your system.

It would appear that because our thought processes are confined within the object they are trying to analyse — our brain — then that imposes another limitation on our knowledge, another source of uncertainty. In that case, the only way to eliminate the uncertainty would be to transcend the system: to somehow move outside our brains. Even Albert Einstein once expressed a similar idea when he said: "No problem can be solved from the same level of consciousness that created it."

This principle — that uncertainty arises because we are part of the universe we are trying to analyse — was presented by Stephen Hawking in a 2002 lecture entitled *Gödel and the End of Physics*. Hawking presented the following insight: "In the standard approach to the philosophy of science, physical theories live rent free in a

Platonic heaven of ideal mathematical models. That is, a model can be arbitrarily detailed and can contain an arbitrary amount of information without affecting the universes they describe. **But we are not angels, who view the universe from outside. Instead, we and our models are both part of the universe we are describing.** Thus a physical theory is self-referencing, like in Gödel's theorem. One might therefore expect it to be either inconsistent or incomplete. The theories we have so far are both inconsistent and incomplete."

I have placed in bold Hawking's quote: "**But we are not angels, who view the universe from outside. Instead, we and our models are both part of the universe we are describing.**" Hawking then goes on to explain that we should therefore expect our theories of the universe to be "inconsistent and incomplete" — leading to fundamental uncertainty.

The only certainty is uncertainty.



We have seen throughout this book how many of the greatest minds in science and mathematics have been repelled by the notion of fundamental uncertainty. Einstein was so repelled by the idea that he constructed endless thought experiments to argue with Niels Bohr. Bertrand Russell tried to eliminate uncertainty from mathematics by writing three huge volumes of the *Principia Mathematica*. In the end, though, Bell's theorem proved that Einstein was wrong, and Kurt Gödel's incompleteness theorem proved that Russell was wasting his time. Some of the greatest minds have been made to look rather foolish in their attempts to eliminate fundamental uncertainty. However, it has been shown time and time again that science only advances when fundamental uncertainty is firstly recognised and then accepted.

So when we discover some apparent fundamental uncertainty in Nature — as in quantum mechanics, for example — we should not be surprised, or throw up our arms in horror or denial. Instead, we should welcome uncertainty.

After all, it is what makes life interesting.

FURTHER READING

A great selection this time, including some of the best popular science books ever written:

Gödel, Escher, Bach by Douglas R. Hofstadter

One of the finest non-fiction books ever written. A story of "strange loops" — including Gödel's incompleteness theorem. A book in which the form is as important as the content.

Chaos by James Gleick

The book which introduced chaos theory to the general public.

Does God Play Dice? by Ian Stewart

Another great book on chaos. More technical and less-wordy than Gleick's book.

Hunting the Hidden Dimension

An excellent NOVA documentary on fractals, available on YouTube.

Quantum by Manjit Kumar

A very detailed account of the development of quantum mechanics, and the arguments between the key figures.

The (Mis)Behaviour of Markets by Benoit Mandelbrot

If you have investments on the stock market, this is a book you cannot afford to ignore.

Pi in the Sky by John D. Barrow

An ambitious attempt to find the meaning of mathematics. Includes the tragic story of Georg Cantor.

Impossibility by John D. Barrow

Examining the limits of science, including the effect of Gödel's incompleteness theorem.

The Newtonian Casino (published as *The Eudaemonic Pie* in the USA) by Thomas Bass

The account of how Norman Packard and Doyne Farmer defeated the casinos of Las Vegas by using their knowledge of Newtonian mechanics.

The Simulation Argument by Nick Bostrom

<http://www.simulation-argument.com/>

Plenty of articles on the theme that we might be living in the Matrix.

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NOTES

[1] Interestingly, the development of the first mechanical computer, the laws of probability, and the invention of the game of roulette are all associated with the French mathematician Blaise Pascal.

[2] Another visionary quote from Lord Kelvin in 1895 was that "Heavier than air flying machines are impossible."

[3] The type of matrix which can be used for these quantum operations is called an *Hermitian* matrix.

[4] The great British mathematical physicist, Paul Dirac, later showed that Heisenberg's matrix mechanics and Schrödinger's wave mechanics were mathematically equivalent.

[5] The physical process behind the so-called "collapse of the wavefunction" is often presented as a great mystery, as something almost mystical. However, if you have read my first book you will know that great strides have been taken in understanding the process as a form of *environmental decoherence*.

[6] 1913: *When Hitler, Trotsky, Tito, Freud and Stalin all lived in the same place*, BBC News, <http://tinyurl.com/viennapeople>

[7] Edward Lorenz, *Deterministic Nonperiodic Flow*, Journal of the Atmospheric Sciences, 1962.

[8] In fact, the producers of the movie, the Wachowskis, asked Keanu Reeves to read *Simulacra and Simulation* as preparation for his role. The book is completely impenetrable — I doubt Reeves thanked the Wachowskis for their decision. Baudrillard has since said that *The Matrix* misunderstands and distorts his work.

[9] If we cannot trust our senses, then Descartes reasoned that we could only trust the contents of our own minds. Hence his famous dictum *cogito, ergo sum* ("I think, therefore I am").

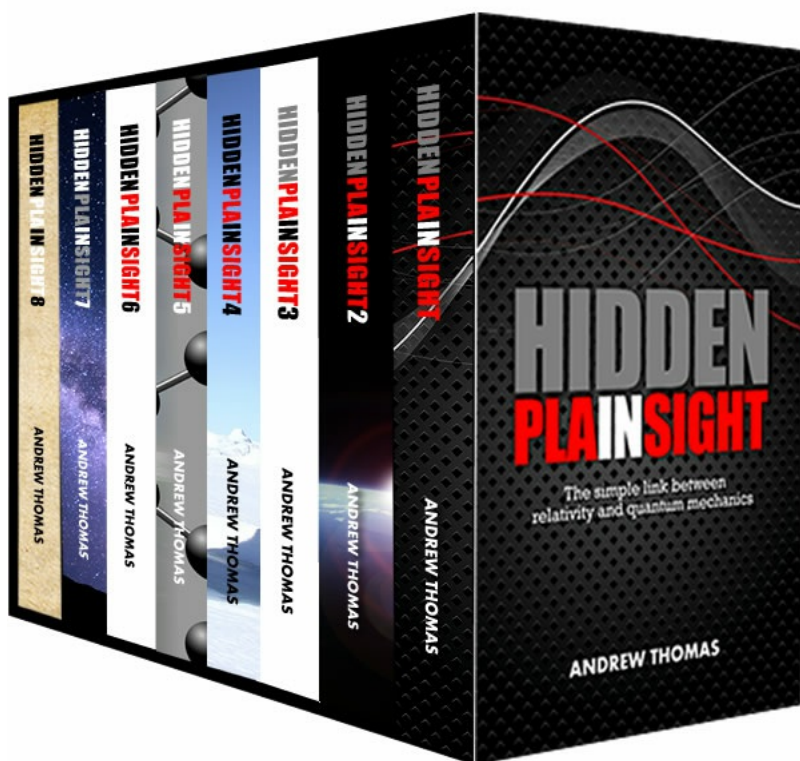
[10] *The Thirteenth Floor* was released just a few months after *The Matrix* was released, and so made nothing like the same impact. *The Thirteenth Floor* features an astonishingly convincing simulated reality of Los Angeles in the 1930s. You would swear it was real ...

[11] The readers of my fifth book who used conventional arithmetic to express reservations about the sum of all the natural numbers being equal to one twelfth should remember this fact: **you cannot use conventional arithmetic when dealing with infinity.**

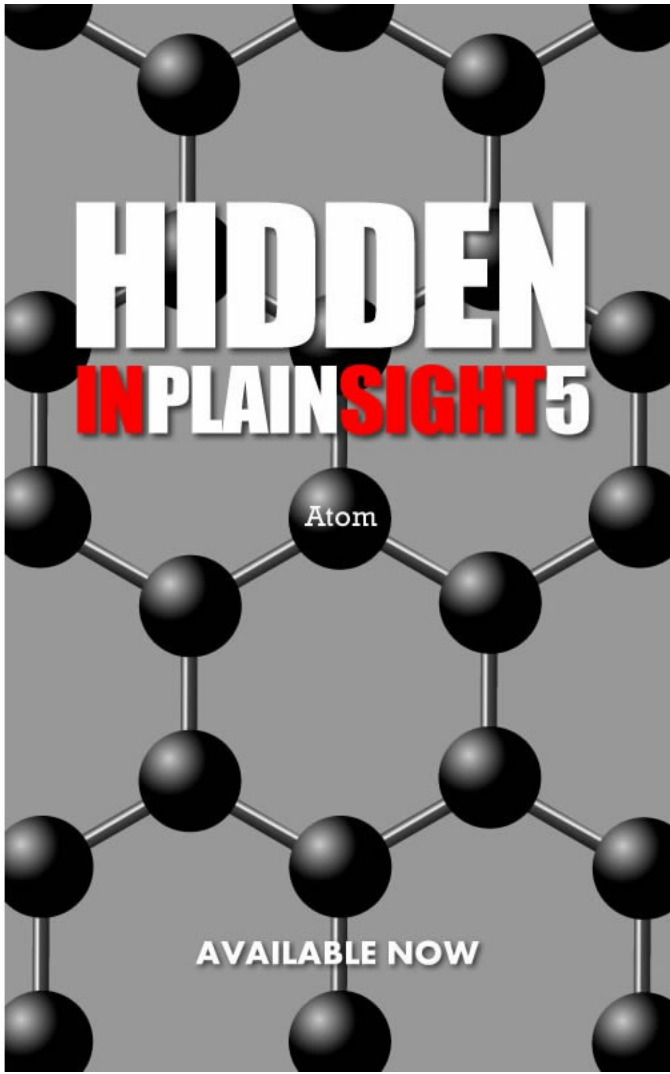
[12] Cantor actually considered the power set of any infinite set, and showed that it must have a greater number of members. For details of how Cantor did that, see this document by Professor Raymond Flood:

<http://tinyurl.com/cantorset>

[13] *How It Works: Book of the Brain*, Catherine Loveday, Future Publishing, 2017.



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Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

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CONTENTS

PREFACE

1) THE INVESTIGATOR

[Rutherford's atom](#)
[The death spiral of the electron](#)
[What is a particle?](#)

2) ADVENTURES IN THE MATRIX

[Basic matrix operations](#)
[Vectors](#)
[The quantum measurement](#)
[The magic word: "Eigen"](#)
[Spin](#)
[But ... what is spin?](#)

3) THE AMAZING MR. DIRAC

[The Dirac equation](#)
[The equation in the Abbey](#)
[The absolute wonder](#)
[The spinning spinor](#)
[The Pauli exclusion principle](#)
[The root of all chemistry](#)

4) ANTIMATTER

[Angels and demons](#)
[The discovery of antimatter](#)
[Backward in time](#)
[The origin of quantum field theory](#)

5) SYMMETRY AND CONSERVATION

[Particle accelerators](#)
[Symmetry](#)
[Noether's theorem](#)

6) GAUGE THEORY

[The electromagnetic force](#)

[Bosons](#)
[Particles of force](#)
[Digging deeper](#)
[The strong force](#)
[The weak force](#)
[The Standard Model](#)
[The unification of forces](#)

7) QUANTUM GRAVITY

[The modified gravity hypothesis \(MGH\)](#)
[The asymptotic freedom of gravity](#)

8) THE GREAT UNIVERSE MANIA

[The numbers of Arthur Eddington](#)
[The return of the amazing Mr. Dirac](#)
[The Dirac connection](#)
[The universe as an atom](#)
[The celestial spheres](#)

PREFACE

This book is an introduction to the principles of particle physics, the physics which deals with atoms and the smallest elements of the universe. The book will emphasise the underlying principles, rather than just listing the particles (and their properties) in a rather encyclopaedic manner. I believe it is much more valuable to gain an understanding of the principles involved.

For example, we will be discovering the principle which explains why material objects feel solid to the touch, but you can't touch a ray of light. We will be discovering the real reason why positive and negative electric charge attract each other (clue: it has to do with symmetry).

I must admit, this book is perhaps more challenging than my previous books. I do think many popular science books underestimate the intelligence of their readers.

I am firmly of the conviction that if a reader is having difficulty understanding a concept then it is not because a concept is hard — it is because it is being badly explained. In this book, care is taken to describe each step simply and clearly.

Once again, thank you for your support.

Andrew Thomas
(hiddeninplainsightbook@gmail.com)
Swansea, UK
2016

*"The road to a knowledge of the stars
leads through the atom."*

- SIR ARTHUR EDDINGTON, 1928

1

THE INVESTIGATOR

At the start of the 19th century, the land of Australia was still an unexplored country. The coastal areas had been mapped by various earlier Europeans (predominantly the Dutch, who named the country "New Holland"). However, due to the size of the continent, it was not certain if these coastal areas were connected as part of a single island, or if Australia was composed of many islands.

In July 1801, an expedition to Australia from Britain was due to set sail on the ship the *Investigator*. The main aim of the mission was to determine if Australia was a connected land mass, but, as a secondary aim, the expedition also aimed to study the flora and fauna of the island.

The expedition chose the Scottish botanist Robert Brown to be its resident naturalist. Brown, the son of a strict church minister, had learnt botany while studying in Edinburgh University where he had taken frequent trips to the Highlands of Scotland to collect and classify rare plants.



The *Investigator* set sail on the 18th July. It arrived in King George Sound in Western Australia six months later. As part of its voyage, the ship had to traverse the treacherous Great Barrier Reef (then called the Labyrinth). The ship eventually performed the first ever circumnavigation of Australia, thus establishing it as a continent.

During the voyage, Brown discovered approximately 2000 species of plants, almost all of which were previously unknown to science. When he returned to London three and a half years later, his reputation as a botanist of note was secured.

Brown's reputation was established on his talent for examining his Australian plant specimens in the smallest detail. In order to achieve this, Brown became skilled at microscopy. Brown realised that the study of microscopic pollen grains could be used as a method to classify plants.

It was while he was using a microscope to examine some of these pollen grains suspended in water that Brown observed something rather peculiar. The pollen grains were seen to move in a jittery, random motion. This random motion was given the name *Brownian motion* (named after Robert Brown), but its origin was to remain a mystery for almost a century.

At this point, our tale takes an unexpected turn. We rejoin our tale in 1905 — the "miracle year" of Albert Einstein.

At the time, the existence of atoms was still in doubt: there had never been a direct observation of the behaviour of atoms. The stage was set for Einstein who, in one of his remarkable acts of intuition, speculated that the motion of the pollen grains might be due to the random motion of water molecules. He realised that a pollen grain was so small that — purely by chance — there would occasionally be significantly more water molecules buffeting one side of the pollen than the other. The resultant motion has been compared to a giant inflatable balloon being bounced around randomly by a crowd in a football stadium.

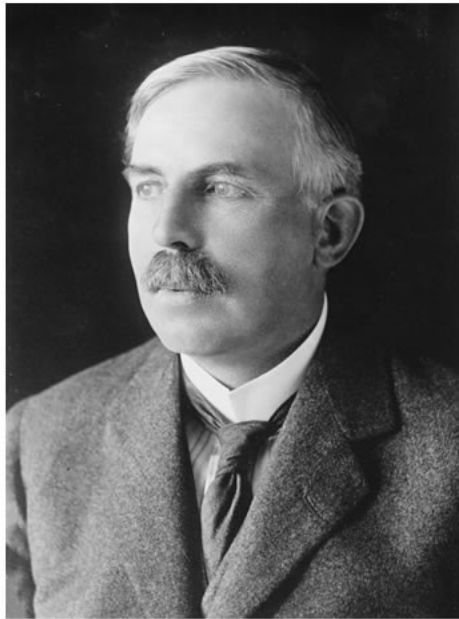
Einstein crushed the mathematics and realised that this effect would result in precisely the random dance of the pollen which was first observed by Robert Brown almost a century earlier.

This atomic explanation of Brownian motion represented the first directly observable effect of the kinetic theory of atoms, and is regarded as the first conclusive evidence of the existence of atoms. From now on, there could be no doubt about it: atoms were real.

And that unlikely chain of events is the story of how the atom was discovered — it all started on Robert Brown's expedition to Australia on board the *Investigator*.

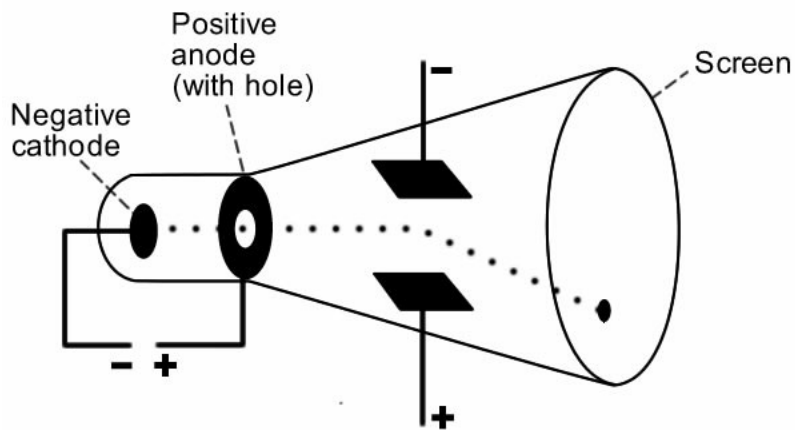
Rutherford's atom

Ernest Rutherford was born in the rural South Island of New Zealand in 1871, the fourth of twelve children. He grew up on a farm, herding cows and riding horseback. It was this adventurous, pioneering spirit and enthusiasm for discovery which propelled Rutherford to become the greatest experimental physicist of his era. Rutherford has been called "the Newton of atomic physics".



Rutherford had an uncanny instinct for designing ingenious experiments using primitive equipment which revealed the structure of the atom. As Richard Rhodes says in his book *The Making of the Atomic Bomb*, Rutherford "won the atom. He found its constituent parts and named them. With string and sealing wax, he made the atom real."

Rutherford won a scholarship to Cambridge University to work in the Cavendish Laboratory under the leadership of J. J. Thomson. Thomson had been performing experiments with the recently-invented cathode ray tube. The cathode ray tube consists of an electrically negatively-charged heated filament called a *cathode*, facing a positively-charged *anode*. All the components are contained in a vacuum in a sealed glass tube:



As the temperature of the cathode increased, it had been found that a stream of particles left the cathode, attracted to the positively-charged anode. If these particles hit a fluorescent screen, they made a small spot of light on the screen (this is how a cathode ray tube forms the main tube on old CRT televisions). Thomson discovered these particles could be deflected by electrically-charged plates, attracted to the positive plate, and their path could also be bent by a magnetic field. He named these particles *electrons*, the first atomic particle to be identified.

It was shown experimentally that the part of the atom which was left behind when these electrons were emitted was heavier, and was positively-charged. With this in mind, Thomson developed a model of the atom as a big lump of positively-charged material into which electrons were evenly distributed. This was called the "plum pudding"

model (because the electrons were like raisins evenly distributed inside a pudding).

However, one of Rutherford's experiments soon revealed that this plum pudding model was incorrect.

By 1907, Rutherford had moved to Manchester University. In Manchester, Rutherford performed experiments involving recently-discovered radioactivity. He enlisted the help of Hans Geiger who had developed a device which could detect individual particles of radiation. Rutherford performed an experiment in which these particles (produced by radioactive radium) were fired at thin gold foils. He found some of the particles were deflected as they passed through the foil, but, more mysteriously, he found that some of the particles appeared not to get through the foil at all — they just vanished. Almost as an afterthought, Rutherford placed a detector in front of the foil instead of behind it, and he discovered — to his great surprise — that some of the particles were being reflected back from the foil.

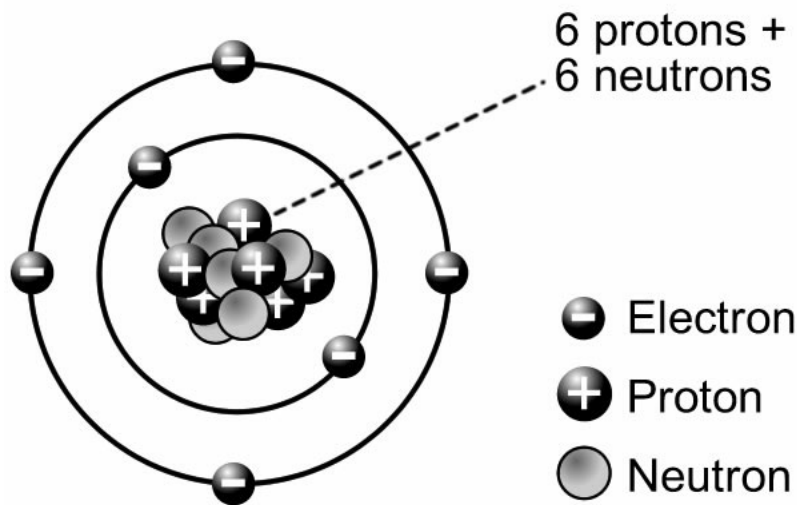
Rutherford was amazed at this discovery: "It was quite the most incredible event that has ever happened to me in my life. It was almost as incredible as if you fired a 15-inch shell at a piece of tissue paper and it came back and hit you. On consideration I realised that this scattering backwards must be the result of a single collision, and when I made the calculations I saw that it was impossible to get anything of that order of magnitude unless you took a system in which the greatest part of the mass of the atom was concentrated in a minute nucleus."

This meant that Thomson's plum pudding model was wrong. Instead, it meant that atoms had a hard centre, a positively-charged *nucleus*.

Rutherford proposed a model of the atom which consisted of electrons orbiting a nucleus composed of positively-charged *protons*. The electrons were held in orbit due to their electrical attraction to the protons. This arrangement resembled a small Solar System, and was called the *Rutherford model* or *planetary model*.

However, the mass of atoms was about twice the mass which would be expected if the nucleus was composed of just protons. Rutherford proposed that the nucleus also contained other particles called *neutrons*, each neutron being approximately the same mass as a proton. These particles were called neutrons because they were electrically neutral. The existence of neutrons was confirmed in 1932.

Atoms are made out of these three particles: electrons, protons, and neutrons. As an example, the following diagram shows Rutherford's planetary model of a carbon atom. It is composed of six negatively-charged electrons orbiting a nucleus which is composed of six positively-charged protons and six neutrons:



The death spiral of the electron

However, it was known that there was a problem with this planetary model. Just as in the case of a planet in the Solar System, eventually the orbit loses energy and the planet would crash into the Sun. A very similar scenario was predicted with this model of the atom. Newton had shown that any object moving in a circle is undergoing an acceleration (a deviation from its natural straight-line path), and according to Maxwell's theory of electromagnetism, any electrically-charged particle will lose energy in the form of radiation if it is accelerated. The electron would

inevitably lose energy and crash into the nucleus in a thousandth of a billionth of a second.

Robert Oerter describes this rather disastrous scenario in his book about particle physics called *The Theory of Almost Everything*: "An electron in such an orbit would have to emit electromagnetic radiation, thereby losing energy, which would send it into a 'death spiral', which could not end until the electron reached the nucleus. With all the negatively charged electrons in the nucleus cancelling out the positive nuclear charge, there would be no electric repulsion keeping the nuclei at atomic distances from each other. In a fraction of a second a house would collapse to the size of a grain of sand."

So what was holding the electrons in their orbit? A solution was proposed by Rutherford's most eminent student, Niels Bohr.

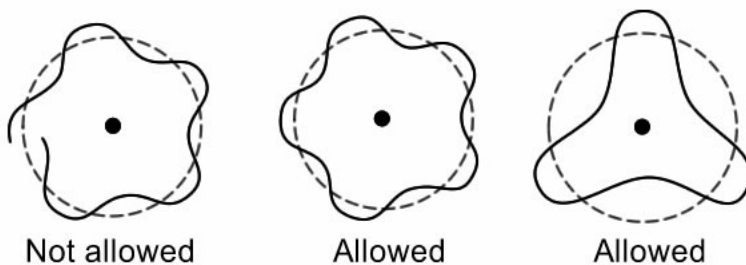
In 1912, Bohr came to Manchester from Cambridge specifically to work under Rutherford. Bohr was concerned about the stability of Rutherford's atom. Rutherford had correctly discovered that electrons orbit the nucleus, but he provided no explanation as to what kept them in orbit. Bohr believed an answer was to be found from the new physics of quantum theory. Bohr was aware of the previous discovery of Max Planck that the energy radiated from a hot body was composed of "quantized" chunks of energy (described in my previous book). This seemed to indicate a new physics beyond classical physics. Bohr suggested that the energy of the orbiting electrons was not continuous, but was instead only allowed specific quantized values. This would result in electrons only being able to occupy specific "allowed" orbits. This restriction on electron energy would prevent the electrons from spiralling into the nucleus.

Bohr's theory resulted in a stable atom. Also, Bohr's theory predicted that radiation of certain specific energies would be emitted by the atom when an electron jumped between these allowed orbits. This prediction of specific energy levels perfectly matched the clearly-defined spectral lines emitted by heated materials.

So Bohr appeared to have found a solution. But it was a rather unsatisfactory solution in that it was a mix of the old classical physics (an atom was still being modelled as an electron spinning around the nucleus in just the same way that Newtonian physics predicted the orbit of planets around the Sun), and the new quantum theory.

A more elegant explanation was provided by the French physicist Louis de Broglie (pronounced "de Broy") in 1923. De Broglie was aware of Einstein's earlier explanation of the photoelectric effect (covered in my previous books) which suggested that a light wave was actually composed of particles called *photons*. Hence, there appeared to be a strange duality between waves and particles. De Broglie made the brave and inspired suggestion that this duality also worked in the other direction: that any particle also had a wavelike nature.

One consequence of this idea was that it provided an ingenious explanation of why electrons were held in their orbits around the nucleus. We find the solution if we no longer consider an electron as being an orbiting particle — like the Earth orbiting the Sun — but instead consider it as being a wave around the nucleus. We could imagine that only a whole number of wavelengths could be allowed around the nucleus: if this was not the case, the wave would not join up with itself when it returned to its starting point and it would interfere destructively with itself.



Different electron orbits represented a different number of whole wavelengths. Electrons could jump between orbits, but only by emitting or absorbing a photon of a fixed ("quantized") amount of energy. This model also implied that there would always be a minimum energy possessed by the electron (called the *ground state*) corresponding to the lowest frequency wave (analogous to the fundamental frequency of a wave on a string).

Hence, this wavelike model of the electron meant the death spiral of the electron into the nucleus could be avoided. And this is essentially the principle by which atoms achieve their size, and prevents houses collapsing into a grain of sand!

What is a particle?

Before we reach the end of this introductory chapter, there is a question which you might well be wondering. The question is: what are particles actually made from?

In order to answer this question, we have to examine particles at the highest level of detail. However, we certainly cannot use a conventional microscope to look at particles. That is because visible light has a wavelength between 4×10^{-7} metres and 7×10^{-7} metres, while atoms are much smaller, approximately 10^{-10} metres across. This is important, because it is not possible to see any object which is smaller than the wavelength of the light which illuminates the object. Hence, it is never going to be possible to see an atom with a conventional microscope.

However, the wavelength associated with a particle is inversely proportional to the energy of that particle. In other words, particles with more energy have shorter wavelengths (according to the previously-discussed theory of Louis de Broglie) and can therefore be used to probe smaller distances. As an example, the wavelength of an electron can be up to 100,000 times smaller than the wavelength of a photon (a particle of light), a principle which gave birth to electron microscopy.

In a modern particle accelerator, it is possible to achieve observations using particles with far higher energy than those used in an electron microscope. Using wavelengths as small as 10^{-16} metres it was possible to detect the existence of the smallest known particles. However, as accelerator energies have increased, with wavelengths now down as small as 10^{-18} metres, no smaller structure has been found in these particles. It would appear that these are *elementary particles* in that they are truly fundamental having no internal structure — no constituent parts. It is simply not possible to break them down into smaller units.

So how big is an elementary particle? As the energy of particle accelerators has increased, these particles appear to be smaller than anything we can detect. In fact, it is believed that these particles have no actual size: they should be considered as infinitely small pointlike particles. It might be said that they have no *spatial extent* — they do not extend into space. Essentially, they are not made of anything! Which makes a kind of sense: if they were made of any material, it would be possible to split that material into two parts to create smaller particles. In which case, the original particles would not be elementary (as they could be split into two "more fundamental" particles).

By this logical argument, it would appear that a truly elementary particle would **have** to be pointlike, or else it could not be considered to be truly elementary.

This type of behaviour, and this strange type of argument, might appear completely bizarre and counter-intuitive. How on earth is it possible to have objects which cannot be broken into smaller objects? How on earth is it possible to have objects which have no spatial extent? The problem is that we are only used to operating in the human-scale ("macroscopic") world, and things work very differently at that vastly larger scale: all objects can be broken into smaller objects, all of these composite objects take up volume in space, etc.

However, at the fundamental scale of elementary particles, the world works very differently, and in very counter-intuitive ways. Another counter-intuitive fact about elementary particles is that all particles of a particular type are identical. For example, all electrons are exactly the same, as if they are perfect copies (we will discover the implications of this later in the book when we consider the Pauli exclusion principle). Again, this has no analogy in our macroscopic world. In our macroscopic world, we always have the option of "delving deeper", to sub-analyse an object to discover distinguishing details. For example, if we want to distinguish two identical models of car, we might divide the car into its constituent parts, and then consider the cars' number plates. Hence, all macroscopic objects can be distinguished. However, when we are dealing with elementary particles, we no longer have access to any lower distinguishing level. This is a clear sign that we are dealing with the lowest level of reality.

When dealing with these fundamental concepts, we have to make the effort to break away from our human-scale, macroscopic preconceptions about how things behave, and how objects are structured. Because only then will we have a chance of understanding the elementary structure of Nature.



This book will consider the structure of the atom, and is essentially divided into three parts. The first part might be described as a study of "the forces which hold the atom apart" (in this chapter we have already seen how energy quantization prevents the electrons from spiralling into the nucleus). The second part of the book might be described as a study of "the forces which pull the atom together", in which we will examine the fundamental forces which hold the electrons and the atomic nucleus together. And the third part of the book considers the balance which arises between these two opposing forces: the forces which hold the atom apart, and the forces which pull the atom together.

It is by considering this concept of "balance" in this third part of the book that we will find a remarkable similarity between the forces which hold the atom together and the forces which hold the universe together. We will discover that the very large and the very small have much in common.

2

ADVENTURES IN THE MATRIX

When Ernest Rutherford gave an interview to the *London Daily Herald* in 1933, he tried to explain how small the atom was: "If everyone in the world spent twelve hours a day placing individual atoms into a single thimble, a century would elapse before it was filled."

At first glance, the intended message of Rutherford's quote appears clear: atoms are inconceivably small. However, there is another possible interpretation because, of course, all sizes are relative. The alternative interpretation is that humans (and thimbles, for that matter) are inconceivably huge.

In similar fashion, whenever I hear the usual quote that humans are insignificantly small in relation to the size of the universe, I get mildly irritated. Because, of course, on the atomic scale (which is a much more sensible standard scale of size) human beings are cosmos-straddling giants. A typical human contains 7,000,000,000,000,000,000,000,000 atoms. We are certainly not "insignificantly small" by that definition.

In fact, it is this extraordinarily huge size of human beings (and our experimental apparatus) which causes us such great difficulty as we attempt to explore the atomic world, because much of the true behaviour of atoms becomes hidden from our eyes. Instead, all we ever consider is phenomena in which the individual behaviour of atoms is "averaged out". Most notably, the peculiar quantum mechanical behaviour of individual atoms is obscured as we only ever consider systems which are composed of billions of atoms. However, if we really want to obtain an accurate picture of the behaviour of individual atoms, it is precisely this quantum mechanical behaviour which we need to capture.

And so, this chapter presents a brief introduction to quantum mechanics, describing the actual techniques used by physicists in order to construct an accurate model of the atom.

Basic matrix operations

Central to this discussion of quantum mechanics will be the mathematical object known as a *matrix*. You might have been introduced to matrices ("matrices" is the plural of "matrix") in your mathematics class in school, and you might have suspected that you would never use such an obscure piece of mathematics in your everyday life. Well, unless you found employment in some fields of science and engineering then you might have been correct. However, in this book you will finally get a chance to use your skills as you discover just how useful matrices really are.

The discussion will show why matrices are so central to quantum mechanics, and why solving problems in quantum mechanics involves solving a problem described by matrices. You will get much more out of the rest of the book if you ensure you understand the concepts in this section. I will be asking you to perform some important matrix calculations later in this book. You won't believe what we can achieve!

A matrix is a square (or rectangular) grid of numbers. Here is an example of a 2×2 matrix (it has two rows and two columns):

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix}$$

We might ask how matrix multiplication (the multiplication of two matrices) might be achieved. For example, how could we multiply the following two matrices:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix}$$

We can multiply these two matrices by the following sequence of steps.

First, consider the first row of the first matrix and the first column of the second matrix (shown in the two dashed ellipses in the following diagram). Take the first number in the first row of the first matrix (which is 2) and multiply it by the first number in the first column of the second matrix (which is 5). This gives us our first intermediate result of 10 (we must remember this). Then take the second number in the first row of the first matrix (which is 4) and multiply it by the second number in the first column of the second matrix (which is 1). This gives us our second intermediate result of 4.

We add our two intermediate results (10 and 4) together to get the answer 14, and that number goes in the first position in our result matrix:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & \\ & \end{bmatrix}$$

To calculate the next entry in our answer matrix, once again we have to consider the first row of our first matrix, but now we consider the second column of the second matrix. We perform a similar series of steps to the first case, but this time we need to calculate $(2 \times 6) + (4 \times 5)$ to give an answer of 32:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & 32 \\ & \end{bmatrix}$$

We continue in a similar fashion until we have filled all the positions in our result matrix. So here is the answer of our matrix multiplication:

$$\begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 14 & 32 \\ 38 & 57 \end{bmatrix}$$

You might want to check the steps yourself to make sure it is the correct answer. $(7 \times 5) + (3 \times 1) = 38$ and $(7 \times 6) +$

$(3 \times 5) = 57$.

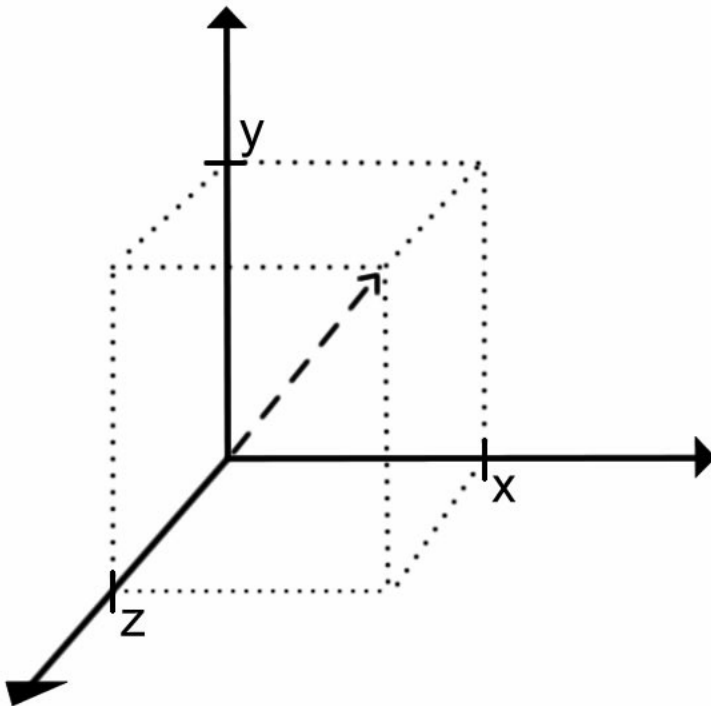
One vitally important feature about matrix multiplication is that it is *noncommutative*. Conventional multiplication is commutative in that it does not matter in which order the numbers are multiplied, the answer will be the same. For example, 7×5 will give the same result as 5×7 . However, matrix multiplication is noncommutative in that the ordering does matter. If the ordering of the matrices is reversed, the answer will be different. You might want to check this by considering the previous example, but this time placing the second matrix before the first matrix. When the multiplication is performed, you should get a different answer:

$$\begin{bmatrix} 5 & 6 \\ 1 & 5 \end{bmatrix} \times \begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix} = \begin{bmatrix} 52 & 38 \\ 37 & 19 \end{bmatrix}$$

So this is something very important which I want you to remember as we will be returning to this point several times in this book: **matrix multiplication is noncommutative**. You get a different result for your multiplication when you reverse the ordering of the matrices.

Vectors

The mathematical construction known as a *vector* is closely associated with matrices. A vector is a line of a specified length which has a definite direction — essentially it is an arrow. In three-dimensional space, we could imagine a vector extending outwards from the origin of our coordinate system, as is the case with the dashed arrow in the following diagram:



You will see that the dashed arrow (the vector) points to a point in space which is a distance x along the horizontal axis, and is a distance y along the vertical axis, and a distance z along the axis which is coming out of the page. You can see that this vector could actually point to any position in space, as long as we have the (x, y, z) coordinates of the position. Hence, three coordinates are enough to define this vector, and we could list those coordinates in matrix form as a matrix which has only one column:

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

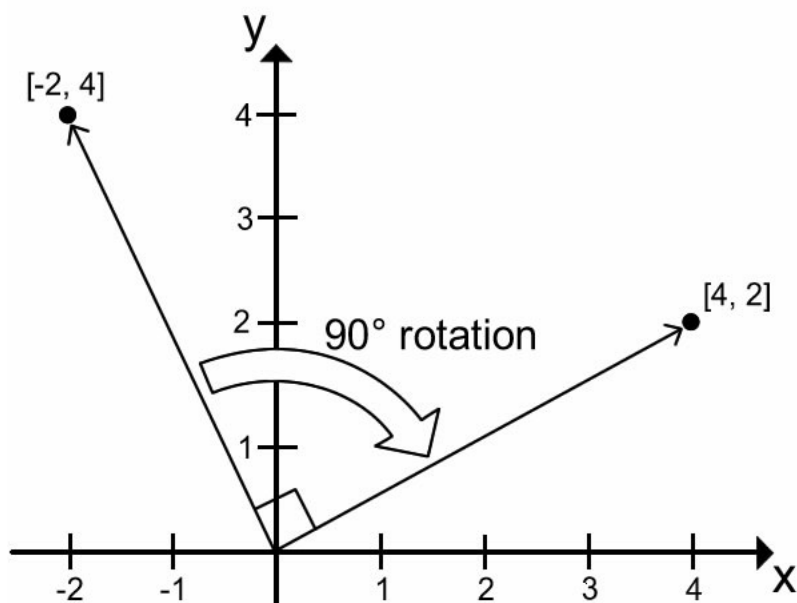
A vector is therefore essentially just a matrix, and so we can perform matrix multiplication by multiplying a vector by a matrix. As we shall see, the result of the multiplication will be another vector. Hence, a matrix can be used for **transforming** a vector into another vector.

Here is an example of a matrix multiplication being used to transform a vector which has just two coordinates $[-2, 4]$ (as an example, a vector drawn on a flat sheet of paper would only have two coordinates: x and y):

$$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \times \begin{bmatrix} -2 \\ 4 \end{bmatrix} = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$$

The result vector is calculated in the usual method. The first entry is $(0 \times -2) + (1 \times 4)$ which is 4, and that goes in the first position in the result vector. The second entry would be $(-1 \times -2) + (0 \times 4) = 2$.

So what is the result of this transformation? A vector with the coordinates $[-2, 4]$ has been transformed into a vector $[4, 2]$. Let us plot these two positions on a graph:



You will see from the graph that the result of this matrix multiplication is to rotate the vector about the origin by 90 degrees.

This ability of matrices to perform transformations is an incredibly useful property. As we shall now discover, this is the reason matrices are used in quantum mechanics.

The quantum measurement

We only have to consider the implications of quantum mechanics when we are dealing with the smallest parts of Nature, which are particles. True, the rules which apply to particles inevitably apply to larger objects as well, but the counter-intuitive behaviour of quantum mechanics gets "averaged out" as we move up the scale from individual particles to macroscopic ("human scale") objects composed of trillions of particles. We simply don't have to deal with the quantum rules directly in our everyday lives.

However, in this book we are interested in the behaviour of particles, so a good understanding of quantum mechanical behaviour is going to be crucial.

I considered the logic of quantum mechanics in my first book, hopefully trying to convey the impression that there is a clear and consistent underlying logic to quantum mechanical behaviour (even though the "weirdness" of quantum mechanics is often stressed elsewhere). It was stated how quantum mechanics is important whenever we want to extract some information about the state of a system. That is just a grand way of saying that quantum mechanics is all about measurement. When we talk about "measurement" you might have an impression of someone using a tape measure, but, really, measurement is a much more general concept. Whenever we detect an object, for example, we are measuring the position of the object and determining that it resides in a particular location. In fact, in the most general case, we might consider "measurement" to be any interaction between particles (because that interaction has the ability to pin down the position of a particle).

In my first book, I described the principles of measurement at the quantum scale in very simple terms:

1. Before we measure certain properties of a particle (e.g., position, momentum) the particle behaves as though it has **all possible values** for that property.
2. After we have performed the measurement, we find the particle property takes only one of the possible values at random. It is fundamentally impossible to predict which value the property will take.

And those two simple principles, basically, are the underlying principles of quantum measurement. Hence, they are the underlying principles of quantum mechanics itself. It is really not so difficult or weird!

With these two principles in mind, I presented a useful analogy to quantum measurement: a roulette wheel. Before the measurement is taken, we might imagine the ball spinning around the wheel to be in all possible states, certainly it has the potential to take all possible states. In this pre-measurement phase, we might consider the system to be in a *superposition* state (i.e., all possible states). However, when the measurement is taken, the ball occupies only one clearly-defined state. The number of the slot indicates the value of the measurement. It is fundamentally impossible to predict which slot the ball will end up in. In other words, it is fundamentally impossible to predict the outcome of a measurement in advance: quantum mechanics can only give you the probability of a certain outcome.

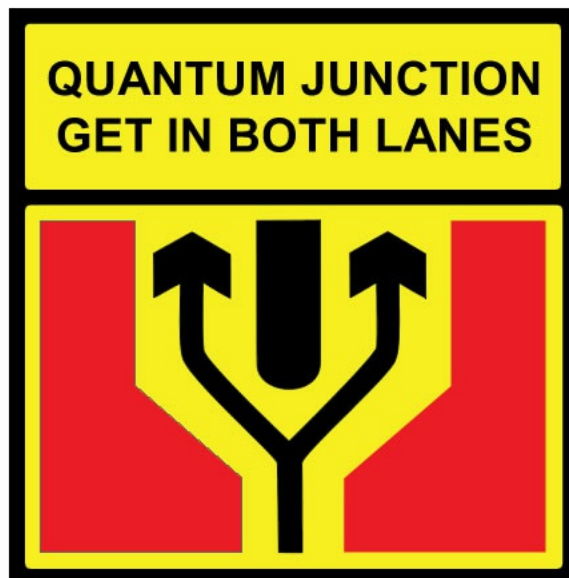
As an example of these principles in practice, my first book described the famous *double-slit experiment*. According to Richard Feynman: "The double-slit experiment has in it the heart of quantum mechanics. In reality, it contains the only mystery of quantum mechanics."

In the double-slit experiment, a light source is in front of a board. Two narrow slits are cut into the board. Light can only pass through these two slits, and the light which passes through the two slits illuminates a screen behind the board. The two light rays from the two slits meet at the screen. Due to the wavelike nature of light — and the resultant constructive and destructive interference — this results in a characteristic pattern of dark and light bands projected onto the screen (for details, see my first book).

This all makes sense, and is in agreement with the classical (i.e., non-quantum) view of waves. Indeed, this effect can even be seen in water waves passing through two slits.

However, the real surprise happens when the intensity of the light is reduced to such an extent that only one particle (one photon) is emitted at a time. In other words, at any point in time there is only a single photon travelling from the light source, through one of the two slits (we do not know which slit), before hitting the screen behind the board. Over time, these individual photons build up a pattern on the screen. Amazingly, the pattern on the screen still exhibits the dark and light interference bands. It appears that the photon is interfering with itself! In fact, **it appears that the photon is passing through both slits at once.**

As amazing as this result might appear, it is in line with the simple principles of quantum mechanics I described earlier in this section. Before we make a measurement of a particle's position (i.e., before we localise the particle by making it hit a screen) the particle behaves as if it has all possible values, as if it is passing through both slits at the same time. At this point, the particle is in a superposition state of all possible values.



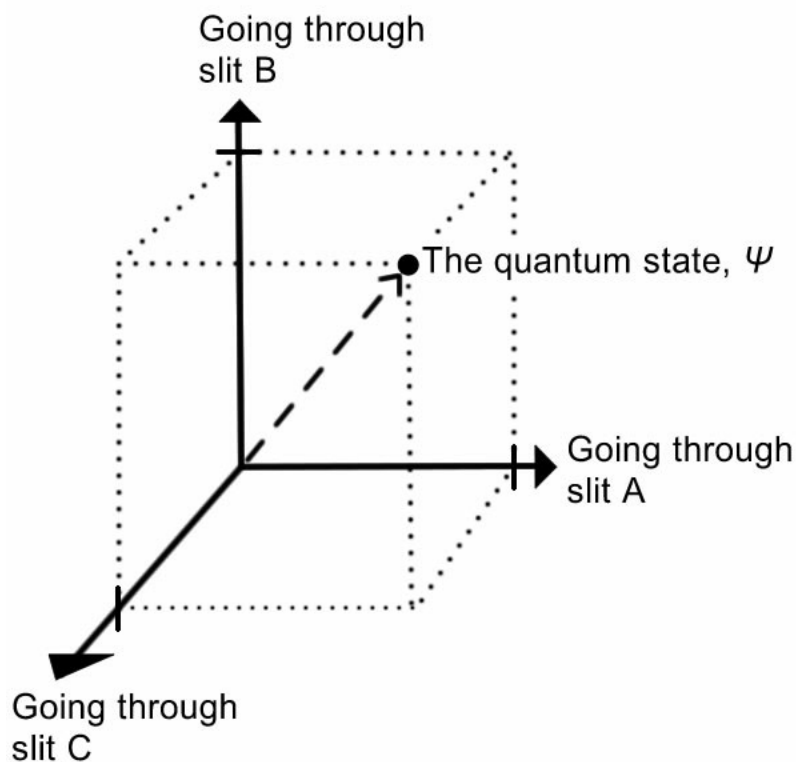
But, you might argue, one particle is only making one dot on the screen. Surely this means that the particle is truly only going through one slot? If we could install detectors on each slit, surely we might be able to detect which slit the particle is actually passing through? If we try this approach, true enough, we discover the particle appearing to only travel through one slot — **but this makes the interference pattern on the screen disappear!** By detecting the

particle, we are effectively localising it, and forcing it to appear in only one position. The act of measurement takes the particle out of its superposition state. Again, this agrees with the principles of quantum mechanics I described earlier in this section: after we have performed the measurement, we find the particle property takes only one of the possible values at random.

At this point, we start to realise why all our work on matrices and vectors was worthwhile. In order to see why that is the case, we have to realise that a particle in a superposition state is really in a combination of all possible states. And we can represent a combination by a vector.

In order to see how we can do this, let's expand the double-slit experiment into a triple-slit experiment. In other words, we get our knife out and cut another slit in the board so that the particle can now pass through three slits in the board instead of just two slits.

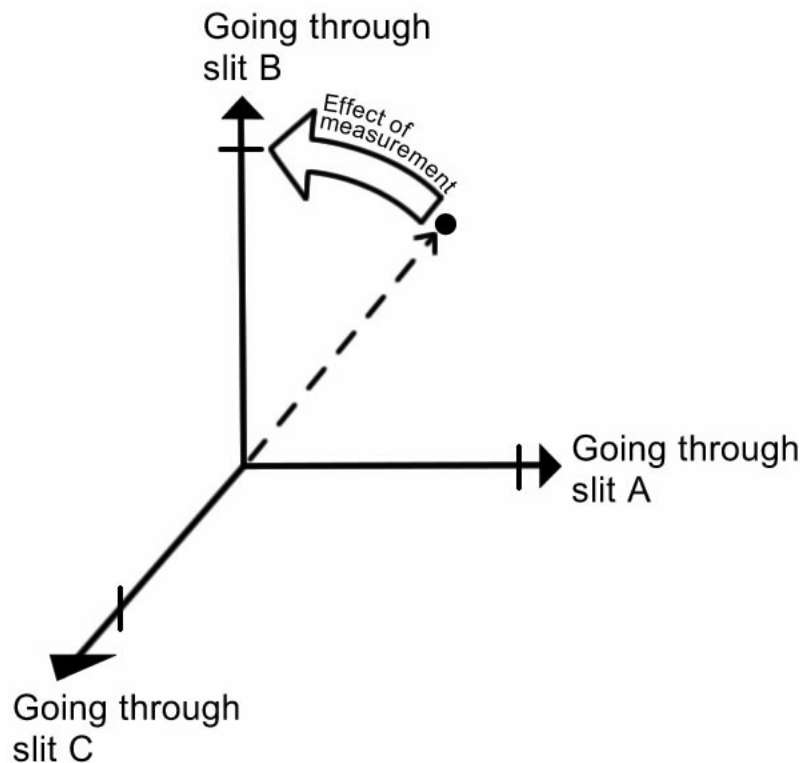
Before the particle hits the screen and is detected, we have to consider the particle as being in a superposition state, which means we now have to consider the particle is passing through all three slits. The state of the particle is therefore in a combination of three states: "Going through slit A", "Going through slit B", and "Going through slit C". In the following diagram, I hope you can see how this superposition state of the particle can be represented as a vector (the dashed arrow) which is composed of all three possible states:



You will notice that this superposition state of the particle is referred to as the quantum state, and is denoted by the Greek letter Ψ (pronounced "sigh"). This is the standard notation used to denote the quantum state of a particle.

So this explains how vectors are a perfect mathematical tool for representing quantum states. Please note that the vectors in the previous diagram no longer represent the three coordinate axes of space. No, the three vectors are now purely a mathematical abstraction representing the three possible states of the particle. This type of vector space which is used for representing quantum states is called a *Hilbert space* (after the great German mathematician David Hilbert).

So what happens when we make a measurement? Well, the particle is pulled out of its superposition (multi-valued) state into a single well-defined state. For example, when we try to detect the position of the particle in our triple-slit experiment, we find it only passing through one slit. As you will see in the following diagram, in state vector terms this is represented by a rotation of the quantum state vector from its previous superposition state to one of the well-defined single states (in this case, going through slit B):



And what have we already seen are very useful tools for rotating vectors? Yes, matrices! (Remember earlier in this chapter we showed how matrix multiplication can rotate a vector). So all our work with matrices was not wasted. We will now see that matrices are the key tool for analysing what happens when we make a quantum measurement.

However, the way we use matrices to predict the possible outcomes of measurements is rather different from this rotational model. The next section describes the procedure which really lies at the heart of all quantum mechanical measurements.

You just need to know the magic word ...

The magic word: "Eigen"

You will find in quantum mechanics that a particular word crops up time and time again. It is a German word, emphasising that Germany led the world in the development of quantum mechanics in the early decades of the 20th century. The word is "eigen", and — in the German style — you will find the word added before another word to make a compound word, such as "eigenstate", "eigenvector", or "eigenvalue".

Apparently in German, the correct translation of "eigen" is "personal" or "idiosyncratic". However, when I see the word "eigen" I think of only one word, and that word is "allowed".

As an example, an *eigenvalue* is the value you will measure when you perform a measurement or observation on a quantum system. Only a few, certain values can possibly result from your measurement: you will find you will only measure one of a few "allowed" values.

As an example, in the previously-described triple-slit experiment, when we perform a quantum measurement on the particle (i.e., measuring its position to detect which slit it went through) we will obtain one of only three possible values: slit A, slit B, or slit C. In other words, only three possible values are allowed. These would represent the eigenvalues of the system.

Remember the analogy I presented earlier of a ball spinning round a roulette wheel? I said that before the measurement is taken, the ball spinning around the wheel represents the multi-valued superposition state. However,

after the measurement is taken, the ball only occupies one clearly-defined slot. The numbers on these clearly defined slots represent the allowed eigenvalues we will measure.

So how do we calculate our possible eigenvalues? Firstly, we have to decide what property we want to measure, because different properties have different eigenvalues. Each different measurable property value (called an *observable*) is associated with a different matrix operation. And that particular matrix operation is achieved by using a particular *operator matrix* (sometimes simply called an *operator*). For example, if you want to know the possible energies which a particle can have, you would use the energy operator matrix. Or, if you want to know the possible values for a particle's momentum, you would use the momentum operator matrix.

This use of a particular operator in order to produce a measurable value emphasises the importance of the observer in quantum mechanics. It is as though the very act of observation creates the measured value. Before the operator is applied, it is meaningless to talk of the value of a property of a particle.

So, when we have selected a suitable operator matrix, what happens next? Well, it turns out that the operator matrix contains within it all the information we need, but we have to extract that information in a rather unusual manner. Remember that the possible states of the particle (e.g., "slit A", "slit B", etc.) can be represented by vectors in a vector space. These vectors are called *eigenvectors* (i.e., the "allowed" states after measurement). So how are eigenvectors and eigenvalues related? The relationship is quite peculiar, but it is vitally important: **The result of multiplying an eigenvector by the operator matrix results in the same eigenvector — but multiplied by a number. And that number happens to be the eigenvalue we measure.**

This method is represented in the following diagram:

The diagram shows the following equation with arrows pointing to the components:

$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \times \begin{bmatrix} 0 \\ 1 \end{bmatrix} = -1 \times \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Labels and arrows in the diagram:

- "Operator matrix" with an arrow pointing to the first matrix.
- "The same eigenvector" with two arrows pointing to the second matrix and the final matrix.
- "The measured eigenvalue" with an arrow pointing to the scalar "-1".

Take some time to ensure you understand the previous diagram. This eigenvalue/eigenvector approach is the **absolutely central** method for analysing quantum mechanical measurements. An actual example will be presented later in this chapter.

For a particular operator matrix, only a few very specific eigenvectors can successfully satisfy this requirement. So a particular operator matrix defines a set of possible eigenvectors. And, as each eigenvector is associated with just one particular measurable eigenvalue, this means that a particular operator matrix gives us the complete set of possible measurements we will find. As Leonard Susskind and Art Friedman say in their book *Quantum Mechanics*: "An operator is a way of packaging up states along with their eigenvalues, which are the possible results of measuring those states."

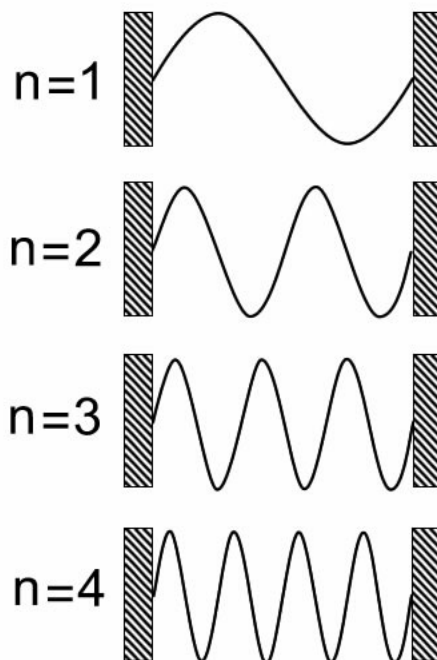
Crucially, the noncommutative property of matrices (which we considered earlier in this chapter) is known to have important consequences for the ordering in which measurements are taken in quantum mechanics. The

Heisenberg uncertainty principle is a consequence because the order in which you take measurements is important: if you measure a particle's momentum first, and then its position, you will get a different result if you performed the measurements in the opposite order. This is due to matrix multiplication — which lies at the heart of quantum mechanical measurements — being noncommutative: the order does matter.

So this is a very mathematical approach to producing "allowed" eigenvalues. But is there a more intuitive approach? Well, yes there is. Where previously have we encountered "allowed" values before? Remember back to the work of Louis de Broglie in the previous chapter who suggested that only an integer (whole number) of wavelengths could be allowed in the orbit of an electron around the nucleus. This meant that the energy of the electron could not be continuously variable, but had to be divided into discrete chunks. In other words, only certain energy levels were allowed. Well, these allowed values of energy precisely correspond to the allowed eigenvalues of energy for the electron.

It has been shown that the eigenvalue approach to finding allowed values, and the "whole number of wavelengths" approach to finding allowed values are mathematically equivalent. In fact, in 1926 Erwin Schrödinger first presented his famous Schrödinger wave equation in a paper entitled *Quantization as an Eigenvalue Problem*.

The following diagram shows how allowed energy states are related to the number of whole wavelengths:



So next time you might be having difficulty in imagining the "allowed" eigenvalues produced by a matrix calculation, just imagine the problem in terms of an allowed number of integer wavelengths instead.

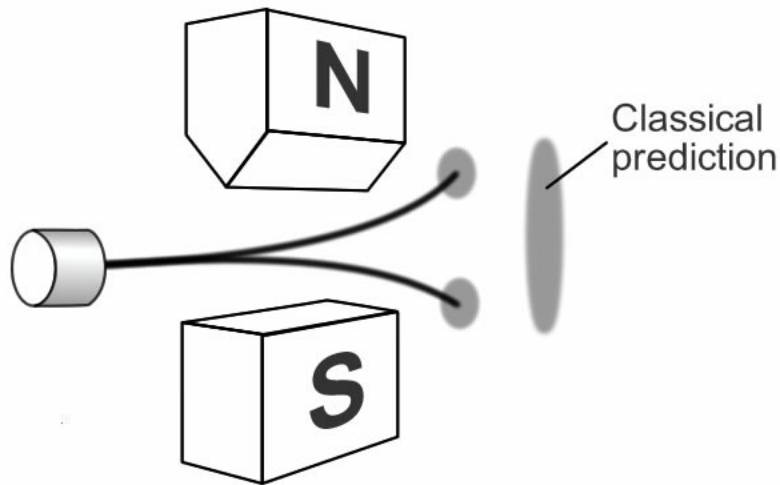
This wavelike nature of the quantum state means the quantum state (or quantum state vector) is frequently referred to as the *wavefunction*. Personally, I generally find it easier to think in terms of a quantum state as a vector, and that is the approach I have followed in this book. But just bear in mind that the two terms both refer to the same thing.

Certainly, this wave-based approach hopefully gives you more of a feel as to how discrete eigenvalues can emerge as the only allowed values for a property. And it is these discrete (rather than continuous) values which we find at the lowest level of Nature, and it is these "chunks" — the *quanta* — which give quantum theory its name.

Spin

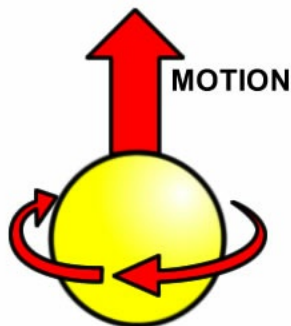
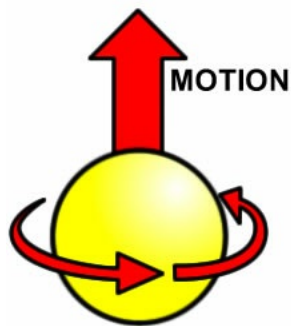
In 1921, Otto Stern and Walther Gerlach performed an experiment in Frankfurt which revealed a new property of particles. The experiment is now known as the *Stern-Gerlach experiment*. In the experiment, Stern and Gerlach sent a beam of particles through a magnetic field. They observed that the particles were deflected, and left two distinct

marks on a screen. In order to explain this, it was proposed that the particle might be spinning about an axis. After all, a moving charge generates a magnetic field, so this would result in the particle behaving as if it was a bar magnet. If the particles turned into bar magnets, then this would explain the observed magnetic deflection.



However, there was a problem with this picture of a spinning particle. If we imagine the particles as spinning around an axis, then we would imagine this axis to be randomly-oriented when the particles were emitted from the gun. We would certainly expect the effect of the magnetic field to deflect the particles, but we would expect this to result in a smooth smearing of the particles when they hit the screen (see the "classical prediction" in the previous diagram). However, this is not what happens. When the particles hit the screen, they cluster into two clearly-defined groups.

This clustering into two groups suggests that when we measure the spin of a particle along a particular axis (such as north-south in the previous example) then only two results are possible. Imagine the curled fingers of your right hand representing the direction of spin of the particle:



SPIN UP

Thumb aligned with direction of motion



SPIN DOWN

Thumb opposite to direction of motion

As you can see from the previous diagram, we can understand the two possible states of the particle by using our right hand with our fingers curled up and our thumb pointed out. In this way, the curling of the fingers forms a *spin vector* representing the rotation of the particle. As you can see from the diagram, if our thumb is directed in the direction of motion of the particle then that represents "spin up". Alternatively, if our thumb points in the opposite direction to the direction of motion, that represents "spin down". When we measure the particle, these are the only two possibilities we will encounter.

So this reminds us of eigenvalues: only two values are **allowed**: spin up or spin down. It is as if our quantum roulette wheel has only two slots into which the particle can land. So we come to the conclusion that the spin of a particle is an example of quantum mechanical behaviour.

So if spin is quantum mechanical in nature, let us use our knowledge of eigenvalues and eigenvectors to express spin in a useful mathematical form.

Firstly, we can see that there are two possible states of spin: "spin up" and "spin down". These will be our two "allowed" eigenvector states, and we can represent these by the two vectors:

$$\text{Spin up: } \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad \text{Spin down: } \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

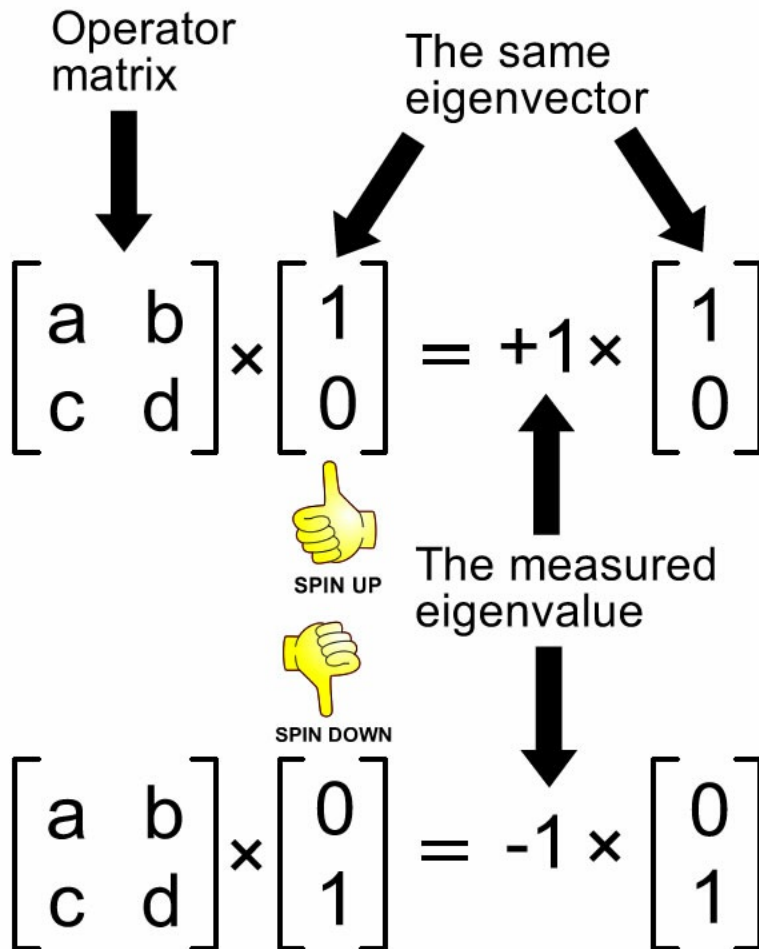
Now, what about the value we actually measure when we make a measurement? In other words, what values

would we expect for our eigenvalues? Logically, we would expect to measure a value of +1 for spin up, and -1 for spin down.

And that is all the information we need. We are now in a position to derive the all-important operator matrix which describes the spin of a particle. Let us represent the operator matrix we need to find by:

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

We are now left with the task of finding the values of a , b , c , and d . How do we do that? Well, using our knowledge of eigenvalues and eigenvectors, we know that the operator matrix must satisfy the two conditions for "spin up" and "spin down":



These two conditions can only be satisfied if $a=1$, $b=0$, $c=0$, and $d=-1$. Hence, the operator matrix which describes spin is:

$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

(You might want to check that this operator matrix satisfies both of the two previous eigenvalue/eigenvector operations.)

So this is great! This single operator matrix contains all the information we need to describe both of the possible spin states about an axis, and the spin values we can measure.

However, there are two more axes about which we could measure spin, and the operator matrices for these additional axes can be found in a similar fashion.^[1] The set of the three operator matrices which describe spin about the three axes (x, y, and z) are called the *Pauli spin matrices* (named after Wolfgang Pauli):

The Pauli Spin Matrices

$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

where i is the square root of -1 (if you multiply i with i you get -1).

So that is very satisfying. From our knowledge of quantum mechanics we have been able to derive the matrices which are used to describe the behaviour of particle spin, and we will be encountering these Pauli spin matrices again later in this book.

However, we produced these matrices merely by observing the behaviour of particles. It would be so much better (and rather amazing) if we could derive these matrices from basic principles.

Well, that is precisely what we shall do in the next chapter.

But ... what is spin?

We have covered a lot of important ground in this chapter, and at quite a pace. But we have managed to get to this point without ever specifying what, precisely, is meant by the spin of a particle. According to most popular science books, there is apparently little doubt that particle spin has nothing to do with actual physical rotation of the particle.

Well, sorry, I can't accept that. I can't help thinking that if you repeat a statement often enough then eventually it becomes a kind of fact which gets copied and repeated and nobody ever gets round to checking it, so it takes on a life of its own.

It is time for a correction.

In the Stern-Gerlach experiment described earlier this chapter, you will remember that particles deflected in a magnetic field behaved **precisely** as if they were actually physically spinning, the spinning particles turning into miniature bar magnets. This was the initial motivation for suggesting that particles have spin and, indeed, provided the motivation for the term "spin". Indeed, no one disputes that these particles possess the property of angular momentum. So why do so many authors appear to suggest that there is no physical rotation? It appears that this is because spin does not behave in the same way as the classical notion of spin with which we are all acquainted. When a measurement is made of quantum spin, the angular momentum of a particle is quantized into chunks of Planck's constant, h . As we have seen, we interpret this as either "spin up" or "spin down" for the particle, which is

obviously not the case for a classically spinning object.

So on the basis of these quantum peculiarities, should we conclude that the particle is not actually physically spinning, or should we instead conclude that this is precisely the sort of behaviour we should expect in quantum mechanics?

I firmly believe we should come to the latter conclusion.

Firstly, when we measure the spin of a particle, some might be surprised that the act of observation appears to force the particle to choose between either "spin up" or "spin down". But this type of observer effect is found throughout quantum mechanics, and we should surely not be surprised by it. In fact, it would have been much more surprising if we had **not** found an observer effect! It would have been much more surprising if had found particle spin operating according to classical rules when we moved down to the quantum level.

Admittedly, particle spin is a very peculiar property. For example, in the next chapter we will be discovering that you need to spin an electron around twice to return it to its starting position! Crucially, though, these peculiarities do not necessarily signify that the particle is not physically rotating.

As was explained at the start of this chapter, when billions of particles work together to form macroscopic phenomena, there is an "averaging out" of quantum mechanical behaviour, and all humans ever see is the classical form of spin. Hence, quantum spin gets turned into classical spin by this averaging process. As in all examples of quantum mechanical behaviour, the classical behaviour arises from the quantum behaviour. But at the base level, they both arise from the same root cause: quantum spin becomes classical spin.

An accurate explanation of spin is provided by Robert Oerter in his book *The Theory of Almost Everything*: "What is this thing called spin? The electron's spin, as the name implies, has to do with rotation. Take a beam of electrons that are all spinning in the same direction and fire it at, say, a brick. If you could keep this up for long enough, and if there were no other forces acting on the brick, the electrons would transfer their rotation to the brick and it would begin to rotate."

Thank you so much Mr. Oerter! It is reassuring to find a popular science author who is not content to repeat the usual "non-rotation" script.

A similar argument is presented by Luboš Motl in a blog posting entitled "The electron is spinning, after all" (<http://tinyurl.com/electronisspinning>).

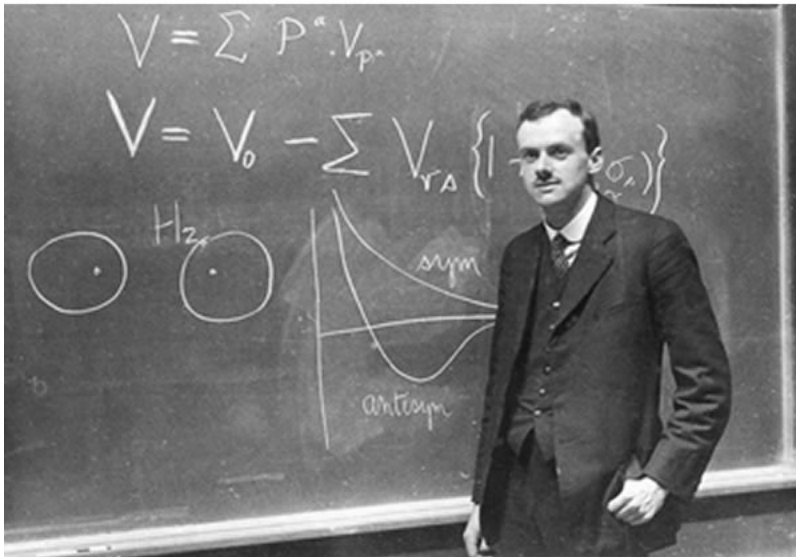
And so that concludes our introduction to quantum mechanics and quantum spin. In the next chapter we will discover how one of the greatest mathematical physicists of all time used this knowledge of quantum mechanics and spin to obtain extraordinary insights into the structure of matter and the atom.

3

THE AMAZING MR. DIRAC

Paul Dirac was born in Bristol, England in 1902. His father was a harsh disciplinarian who imposed a strict work ethic on the young boy. As his mother later said: "His father's motto has always been to work, work, work, and if the boy had showed any other tendencies, then they would have been stifled. But that was not necessary. The boy was not interested in anything else." As a result of this sheltered upbringing, Dirac grew up quiet and withdrawn, and rather emotionally stunted. "This balancing on the dizzying path between genius and madness is awful", Einstein later said of Dirac. However, Dirac's talent, hard work and phenomenal mathematical ability eventually resulted in Stephen Hawking describing him as "probably the greatest British theoretical physicist since Newton."

Dirac's technical ability at mathematics was apparent from an early age. In 1919 as a young student, Dirac was profoundly affected by a breakthrough in the field of physics. As Graham Farmelo recounts in his biography of Dirac: "No event in Dirac's working life ever affected him as deeply as the moment when relativity 'burst upon the world, with a tremendous impact' as he remembered nearly sixty years later."



The predictions of special relativity agreed with Newtonian physics for speeds which were much lower than the speed of light, but special relativity modified Newton's laws for speeds close to the speed of light. Purely as a hobby while he was studying as an undergraduate in college in Bristol, Dirac practised upgrading Newtonian theories to incorporate special relativity. According to Dirac: "There was a sort of general problem one could take, whenever one saw a bit of physics expressed in a non-relativistic form, to transcribe it to make it fit in with special relativity. It was rather like a game, which I indulged in at every opportunity."

When he won a scholarship to Cambridge University, Dirac applied his mathematical virtuosity to quantum mechanics, operating at a far higher mathematical level than his fellow physicists who often came from an engineering background, and therefore viewed the atom as a mechanical object. Dirac's approach proved fruitful, showing that a purely mathematical approach was more suited to capturing quantum mechanical behaviour.

The Dirac equation

The challenge for physicists in the 1920s was to combine quantum mechanics with the special theory of relativity.

Erwin Schrödinger had derived a famous equation which described the quantum mechanical behaviour of a particle, but the equation was not relativistic, which meant it did not describe the behaviour accurately as the particle's speed approached the speed of light. Paul Dirac was determined to find a relativistic equation which accurately described the quantum mechanical behaviour of an electron.

In Chapter Eleven of his biography of Dirac, Graham Farmelo describes the motivation and thought processes of Dirac in detail which provides a fascinating insight into Dirac's approach as he successfully derived one of the most important equations in physics, now simply known as the *Dirac equation*.

We will now derive the Dirac equation. What follows might appear to be rather complex. However, there is a considerable reward for us if we take our time and work through this. We will uncover the truth as to why the electron has spin. We will discover why the behaviour of matter particles (such as electrons) makes a solid object feel hard to the touch (and why, conversely, you cannot feel a ray of light). And we will discover how this leads to an understanding of all of chemistry: why the elements have their different characteristics, and how they combine to produce everyday materials. We will even discover why there is matter and antimatter.

And we will also be obtaining an insight into how one of the greatest minds in physics derived one of the most important results in the history of physics.

Dirac took as his starting point the most important equation in special relativity, which is the *energy-momentum relation*:

$$E^2 = (pc)^2 + (mc^2)^2$$

where E is the total energy of a particle, m is its mass, p is its momentum, and c is the speed of light (this equation was derived and considered in detail in my third book). This equation reveals the relationship between energy, mass, and momentum, and it applies to absolutely everything in the universe, from a rolling billiard ball to the energy and momentum of light itself.

You will see that if a particle is stationary, i.e., if its momentum, p , is set to zero, then the equation reduces to Einstein's famous equation $E=mc^2$. However, the energy-momentum relation is more general than Einstein's equation as it can be shown to apply even to massless objects, such as photons.

You will see that the energy-momentum relation can also be written as:

$$E = c\sqrt{p^2 + (mc)^2}$$

Dirac considered this equation and did not like the fact that the p and mc terms were squared. In his biography of Dirac, Graham Farmelo explained Dirac's motivation: "Believing that the relativistic equation would be fundamentally simple, he thought it most likely that the equation would feature the electron's energy and momentum just as themselves, not in complicated expressions such as the square root of energy or momentum squared."

So Dirac considered the content of the square root and tried to express it purely in terms of p and mc , without those terms being squared. What he then had to do was work out the relative amounts of each term.

So Dirac tried to represent the energy-momentum relation as two bracketed terms multiplied together: [2]

$$p^2 + (mc)^2 = (ap + bmc)(ap + bmc)$$

where a and b are some numbers which have to be calculated. They represent the amounts of p and mc which are required.

If we multiply-out the two bracketed terms, we find we get something which looks very close to the energy-momentum relation, but is not quite exactly right. The result includes a term which does not appear to fit (I call this the "unwanted part" in the following diagram):

$$(ap + bmc)(ap + bmc) =$$

$$ap(ap + bmc) + bmc(ap + bmc) =$$

This part closely resembles the energy-momentum relation

$$\boxed{a^2 p^2 + b^2 (mc)^2} + \boxed{(ab + ba) pmc}$$

The "unwanted part"

Considering the first part of the result, we can see that if we set $a=1$ and $b=1$ then the a and b terms effectively disappear (multiplying by 1 is the equivalent of not multiplying at all) and we are left with precisely the old energy-momentum relation. So it would appear that those two values for a and b would represent a solution to Dirac's relativistic equation for the electron. However, the problem is that the "unwanted part" does not vanish with those values of a and b .

So Dirac was stuck with a problem. He needed to find values for a and b such that $a^2=1$ and $b^2=1$. However you will see from the "unwanted part" that he also needed $(a \times b + b \times a)$ to equal zero to remove the entire "unwanted part". Unfortunately, it was clear that no simple numbers satisfied these requirements. In fact, bizarrely, the requirement for $(a \times b + b \times a)$ to equal zero appeared to indicate that a and b had to be mathematical objects for which a different order of multiplication produced a different result (so that $a \times b$ might produce a positive number, while $b \times a$ produced an equal negative number — the sum of those two numbers then being zero).

So where have we heard of this type of noncommutative multiplication before, multiplication in which the ordering matters?

The story is that Dirac was staring into the fireplace at Cambridge when he was struck by a stroke of genius. He realised that a and b were not simple numbers at all. Instead, he realised that matrices exhibited precisely this type of noncommutative multiplication which was required (as we discussed in the previous chapter).

Here is an example of two matrices which would meet Dirac's requirement: [\[3\]](#)

$$a = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad b = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

Remember, the first requirement is that the square of either of the matrices must be equal to one. So let's pick one of the matrices — say, matrix a — and square it (multiply it by itself):

$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

You will see the result is a matrix which has ones in the top-left to bottom-right diagonal, and zeroes everywhere else. This is called the *identity matrix* and it is the matrix equivalent of "1" (because, if you multiply a matrix with the identity matrix then the original matrix is unchanged — just as if you were multiplying with 1). So the first of Dirac's requirements is satisfied (you might want to check that the square of matrix b is also the identity matrix).

The second of Dirac's requirements is that $(a \times b + b \times a)$ must equal zero. Let us test that this second requirement is satisfied:

$$a \times b = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$b \times a = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

So therefore:

$$(a \times b) + (b \times a) = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

(Matrix addition is performed simply by adding the numbers which have the same positions in the two matrices).

You will see that the result of $(a \times b + b \times a)$ is the zero matrix (a matrix with zeroes in all its positions). So the second of Dirac's requirements is also satisfied by these two matrices.

So have we solved the problem? Have we found the relativistic equation of the electron?

Well, no, there is a problem.

According to relativity, space and time are placed on an equal footing and are combined to create *spacetime*. Spacetime is therefore four-dimensional (three dimensions of space, and one of time). But the analysis so far has only considered two dimensions: one dimension of space (a single value for momentum) and the time dimension. Remember, Dirac was trying to create a relativistic theory. So to be fully consistent with relativity, we have to consider the additional two space directions.

In the analysis so far, we had to find two matrices a and b such that either matrix squared equalled one, and also satisfied the requirement that $(a \times b + b \times a)$ must equal zero. Now we are moving to consider the two additional dimensions, we need to find a total of **four** matrices — a , b , c , and d — which satisfy the following requirements:

- a^2 must be equal to one, but b^2 (along with c^2 and d^2) must be equal to minus one.[\[4\]](#)
- If you take **any** two of the four matrices (let's call the two selected matrices x and y), then $(x \times y + y \times x)$ must

equal zero.

(You will see that these requirements are virtually identical to the earlier situation in which we only considered two dimensions and two matrices).

However, it is simply not possible to find four 2×2 matrices which satisfy these requirements. Dirac found he could only satisfy these requirements by using larger 4×4 matrices. These important matrices are called the *gamma matrices*:

The Gamma Matrices

$$a = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix} \quad b = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$$

$$c = \begin{bmatrix} 0 & 0 & 0 & -i \\ 0 & 0 & i & 0 \\ 0 & i & 0 & 0 \\ -i & 0 & 0 & 0 \end{bmatrix} \quad d = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

This might be a good time to take your pen and paper out and check that these gamma matrices are correct and satisfy Dirac's requirements. Remember, a^2 (matrix a multiplied by itself) must be equal to one (the identity matrix). However, b^2 (along with c^2 and d^2) must be equal to minus one (the negative of the identity matrix).

Also, check that if you select **any** two of these gamma matrices (let's call the two selected matrices x and y), then $(x \times y + y \times x)$ must equal zero.

(Remember that i is the square root of -1 . So if during the calculation you find you get a term which is i multiplied by i then the result is -1).

So, at last, these gamma matrices satisfy Dirac's requirements. And this is so important because — as we shall see — it is these gamma matrices which form the basis of the Dirac equation, and hence they describe the remarkable behaviour of electrons.

The equation in the Abbey

Once he had found his gamma matrices, Dirac then had to apply the final step in the creation of his relativistic equation of the electron: he had to "quantize" the equation, to make the equation agree with quantum mechanics. Fortunately, we already know how to do this as we studied it in the last chapter: it is simply to use the standard eigenvalue/eigenvector form which — as stated earlier — is used to describe all quantum mechanical measurements.

A concise form of the Dirac equation is shown in the following diagram. You should recognise the standard form of the eigenvalue/eigenvector equation as described in the previous chapter. On the left hand side of the equation is an operator and a eigenvector (the state vector, Ψ , considered in the previous chapter), and on the right hand side of

the equation is an eigenvalue multiplying the same eigenvector:

The diagram shows the Dirac equation $i\gamma\partial\psi = m\psi$. Labels with lines pointing to the equation are: "Operator" pointing to $i\gamma\partial$ (which is enclosed in a dashed box), "Eigenvector (state vector)" pointing to ψ , "Gamma matrices" pointing to γ , and "Eigenvalue" pointing to m .

You will see that the set of the all-important gamma matrices (denoted by the Greek letter "gamma", γ) is included in the operator.

Paul Dirac died in 1984, and a commemorative plaque was installed on the floor of Westminster Abbey in London. You can see that the Dirac equation (which we have just derived) is inscribed on the plaque just below Dirac's name:



So, well done, we have derived the Dirac equation, one of the most important equations in physics. According to

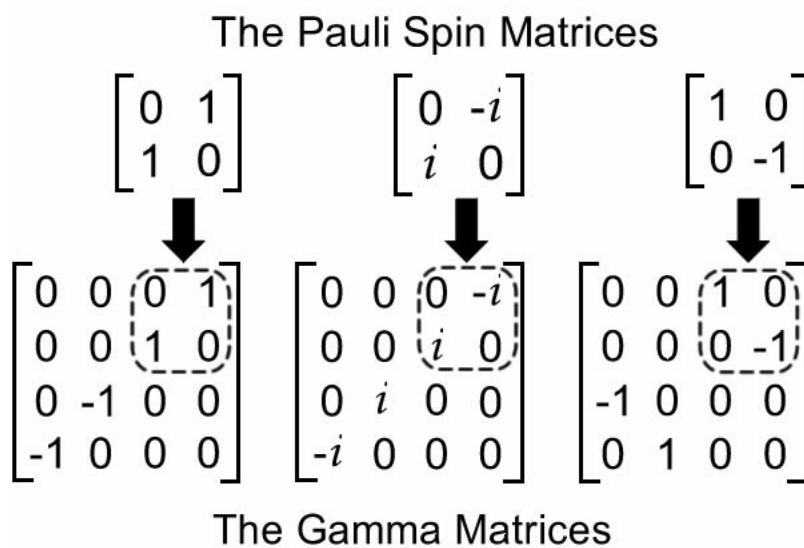
Nobel Prize winning physicist Frank Wilczek: "Of all the equations of physics, perhaps the most magical is the Dirac equation. It is the most freely invented, the least conditioned by experiment, the one with the strangest and most startling consequences. It became the fulcrum on which fundamental physics pivoted."

The only question left now is ... what does it all mean?

The absolute wonder

So now we have derived the Dirac equation, the relativistic equation for the electron, we have to determine what are the implications of the equation for the behaviour of the electron. We will find that the many implications are really quite remarkable, and explain the properties of the matter of which the world is made.

Firstly, if we examine three of the gamma matrices, we find that the 2x2 matrices in the top right segment of the gamma matrices precisely match the Pauli spin matrices (describing the spin of the electron) which we considered in the previous chapter:



It appears that the gamma matrices seem to be describing the spin of the electron. Indeed, according to Dirac: "The gamma matrices are new dynamical variables which it is necessary to introduce in order to satisfy the conditions of the problem. They may be regarded as describing some internal motions of the electron, which for most purposes may be taken as the spin of the electron postulated in previous theories."

So this is really something quite remarkable. Dirac derived the need for electron spin **purely mathematically!** It is as if mathematics alone is predicting that the electron must be spinning (this derivation is in contrast to how we derived the Pauli spin matrices merely by **observing** electron spin and trying to model it mathematically).

This was truly an amazing achievement by Dirac. The physicist John Van Vleck compared Dirac's explanation of electron spin to "a magician's extraction of rabbits from a silk hat." According to Leon Rosenfeld, "the equation was immediately seen as **the** solution. It was regarded really as an absolute wonder."

This was perhaps the first time that mathematics on its own was used to predict the behaviour of Nature. It revealed the extraordinary power of mathematics as a tool for theoretical physics.

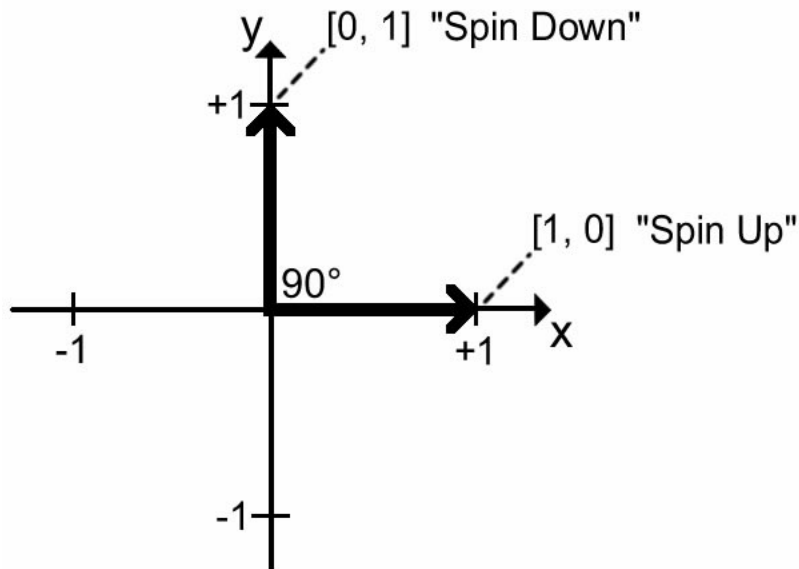
The spinning spinor

So we have now seen that the Dirac equation can be used to give us the Pauli spin matrices which describe the spin of an electron. And we have also seen that the Pauli spin matrices show that we will only measure an electron as being in one of two possible states: either "spin up" or "spin down".

Now let us consider what happens when an electron is rotated. We will find that the answer is quite astonishing.

In order to explain this behaviour, remember that in the previous chapter it was explained how the "spin up" and

"spin down" states of the electron can be expressed as vectors. The "spin up" state can be described by the vector $[1, 0]$ and the "spin down" state can be described by the vector $[0, 1]$. Let us draw those two vectors on a graph:



In the previous graph, you can see that the "spin up" state is denoted by a thick horizontal arrow from the graph centre to the coordinate $[1, 0]$ ($x=1, y=0$), thus forming the "spin up" vector. You can also see that the "spin down" state is denoted by a thick vertical arrow from the graph centre to the coordinate $[0, 1]$ ($x=0, y=1$), thus forming the "spin down" vector.

Note that the two vectors are at 90° to each other (for this reason, the two states are said to be *orthogonal*).

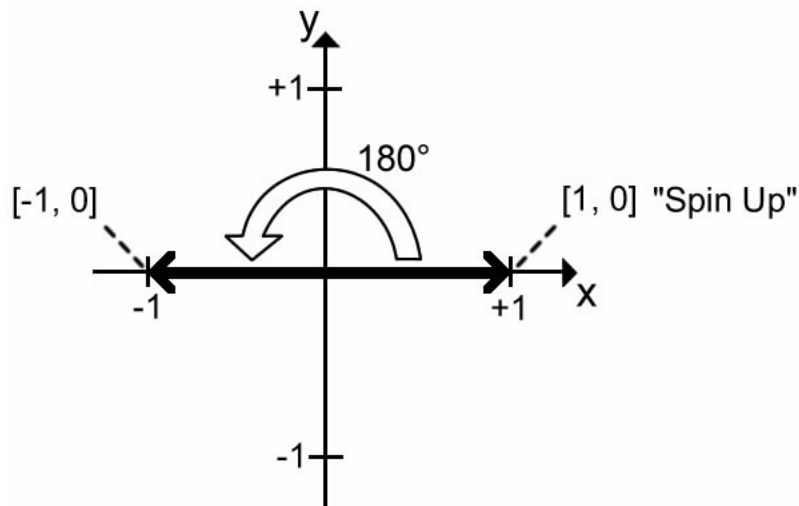
But here is the crucial point: in order to convert a "spin up" electron into a "spin down" electron we have to physically rotate the electron in real space by 180° (turning something pointing up into something pointing down). Amazingly, this suggests that if we physically rotate an electron by 180° , its quantum state (described mathematically by vectors) only gets rotated by 90° .

This reveals that the quantum state of an electron gets rotated by only half the amount that the electron is physically rotated. It is as if the physical electron is connected to its quantum state by a 2:1 gearing system. Bizarrely, this reveals that to return the quantum state to its original position (requiring a full spin of the quantum state by 360°), we have to physically rotate the electron by two full spins: 720° .

This is an amazing and crucial result: **an electron must be physically rotated twice, 720° , in order to rotate the quantum state by 360° , thus bringing the electron back to its original quantum state.**

This is really quite an extraordinary claim. Nothing in our everyday experience behaves like this: you don't have to rotate any ordinary object twice in order to bring it back to its original position — just one full turn is always enough! However, in the strange world of fundamental particles, we have to forget about our everyday experience and have an open mind about new modes of behaviour.

Now let us see what happens when we physically rotate our electron by 360° . Intuitively, we would expect a "spin up" electron to return to its initial "spin up" state when it is rotated by one full turn in physical space. However, we have just shown that a quantum state is rotated by only half the amount of the rotation of the physical electron. This means that the quantum state of the "spin up" electron is only rotated by 180° :



In the previous diagram, you will see that the $[1, 0]$ "spin up" electron vector (pointing to the right) has been rotated around the centre of the graph by 180° so it ends up pointing to the left. This represents the rotation of the physical electron by one full turn: 360° . But we can see that the coordinates of the resultant vector (pointing to the left) are $[-1, 0]$. We can see that these are not the coordinates of the "spin up" electron. In fact, they are the coordinates of the "spin up" electron **multiplied by -1** (because $[1, 0]$ multiplied by -1 gives $[-1, 0]$). Most obviously, the vector is multiplied by -1 because it is the same length as the initial vector but **points in precisely the opposite direction**. It is the negative of the initial vector.

So, remarkably, this reveals that when we rotate an electron by a full 360° we do not end up with the same quantum state we started with. Instead we get the original quantum state multiplied by -1 . **We will see in the next section that this is a hugely important result.**

This is an example of a mathematical object called a *spinor* (pronounced "spin-or" not "spine-or"). A spinor is an object which you have to rotate twice in order to return it to its original state. Needless to say, there is nothing in our everyday experience which behaves like this — we are obviously used to objects returning to their original state when we turn them by one full rotation. However, if you rotate a spinor by one full revolution, 360° , it is equivalent to multiplying the spinor by -1 . If you then rotate it a further 360° you return the object to its original state (because -1 multiplied by -1 would give $+1$). So to return a spinor to its original state you have to rotate it by two full spins: 720° .

A particle (such as an electron) which you have to rotate twice to return to its original state is called a *spin- $\frac{1}{2}$* particle (you might say a full rotation only gets you halfway!).

Rather wonderfully, this is best illustrated by a practical example. It so happens that the rotation of the elbow and shoulder in the human arm is a perfect model of a spinor (there are some undoubted evolutionary advantages to this spinor design, allowing the hand to rotate fully without the arm getting tangled). I have recorded a video showing me using my arm to rotate a glass of water which represents an electron.

I can recommend you watch the video at <http://tinyurl.com/particlerotation>.

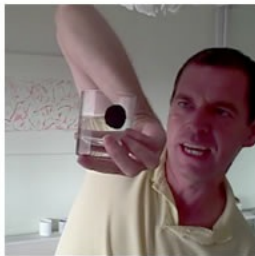
Here are some still images from the video:



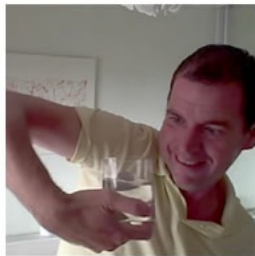
0°



180°



360°



540°



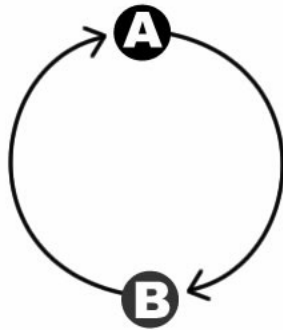
720°

Though it might sound almost unbelievable that spin- $\frac{1}{2}$ particles have to be rotated by 720° to return to their original state, it has been directly experimentally proved. A stream of neutrons, whose spin was all oriented in the same direction, was split into two beams. One stream was rotated about an axis along its direction of motion, and then the two beams were recombined. When the rotation angle was 360° , the two beams cancelled-out. Amazingly, though, when the particles were rotated twice, through 720° , the two beams combined to produce a stronger signal. This shows the peculiar rotational behaviour of spin- $\frac{1}{2}$ particles is a genuine measurable effect.

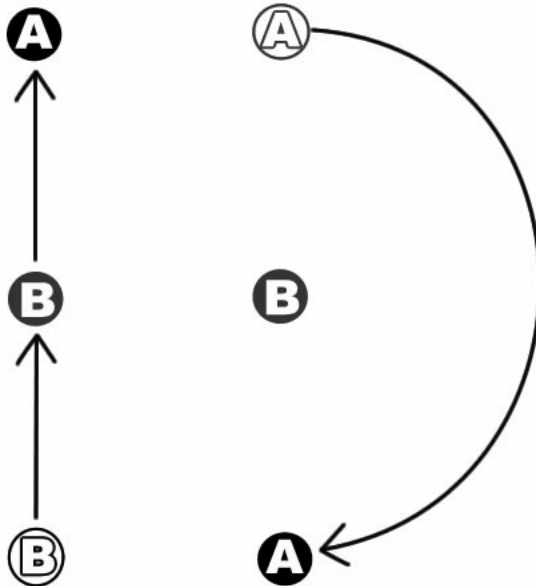
The Pauli exclusion principle

All spin- $\frac{1}{2}$ particles are called *fermions*. Fermions are the particles which form atoms, and hence form all the matter in the universe. But why should spin- $\frac{1}{2}$ particles be the matter particles? Well, we will now discover that the reason that fermions behave like matter particles is directly linked to their peculiar rotation characteristics.

The secret lies in what happens when we exchange two particles. Imagine we have two fermions of the same type: particle A and particle B (see the following diagram). These might be electrons, for example. We want to exchange (swap) the two particles. The most obvious way we could do this would be by moving particle A to the position of particle B while, at the same time, moving particle B to the position of particle A:



However, this is not the only way we could exchange the particles. It is possible to exchange the particles using a different method while still producing exactly the same result. As shown in the following diagram, we could translate both particles vertically, and then **rotate the whole system around the centre of particle B**. This would produce exactly the same end result, with particle B now above particle A:



But what happens to the quantum state (the wavefunction) of the system when the system is translated and rotated like this? Well, firstly, the translation has no interesting effect. So that means we have done something extremely clever here: we have converted the process of particle exchange into a process of simple rotation of particles: we have shown that the mathematics of particle exchange and particle rotation is essentially the same. And we know precisely how fermions behave when they are rotated as we worked it out in the previous section. We have seen that fermions behave quite peculiarly when they are rotated. So we will have to examine the impact of the rotation on the quantum state of the system.

It can be seen that particle A was rotated by 180° , and particle B was also rotated by 180° (around its centre). The total rotation as far as the quantum state of the system is concerned is the sum of the rotations of the two particles, which is therefore 360° (for more details of this approach to particle exchange and rotation, see the footnote [6]).

This is a crucial result. Because, as saw in the previous section, a 360° rotation of a spin- $\frac{1}{2}$ particle results in the quantum state being multiplied by -1 . It is said that the wavefunction in that case is *antisymmetric* (because it does not join up with itself when it is rotated: it is multiplied by -1). We can now see that particle exchange is also antisymmetric: if you exchange two fermions, the quantum state is multiplied by -1 .

(If you continue and exchange the particles back again, the quantum state is multiplied by -1 again, thus restoring

the original quantum state because -1 multiplied by -1 gives $+1$).

Now let us consider the situation when two fermions which are in the same state are exchanged. Firstly, we will have to consider what does it mean for two particles to be in the same state.

As described in Chapter One, all particles of a particular type are identical: every electron is the same as every other electron. But does this mean that all electrons are indistinguishable from each other? No, of course not. There are obviously many separate electrons in the universe, and we (and Nature) can distinguish each electron from every other electron because they are in different positions, or they might be moving at different velocities. So even though every electron is **identical**, electrons are not **indistinguishable**.

There are only a few ways in which particles can be distinguished (e.g., their position, their momentum) and these distinguishing features are called *degrees of freedom* (considered in my third book).

For electrons orbiting the same atomic nucleus, there are only a very few ways in which those electrons can be distinguished from each other (they have very few degrees of freedom). As a result, the possibility arises that two electrons might be in exactly the same state. If those two electrons are exchanged, there clearly cannot be any overall change to the quantum state of the system because the electrons are **completely indistinguishable**. Nature has fundamentally no way of distinguishing them. If the electrons are exchanged, nothing can possibly change.

However, as we have just seen, if any two fermions are exchanged then the quantum state of the system must be multiplied by -1 . These two results — one saying nothing can possibly change, one saying the quantum state must change — are clearly contradictory. In fact, the only number which does not change when it is multiplied by -1 is the number zero. It would appear that the system can only be described by a wavefunction with the value of zero. We can come to only one conclusion: this contradictory state cannot exist.

We have derived the *Pauli exclusion principle*: **two identical fermions cannot occupy the same quantum state**.

As Jim Baggott says in his book *Higgs*: "The principle derives from the mathematical form of the wavefunction for any composite state consisting of two or more electrons. If the composite state were assumed to be created with two electrons which have precisely the same physical characteristics, then the wavefunction has zero amplitude — such a state could not exist."

Atoms are mainly empty space, so why can't I push my finger through a wooden desk? Isn't there enough empty space for two atoms to pass through each other? Well, it is the Pauli exclusion principle which brings solidity to matter. I cannot push my finger through a wooden desk because any penetration of my finger would result in the electrons in the atoms in my finger being in the same state (same position) as the electrons in the atoms in the wood. The exclusion principle states that is simply not possible. Hence, the wood appears impenetrable to your finger.

So the Pauli exclusion principle results in fermions taking the role of the matter particles, the particles which compose all of the objects in the material world. Cars, trees, water, gases, human beings, are all composed of fermions: protons, neutrons, and electrons.

The root of all chemistry

So, we have now seen that no two fermions can occupy the same state. This is definitely going to have an impact on electrons in a atom orbiting the atomic nucleus.

If you remember back to the discussion in Chapter One, electrons can orbit the nucleus in only certain quantized orbits (or *shells*), the shells being nested around each other like Russian *matryoshka* dolls. The shell in which an electron resides is determined by the energy of that electron. It would appear that any two electrons in the same shell would be in the same state (possessing the same energy). Therefore, according to the Pauli exclusion principle, this would appear to prohibit each shell from containing more than one electron.

However, there are a few other ways in which the state of orbiting electrons can be distinguished. This is because the spherical shells are not necessarily completely identical. Essentially, they can wobble in an elliptical manner (think of a soap bubble wobbling as it rises in the air). These deformations of the shells provide us with a few more ways to distinguish the states of electrons which possess the same energy (i.e., the electrons have a few additional degrees of freedom).

In fact, an electron orbiting the nucleus can be defined by three quantum numbers: n (the shell number, determined by the energy of the electron), l (the shape of the shell), and m (the direction in which the shell is pointing). There are strict rules as to what values these numbers can take. For a given shell number, n , the rules are:

1. l can take any integer value from 0 to $(n-1)$.
2. m can take any integer value from $-l$ to l .

You will see that these two simple rules can be used to construct the following table (which considers the first three shells in which n is 1, 2, or 3). What we are interested in is how many unique combinations of the three numbers there can be, because that tells us how many electrons (each being in a unique state) there can possibly be in each shell. You can clearly see from the table just how many unique combinations there can be for any value of n :

n	l	m	Number of combinations for a particular value of n
1	0	0	1
2	0	0	4
2	1	-1	
2	1	1	
3	0	0	9
3	1	-1	
3	1	0	
3	1	1	
3	2	-2	
3	2	-1	
3	2	0	
3	2	1	
3	2	2	

This table suggests that there is only one unique combination of the three quantum numbers in the first shell, there are four combinations in the second shell, and nine unique combinations in the third shell. In other words, the number of combinations is given by n^2 .

This number should also represent the number of electrons it is possible for a shell to hold (because each of those electrons would be in a unique state). In other words, the lowest energy shell should be capable of holding just one electron, the second shell should be capable of holding four electrons, and the third shell should be capable of holding nine electrons.

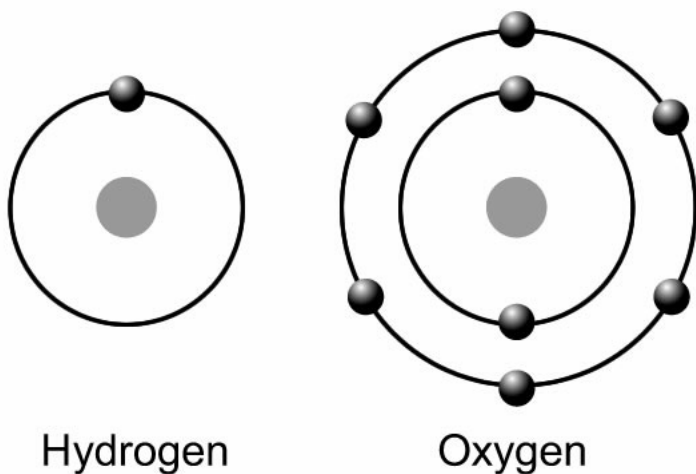
However, this is not quite right as there is one additional degree of freedom possessed by each electron, and that is the value of electron spin. Remember, each electron also has the freedom to be either "spin up" or "spin down". These two options means that the number of electrons it is possible for each shell to hold must be multiplied by two. The formula therefore becomes $2n^2$.

This doubling means we should now expect the first shell to be capable of holding two electrons, the second shell should be capable of holding eight electrons, and the third shell should be capable of holding eighteen electrons. And so on.

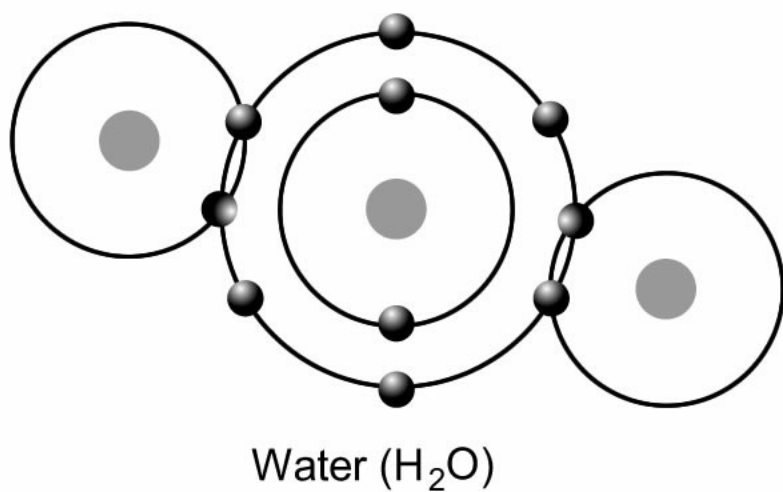
This, finally, is correct. The number of electrons each shell can hold is 2, 8, 18, 32, 50, ...

Let us see what this means in practice by considering the structure of some chemical elements.

Hydrogen is the lightest element, having an atomic number of 1. This means that an atom of hydrogen has just one proton — and one orbiting electron. However, oxygen has an atomic number of eight, which means it has eight orbiting electrons. All of these eight electrons cannot fit into the lowest energy shell because we know only a maximum of two electrons can fit into that shell. Therefore, two electrons go into the lowest shell, and the remaining six electrons have to go into the next higher shell:



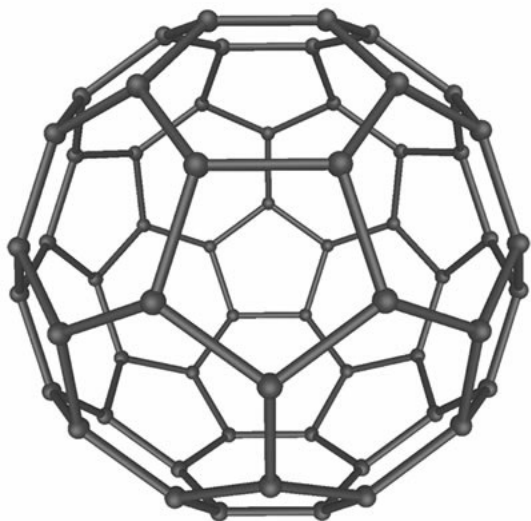
The important factor is now the number of electrons in the outer shell of these atoms. These are called the *valence* electrons. We can see that the hydrogen atom has one valence electron, while the oxygen atom has six valence electrons. This raises the possibility of two hydrogen atoms sharing their valence electrons with one valence electron of the oxygen atom:



In the diagram above we can see that each of the two hydrogen atoms is sharing its valence electron with one of the valence electrons of the oxygen atom. In this way, each hydrogen atom effectively gains one more electron in its outer shell (thus filling its outer shell, which can only contain two electrons), and the oxygen atom effectively gains two electrons in its outer shell (thus filling its outer shell, which can contain eight electrons).

This forms a molecule of water: H₂O (two atoms of hydrogen, one atom of oxygen).

This method of sharing valence electrons is called *covalent bonding* and is the structural method which forms molecular compounds such as carbon dioxide, methane, glucose, or even buckminsterfullerene:



Buckminsterfullerene's "bucky ball" structure is an example of an *allotrope* of carbon, just one example of how sixty carbon atoms can join together to form a molecule (which resembles a microscopic football). Other allotropes of carbon (different structural arrangements) are diamond and graphite, and also *graphene* — hexagons of carbon atoms which join together to form a layer which is just a single atom thick (an illustration of graphene is shown on the front cover of this book). Graphene is acclaimed as the new wonder material, 200 times stronger than steel, yet transparent and flexible.

However, some atoms have full outer shells of electrons. These are the so-called *noble gases*: helium, neon, argon, krypton, xenon, and radon. Because they have full outer shells, atoms of these gases do not combine with other atoms to form molecules. This makes them chemically inert.

We can see that the Pauli exclusion principle — and the numbering of electrons in the shells of atoms — is therefore responsible for the whole of chemistry. As Jim Baggott says in his book *The Quantum Story*: "By preventing the electrons from collapsing or condensing into the lowest-energy orbit, the exclusion principle allows complex multi-electron atoms to exist in the pattern described by the periodic table. It enables the existence of a marvellous variety of elements, the multitude of possible chemical combinations, and hence all material substance, living and non-living. This was a fantastic achievement."

We have covered a great deal of ground in this chapter, and some of the material was challenging, but I hope you can now see that it was worth it. We have derived the Dirac equation, shown how it predicts the spin of electrons, shown how the antisymmetric nature of that spin leads to the Pauli exclusion principle, and finally shown how the Pauli exclusion principle leads to the solidity of matter and prevents all the electrons in an atom collapsing to the lowest energy shell — thus giving atoms their structure. It is that structure which leads to the whole of chemistry. The Dirac equation undoubtedly deserves a book all to itself.

And we have not even considered the most extraordinary prediction of the Dirac equation ...

4

ANTIMATTER

The date is 30th June 1908.

Sergei Semenov had just finished his breakfast and was sitting outside his house, enjoying the cool air before the summer sun rose in the sky to bring the extreme summer heat. Occasionally, hunters and fishermen would pass by, but usually his only neighbours in this remote region of Siberia were the bears and deer who roamed the endless pine forest.

As Sergei peered up into the cloudless sky that morning, suddenly he saw the sky split in two, divided by a towering wall of flame. The heat was so intense that Sergei felt as though his shirt was on fire. However, before he could rip his shirt off, a shockwave hit Sergei, blowing him off his feet and sending him sprawling several metres away.

Sergei's wife ran out of the house, in a state of panic. When she saw her husband virtually unconscious, she dragged him back into their house. But there was no safety to be found there. The earth shook, and rocks started falling from the sky like fiery cannon balls. Sergei and his wife cowered on the floor of their home, waiting for what was surely the end of the world.

Thirteen years passed. World War One, and the 1917 Russian Revolution, all passed without impacting on remote Siberia in any way. Then, in 1921, a mineralogist Leonid Kulik based in St. Petersburg heard the rumours of the catastrophic event, apparently centred on the Tunguska river valley, in one of the most remote regions of Siberia. Kulik believed the event was caused by a meteorite impact, and managed to persuade the Soviet Academy of Sciences to pay for a mission to recover iron from the meteorite which could be used by Soviet industry.

Kulik's team faced an arduous journey to the site of the explosion, carrying heavy equipment largely by hand as they fought through uncharted forest and swamp. When Kulik arrived at the site he was amazed to find scorched trees flattened like matchsticks over an area about the size of Greater London, but he found no impact crater (which would be expected for a meteorite of that size).

Here is one of Kulik's original photographs:



Kulik drained many of the swamps in the area, but found no evidence that any of them were impact craters. He plotted the position of every tree, but no evidence of meteorite fragments were found. Kulik continued to investigate Tunguska for a further 20 years without finding evidence of a meteorite impact. When the Nazis invaded Russia in 1941, Kulik volunteered to fight for the Red Army. He was captured by the Germans, and died a year later.

Asteroid 2794 *Kulik* was named in honour of Leonid Kulik.

Meteorite impact remains the most likely explanation for the explosion. However, Prof. Frank Close of Oxford University has another explanation. In his book *Antimatter* he considered the theory that a block of antimatter might have been the cause of the explosion. Antimatter is perhaps best known as the power source behind a *Star Trek* warp

drive, but it is most certainly a real substance possessing incredible power. Antimatter is the precise opposite of everyday matter which, for example, makes cars and trees. Everyday matter is made of fermions (*fermionic* matter), the particles we have already considered. Antimatter is made of *antifermions*.

When antimatter comes into contact with matter, they annihilate each other in a blinding flash of energy (gamma rays, high-energy light). Antimatter releases more explosive energy than anything else in existence. An antimatter bomb would be 1,000 times more efficient (in terms of fuel) than the fission bombs dropped on Hiroshima and Nagasaki. An antimatter power source would be 100 times more efficient than nuclear fusion.

Undoubtedly, antimatter is being taken seriously by the military as the ultimate weapon of mass destruction. In 2004, Kenneth Edwards, the director of the Munitions Directorate at Eglin Air Force Base in Florida, gave a keynote speech at the NASA Institute for Advanced Concepts. His speech stressed that even small granules of antimatter — almost invisible — could possess devastating destructive potential. Just 50 millionths of a gram of antimatter would generate a blast equal to the explosion at the Federal Building in Oklahoma City in 1995, which killed 168 people.

The theory that a lump of "antirock", one metre across, was the cause of the Tunguska blast is based on the fact that no solid evidence of a meteorite or its crater has ever been found. Whatever caused the Tunguska blast disappeared into thin air — just like an antimatter/matter annihilation. The antirock theory might just be one of many highly speculative suggestions about the source of the Tunguska explosion, suggestions which include the idea that a missing 1972 atomic bomb might have dropped through a wormhole and travelled backward in time to 1908. However, at the very least, the antimatter theory draws our attention to the undoubted vast power and potential of the mysterious substance known as antimatter.

Angels and demons

Antimatter also plays a central role in Dan Brown's bestselling book (and movie starring Tom Hanks) *Angels and Demons*. Though the plot of *Angels and Demons* is fairly preposterous, the science related to antimatter is accurate. Indeed, CERN (the largest particle physics laboratory in the world) has even created its own *Angels and Demons* website:

<http://angelsanddemons.web.cern.ch>

You will notice the Dirac equation is featured at the top of the following page on the CERN webpage. This is a clue as to the nature of antimatter:

<http://angelsanddemons.web.cern.ch/antimatter>

Warning: spoilers ahead. The plot of *Angels and Demons* considers a rogue scientist who secretly uses the LHC (Large Hadron Collider, based in CERN) to create a quarter of a gram of antimatter. The antimatter was suspended in a vacuum by a magnetic field to stop it annihilating and exploding by touching the sides of the canister (this is all good science: CERN has trapped antimatter for 57 days using a similar method — a world record).

In the book, the antimatter is used to form a bomb which threatens the Vatican City. The quarter gram of antimatter is equated to an explosive power of five kilotons of TNT (about a quarter of the power of the Hiroshima nuclear explosion).

The main character in the book, Robert Langdon (played in the movie by Tom Hanks), then has to pursue many clues in a frantic chase to discover the antimatter before it destroys the Vatican. In this respect, the task of Robert Langdon is similar to the task of a physicist: solve a series of puzzles and follow a series of clues to get to the bottom of things.

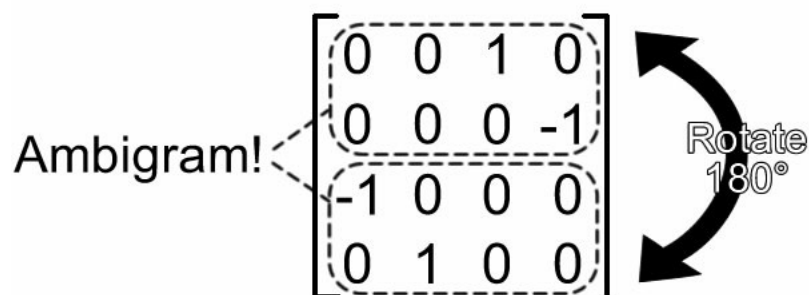
As an example, some of the clues which Langdon has to unravel take the form of *ambigrams*, which are symmetric words which read the same when they are turned upside down. An example of an ambigram version of the word "Antimatter" is: [7]

Antimatter

Yes, turn the book upside down and you will see that the word is still the same upside down. How remarkable. So when we do physics we have to think like Robert Langdon. We have to look for clues, and solve mysteries.

As an example, let us consider one of Paul Dirac's gamma matrices. We might stare at it for a while, and wonder about its significance. We might even turn our book upside down in desperation. In which case we would notice something highly significant ...

... the gamma matrix is an ambigram!



Just like one of Robert Langdon's symmetric words, if you rotate this book 180°, turning this gamma matrix upside down, then you find the gamma matrix looks the same. All the ones and zeroes appear in the same position. We have discovered a vital clue. This property of the gamma matrices surely has some deep underlying significance.

We know that one half of a gamma matrix gives us one Pauli spin matrix, and we know that that Pauli spin matrix describes an electron which is either "spin up" or "spin down". But what does the other half of the gamma matrix represent?

When the Dirac equation was derived in 1928, it was quickly realised that the "other half" of the gamma matrices had to represent negative energy states of the electron. If we consider the energy-momentum equation again (which Dirac used to derive his equation) we see it is a formula for the square of the energy, E^2 . That meant that the actual value of E could be a positive value **or a negative value**, because the square of a negative value also gives a positive result. However, no negative energy had ever been observed. A stationary object has zero energy of motion, and once it starts moving its energy only increases. To talk of negative energy seemed absurd.

Many physicists criticised the Dirac equation on the basis of its prediction of negative energy states. In response, Dirac felt obliged to defend his theory, and presented a possible solution which made use of the Pauli exclusion principle. Dirac suggested that all of the negative energy states had already been filled by a vast "sea" of electrons. This is not unreasonable, as electrons would naturally seek the lowest energy state, and a negative energy state is, of course, lower than any positive energy state. The Pauli exclusion principle then states that no two electrons can be in precisely the same state, so with all the negative states occupied there would be no more room for other electrons to enter negative states. The remaining electrons would effectively be forbidden from having negative energy.

Dirac went even further. He suggested that any unoccupied "hole" in the Dirac sea of negative energy states would effectively represent a positive charge (because it would require a negatively-charged electron to fill the hole). Hence, Dirac suggested that these "holes" might be positively-charged protons. It was only when it was realised that a proton is approximately 2,000 times heavier than an electron that Dirac shelved that idea.

By 1931, most physicists had lost interest in the "Dirac sea" proposal, and even Dirac appeared to have lost confidence in his "hole" theory as well. Instead, Dirac now predicted something much more solid: "A hole, if there was one, would be a new kind of particle, unknown to experimental physics, having the same mass and opposite charge to an electron. We may call such a particle an anti-electron."

Paul Dirac had just predicted the existence of antimatter.

The discovery of antimatter

Before the days of particle accelerators, experimental particle physicists used a *cloud chamber* for discovering new particles. A cloud chamber is a sealed glass container containing water vapour. Any charged particle which passes through the cloud chamber leaves a thin trail of condensed water droplets in its wake, like vapour trails behind a jet aircraft. By measuring the curvature of the trail under the influence of a magnet, it is possible to tell if the particle is positively or negatively charged (the particles curve in different directions). The paths of lighter particles are curved by a greater amount.

The Earth is constantly bombarded by *cosmic rays*, which are high-energy particles from outer space. These are actually an excellent source of particles for experimental purposes, with some of these particles possessing far greater energies than can be produced by our largest particle accelerators. Cosmic rays can be detected by cloud chambers, leaving wispy ghost-like trails as they pass through.

In 1932, a research student at Caltech called Carl Anderson was using a cloud chamber when he noted something unusual. Electrons are light particles, and leave thin wispy trails through a cloud chamber. Anderson saw several particles leaving these wispy trails, but they curved in opposite directions. This appeared to indicate that some of the electrons had positive charge. This is precisely what would be expected of the mirror-image antimatter version of the electron: the *positron*.

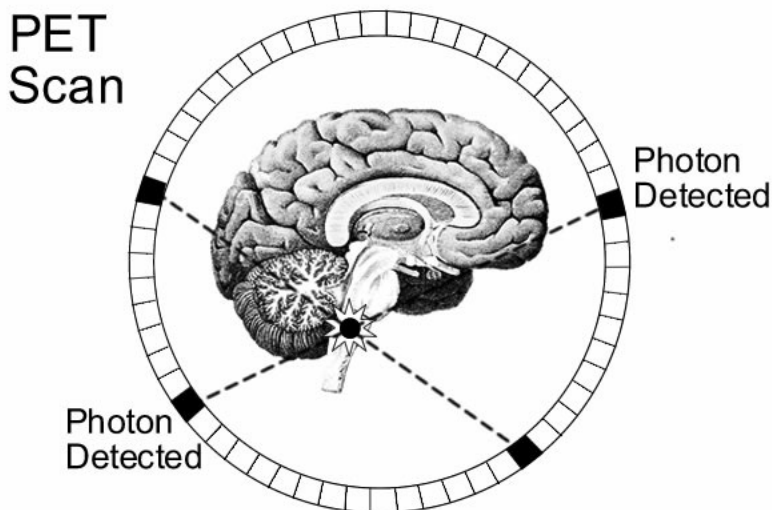
Antimatter had been detected. Dirac's theory had been confirmed. Carl Anderson received the Nobel Prize in 1936 for his discovery.

Dirac's equation applies to all fermions, not just electrons. So a proton also has an antiparticle, called the *antiproton*. And the antiparticle of the neutron is the *antineutron*. In fact, we now know that every particle has an antiparticle.

Antimatter can be produced naturally by radioactive sources. Even a banana — which contains potassium-40 — produces one positron about once every 75 minutes. Antimatter can also be produced in particle accelerators, though the amounts are extremely small: the total produced by CERN is only about 15 nanograms. If all the antimatter produced by humans was annihilated at the same time, the energy produced would not be enough to make a cup of tea.

Because it is produced in such small quantities, antimatter is the most expensive substance in existence. Gold is worth 56 dollars per gram. Platinum is worth 60 dollars per gram. Rhino horn is worth 110 dollars per gram. Heroin is worth 130 dollars per gram. All of these substances are expensive, but antimatter is slightly more costly, at 6.25 trillion dollars per gram.

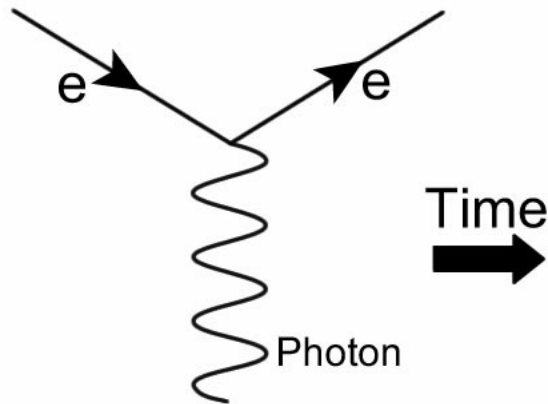
Antimatter has found a use in medical science. In Positron Emission Tomography (PET) scanning, the patient is injected with a radioactive positron source. When the positrons are emitted, they are immediately annihilated by the surrounding matter (in the tissue). This annihilation produces gamma rays (high-energy light). The gamma rays are actually composed of two photons, travelling in precisely opposite directions (due to conservation of momentum). If the patient is placed inside a circular detector, a line can be drawn between the two detected photons. This allows very accurate three-dimensional models of the tissues of the body to be constructed on a computer.



Backward in time

Richard Feynman is regarded as one of the greatest physicists of the 20th century. He is also regarded as one of the most flamboyant, with a love of playing the bongo drums, and a gift for explaining complex ideas in an imaginative and entertaining manner. Feynman worked on the Manhattan Project, developing the atomic bomb, but it was for his work on developing a quantum explanation of the electromagnetic force that he obtained his Nobel Prize in 1965 (we will be considering this in detail in Chapter Six).

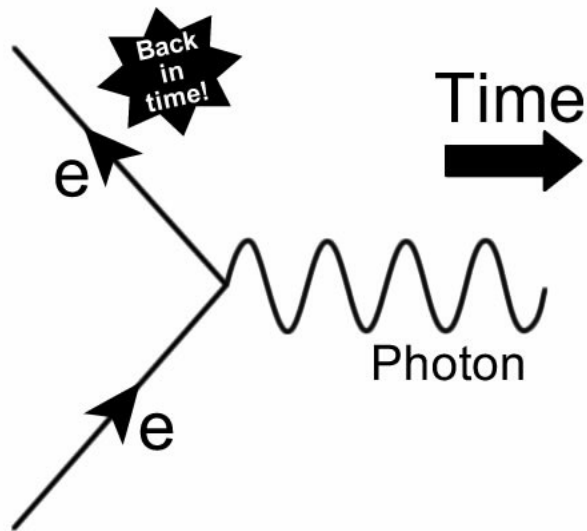
As part of Feynman's solution, he developed a series of simple diagrams to represent interactions between particles. These are called *Feynman diagrams*. As an example, all electromagnetic phenomena can be reduced to the simple interaction shown in the following Feynman diagram:



The diagram represents a single *vertex* from a Feynman diagram. In the diagram, you will see that there is a time axis flowing from left to right. The vertical axis represents space. So this particular Feynman diagram represents an electron coming in from the left side of the diagram, and emitting a photon (denoted by the wavy line), with the result that the path of the electron is altered. This is due to conservation of momentum: imagine you are ice skating, and you throw a heavy object to one side, your path would be modified to the opposite direction.

Back to the diagram, the theory of relativity tells us that we can treat time as just another dimension — just like the three dimensions of space. So, rather wonderfully, this gives us the freedom to rotate a Feynman diagram to any orientation (effectively exchanging time and space) and the interactions which result will still be valid.

As an example, the following diagram shows the previous Feynman diagram rotated 90° anticlockwise:



This diagram now reveals something remarkable. Let us analyze it.

We still see the bottom electron entering the diagram from the left, and it is moving in the forward time direction. But the top electron now appears to be moving in the reverse time direction! Surely that cannot be correct, can it?

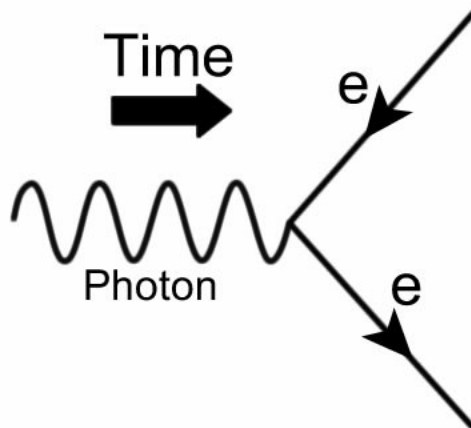
Well, let us imagine the top electron is actually an anti-electron: a positron. In that case, we can re-interpret the diagram as showing an electron and a positron coming in from the left, and annihilating each other releasing energy (the photon). So the diagram makes sense if we interpret the top electron as a positron.

But the top electron is clearly moving in the backward time direction. Remarkably, what this reveals is that we can interpret a positron (an anti-electron) as an electron moving in the backward time direction!

It is quite an amazing result, but it is now generally accepted: a positron is an electron which is moving backward in time. (This ties in nicely with the theme of my third book, which explored the idea of negative energy as motion in the backward time direction).

The origin of quantum field theory

Let us see what other remarkable things we can discover from this Feynman diagram. Let us continue to rotate our Feynman diagram, this time by a further 180°:



Again, this is quite remarkable. We now see a photon coming in from the left, and the photon producing a pair of particles: an electron and a positron (the top electron which is travelling backward in time). The photon is not a fermion, it is not a matter particle, so we can interpret this diagram as the production of a pair of matter particles from — essentially — pure energy. It is clear from this that the number of matter particles in the universe is not fixed.

What is even more remarkable is that — according to the uncertainty principle of quantum mechanics — it is possible for a small amount of energy to appear essentially "out of nothing" (as long as it is only present for a short time). You might think of this as a short-term bank loan: you can borrow money from nothing, as long as you pay it back after a short time. This means that energy (and, therefore, matter particles) can appear essentially "out of nothing".

This, then, changes the way we have to look at particles — and empty space. Instead of considering particles as simply wandering around in empty space, we now see that particles are being constantly produced and annihilated in space. Space is clearly not empty, but is a seething mass of particles appearing and disappearing. Instead of "empty" space, we now consider space as being the *vacuum*. The vacuum is far from empty.

In fact, if the number of particles is not fixed, and particles can easily appear and disappear, then this underlying vacuum or field of space should be considered as being "more fundamental" than the particles themselves. It is the properties of the vacuum that should be considered, as it is the constant presence of the vacuum which truly controls the particles. Essentially, this represents a move away from a particle-based theory toward a field-based theory.

As Roger Penrose says in his book *The Road to Reality*: "The key property of an antiparticle is that the particle and antiparticle can come together and annihilate one another, their combined mass being converted into energy, in accordance with Einstein's $E=mc^2$. Conversely, if sufficient energy is introduced into a system then there arises the strong possibility that this energy might serve to create some particle together with its antiparticle. Thus, our relativistic theory certainly cannot just be a theory of single particles, nor of any fixed number of particles whatever. Indeed, according to a common viewpoint, the primary entities in such a theory are taken to be the quantum fields, the particles themselves arising merely as 'field excitations'."

This reveals a move away from a quantum theory of particles to *quantum field theory*. Later in this book we will examine how quantum field theory provides us with an explanation of the fundamental forces between particles.



This brings us to the end of the first part of this book. We have considered the structure of the atom, specifically "the forces which hold the atom apart". We have seen how energy quantization prevents electrons from spiralling into the nucleus. We have also seen how the Pauli exclusion principle prevents all the electrons from occupying the ground state — the lowest energy level — thus giving the electron shells of atoms their characteristic form.

We will now move onto the second part of the book, "the forces which pull the atom together". And we will start by considering two of the most important principles in physics.

5

SYMMETRY AND CONSERVATION

In this chapter we will be considering some of the most valuable tools in the particle physicist's toolkit: the laws of conservation, such as the law of conservation of energy. We will also be uncovering a remarkable and surprising link between conservation and symmetry, a link which has proven to be remarkably fruitful in the attempt to make sense of the behaviour of elementary particles.

As Paul Davies says in his introduction to Richard Feynman's book *The Character of Physical Law*: "A great unifying theme among particle physicists has been the role of symmetry and conservation law in bringing order to the subatomic zoo."

What is a law?

In human terms, we might have laws restricting where we can park our cars, or maybe laws prohibiting us from stealing from supermarkets. These laws have been developed for the good of all society, and most people abide by those laws, maybe because of a sense of moral duty, or maybe because of a fear of punishment for any transgression. However, if we so wished, we could choose to break any of these laws.

In this respect, the laws of Nature are different from human laws. Try breaking the law of conservation of energy! You will have great difficulty (hint: it's not possible).

And the laws of Nature do not just constrain the behaviour of humans — they constrain the behaviour of everything in existence. The behaviour of all atoms, all particles, must abide by these fundamentally unbreakable laws of Nature. As Vincent Icke describes in his book *The Force of Symmetry*: "The essential uncertainty of quantum behaviour might create the uneasy suspicion that anything goes in this world. But since the universe has a very definite structure, it seems very unlikely that everything is allowed. As it happens, there are many things that are forbidden, and it is the forbidding rules that give structure to the world."

You may well be aware of conservation laws such as the law of conservation of energy, or the law of conservation of momentum. A conservation law says that some measurable property of a system is maintained at a constant value over a period of time. For example, consider two objects colliding with each other. If you calculate the total momentum of both objects before the collision, you will find the total value is the same after the collision. This is an example of the law of conservation of momentum.

The law of conservation of energy is very similar. If you calculate the total energy before the collision, you will find that total value is unchanged after the collision. Another way of stating this principle is to say that energy cannot be either created or destroyed.

However, you might very well discover that the total kinetic energy of the objects (the energy associated with the movement of the objects) is not maintained after a collision. This is because energy can take different forms. There is energy associated with heat, and with sound, and with radiation. If the objects produce a tremendous crash when they collide, then some of the kinetic energy has been converted into sound, and probably into heat as well. The total kinetic energy might well be reduced, but if you could calculate the total of all forms of energy after the collision then you would, indeed, find that the total amount of energy had been conserved.

Brian Cox explained this conservation principle in his BBC TV Series *Wonders of Life*: "Over the years, the nature of energy has proved notoriously difficult to pin down, not least because it has the seemingly magical property that it never runs out — it only ever changes from one form to another. The key thing is, energy is conserved: it is not created or destroyed. The fact that energy is neither created nor destroyed has a profound implication. It means energy is eternal. The energy that's here now has always been here, and the story of the evolution of the universe is just the story of the transformation of energy from one form to another. Every single joule of energy in the universe today was present at the Big Bang 13.7 billion years ago."

Several conservation laws have been discovered, most notably the law of conservation of energy, conservation of momentum, conservation of angular momentum, and conservation of electric charge. The first three of these conservation laws demand that a particular quantity (for example, the amount of energy) in a system remains constant over time. However, the fourth of these laws — the conservation of electric charge — is an example of a different type of conservation law in that it simply involves the "counting" of objects. Some elementary particles — for example, electrons — have negative electric charge. Some different elementary particles — for example,

positrons — have positive electric charge. The charge conservation law requires a bit of counting: add up the number of particles with positive charge, subtract the number with negative charge, and you will find the total number does not change with time.

(The "counting" conservation laws are perhaps the most intuitive of the conservation laws. Place a number of balls in a bag. Come back three days later and you will still find the same number of balls in the bag. We take these things for granted, but that is a conservation law in action! Richard Feynman simply referred to a law of "conservation of objects", though we might consider it being fundamentally due to a law of conservation of mass and energy.)

Why are the conservation laws so extremely valuable to particle physicists? Well, if you know that some total property of a system of particles is going to be conserved, you can use this information to infer which type of particles can possibly be produced, for example, during a collision. If you find your sums do not add up — for example, if you have a surplus of energy left over after the collision — you might infer that an additional particle had been produced to account for the surplus energy.

But bear in mind that any additional particle would have to satisfy **all** the conservation laws. In other words, it would have to comply with the law of conservation of energy, and conservation of momentum, and of spin, and of charge. So all these conservation laws impose considerable constraints on particle production.

Let us examine this more closely by considering an example of particle decay. Particle decay occurs when a particle spontaneously (and randomly) transforms into other particles. As an example, the process of beta radioactive decay involves the decay of a neutron — in the nucleus of an atom — into a proton. An electron is also emitted in the process, and it is this electron which constitutes the beta radiation emitted by the nucleus.

However, when physicists applied the law of conservation of energy to this decay process, they found something was missing. The energy of the resultant proton and electron did not add up to the energy of the initial neutron. So where did the excess energy go?

In 1930, Wolfgang Pauli proposed that the excess energy went into creating an additional emitted particle. This would ensure that the energy of the particle going into the interaction matched the energy of the particles coming out of the interaction. This gives you an idea of how the conservation laws are a vital tool which can be used to predict the existence of new particles.

But what else did the conservation laws say about this new particle? Well, let us consider the law of conservation of electric charge. The neutron going into the interaction did not have any electric charge (hence its name). Coming out of the interaction, the proton had a positive charge, but this was balanced by the electron coming out of the interaction which had a negative electric charge. So the law of conservation of electric charge was already correctly balanced: no charge going in, no net charge coming out. This meant that the hypothetical new particle could have no electric charge or that would cause an imbalance. For this reason, in 1934 Enrico Fermi gave the new particle the name *neutrino* (a "small neutral thing" — in Italian).

The neutrino was eventually discovered in 1956, but its existence and properties had been predicted twenty years earlier thanks to the conservation laws.

Particle accelerators

In a particle accelerator, electrically-charged particles are accelerated by electric forces (the modern descendent of Ernest Rutherford's cathode ray tube). A magnetic field is then used to curve the path of those particles, and this can result in particles travelling around a large loop, accelerating to a speed close to the speed of light. The particles are then made to collide with a variety of targets. By examining the results, we can learn about the structure of matter.

The Large Hadron Collider (LHC) is the largest particle accelerator ever made. In fact, it is the largest machine ever made. The LHC is a 27-km circumference loop which straddles the French-Swiss border. It is buried 175 metres deep (not for any scientific reason — only because it was simply cheaper than buying land in Geneva).

The purpose of the LHC is to accelerate beams of protons to nearly the speed of light, and then to collide two beams and examine the results.

Nothing can move faster than the speed of light, so the speed of light forms the upper speed limit for accelerated particles. However, the energy of a particle increases sharply as it approaches (but does not exceed) the speed of light. An accelerated proton in the LHC can move at 99.9999991% of the speed of light, at which point its energy is 7 TeV ("eV" represents "electronvolt" — a small unit of energy which is the standard measure of energy in particle accelerators, with 1 TeV being equal to a trillion electronvolts). An energy of 1 TeV represents the energy of a single flying mosquito. So at the LHC, the energy of 7 flying mosquitos is packed into a single proton (about a million million times smaller than a mosquito). This represents the current world record for particle accelerator

energy.

The two beams of protons travel around the LHC in opposite directions before colliding head-on, giving a total collision energy of 14 TeV (7 TeV per beam).

The 27-kilometre circumference of the LHC might sound a long way, but a proton accelerated to nearly the speed of light will make over 11,000 circuits of the loop each second. At this speed, the entire beam of protons has the same energy as a French TGV train travelling at top speed. In fact, the protons are travelling so fast that in their 10-hour lifetime in the accelerator they travel 10 billion kilometres: equivalent to the distance to Neptune — and back. In ten hours!

So what is the purpose of these extraordinary particle accelerators? Why must the collision energies be so large?

There is, perhaps, a general misconception as to the purpose of these machines. It is not helped by the use of the term "atom smasher" to describe them. The impression is often that these machines need high collision energies to "break" particles into "smaller and smaller pieces". However, as was described in Chapter One, elementary particles are believed to be infinitely small points, with no internal structure — no constituent parts. It is simply not possible to break them down into smaller units.

No, the reasoning behind the construction of these giant accelerators is based on the principle of the conservation laws we have been considering in this chapter. In order to see why this is the case, we need to introduce the concept of particle *mass*.

Mass is a **property** of particles. In the same way that a particle might have a certain amount of electric charge, a particle might have a certain amount of mass. A particle's mass determines its resistance to being accelerated, and it also determines its gravitational attraction.

A particle which has mass is called a *massive* particle. We use this term "massive" in everyday language, but we are often rather careless in using the word to describe the size of objects, for example: "The cruise liner is massive". However, physicists use the term "massive" in the very strict sense of describing an object "which possesses mass" (there is also the related word "massless" for describing particles which do not possess mass).

As an example, a neutron star can be about the size of a city, but it is much more massive (i.e., it possesses far more mass). A teaspoon of neutron star material would weigh a billion tons. So "massive" is not a measure of size. With this in mind, remember that all elementary particles should be considered as being infinitely small points with no size. So an elementary particle can be "massive", but have no size! Just think of mass as simply a number — a property — which we assign to a particle.

So a massive particle has a certain amount of mass. And, because of Einstein's famous formula for mass-energy equivalence, $E=mc^2$, we can therefore think of a particle as being composed of a certain amount of energy. With this in mind, the purpose of modern particle accelerators is not to split particles, the aim is to concentrate enough energy into a small volume of space so that a massive particle might be spontaneously created. The more massive the particle, the more energy is required to create it.

As an example, an electron is a massive particle which has a mass of 9×10^{-31} kg. This is such an awkward, extremely small value that the mass is more usually given in terms of its energy equivalent: 0.5 MeV (where "MeV" represents a million electronvolts — remember the electronvolt is a unit of energy which was introduced earlier). So in order to produce an electron from a collision, particles would have to be accelerated to tremendous speeds, thus giving them sufficient kinetic energy. The aim is that the act of compressing enough energy into a small volume of space would allow a massive particle to be spontaneously created from the collision.

So particle accelerators are not "atom smashers" at all — they are particle creators. And the effectiveness of this approach was clearly demonstrated when the Higgs boson was recently created and detected by the LHC with a mass of 126 GeV (1 GeV being equal to a billion electronvolts).

(At the time of writing — December 2015 — the latest news from the LHC is that another particle has possibly been found at 750 GeV, though we will have to wait until summer 2016 for confirmation).

In a BBC documentary entitled *Dancing in the Dark*, Professor David Charlton who works at the LHC explained how new massive particles might be created in the LHC: "When the protons collide, most of the particles which are produced tend to be low-mass particles, such as the familiar protons and neutrons. But sometimes, very rarely, you produce these much more massive particles, and that is what we are looking for. So we might produce Higgs particles, or maybe we might produce even more massive particles which are ones we don't know about — they would be beyond the Standard Model. These are the particles we are really looking for."

David Charlton goes on to explain how these new particles might be detected: "The idea is we are looking for imbalances of momentum of the event that signifies that there are unobserved particles emitted with high-energy, carried out of the detector. What we are seeing is an absence of something, an **imbalance** of something. It is some particles which we can't observe but we can infer that they are there by looking at the rest of the event."

I want to emphasise Prof. Charlton's use of the word "imbalance". We will return to this concept of balance and

imbalance later in this book as I believe it is the key to obtaining new insights about the behaviour of Nature. The concept of balance is essential to understanding the universe. Basically, the universe always has to be in balance, and it resists that balance being upset.

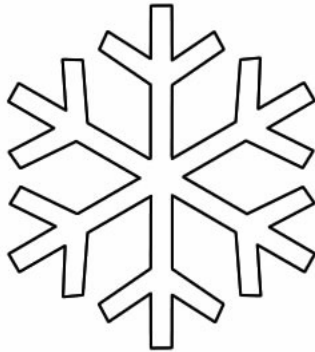
But you will recognise how the techniques described by Prof. Charlton for detecting new particles — detecting imbalances in the energy in and out of the interaction — is exactly the same technique described earlier in this chapter which was used to predict the existence of the neutrino, before it was discovered in 1956. And at the core of this approach lie the crucial laws of conservation: energy and momentum, which must be conserved throughout the interaction.

Symmetry

So now we have considered the conservation laws, and seen how they provide a valuable tool for the particle physicist. However, the conservation laws go hand-in-hand with another vitally important principle.

The other great tool has been the discovery of the importance of symmetry. It might come as a surprise to learn that conservation and symmetry appear to be bound together in a very fundamental way. The connection between symmetry and the conservation laws is one of the most profound connections in physics.

We all recognise symmetry when we see it. For example, a human face has left/right *mirror symmetry*. A snowflake has rotational symmetry:



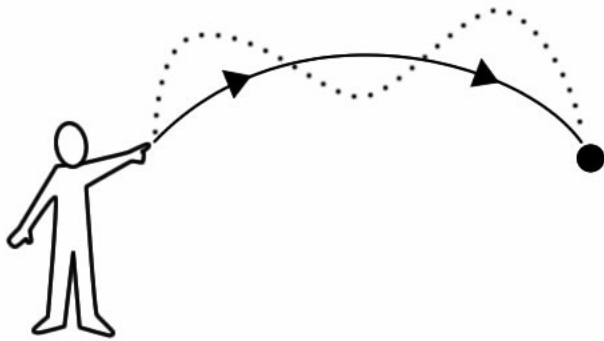
While we all recognise symmetry when we see it, we will need a more formal definition of symmetry for our purposes. And that definition is that if you apply a transformation to an object (for example, rotating the snowflake by sixty degrees) and the transformed object remains identical to the original object then that represents a symmetry. This definition makes it clear that the snowflake possesses rotational symmetry.

Symmetry plays a remarkable role in physics, at a very fundamental level. In this book, we will be exploring how symmetry provides not only the conservation laws, but also the properties of particles, and the forces between those particles. Nobel Prize-winning physicist Phil Anderson has even stated: "It is only slightly overstating the case to say that physics is the study of symmetry."

In order to explain the importance of symmetry, and the connection with conservation, let us introduce the construct known as the *Lagrangian*. The Lagrangian is a hugely important concept in physics, seemingly revealing something profound about the behaviour of Nature. If we are considering classical mechanics (i.e., the study of the motion of large objects — not including quantum mechanics) then we can define the Lagrangian as being equal to the difference between the kinetic energy and the potential energy of an object. In itself, this is not very interesting. However, it becomes interesting when we consider how the value of the Lagrangian changes when an object moves.

We can calculate the Lagrangian of a moving system throughout its motion to get a series of values. If we then sum all those values we get what is known as the *action*. If we consider the action of our moving system over a period of time, we will find that the value of that action will always be the lowest possible value. This very important principle is called the *principle of least action*.

As an example, consider the following image of the trajectory of a ball:



We can calculate the Lagrangian of the motion of the ball (remember: the Lagrangian is the difference between the kinetic energy and the potential energy) at each point, and then we can sum all of those points to calculate the action. The principle of least action tells us that the action will be the smallest possible value for the path taken by the ball. In this case, the smooth path taken by the ball results in the smallest action.

We already know Newton's laws of motion which tell us how an object moves, so why do we need this Lagrangian approach? Well, firstly it can be shown that we can derive Newton's laws of motion from the Lagrangian, so both approaches are equivalent. But the Lagrangian approach seems to be revealing a deeper truth about Nature. Rather than just stating an arbitrary law (e.g., Newton's second law of motion states that the acceleration of an object is proportional to the applied force), the principle of least action seems to reveal a general principle, almost a "desire" by Nature to minimise a certain quantity. As Jerry Marion says in his book *Classical Dynamics of Particles and Systems*: "In the Newtonian formulation, a certain force on a body is considered to produce a definite motion; that is, a definite **effect** is always associated with a certain **cause**. According to the principle of least action, however, the motion of a body may be considered to result from the attempt of Nature to achieve a certain **purpose**, namely, to minimize the time integral of the difference between the kinetic and potential energies."

So this underlying purpose appears to provide a rationale as to why objects move the way they do. This generality — this deep truth — means the Lagrangian approach can also be applied to fields, and general relativity, and even to quantum mechanics. As Dwight Neuenschwander says in his book *Emmy Noether's Wonderful Theorem*, the generalizability of the principle of least action to the widest scope of physics, even far beyond mechanics, gives the principle "a depth and versatility not shared by the other mechanical principles."

In order to get useful results from the Lagrangian approach we need to introduce the *Euler-Lagrange equation*:

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$$

The equation may look rather daunting but I will attempt to explain it as simply as possible.

The Euler-Lagrange equation is important because it represents the condition when the action is at a minimum value (remember the principle of least action). So the Euler-Lagrange equation can be used to predict the behaviour of Nature (as an example, the Euler-Lagrange equation can be used to derive Newton's laws of motion).

So let us analyze this important equation piece-by-piece.

Firstly, on the right-hand side of the equals sign we find an expression which represents the rate at which the Lagrangian changes when one of the variables describing the motion of the system changes (for example, x might represent the coordinate of a thrown ball as it flies through the air):

The rate of change of the Lagrangian, L , with respect to some variable, x .

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$$

We can make this part of the equation a lot simpler if we only consider situations in which the Lagrangian has a symmetry. In a symmetrical situation, as was explained earlier, some value remains unchanged when we apply a transformation. So the rate of change of the Lagrangian in the case of a symmetrical situation would be zero (the Lagrangian does not change when the coordinates change). And so, for symmetrical situations, we can set the right-hand side of the Euler-Lagrange equation to zero. This leaves us with a simpler form of the equation:

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = 0$$

Now considering the left-hand side of the equals sign, the d/dt part means the differential of an expression "with respect to time". This means the "rate of change" of an expression, or — more simply — the speed at which some expression is getting larger or smaller:

The rate of change with respect to time, t

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = 0$$

Because in this new equation we have set this value equal to zero (on the right-hand side of the equation), this means that the rate of change of the expression in the brackets is zero. Or, put more simply, the expression in the brackets is not changing with time, which means the expression in the brackets is **conserved**.

So, to sum up, this analysis of the Euler-Lagrange equation has shown us that if there is a symmetry in the Lagrangian (i.e., if the value of the Lagrangian is not changed when one of its coordinates changes) **then there will be a conserved quantity**.

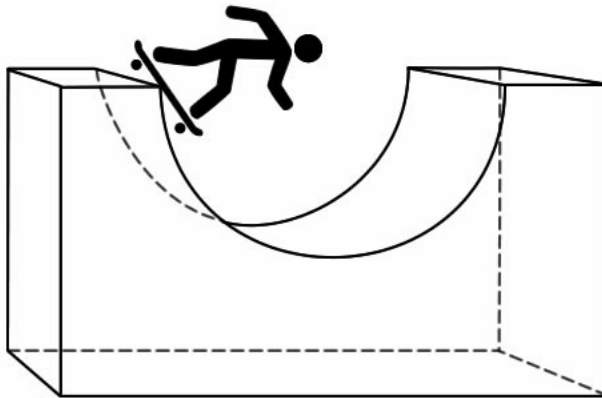
As an example, the laws of Nature do not change when we move an object in space. Basically, it does not matter where in space you perform your experiment — you will always get the same result. This is called *space translation invariance* and it was considered in my earlier books. Space translation invariance actually represents a symmetry: remember, a symmetry occurs when we apply a transformation and nothing changes.

As we have seen, the Euler-Lagrange equation indicates that if the Lagrangian does not change with respect to one of the variables of the system then we should be able to find some quantity which is conserved over time. In the

particular example of symmetry in space, the conserved quantity (in the brackets) according to the Euler-Lagrange equation is momentum. [8]

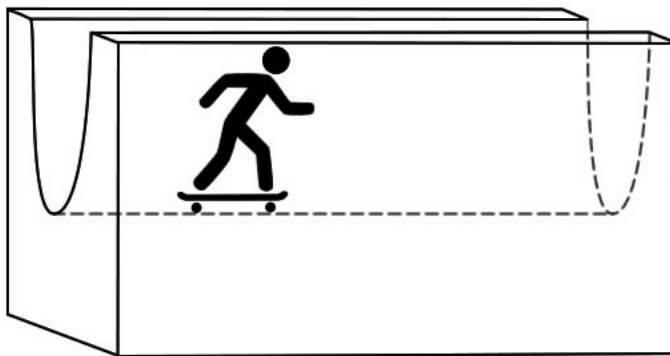
So the Euler-Lagrange equation predicts the law of conservation of momentum **because there is a symmetry in space.**

But this is a very mathematical approach. Can we achieve a more intuitive understanding of this principle? Yes, we can. In his book about the Standard Model of particle physics called *The Theory of Almost Everything*, Robert Oerter presents the example of a skateboarder in a half pipe. The following diagram shows the half pipe oriented in such a way that the skateboarder rolls up and down the pipe, travelling from left to right:



Considering the direction the skateboarder is travelling, there is no symmetry in the half pipe: the pipe drops down, then rises up the other side. Similarly, the skateboarder's momentum is not constant: he is fastest at the bottom of the half pipe, but slows to a stop at the top.

Now let us consider a different orientation of the half pipe. Let us rotate the half pipe. In the following case, the skateboarder again travels from left to right inside the half pipe, but this time the half pipe has symmetry from left to right: the height does not alter:



In this case, the momentum of the skateboarder is a constant: he travels at the same constant velocity along the base of the half pipe. In other words, the momentum of the skateboarder is conserved.

So when there is a symmetry in space, momentum is conserved.

The Euler-Lagrange equation can also be used to show that where there is a symmetry in time, energy is conserved. So in our universe — which has both space translation invariance and time translation invariance — we find we have a law of conservation of momentum, and a law of conservation of energy.

However, the full connection between symmetry and conservation was revealed in 1915 by the German mathematician Emmy Noether.

Noether's theorem

Amalie "Emmy" Noether was born in Bavaria, Germany, in 1882. Her father, Max, was a mathematician in the University of Erlangen, and Emmy decided to follow in her father's footsteps by studying mathematics at the university. However, life was not easy for a Jewish female in academia at that time. Indeed, the faculty senate at the university declared that admitting women would "overthrow all academic order". Noether had to work hard throughout her career to overcome prejudice and establish her reputation as a brilliant mathematician.



After earning her Ph.D., Noether published several impressive papers before applying for an academic appointment in the renowned mathematics department at the University of Göttingen. The great mathematician, David Hilbert, who worked at Göttingen, fought for Noether at a faculty meeting: "I do not see that the sex of the candidate is an argument against her admission as an associate professor. After all, we are a university, not a bathhouse."

Hilbert managed to skirt the rules by employing Noether as a guest lecturer. It was shortly after arriving at Göttingen that Noether published the theorem which bears her name.

Noether showed that the previous results from the Euler-Lagrange equation were merely special cases of a more general result. As we saw earlier, the Euler-Lagrange equation indicates that if the Lagrangian is symmetrical with respect to one of its spatial coordinates, then there will be a conserved quantity. Emmy Noether generalised this result by revealing that **if there is any symmetry in the Lagrangian at all, then there is always a conserved quantity**. This result is called *Noether's theorem*.

It is this result of Emmy Noether's which has proven to be of tremendous value for particle physics. If a symmetry is discovered, there will be an associated conserved quantity. The conserved quantity could be something other than momentum or energy. And Noether's theorem works the other way round as well: if a conserved quantity is discovered, there will be an associated symmetry.

So let us end this chapter with a limerick written by David Morin of Harvard University:

*As Noether most keenly observed
(And for which much acclaim is deserved),
We can easily see
That for each symmetry,
A quantity must be conserved.*

6

GAUGE THEORY

At this point, as we continue our quest for "the forces which hold the atom together", we start to consider the force which holds electrons in their orbit around the atomic nucleus. This is the electromagnetic (or, more simply, the electric) force. In the 18th century it was discovered that positive electric charge attracts negative electric charge, while charges of the same sign repel each other. So, at this point, it would be quite possible to simply state that negatively-charged electrons are held in orbit around the positively-charged nucleus due to the electromagnetic force. And then consider the matter settled, and move on to the next chapter.

However, we can do better than that. Developments in quantum field theory in the second half of the 20th century have provided us with great insights into the fundamental nature of the electromagnetic force. It has been discovered that there is a principle called *gauge theory* which emerges from symmetry and appears to lie at the heart of the behaviour of forces. In this chapter we will examine gauge theory, discovering how it generates forces, and how it predicts the existence of additional fundamental particles.

The electromagnetic force

So electrons are held in their orbit by the electromagnetic force. Electrons have negative electric charge, and are therefore attracted to the protons which have positive electric charge. But why does this attraction exist? Our task in this chapter is to try to get to the fundamentals of this force, analysing how it can reach out over space to attract two objects together.

Crucially, in our attempt to get to the bottom of the electromagnetic force, we have been given a big clue: electric charge is always conserved. This was first discovered by Benjamin Franklin in 1747. If you have a closed system (no charge is allowed to enter or leave the system), then the total amount of charge (positive charge minus negative charge) in the system will not vary with time.

So what can we infer from this conservation of charge? Well, Noether's theorem tells us that whenever we have a conserved quantity, there will always be an associated symmetry. Now we start to see the value of Noether's theorem: we have to find the symmetry inherent in electric charge.

Well, fairly obviously, there is a symmetry between positive charge and negative charge: they are just the two flip sides of the same thing. It appears we have the freedom to instantaneously change every positive charge to a negative charge — and vice versa — without changing the overall situation. This freedom to apply a sudden reversal of a property across the entire universe is called a *global symmetry*.

However, in the mid-1950s, physicists Chen-Ning Yang and Robert Mills realised there was a problem with this universe-wide transformation. They realised that the theory of special relativity prohibited any such global instantaneous transformation across space: no signal can propagate faster than the speed of light. Yang and Mills realised that the change would have to be spread across the universe at the speed of light via a **field**.

Let's imagine we have an electron and we somehow manage to invert its electric charge by making it positive (this is called a *local symmetry* transformation). Essentially, we have taken one corner of the universe and given it a tweak: we have upset the balance of the universe. Remember, the universe only continues to function normally if **every** charge is swapped at the same time. In his book *Deep Down Things*, Bruce Schumm calls this upsetting "a delicate and precise balance" (this theme of balance is becoming a recurring theme). It is as if we have turned-over just one corner of a huge rubber sheet. There will be a ripple of change spreading out across the sheet until the whole sheet turns over. It is just the same for the universe. Our tweak generates a field of change which has to spread out across the whole universe.

Hence, we have discovered that the presence of a local symmetry must result in a field. This necessary connection between symmetry and fields forms the basis of gauge theory which lies at the heart of modern particle physics.^[9] As the idea was developed by Yang and Mills, gauge theories are often called *Yang-Mills theories*.

For the case of electric charge symmetry, the gauge field is the electromagnetic field which spreads through space. It is the electromagnetic field which keeps track of charge, responding to any disturbance, and effectively maintaining the balance of the universe. We will now see how this electromagnetic field is itself formed of

fundamental particles.

Bosons

Earlier in the book, we considered the fermions, which are particles with antisymmetric wavefunctions (if you rotate a fermion by 360° , we saw that its wavefunction is multiplied by -1). The elementary fermions were therefore called spin- $\frac{1}{2}$ particles. The antisymmetric nature of the fermion wavefunction meant that fermions resisted being together in the same state.

There is another group of particles called *bosons*. In many ways, bosons are the opposite of fermions. If you rotate a boson by 360° , its wavefunction is unchanged (in line with our intuition of how physical rotation should behave). A photon is an example of a boson which has to be rotated once to return to its original state. For this reason, a photon is an example of a *spin-1* particle.

This symmetric behaviour of the bosons means that — contrary to the behaviour of fermions — they like being in the same state. The wavefunction of bosons in the same state does not cancel out (as in the case of fermions), instead it accumulates and becomes larger. This means there is more chance of finding bosons in the same state. Bosons like to congregate together, which explains why many photons like to congregate together to form a ray of light, spreading through space.

All particles can be categorised as either fermions or bosons. It is therefore the most important categorisation of particles.

As was explained in Chapter Three, it is the refusal of fermions to occupy the same state which results in them taking the role of the matter particles, the particles which compose all of the substance in the material world. Cars, trees, water, gases, human beings, are all composed of fermions. The bosons, however, have no resistance to being in the same state, which results in them being intangible and insubstantial. This fact makes it all surprising that — in the *Star Wars* universe — the Jedi Knights decided to construct their swords from light. Lightsabers would be fundamentally incapable of damaging a fermion-based opponent. The moral of this tale is that you should never construct your swords from bosons.

It was James Clerk Maxwell who showed that light was an electromagnetic wave, a disturbance of the electromagnetic field. And it was Einstein who showed that we should think of light as a stream of photons. Hence, we can think of the photon as the boson which forms the electromagnetic field. This makes a lot of sense, as we have just discussed how bosons like to congregate together in vast numbers, which makes them the ideal particle for forming an extended field stretching across space.

So what have we discovered so far in this chapter? Well, in the first section we studied gauge theory, and it was revealed how a local symmetry introduces the necessity for a gauge field which spreads through space. It was stated that, for electric charge symmetry, the resultant gauge field is the electromagnetic field. Now, in this section, it has been explained how the electromagnetic field is itself composed of particles: photons.

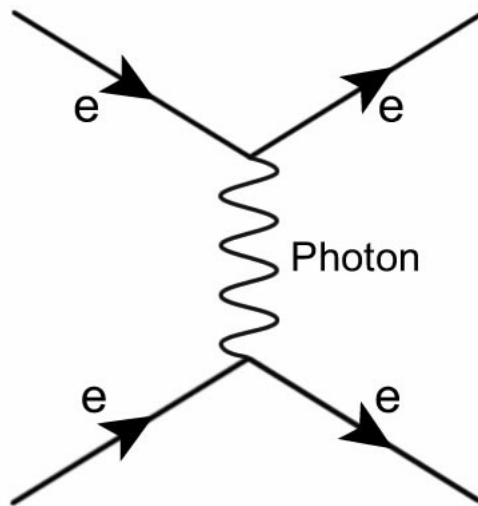
In fact, every gauge field is composed of bosons, and these are called *gauge bosons*.

The photon is perfectly suited to the task of being a gauge boson: it is massless and long-range, as suited to the task of keeping track of electric charge across the universe as it is to bringing us light from the distant stars at — well — the speed of light (fairly obviously!).

But there is another interpretation of the role of gauge bosons ...

Particles of force

We considered the Feynman diagram of an electron emitting a photon in the chapter on antimatter. We can now consider the diagram of the emitted photon deflecting the path of a second electron:



So what does this interaction appear to represent? Well, clearly we could imagine this interaction as representing the electric repulsion between two electrons, two particles with the same electric charge repelling each other. This deflection of electrically-charged particles is the result of the electromagnetic field, which extends through space to affect the paths of electrically-charged particles. This makes a lot of sense, as we have just discussed how the photon is the boson which constitutes the electromagnetic field.

But, from the Feynman diagram, we can also see that we can think of the photon as transferring force. We have two matter particles (the fermions: the electrons), and we have an intangible boson (the photon) transmitting a force across space between the two electrons. Hence, we can think of gauge bosons as the force particles, responsible for transmitting forces between two material objects made of fermions.

To sum up, at the start of this chapter we saw how gauge theory connected the symmetry of electric charge with the necessity for the electromagnetic field. In the next section we saw that the particle which constitutes a field is a boson, and for the electromagnetic field the boson is the photon. In this section, we have seen that we can think of these bosons as being the particles which transmit forces. Hence, the photon is the boson which transmits the electromagnetic force.

But, most importantly, we have discovered a connection between gauge symmetry and forces. In particular, we have seen how gauge symmetry of electric charge results in the electromagnetic force. This is a hugely important result as it is now believed that all of the four fundamental forces arise from gauge symmetry. Gauge theory lies at the heart of the Standard Model of particle physics.

Digging deeper

It is interesting to note that we have not considered the truly fundamental principle underlying the symmetry of electric charge.

As has been discussed earlier in the book, quantum mechanics predicts that every particle also has a wavelike nature: a wavefunction. And every wave — even the waves on the sea — has an associated *phase*. If two waves meet and they are "in phase" then they will interfere constructively and become larger. Conversely, if they are "out of phase" they will interfere destructively and the result will be smaller.

Quantum mechanics tells us that if we have a group of particles — and their wavefunctions — then we can increase or decrease the phase of all the wavefunctions by a constant amount without changing the overall situation. This is because all that matters is the **difference of the phases** of the wavefunctions, **not the absolute values** of the wavefunctions. The difference between phases is important because it can create interference patterns (as in the famous double-slit experiment).

So this is the true source of the symmetry which leads to the electromagnetic field. We have the freedom to increase or decrease the phase of the wavefunctions of particles without changing the overall situation. However, this transformation has to be applied globally in order not to disturb the overall balance of the universe. In order to

ensure the global balance is not disturbed, this requires the electromagnetic field. Hence, this is the true source of the gauge field.

If the **sign** of the phase (not just the amount of the phase) of a wavefunction is completely inverted (positive to negative, or vice versa, as if it is reflected in a mirror) then this has the effect of changing the sign of the charge of the particle. So, as was discussed earlier, this is how we have the freedom to completely invert the sign of the charges of a group of particles without changing the overall situation. [\[10\]](#)

And it is this "gauge symmetry" — this freedom to rotate the phase of a particle's wavefunction — which leads to the law of conservation of electric charge (remember: Emily Noether said that each symmetry implies a conserved quantity). [\[11\]](#)



We have now reached the conclusion of an important part of this book. In our discussion of "the forces which hold the atom apart" and "the forces which pull the atom together", we have now considered all the forces involved in forming the overall shape of the atom, i.e., the electron shells.

In this chapter, the fundamentals of the electromagnetic force have been described, the force responsible for holding electrons in orbit. We have seen how gauge theory emerges from the conservation of electric charge, and the associated symmetry. It is gauge theory which predicts the existence of the photon, the particle which actually transmits the electromagnetic force.

Hence we have completely examined the forces governing the outer shell of the atom. It is now time to look inside the atom, and examine the nucleus.

The strong force

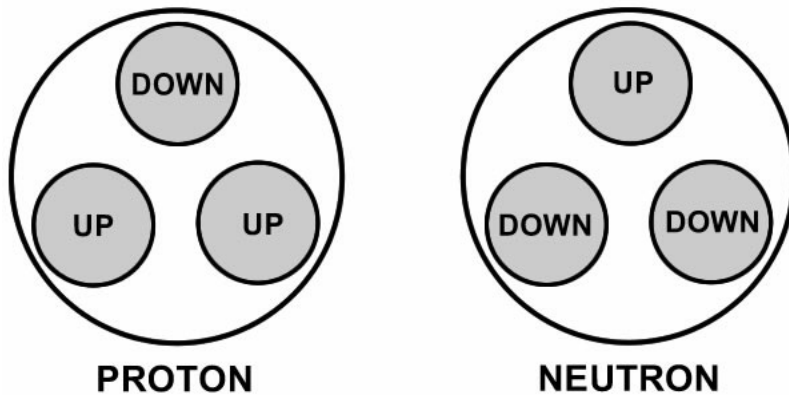
In this discussion of electromagnetic attraction and repulsion, a thought might have occurred to you: as protons have positive charge, how can they be tied together so closely in the nucleus without strongly repelling each other? It turns out that a different, stronger force is required to hold the protons together in the nucleus, and this is the *strong nuclear force*.

However, it turns out that the strong nuclear force does not represent a truly fundamental interaction. The true force is even stronger, and operates on a smaller scale, operating **inside** protons and neutrons. The strong nuclear force is then only a residual force, leaking-out of the protons and neutrons, but still strong enough to hold the protons and neutrons together to form atomic nuclei. So to understand the truly fundamental interaction, we have to go inside the protons and neutrons, to uncover the fundamental force known as the *strong force*.

In our discussion so far, we have only dealt with truly elementary particles, particles which are not composed of any smaller particles. However, it has been discovered that both protons and neutrons are each composed of three smaller particles called *quarks*. Quarks are believed to be truly fundamental particles, i.e., they are not composed of anything smaller.

Protons and neutrons are composed of two different types of quarks called *up* quarks and *down* quarks (there are four other types of quarks with hugely greater masses which can only be formed in high-energy particle accelerators, but they all rapidly decay to up and down quarks).

A proton is composed of two up quarks and one down quark. A neutron is composed of one up quark and two down quarks:



But how can this combination of quarks result in the proton having a +1 electric charge, while the neutron has neutral electric charge? For this to be the case for the proton, it appears that twice the charge of the up quark plus the charge of the down quark must equal a +1 electric charge. While for the neutron, it appears that the charge of the up quark plus twice the charge of the down quark must equal zero electric charge. So you might want to remember your high school mathematics and try solving the necessary simultaneous equations to find the answer:

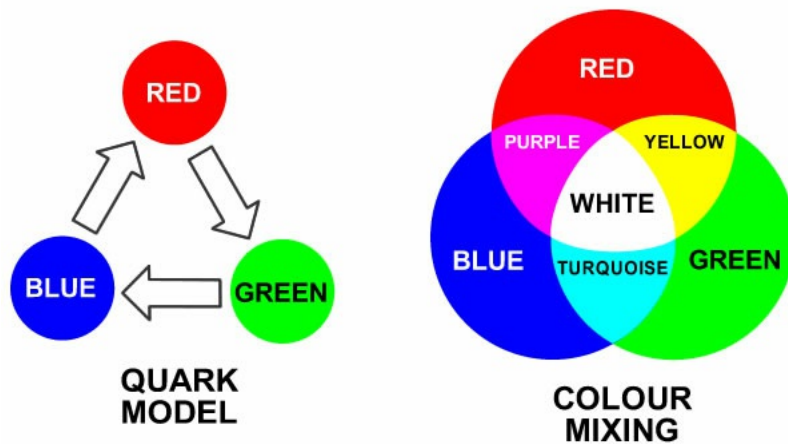
$$\begin{aligned} 2U + D &= 1 \\ U + 2D &= 0 \end{aligned}$$

where U is the electric charge of the up quark, and D is the electric charge of the down quark.

If you do your sums correctly, you will find that — surprisingly — the quarks must have fractional electric charge. The up quark must have a positive two thirds electric charge, while the down quark must have a negative one third electric charge.

However, electric charge is not the charge which holds the quarks together. "Charge" is a generic term which describes how a particle reacts to a particular field (e.g., the electromagnetic field). Only particles with certain charge will react to the field, for example, only particles with electric charge will react to the electromagnetic field. Quarks have a form of charge called *colour charge*. A quark can have either red, green, or blue colour charge, named after the primary colours of light (there is no actual colour involved in any of this — it is just a naming convention).

Just as particles with positive and negative electric charge get attracted together, so quarks with different colour charge get attracted together. But the rule underlying this attraction is quite unusual: quarks are attracted together so that the resultant composite particle has no overall colour. How can this be? Well, consider the mixing of light. A computer (or television) screen is composed of a grid of red, green, and blue dots or stripes, and when all three colours are illuminated, the result is white light (i.e., no colour). This is called additive colour mixing. So quarks are attracted together to form composite particles which are white overall, which can be achieved by attaching a red, green, and blue quark together:



Hence, this explains how three quarks can be grouped together to form protons and neutrons. This principle — that composite particles made of quarks are always colourless — does not just apply to protons and neutrons. For example, we can consider the antiparticle version of a quark (*antiquark*) as having negative colour charge. Hence it is possible for a quark to bind with its antiquark equivalent, for example, a red up quark and a red antidown quark, with the result being colour-neutral. These two-quark particles are called *mesons*. In theory, it is even possible for more than three quarks to form composite particles — as long as the overall result is colourless. In 2015, a *pentaquark* — composed of five quarks — was discovered at the LHC. Again, the pentaquark was an arrangement of quarks which had no overall colour.

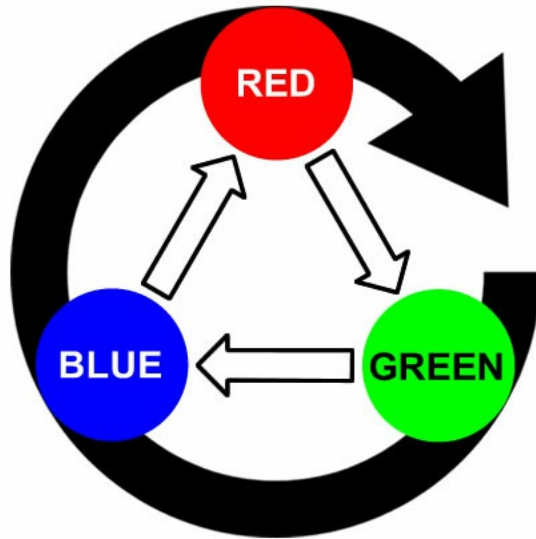
One interesting aspect of the behaviour of the strong force is that the quarks become more strongly attracted the further apart they are separated, but at small distances (e.g., inside the proton) there is no longer an attraction, instead the quarks are very loosely bound. This behaviour is called *asymptotic freedom*. As Robert Oerter explains in his book *The Theory of Almost Everything*: "As we go to longer distances, the strength of the color force increases. Conversely, at shorter distances, the strength of the color force decreases. It's like putting two fingers inside a rubber band to stretch it. The farther apart you pull your fingers, the larger the force. But if you move your fingers together, the rubber band goes slack."

We will be returning to consider asymptotic freedom in the next chapter.

Like the electromagnetic force, the strong force emerges as a result of another gauge theory. There is a gauge theory because there is a conserved quantity (colour charge is conserved throughout all interactions), and there is therefore an associated symmetry. Robert Oerter describes this colour symmetry in his book: "If we could reach inside every proton and neutron in the universe and instantaneously replace every red quark with a green quark, every green quark with a blue quark, and every blue quark with a red quark, there would be no way to tell that we had done so. The universe would continue on exactly as before the change."

Note the similarity of this description to the symmetry of charges in the electric force. This is just what you would expect in every gauge theory: if you swap particles in a symmetrical way, you effectively change nothing.

And it is clear we can think of this symmetry transformation as a form of rotation of a quark "colour wheel". When we rotate the colour wheel, red goes to green, green goes to blue, and blue goes to red. This quark colour wheel is shown in the following diagram:



The technical name for this symmetry is $SU(3)$, because there are three different quark colours, three different positions on the colour wheel. [\[12\]](#)

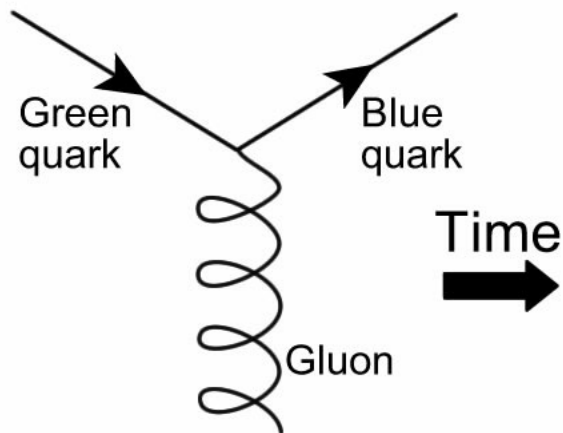
Compare this form of abstract mathematical rotation of particle types on a "symmetry colour wheel" with the actual physical rotation of the snowflake we considered earlier:



In both cases you can see that it is possible to rotate the object (snowflake, or quark colours) by a certain angle while leaving the situation unchanged. This shows how the principle of symmetry lies at the heart of particle physics.

But what is responsible for this rotation? Well, the strong force is another example of gauge theory, and if we have a gauge theory, we need to have gauge bosons. For the electromagnetic force, the gauge boson was the photon. In the case of the more complicated strong force, there is a group of gauge bosons called *gluons*.

The following vertex of a Feynman diagram shows a gluon modifying the path of a quark in much the same way as we have seen a photon modifying the path of an electron:



(Note that the symbol for the gluon on a Feynman diagram is different from the symbol for a photon. Yes, they are both gauge bosons, but you can see that the gluon is denoted by a curly line, whereas the photon was denoted by a wavy line.)

We know that the gluon is the gauge boson for the strong force, so the gluon forms the gauge field which is responsible for keeping track of any changes in local symmetry (any rotation of the local colour wheel) and transmitting those changes across space. We can see in the previous diagram how this is achieved: the gluon has the ability to change the type of a quark. In the diagram, the gluon changes a green quark into a blue quark. So in this way, any local changes of a quark type (any local rotation of the colour wheel) can be effectively transmitted by gluons, changing other quark types accordingly (just like the turning over of a corner of a rubber sheet, described earlier in this chapter).

How many gluons are required? In other words, how many gauge bosons are needed by the strong force? Well, the rule for gauge theories is that you have to count each possible position on the symmetry colour wheel, which in the case of the strong force means we have three different quark colours on the colour wheel. If we call this number n then the number of gauge bosons which are required is given by n^2-1 . So, the strong force requires eight gauge bosons, eight different types of gluon.

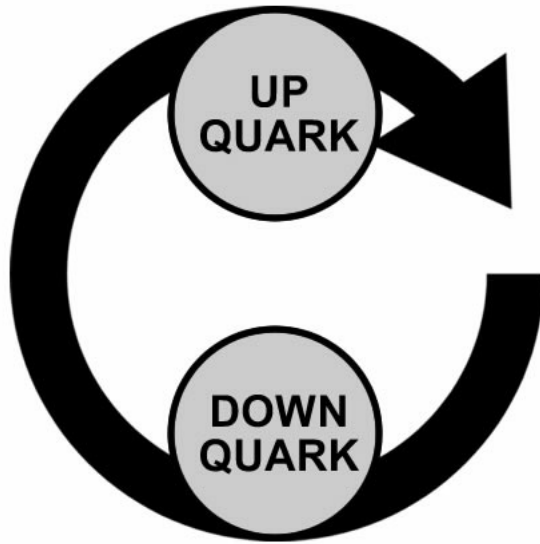
The theory we considered earlier which describes the electromagnetic force in terms of the interactions between electrons and photons is called *quantum electrodynamics*, or QED. The theory we have just considered which describes the strong force in terms of the interactions between quarks and gluons is called *quantum chromodynamics*, or QCD (where "chromo" means "colour").

The weak force

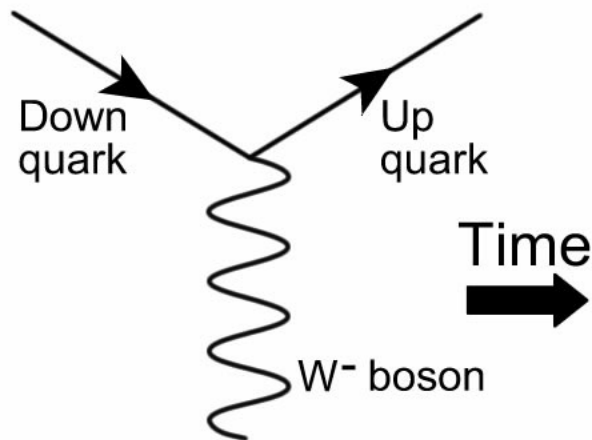
There are four fundamental forces. So far, we have considered the electromagnetic force, and the strong force. Gravity will be considered in the later chapters of this book. Which means we can now move on to consider the *weak force*.

The weak force is another example of a gauge theory. And if we have a gauge theory, then that means there must be another symmetry. The weak force is based on the symmetry between a down quark and an up quark: a down quark can be changed (rotated on the wheel) into an up quark, and vice versa. There is also a similar symmetry between an electron and a neutrino. When we find two particles connected by a symmetry in this way, they are called a *doublet*.

So the symmetry of the weak force is actually rather simpler than that of the strong force. There are three positions on the "colour wheel" of the strong force, but we see that there are only two positions of symmetry rotation on the symmetry wheel of the weak force:



Technically, this is called an SU(2) symmetry (because there are only two positions on the symmetry wheel). How many gauge bosons are required by the weak force? Well, remember the rule: if n is the number of positions on the symmetry wheel (in this case, $n=2$) then the number of gauge bosons is given by n^2-1 . So, the weak force requires three gauge bosons, and these are called the W^+ , W^- , and Z bosons. The W^+ has a positive electric charge, the W^- has a negative electric charge, and the Z is neutral (we will soon see why these bosons must have charge). The following vertex of a Feynman diagram of the weak force shows a down quark changing to an up quark (remember: these two particles form a symmetrical doublet according to the weak force), with the emission of a W^- boson:



Note the similarity of this diagram representing a weak force interaction with the earlier diagram showing an electron deflected by a photon (according to the electromagnetic force), and also the earlier diagram of a quark deflected by a gluon (according to the strong force). The form of all three diagrams is basically identical, showing that all three gauge theories work on the same principle. Let us briefly consider those earlier diagrams. According to the electromagnetic force, when the photon "hits" the electron, the photon rotates the symmetry wheel of the electron (actually, the wavefunction of the electron gets rotated — as explained earlier in this chapter). In the diagram of the strong force, when the gluon "hits" the quark, the gluon rotates the symmetry colour wheel of the quark, changing the colour type of the quark. And in the diagram of the weak force, when the W boson "hits" the quark, the boson rotates the symmetry wheel of the quark, changing

the down quark into an up quark.

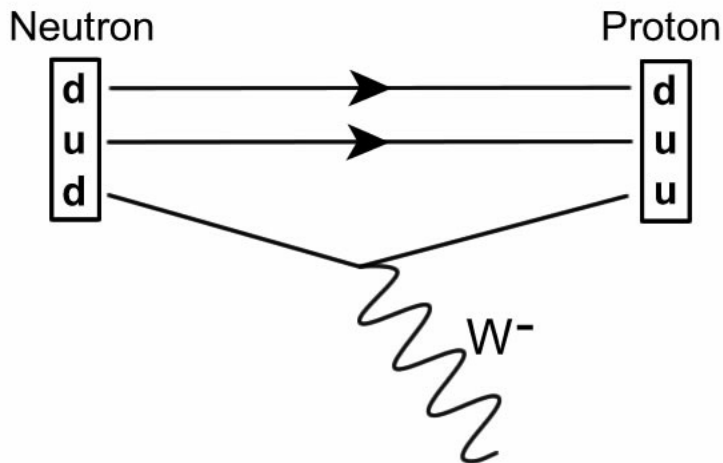
So, for each of the three fundamental forces, we see a gauge boson causing a rotation of a particle's symmetry wheel, usually causing that particle to change into a different particle (the next position on the symmetry wheel). [13]

In all three of the Feynman diagrams, we see a fermion (matter particle: electron or quark) being deflected by a boson. Clearly this, then, is the origin of forces. But we can also see from this discussion that the true root cause of forces is gauge symmetry.

Now let us return to consider the weak force again. The previous diagram showed a down quark changing into an up quark (via the weak force). At this point you might realise we have a problem regarding conservation of electric charge. This is because — if you remember earlier — the down quark has a negative one third electric charge, while the up quark has a positive two thirds electric charge. This means that the difference in electric charge of the quark coming out of the interaction and the quark going into the interaction is one positive unit of electric charge. Essentially, the overall electric charge has increased by one unit — which breaks the law of conservation of electric charge. The only way in which balance can be restored is if the emitted W^- boson possesses one negative unit of electric charge. This explains why the W^- boson has to be negatively-charged (which is why it has a minus sign). Once again, note the importance of the concept of "balance" in this interaction.

Let us now consider the implication of this conversion of a down quark into an up quark via the weak force. Earlier in this chapter, it was described how the neutron is composed of two down quarks and one up quark. Therefore, if one of those down quarks is converted to an up quark, then that neutron is converted into a proton (remember, a proton is composed of two up quarks and one down quark). This conversion of a neutron into a proton is what happens during radioactive beta decay.

The following diagram shows beta decay as a result of the weak force:



See if you can identify the position of the earlier Feynman diagram for the weak force in this diagram of beta decay. Hence, we can see that forces also provide the mechanism of particle decay.

The emitted W^- boson rapidly decays into an electron and antineutrino (as explained in the earlier discussion in Chapter Five of how the neutrino was predicted), and it is the emitted electron which forms the beta radiation.

The Standard Model

With the successful application of gauge theory to particle physics in the 1960s and the 1970s, the field of particle physics was considered to be so mature and well-established that an accurate orthodox model could be constructed. This became known as the Standard Model of particle physics (more usually referred to as simply the *Standard Model*). The Standard Model was developed by many physicists, and has been described by Sheldon Glashow — one of the key architects of the Standard Model — as "a tapestry woven by many hands".

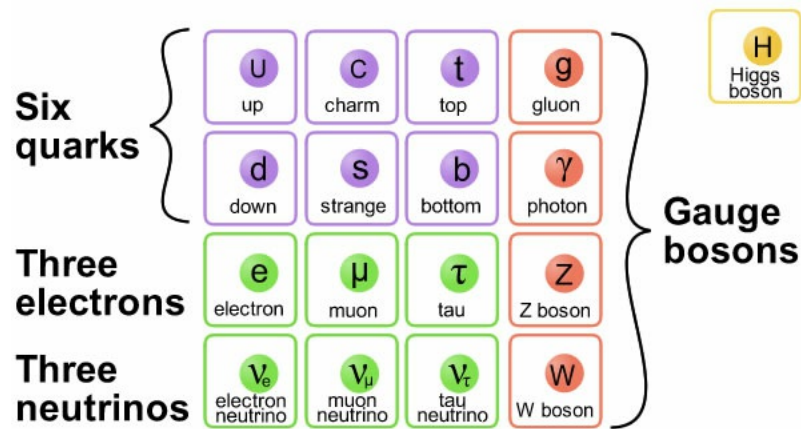
The Standard Model contains a listing of all known elementary particles, together with a deep understanding of their interactions. Experiments have tested the predictions of the Standard Model to great accuracy. The Standard

Model is truly an accurate model of the subatomic world.

Because the Standard Model accurately describes the building blocks of our world, it can be used to derive and explain almost all other scientific theories. For example, it is possible to use the Standard Model to derive the laws of electricity and magnetism, thermodynamics, optics, and nuclear energy. It can explain how a star produces energy, and it can explain the functioning of an ant.

So is the Standard Model truly the long-awaited "theory of everything"? Well, not quite. The biggest omission is that the Standard Model says nothing at all about the dominant force in the universe: gravity. It also leaves some other unresolved puzzles, most notably it provides no clue as to the nature of dark matter which supposedly constitutes over 80% of the matter in the universe.

The Standard Model is usually presented as a listing of seventeen elementary particles. We have considered almost all of these particles already in this book:



Let us examine the diagram. Firstly, let us consider the twelve fermions in the diagram (the matter particles: the quarks, electrons, and neutrinos on the left of the diagram). We have considered the quarks in this chapter. Electrons have been considered throughout this book (the diagram reveals that there are actually three different types of electron, two of which have vastly greater masses). Neutrinos were considered in Chapter Five (again, the diagram reveals that there are three types of neutrino).

On the right hand side of the diagram we find the five bosons, of which four are gauge bosons. In this chapter we have considered the photon's role in the electromagnetic force. We have also considered the role of gluons in transmitting the strong force (as was explained earlier, there are actually eight gluons in total, but these do not all feature on the diagram), and we have considered the role of the W and Z gauge bosons in transmitting the weak force.

So the only particle we have not yet considered is the Higgs boson ...

The unification of forces

On the previous diagram of the particles of the Standard Model, you will see that the Higgs boson stands out on its own. This is because the Higgs boson is not a gauge boson like the other bosons on the diagram — because the Higgs boson does not arise from gauge theory.

Instead, the Higgs boson is the particle associated with the *Higgs field*, and the Higgs field is responsible for giving mass to the elementary particles. Particles which interact more strongly with the Higgs field gain more mass.

We can think of the mass of an object as the object's resistance to being accelerated by a force (or, equivalently, the amount by which the object feels the strength of gravity). In this respect, it is possible to describe the effect of the Higgs field as being similar to the effect of a sea of molasses, slowing the particle down. The Higgs field acts to resist any acceleration of the particle, so the particle gains mass (mass being defined as resistance to acceleration).

What makes the Higgs field interesting from the point of view of the Standard Model is that particle types do not interact with the Higgs field in a symmetrical manner. We can therefore think of the Higgs field as "breaking the symmetry" of particles which would otherwise be identical — in effect, producing the different particles of the Standard Model. As an example, you can see on the previous diagram of the Standard Model that there are three

different types of electron: the electron, the muon, and the tau. The only thing which separates these particles is their mass (the tau is heavier than the muon, and the muon is heavier than the electron). If the Higgs field had not given these particles different masses then they would be identical in every way.

Of particular interest is the way the Higgs field appears to have broken the symmetry of four of the gauge bosons: the photon (of the electromagnetic force), and the three gauge bosons of the weak force. It is believed that these four gauge bosons were originally the gauge bosons of a single force, called the *electroweak force*. However, the Higgs field had an asymmetric effect: the end result was to give mass to the weak force bosons, while the photon emerged as massless particle. As a result, the weak force — with its massive bosons — remained short-ranged and confined to the atomic nucleus, while the massless photons were long-ranged and free to roam the universe. This gave an impression of two separate forces: the long-ranged electromagnetic force, and the short-ranged weak force.

It is believed that this separation of the electroweak force into two separate forces happened in the first moments after the Big Bang, when the universe cooled from extremely high temperature. Perhaps this suggests that forces become unified at high energies?

Indeed, one of the most intriguing outcomes of high-energy particle accelerator experiments is an indication that the effect of the strong force becomes weaker at higher energies, while the strength of the electromagnetic force increases. This seems to suggest that the strengths of the three forces would be the same at extremely high energies. These energies would be a thousand million times greater than can be reached by current particle accelerators, but these conditions would have existed in the first fractions of a second after the Big Bang. Maybe all four fundamental forces — including gravity — were actually one unified force at the time of the Big Bang. After just a fraction of a second after the Big Bang, the universe cooled and the four separate forces would have become "frozen out" to become distinct forces.

QUANTUM GRAVITY

Up to this chapter, this book has reflected orthodox physics. The book has been based on the Standard Model of particle physics, which has been experimentally tested to tremendous accuracy time and again. I would imagine all professional physicists would agree with the majority of the book so far.

However, as readers of my previous books will know, my books tend to follow a pattern. The majority of the material presented represents orthodox physics, but I do like to include some original ideas and hypotheses towards the end of the books. This book is no exception. If you wish, you could certainly stop reading this book at this point and feel satisfied that you have read a useful primer on particle physics. But if you are feeling adventurous, and fancy something a bit different (and rather challenging), please press onward. Just bear in mind that much of the material presented in the remaining chapters (especially the material representing my own ideas) should be considered speculative.

However, be reassured that I have confidence in everything which follows.

The Standard Model is undoubtedly a marvellous achievement, but it is not complete: it says nothing about gravity. And that is a fairly monumental omission as gravity is the dominant force which essentially rules the universe.

Einstein's wonderful theory of general relativity is most certainly not the final theory of gravity. General relativity predicts a universe completely spanned by a *gravitational field*. The gravitational field determines how objects move when they are in free-fall, so it effectively defines the force of gravity. However, the gravitational field is a *classical* field — just like Maxwell's electromagnetic field — in that it has no reference to quantum mechanics whatsoever. Einstein's gravitational field is a smooth, continuous surface in all places — not quantized into particles. However, we know that all particles (and fields) have to comply with the principles of quantum mechanics, so there is a need to develop a quantum version of general relativity, with a gravitational field quantized into particles (which, optimistically, have already been given a name: *gravitons*). This would be the final and correct theory of quantum gravity.

Quantum gravity is an active research field in fundamental physics, but definite progress has been painfully slow (non-existent?). The development of a successful theory of quantum gravity is the holy grail of modern fundamental physics.

The biggest challenge for research into quantum gravity is that the two relevant theories — general relativity and quantum mechanics — operate on two completely different scales. General relativity (gravity) is the theory which dominates at large scales, holding stars and galaxies together. Whereas quantum mechanics is the theory which dominates the atomic world. Gravity becomes an irrelevancy for particle interactions — it is simply too weak a force for particles with such small masses. But if we are trying to develop a theory of quantum gravity, that will entail generating equations which describe quantum mechanical behaviour and general relativity **in the same equation**. However, there is simply no way of checking such an equation, or basing such an equation on observations, if we cannot observe anything in the universe for which quantum mechanics **and** general relativity are **both** relevant. The scales of the two phenomena are simply too wide apart: either we observe galaxies and large-scale objects (gravity only — no quantum effects) or we observe particles (quantum mechanics only). It seems there is nothing in-between scales for us to base our equation on.

However, there is just one thing suitable: a black hole.

Black holes are such extreme objects that they can only be completely understood by a theory that must combine both quantum mechanics and general relativity. The event horizon of a black hole is particularly interesting in this respect. Clearly, general relativity is vital to understand the event horizon as general relativity predicts extreme curvature of space at the position of the event horizon (the *Schwarzschild radius*). However, the importance of quantum effects also cannot be ignored at the event horizon. Most notably, Hawking radiation (considered in my second book) is predicted to be generated at the event horizon purely by quantum mechanical effects, and Hawking radiation is vitally important as it is supposed to be the mechanism which eventually results in the evaporation of the black hole.

So in order to fully understand the behaviour of black holes, we will have to develop an equation which describes

both general relativity **and** quantum mechanics. Black holes really are quite unique objects.

However, even if we are unable to study a black hole closely, our existing knowledge of general relativity and quantum mechanics can provide us with clues about the behaviour of quantum gravity. Starting with quantum mechanics, we know that the uncertainty principle places fundamental limitations of our ability to make accurate measurements of the width of an object. Specifically, if an object has a mass, m , then we can only accurately measure the width of that object if its width is no smaller than the object's *Compton wavelength*:

$$l_C = \frac{h}{mc}$$

where h is the Planck constant, and c is the speed of light. If we try to measure any smaller distance than this then quantum effects — and quantum uncertainty — become dominant.

Remember we are trying to develop a theory of quantum gravity. We have just considered quantum mechanics, so now let us consider general relativity.

General relativity imposes a similar limit on our ability to measure small objects. We know that if we compress a mass to a distance smaller than its Schwarzschild radius then it forms a black hole. So the Schwarzschild radius represents the distance at which general relativity becomes crucial for understanding the behaviour of objects:

$$r_S = \frac{Gm}{c^2}$$

where G is the *gravitational constant*.

Remember, we are interested in developing a theory of quantum gravity, so we want to find objects for which both quantum mechanics and general relativity are essential. We therefore need an object with a width equal to its Compton wavelength **and** its Schwarzschild radius. So let us set the formula for Compton wavelength equal to the

$$\frac{h}{mc} = \frac{Gm}{c^2}$$

formula for Schwarzschild radius:

Solving for m , we get:

$$m_P = \sqrt{\frac{hc}{G}}$$

This is called the *Planck mass*. Note that the formula for the Planck mass includes the two fundamental constants of general relativity (G and c), and the fundamental constant of quantum mechanics, h .

Now we will take this formula for the Planck mass and substitute it back into the formula for either the Compton wavelength or the Schwarzschild radius (it doesn't matter which one we choose — we have set them both equal in this case). Let's select the Schwarzschild radius:

$$r = \frac{Gm}{c^2} = \frac{G}{c^2} \times \sqrt{\frac{hc}{G}}$$

Square both sides of the equation to get rid of the square root:

$$r^2 = \frac{G^2}{c^4} \times \frac{hc}{G} = \frac{hG}{c^3}$$

Now take the square root of both sides of the equation (to get us back to a formula for distance — not the square of the distance):

$$l_P = \sqrt{\frac{hG}{c^3}}$$

This distance is called the *Planck length*. Again, note that this formula for the Planck length just includes the two fundamental constants of general relativity (G and c), and the fundamental constant of quantum mechanics, h . This is encouraging: it indicates the length is significant for both general relativity and quantum mechanics — just what we were looking for. The Planck length is considered to be the most important distance in quantum gravity research. The suggestion is that the laws of physics at distances smaller than the Planck length could only be described by a joint theory of quantum gravity.

Unfortunately, if you put actual values into the formula you can calculate that the value of the Planck length is an incredibly small distance: 1.6×10^{-35} metres, which is about 10^{-20} times the size of a proton. The fact that this is such a small length is often quoted as the reason why observations of quantum gravity would be so difficult to obtain (particle accelerators would require astronomical energies to probe such small distances).

Rather disappointingly, this represents pretty much the state-of-the-art of what we know for sure about quantum gravity (this, Hawking radiation, and the spin value of the graviton). I told you progress has been slow.

The previous calculation shows that if we want to study the behaviour of quantum gravity, we need to obtain a sample of matter equal to the Planck mass (surprisingly large: about 21 micrograms) and then compress it to its Schwarzschild radius (which, in the case of the Planck mass, is equivalent to the Planck length). Of course, by doing this we are effectively creating a black hole (any mass compressed to its Schwarzschild radius forms a black hole). So what we really need from a theory of quantum gravity is a theory which can describe behaviour at distances smaller than the Schwarzschild radius of a black hole (to be precise, a Planck mass black hole).

At this point, a novel hypothesis which I presented in my earlier books emerges as a potential theory of quantum gravity as it clearly fulfils this requirement. The modified gravity hypothesis (MGH) was first presented in my second book. The whole basis of the MGH is that it predicts novel behaviour inside the Schwarzschild radius. We also saw earlier that any theory of quantum gravity would have to be a theory which can describe the behaviour of black holes — and the MGH fulfils that requirement perfectly.

This is encouraging, but it is only half the battle. To get a full theory of quantum gravity we would need to obtain a quantum version of the MGH, which is what we will consider later in this chapter. But first, please allow me to briefly recap the modified gravity hypothesis.

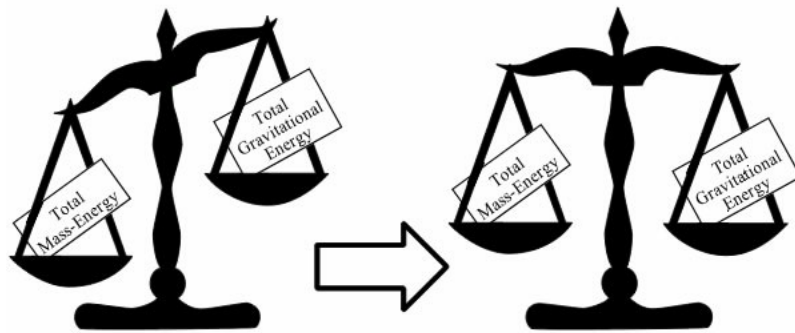
The modified gravity hypothesis (MGH)

Gravity still remains something of a mystery. We still do not know what happens at the predicted *singularity* at the heart of black holes, or why the expansion of the universe appears to be accelerating. If you read my second book, you will know that it proposed a simple and ingenious modification to the theory of general relativity which solved these — and many more — problems. We sorely need some new insights into how gravity operates at the quantum level, thus providing some pointers to a possible theory of quantum gravity. We will now consider if the modified gravity hypothesis (MGH) proposed in my second book might provide pointers in this direction.

To start, here is a brief reminder of the motivation behind the MGH, and a list of the quite remarkable predictions provided by such a simple idea. I will try to keep this brief, so for the details see my second book.

Firstly, the motivation behind the MGH is that the universe has zero total energy. This statement seems to have become almost accepted as orthodox physics. It is possible for the universe to have zero total energy if gravitational energy is considered to be negative. Richard Feynman considered the relevant equation in one of his 1960s lectures: "If now we compare the total gravitational energy to the total rest energy of the universe, lo and behold, we get the amazing result that the total energy of the universe is zero. Why this should be so is one of the great mysteries — and therefore one of the most important questions in physics. After all, what would be the use of studying physics if the mysteries were not the most important things to investigate?"

If we take the implications of Feynman's equation seriously, we find a universe predicted to expand to a certain equilibrium distance, at which point the gravitational energy of the universe will be in perfect balance with the energy contained in the mass of the universe:



So, once again, we find the importance of the concept of balance in the universe. We have seen throughout this book how balance plays a vital role in constraining and determining the laws of Nature. In our earlier discussion of the conservation laws, we found Professor David Charlton working at the LHC explaining how new particles can be detected from the requirement that the energy going into a particle interaction must be perfectly balanced with the energy coming out. Also, in the previous chapter, it was explained how gauge theory arises from any local disturbance in the balance of the universe, a field being required to correct what Bruce Schumm called "a delicate and precise balance". And in the MGH we again find a universe fighting to restore a balance of energies. As I explained in my second book, it is as though the motivation as to why forces exist at all is because they reconfigure the structure of the universe in order to correct imbalances.

The equilibrium distance, as predicted by the MGH, turns out to be a well-known distance: the Schwarzschild radius. The Schwarzschild radius is best known as the radius of the event horizon of a black hole (if you compress a mass to a size smaller than its Schwarzschild radius, it forms a black hole). But every mass has an associated Schwarzschild radius — not just black holes. What makes the MGH so ingenious is the fact that for almost every object in the universe its Schwarzschild radius is an almost undetectably small distance (the Schwarzschild radius of a human being is about a trillionth of the size of an atom). So, crucially, this results in the MGH predicting an attractive force of gravity which is in agreement with all the well-tested measurements of general relativity.

However, among the remarkable predictions of this simple hypothesis are the following:

- A universe which is spatially flat — without inflation (as a universe which expands to its Schwarzschild radius will be naturally spatially flat).
- A universe with an accelerating expansion — without fine-tuned dark energy.
- A simple solution to the black hole information loss paradox, and a simple explanation as to why the entropy of

a black hole is proportional to the area of its event horizon.

It is a very elegant solution to some of the most pressing problems in cosmology. However, as explained earlier, we now want to move on a try to find the implications for quantum gravity.

The asymptotic freedom of gravity

As was explained earlier in this chapter, inside the incredibly small Planck length, it is predicted that the effects of general relativity and quantum mechanics become equally dominant. We really have no idea what reality is like at these scales, though there have been some educated guesses. The most famous guess was by John Wheeler in 1955. Wheeler realised that — at distances smaller than the Planck length — quantum mechanics would play a major role in shaping the spacetime of general relativity. The Heisenberg uncertainty principle would result in random twisting turbulence in the structure of space itself. Wheeler gave this the name *quantum foam* or *spacetime foam*. Unfortunately, in the absence of a theory of quantum gravity, we have no way of testing Wheeler's idea.

The major roadblock in the development of a theory of quantum gravity has been the tendency of infinities to enter candidate theories. The problem in creating a quantum theory of gravity stems from the fact that there is energy contained in the gravitational field connecting the masses. That field energy increases the effective mass of the objects (via $E=mc^2$). But if we increase the mass of the objects, then that increases the strength of the gravitational field, etc. etc. You can imagine how the strength of gravity in this model appears to rapidly shoot off to infinity. And if we have infinities in a physical theory, it shows the theory is flawed. So any potential theory of quantum gravity we might construct would have to possess some mechanism for avoiding these infinities.

The MGH suggests that gravity is not a universally attractive force in all circumstances, but in fact acts to move objects to a certain equilibrium distance (the Schwarzschild radius). Outside the equilibrium distance, gravity acts as a purely attractive force, but inside the equilibrium distance gravity is no longer attractive and no longer acts to bind objects closely together.

Now, put your thinking caps on and try and remember where we have encountered a similar phenomenon earlier in this book.

If you remember back to our discussion of the strong force in the previous chapter, it was explained how quarks become more strongly attracted the further apart they are separated, but at small distances (e.g., inside the proton) there is no longer an attraction, instead the quarks are very loosely bound. This was the phenomenon of asymptotic freedom. A comparison was made to a rubber band being stretched between fingers. **It is clear that asymptotic freedom is a very similar phenomenon to the behaviour of gravity at short distances as predicted by the MGH.** This reveals a possibly intriguing connection between the behaviour of the strong force (QCD) and the behaviour of gravity.

I can quote the Wikipedia article on the development of the theory of asymptotic freedom: "The discovery was instrumental in rehabilitating quantum field theory. Prior to 1973, many theorists suspected that field theory was fundamentally inconsistent because the interactions become infinitely strong at short distances." This sounds uncannily similar to the current puzzling situation regarding the force of gravity, which is predicted to rise to a huge force at small distances, and an infinitely strong singularity in the heart of black holes. The MGH predicts that gravity will no longer be attractive inside the Schwarzschild radius, and I find this similarity to asymptotic freedom intriguing and suggestive. The MGH appears to predict that gravity becomes asymptotically free inside the Schwarzschild radius.

Just as the theory of asymptotic freedom rescued the strong force, maybe the MGH can get the current theory of gravity out of a (very black) hole?

This would maybe suggest that the behaviour of gravitons (the gauge bosons of gravity) has to be similar to the behaviour of gluons (the gauge bosons of the strong force). This is perhaps not such a surprise. The reason given for asymptotic freedom in the strong force is that the gluons can interact with other gluons in complicated ways — giving surprising results. It is known that gravitons must also interact with themselves: gravitons form the gravitational field, the gravitational field contains energy, and energy has a gravitational pull. So "gravity gravitates".

In his book *The Trouble With Physics*, Lee Smolin explains this problem with self-interaction: "Gravitational waves interact with each other. They interact with anything that has energy, and they themselves carry energy. This problem does not occur with electromagnetic waves, because though photons interact with electric and magnetic charges, they are not themselves charged, so they go right through each other."

Just as self-interacting gluons generate asymptotic freedom, perhaps self-interacting gravitons also exhibit

asymptotic freedom?

So the MGH not only explains the universe on the largest scale, but it also points to a new direction for research on the very smallest scale of quantum gravity.



The modified gravity hypothesis (MGH) makes a wide range of predictions which agree with observation.

It explains why gravity is always seen as an attractive force (in agreement with general relativity), but predicts repulsive gravity for the universe as a whole — powering an accelerating expansion. It predicts a spatially-flat universe without inflation. It provides a simple solution to the black hole information loss paradox, and explains the value of black hole entropy. Finally, an asymptotically-free version of gravity arises naturally from the hypothesis, suggesting a new direction for quantum gravity research. It even makes predictions about the behaviour of gravitons.

The MGH is clearly extremely wide-ranging, making predictions below the Planck length, and also at cosmological scales. Hence, the hypothesis starts to resemble a candidate *theory of everything* (or, perhaps more accurately, a *theory of quite a lot*). However, whereas it might require an entire book to describe other theories of everything — such as string theory or loop quantum gravity — the MGH could be described by just a single sentence: "If the universe has zero total energy, then that implies gravity acts to move the masses in a system to the Schwarzschild radius of that system".

We hear a lot about how "string theory predicts gravity". Well, according to the MGH, a zero-energy universe alone predicts Newtonian gravity (for the equations, see my second book). It's all wonderfully simple. [\[14\]](#)

Nobel Prize winner Sheldon Glashow makes another point about string theory: "Superstring theory does not follow as a logical consequence of some appealing set of hypotheses about Nature". However, the MGH most certainly derives from a single logical principle. Indeed, it was built-up from that principle.

While string theory makes few (if any?) firm predictions, the MGH clearly predicts a spatially flat universe. It also predicts a naturally-occurring accelerating expansion of the universe — which is known to be a problem for string theory. The hypothesis also provides a simple solution to the black hole information loss paradox.

I am not suggesting that string theory is wrong. But what I am suggesting is that the modified gravity hypothesis is more predictive, more testable, and is based on a stronger logical foundation.

The MGH requires no external setting of arbitrary parameters, no landscapes of possible solutions, no multiverses, no hidden dimensions. And unlike other theories — such as string theory, supersymmetry, and loop quantum gravity — the modified gravity hypothesis does not require us to search deeper to discover new structures and particles. Instead, the hypothesis suggests we just need to try harder to make sense of what we already know.

THE GREAT UNIVERSE MANIA

To end this book, here is a very peculiar tale.

In the 1930s, a strange fever afflicted the physics department of Cambridge University. But this was no biological virus. This was a strange virus of the mind, a contagious idea so apparently compelling but — at the same time — so cruelly destructive that the reputations of many of the most renowned physicists were permanently damaged.

An article in the journal *Nature* disparagingly called the Cambridge fever "the great universe mania". In this chapter we will examine the cause of this mania, seeing why it caused so much uproar in physics, and trying to understand why so many careers and reputations were damaged. We shall see that among those swept up by the enthusiasm — and destructiveness — of the movement was none other than the great Paul Dirac. It was to be Dirac who made some of the wildest pronouncements during the period of the great universe mania.

Although Dirac received heavy criticism at the time, we shall see that it is possible that Dirac was simply a hundred years ahead of his time.

The numbers of Arthur Eddington

In 1929, the American astronomer Edwin Hubble discovered that the furthest galaxies appeared to be retreating at a faster rate. This appeared to indicate that the universe was expanding, which, in turn, appeared to imply that the universe originated from a small region of space. This was the *Big Bang* theory of the universe, which ushered in a scientific revolution of our image of the universe. Hubble's discovery kickstarted the area of physics research known as *cosmology*, which considers the structure of the entire universe at the largest scales.

The discovery of the Big Bang generated huge ripples of excitement throughout the scientific community. In Cambridge, some of the most notable physicists started to investigate this fledgling field of cosmology. Arthur Eddington was a professor who was one of the first physicists at Cambridge to understand the principles of general relativity. Eddington had created a sensation by showing that light rays bent around the Sun (seen in a photo taken during a solar eclipse), thus proving Einstein's theory of general relativity to be correct. Eddington also became a cosmologist, applying the principles of general relativity to create models of the structure of the universe as a whole.

When Eddington became aware of Hubble's discovery of an expanding universe, he immediately suspected that the *cosmological constant* in Einstein's general relativity equations was the source of the expansion. He then sought to find a mechanism by which the value of the constant might be set to a value which would lead to the observed expansion. But Eddington was also something of a maverick, with an unorthodox style of doing physics. And so the mechanism which Eddington suggested was unlike anything seen before.

Essentially, Eddington realised that we have to use measurement apparatus made of particles (e.g., protons, electrons) in order to measure anything at all. So the size of particles inevitably becomes an intrinsic part of the measurement. According to Eddington, "any apparatus used to measure the world is itself part of the world". So if we want to measure the size of the universe, then the size of particles will inevitably be involved in the measurement result in some way. Eddington took this to mean that there would inevitably always be some fixed relationship between the size of the universe and the size of a particular particle. Hence, although the observed value for the size of the universe might appear to be set to an arbitrary value, it might be possible to find an analytical relationship between the size of the universe and the size of a particle.

If this all sounds a bit crazy, bear with me. It gets crazier.

As an example of the type of peculiar calculation performed by Eddington, we find that the value of the ratio of the strength of the electromagnetic force to the gravitational force is approximately 10^{40} . So what did this value mean? Eddington had no idea. So he decided to see where else this number appeared in physics.

At this point, Eddington entered dangerous territory. He started to use *numerology*. Numerology — as far as physics is concerned — is a largely discredited "science" which essentially involves "working backwards from the answer". The idea is to take some numerical constant and then try to mathematically construct that constant from other known constants, such as pi, or the charge of an electron. If you happen to get lucky — hey — it would appear you have managed to discover some deep secret about Nature. You would have effectively discovered a numerical

answer without knowing the underlying theory.

However, this method of "working backwards from the answer" is clearly not as satisfactory as initially constructing a well-founded hypothesis which unambiguously predicts the value of the constant, which is the way good physics is supposed to be done. As John Barrow says in his book *The Constants of Nature*, such a hypothesis would "supply a large and consistent theoretical edifice from which the prediction would follow."

Another problem is that it is possible to play around with numerology without having any expertise in physics, any ability to construct well-founded hypotheses. As a result, numerology has got a bad press as the domain of untalented amateurs who try to promote their dubious (and usually flawed) hypotheses with relentless zeal. Arthur Eddington was also a highly-successful populariser of science, and John Barrow had this to say about Eddington's range of books: "The most interesting thing about Eddington's attempts to explain the constants of Nature by algebraic and numerical gymnastics is their enduring effects on the readers of his popular science books. He liked to tell his general readers about his new 'calculations' of the constants of Nature and the overwhelming impression he conveyed was that it might be possible to unlock some of the most deeply hidden secrets of the universe by a little bit of inspired guesswork and numerology. If you noticed that some equations had solutions that lay close to the numbers like 137 and 1840 then you were in business as a rival to Einstein. I believe that Eddington's work, and his widespread popularisation of it in books that sold in huge quantities and continued to be read for more than 60 years after they were first published, inspired a generation of amateurs who dreamed of finding the numerical explanation for the constants of Nature. Every week I receive letters that contain calculations of a sort that owe much to Eddington's style and approach to Nature. They are characterised by very detailed numerical calculations, a confinement of interest to a small subset of the constants of Nature, and no desire to predict anything new."

If we return to consider Eddington's interest in the huge number 10^{40} (the ratio of the strength of the electromagnetic force to the gravitational force), Eddington realised that this was approximately equal to the square root of the total number of protons in the observable universe, which is believed to be approximately 10^{80} . This became known as the *Eddington number*. However, Eddington was not satisfied by the apparent imprecision in its value. So during a transatlantic boat crossing, Eddington calculated the number to great precision (by hand), eventually proclaiming: "I believe that there are 15,747,724,136,275,002,577,605,653,961,181,555,468,044,717,914,527,116,709,366,231,425,076,185,631,031,296 protons in the universe, and the same number of electrons."

Unfortunately, as John Barrow explains in his book, one of the problems with numerology is that "after a while it starts to become addictive". Eddington certainly seems to have been caught by the bug, and it was this contagion which spread around Cambridge University. Eddington started applying his dubious methods to an ever-wider range of constants, often receiving scorn from fellow physicists.

One of Eddington's complicated mathematical formulae supposedly resulted in the value 136, the inverse of the *fine structure constant* (which describes the strength of the electromagnetic force). However, when later measurements placed the value nearer the inverse of 137, Eddington changed his reasoning to suggest that a value of one should be added to his calculation. At this point, some of his critics suggested he should be called "Arthur Adding-one".

After one of Eddington's lectures, two physicists were overheard talking. One said "Do all physicists go off on crazy tangents when they get old?" To which the other physicist replied "Don't worry, you have nothing to worry about. A genius like Eddington may perhaps go nuts, but people like you just get dumber and dumber."

However, I can't help feeling that — as far as physicists are concerned — the main crime committed by numerology is that it has never been successful: it has never been used to correctly predict the value of a constant. Not once. I can't help feeling that if it had ever had any success — however small — then the method would have been rapidly re-evaluated as a perfectly reasonable approach to doing physics. A rather similar re-evaluation seems to have recently happened to multiverse theories which used to be regarded as unscientific but are now being sold as the solution to the current slow progress in physics. If numerology had enjoyed any success then I suspect we would all now be numerologists instead of string theorists. Even a small success can attract a huge amount of attention and research effort.

With this in mind, it might be said that there is nothing particularly unreasonable about an intelligent approach to numerology. As the renowned physicist James Jeans said: "Few, if any, of Eddington's colleagues accepted his views in their entirety; indeed, few if any claimed to understand them. But his general train of thought does not seem unreasonable in itself, and it seems likely that some such vast synthesis may in time explain the nature of the world we live in, even though the time may not be yet."

The return of the amazing Mr. Dirac

In 1937, Paul Dirac was the Lucasian Professor of Mathematics at Cambridge University, one of the most prestigious academic posts in the world. When Dirac made an announcement, the world listened. So it must have come as a great surprise when he announced his decision to change his research area from quantum mechanics to cosmology. As Graham Farmelo says in his biography of Dirac, this involved "refocusing his imagination from scales of a billionth of a centimetre to thousands of light years."

Dirac's first contribution to the topic was written while he was on his honeymoon. It was a 650-word letter to the journal *Nature*. The letter showed that Dirac was not immune to the numerology fervour, as it became clear that Dirac had been largely influenced by the work of Eddington. When Niels Bohr read the letter, he said "Look what happens to people when they get married."

Like Eddington, the letter considered the number 10^{40} , the ratio of the strength of the electromagnetic force to the gravitational force. But Dirac compared this number to the ratio of the radius of the universe to the radius of a proton. The results were very similar, certainly similar enough to convince Dirac that there was a connection. It is certainly unusual to find such a huge number in science, and even more surprising to find approximately the same number arising from two different calculations. As John Barrow said: "There must exist some undiscovered mathematical formula linking the quantities involved. They must be consequences rather than coincidences."

This is called the Dirac *large numbers hypothesis*.

However, it was realised that there was a fundamental problem with Dirac's idea: the universe is expanding. If the universe is expanding, then that suggests that the universe will be larger in the future, and that it was smaller in the past. But Dirac was only using the current radius of the universe in his formula. How could the formula (radius of the universe to the radius of a proton) continue to give the vital 10^{40} number if the radius of the universe was varying?

Dirac provided a fairly astonishing answer. He realised the 10^{40} number could not be maintained in an expanding universe: it was bound to increase. So he suggested that the other magic number — the ratio of the strength of the electromagnetic force to the gravitational force — was also increasing at the same rate. Dirac suggested this increasing ratio would be possible if the strength of the gravitational force was steadily decreasing.

This is surely a sign that Dirac's hypothesis was in deep trouble, with an attempt by Dirac to patch over the problem. If the gravitational force is decreasing, then that suggests the force was much greater in the past. However, it was realised that this increased gravity would have resulted in increased energy output from the Sun, and the Earth would have been much hotter in the past. In 1948, the American physicist Edward Teller showed that in the pre-Cambrian era, 200-300 million years ago, Dirac's workaround would have resulted in the oceans boiling, and life on Earth could not have survived.

So Dirac's hypothesis was falsified, proved to be untrue. Dirac appears to have rapidly lost interest in his idea. But is it now possible to revisit the large numbers hypothesis and show that Dirac was correct in believing that there was a deep underlying connection between the two ratios?

The Dirac connection

The problem with Dirac's approach was that he used the current radius of the universe in order to produce the magical 10^{40} value. In an expanding universe, this value was bound to vary accordingly, thus breaking Dirac's suggested connection.

However, at this point the modified gravity hypothesis (MGH) can step in and provide a solution to Dirac's problem. If you remember, the MGH suggests that the universe has a certain equilibrium radius, and the universe will expand until it reaches that radius. The universe may currently be smaller than the equilibrium radius, or it may currently be larger, but — crucially — **the value of the equilibrium radius does not alter with time**. It is the equilibrium radius which reveals deep truths about the universe — not the current value of the radius, which is an arbitrary value. If we consider the equilibrium radius of the universe then all of a sudden Dirac's hypothesis makes a lot more sense.

If Dirac had used the equilibrium radius instead of the current radius then he would have got the same numerical result. If you remember, the MGH predicts an equilibrium radius for the universe equal to:

$$R_U = \frac{2GM_U}{c^2}$$

where M_U is the mass of the universe.

The ratio of this radius of the universe to, say, the radius of an atom is then approximately:

$$\frac{GM_U}{c^2} \times \frac{1}{R_{ATOM}} \approx 10^{40}$$

So we get the same magical 10^{40} value, but, crucially, all the values in this expression are constant values which do not depend on the current radius of the universe. **So this value does not alter with time.** And if the value does not alter then there is no longer any need for Dirac's horrible workarounds such as a varying force of gravity, which effectively falsified his hypothesis.

It is important to note that this is no longer numerology as practised by Eddington and Dirac. This is a prediction of a well-founded (though admittedly highly-speculative) hypothesis, constructed from first principles, a hypothesis which makes predictions and agrees with known measurements. Dirac's large numbers hypothesis was based on his conviction that these numerical coincidences were revealing some deep — but unknown — truth about the universe. It is possible that the modified gravity hypothesis is the truth he was seeking.

The universe as an atom

However, of course, this is only half the story. So far, we have calculated the value for the ratio of the size of the universe to the size of an atom, and found the value equal to 10^{40} . Crucially, we have also just shown that this value does not necessarily have to alter with time. For the next step, if you remember, Dirac considered this 10^{40} value and found it was the same as the ratio of the strength of the electromagnetic force to the gravitational force.

Is this a just a crazy coincidence? Or could the radiuses of the universe and an atom be related to the strengths of the electromagnetic and gravitational forces in some way?

Firstly, considering the atom. What forces control the size of the atom? Well, the strong force is short range, confined to the nucleus, and so does not play a role. And gravity is too weak at these scales. So it is the electromagnetic force which controls the overall shape of the atom, holding electrons in orbit around the nucleus.

Secondly, considering the universe, the electromagnetic force tends to cancel in atoms, positive charge equalling negative charge, so large objects become electrically neutral. Hence, the electromagnetic force does not play a role in shaping the universe. It is gravity which is the dominant force in the overall size of the universe, even though it is by far the weakest of the four forces. Gravity dominates because all mass has the same gravitational charge (there is no such thing as negative mass). Hence, for very large objects, the force of gravity steadily accumulates until it becomes the dominant force.

So the strength of the electromagnetic force controls the size of the atom, and the strength of gravity determines the size of the universe.

Remember we are now dealing with objects which are in an equilibrium state, meaning the forces holding them together are precisely equal to the forces pulling them apart. This results in an equilibrium radius for the object, and it is this equilibrium distance which interests us. The MGH suggests the universe has an equilibrium radius in much the same way that an atom has an equilibrium radius.

Gravity dominates the universe and determines its size in much the same way as the electromagnetic force determines the overall size of atoms. It is as though the universe is a scaled-up atom!

So, as wild and crazy and randomly unconnected as it may have appeared at first sight, it appears that there might

well be an underlying logic to the Dirac large numbers hypothesis.

At these two extremes of scale — the atom and the universe — we find similar situations. We find objects in stable, equilibrium situations dominated by a single particular force. This results in simplicity at the two extremes of scale.

Neil Turok considered this simplicity in his 2015 talk at the Perimeter Institute called *The Amazing Simplicity of Everything* (<http://tinyurl.com/turoklecture>): "The astonishing thing about recent discoveries in physics is that they tell us the universe is surprisingly simple and regular, on the tiniest scale and on the hugest scale. It's only complicated in the middle. To first approximation, the universe is absolutely uniform in all directions. The whole universe is as simple as the simplest atom. If you think about a hydrogen atom, how many numbers do you need to describe an atom? An atom is a pretty simple thing: you have a nucleus, you have an electron going around it, you have the force of electrical attraction between the nucleus and the electron. Well, it turns out to describe the universe you need just one number. That number describes the universe — fewer numbers than you need to describe a single atom. So the universe turns out to be the simplest thing we know."

The celestial spheres

When we look up at the night sky, we see a number of different celestial objects. Perhaps we see the Moon, maybe we see planets, we almost certainly see stars. In other words, we see **spheres**. And this spherical model applies over the largest range of scales: the largest star has a volume 100 trillion times larger than the Earth, but they are both spheres.



And this consistency over scales still applies if we look down to the smallest scale, where we find atoms, more spheres. Even quarks in a proton are distributed in a spherically symmetric way (for this reason, Bruce Schumm called a proton a "subnuclear atom"). A sphere is an object in perfect balance: the forces which pull the sphere together are balanced by the forces which push the sphere apart. Nature likes balance. Nature tries to correct imbalance.

However, our best current theory of gravity predicts two of the most important objects of all are in a state of raging imbalance. Those two objects are black holes, and the entire universe itself. General relativity predicts that black holes are so totally imbalanced that they are crushed down to an infinitely-small singularity at their centre. As far as the entire universe is concerned, general relativity predicts another out-of-control imbalance — this time in the opposite direction: an ever-increasing expansion of the universe until it is infinitely large.

The modified gravity hypothesis restores balance. It eliminates the infinities.

It predicts spheres.

The modified gravity hypothesis predicts black holes which have their mass smeared around their Schwarzschild

radius (in practice, the mass would be concentrated in the accretion disk which surrounds every black hole). For the entire universe, the hypothesis predicts an equilibrium radius, with the universe expanding to that equilibrium like a soap bubble.

The modified gravity hypothesis reveals a universe which seeks perfect balance, from the scale of atoms and protons, up to the scale of black holes, galaxies, and the universe itself.

A universe in perfect balance.

FURTHER READING

Deep Down Things by Bruce Schumm

Still the best guide to particle physics for the general reader.

The Making of the Atomic Bomb by Richard Rhodes

Surely the best book on particle physics ever written.

The Force of Symmetry by Vincent Icke

This gem of a book appears to have been completely overlooked. An accessible description of the role of symmetry in particle physics.

The Constants of Nature by John D. Barrow

Includes a section on numerology, Arthur Eddington, and Paul Dirac. A good read.

The Strangest Man by Graham Farmelo

The definitive biography of Paul Dirac.

Introduction to Elementary Particles by David Griffiths

The best intermediate particle physics textbook. Technical.

Angels and Demons by Dan Brown

Get the *Special Illustrated Edition* off eBay or Amazon — it's wonderful. Steer clear of the movie.

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Thanks to Kip Thorne for his helpful answer to an email query.
I loved *Interstellar*.

PICTURE CREDITS

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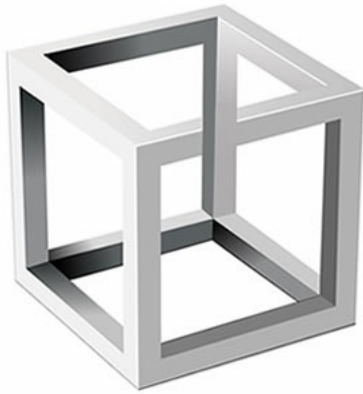
Photograph of the Dirac plaque is by Stansilav Kozlovskiy and is provided by Wikimedia Commons.

NOTES

- [1] For details, see Section 3.4 of Leonard Susskind and Art Friedman's book *Quantum Mechanics*.
- [2] As this is now the square of two identical terms, the square root of this expression is just one of these two terms. So if we take just one of these terms we will be able to eliminate the square root from the energy-momentum relation.
- [3] Do you recognise these two matrices? They are actually two of the Pauli spin matrices we considered in the previous chapter. This is a big clue as to what is coming later.
- [4] Why should the sign be positive for a, but negative for b, c, and d? This is because distances in space and time do not work in quite the same way. The further you travel in space, the shorter the distance you travel in time. Hence, a space-travelling astronaut will age more slowly than his counterpart left on Earth.
- [5] Yes, I am aware that the gears in the arrangement shown in the diagram will actually rotate in opposite directions. Please just ignore that — it is not important.
- [6] For more details of this approach, see Chapter Twelve of *Quantum Field Theory and the Standard Model* by Matthew D. Schwartz.
- [7] Custom ambigram designed specially for this book by FlipScript Corporation.
- [8] This is because the formula for kinetic energy (used in the formula for the Lagrangian) is $\frac{1}{2}mv^2$, so the partial differential of the Lagrangian with respect to velocity (the partial differential being the conserved quantity) is mv , which is the formula for momentum.
- [9] "Gauge" means a standard of measurement. Gauge theory is based on the principle that it is possible to choose a different standard at each point in space.
- [10] This is called *CP-symmetry*, where the "CP" stands for "charge parity". It is known that there are some violations of this symmetry.
- [11] Technically, this type of symmetry, being able to rotate the wavefunction of a particle, is give the term U(1) symmetry. The term "U(1)" means "rotation in one complex dimension". For more information, see the book *Deep Down Things* by Bruce Schumm.
- [12] The term "SU(3)" means "rotation in three complex dimensions". For more information, see the book *Deep Down Things* by Bruce Schumm.
- [13] Positioning different particle types on a symmetrical rotating wheel is described mathematically by *group theory*. It is possible to transform any element in the group into any other element of the group merely by rotating the wheel. For particle physics, the type of continuous groups which interest us are called *Lie groups* (pronounced "Lee").
- [14] As a purely speculative thought, it is interesting that the principle that the universe has zero total energy when "viewed from outside" is reminiscent of the colour-neutrality of quark composites produced by the strong force (e.g., protons have zero colour when "viewed from outside"). We can consider mass/energy to be the charge of the force of gravity. Hence, it appears that forces create composite objects which are charge-neutral when viewed from outside: gravity creates objects which are energy-neutral, the strong force creates objects which are colour-neutral, and the electric force creates objects which are electrically-neutral (such as atoms). Is this significant?

HIDDEN PLAINSIGHT6

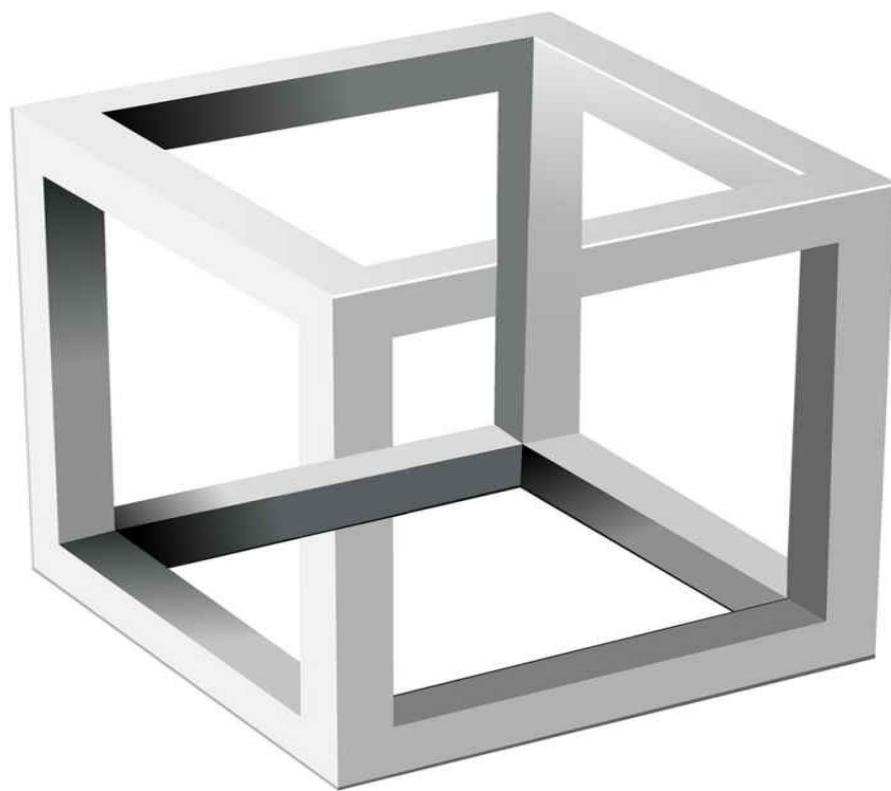
Why three dimensions?



COMING SOON

HIDDEN **INPLAIN****SIGHT****6**

Why three dimensions?



ANDREW THOMAS

HIDDEN IN PLAIN SIGHT 6

Why Three Dimensions?

Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

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Why Three Dimensions?

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CONTENTS

PREFACE

1) THE MAGIC NUMBER

The prime number

The number of sufficient magnitude

Occam's razor

The natural number

2) DIMENSIONS

What is a dimension?

Spacetime

Absolute space

3) THE GEOMETRY OF THREE DIMENSIONS

The Platonic solids

The Platonic solids in higher dimensions

The stability of orbits

Anthropic theories

4) GENERAL RELATIVITY

The curvature of space

Tensors

Tidal forces

5) INTO THE FIFTH DIMENSION

Kaluza-Klein theory

Potential

The circular dimension

Microscopic dimensions

6) STRING THEORY

The music of strings

The best-kept secret in mathematics

The hidden dimensions of string theory

7) WHY THREE DIMENSIONS?

[Part 1: A bit of relativity](#)

[Part 2: A bit of thermodynamics](#)

[Part 3: A bit of particle physics](#)

[Part 4: A bit of quantum mechanics](#)

[Part 5: Why three dimensions?](#)

APPENDIX

PREFACE

Why are there only three dimensions? It is surprising just how little research there has been on why there are three dimensions of space. In fact, I believe this is only the second book dedicated to the precise question which has ever been written (the first book was written by Ptolemy, two thousand years ago).

You might imagine that the question of why there are three dimensions of space would be one of the most outstanding and pressing questions facing physics today. But it is rarely mentioned in that respect. Whenever a list is compiled of the most important questions facing physics, the usual suspects always appear: unifying gravity and quantum mechanics, dark energy and dark matter, the so-called hierarchy problem in particle physics. But you will rarely see the question arising of why there are only three dimensions. Is the question considered too difficult, and is therefore best ignored?

Admittedly, as we shall see later, string theorists might argue that there is plenty of research in string theory to provide an answer to why we only observe three dimensions — though string theory actually predicts there are ten dimensions of space! So string theory is not so much a drive to answer the question of why there are only three dimensions — it is more a drive to answer the question of why we do not observe the troublesome seven dimensions which are predicted by string theory but do not fit the bill.

This book also contains a description of the very exciting recent discovery of gravitational waves.

I have really enjoyed writing this book, probably my most enjoyable book so far. I have found it to be a fascinating topic, with lots of interesting side-issues emerging. I hope you enjoy reading it as much as I enjoyed writing it.

I think the conclusion in the final chapter is particularly convincing.

Once again, thank you for your support.

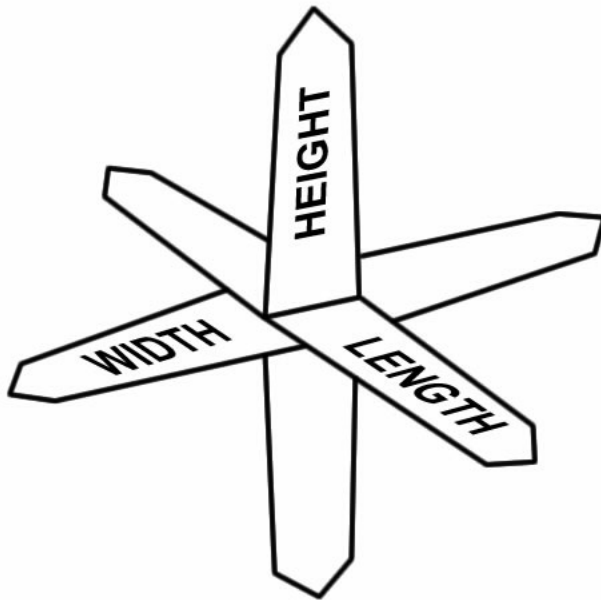
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2016

1

THE MAGIC NUMBER

In 1990, the American hip-hop trio De La Soul had one of their biggest international hit singles. The track was called *The Magic Number*, and it reached No. 7 in the UK pop chart. The song emerged at a time when rap music was dominated by violent and misogynistic themes. In contrast, De La Soul sang about love and peace and harmony, themes which were more commonly associated with the 1960s hippie community.

In the lyrics of the song, De La Soul appear quite convinced that the "magic number" is the number three. As an inquisitive physicist, I was intrigued by this apparent certainty as we clearly live in a universe which has three dimensions. An object can move in three independent directions: left/right, forward/back, and up/down. Perhaps surprisingly, we simply do not know why it is the case that there are three dimensions. Why is three genuinely a magic number in this respect?



So I was intrigued by the De La Soul track and decided to investigate the lyrics more closely. Had this talented but otherwise seemingly unremarkable trio stumbled upon a secret which had so far eluded the best minds of the scientific community?

Perhaps it was a long shot. And, after reading the lyrics, I must admit I was disappointed.

At the core of De La Soul's thesis seemed to lie the idea that three was a "magic number" purely on the basis that there were three musicians in their group. Furthermore, they appeared to regard their repeated assertion that "Three is the magic number" as some sort of substitute for a testable scientific hypothesis.

So what is so special about the number three? This opening chapter will just consider the number three. Is there anything obviously remarkable about this number? Is it inherently special?

The prime number

After my initial disappointment, I returned to consider the De La Soul track and decided that perhaps there might be some truth in what they said. I came to this conclusion because, basically, it's a great track. You don't mind that their argument is unconvincing because the lyrics work in the overall context of the song. What is more, the song was a big hit, which seems to suggest that a lot of people agreed with De La Soul: the number three certainly seemed

like a plausible contender to be a magic number.

So why did the number three work in the context of the song? That question is equivalent to asking why treating the number 17, or 54, or 378.25 as the magic number simply would not work as the lyric.

"378.25, and that's the magic number." I don't think so.

Of course, an obvious answer is that the word "three" only has one syllable, whereas the phrase "three hundred and seventy eight point two five" has eleven syllables, so it simply would not fit into the rhyming structure of the line. But the word "six" has only one syllable, as does "one", "two", "three", "four", "five", "eight", "nine", "ten", or "twelve". With all these possible alternatives, why pick three as the magic number? Let us consider the properties of the number.

Firstly, three is a *natural number*, which are the numbers used for counting. For example, we might say "There are six apples on the table". The natural numbers are the non-negative integers. According to the German mathematician Leopold Kronecker: "God made the first ten numbers; the rest is the work of man." With this quote, Kronecker emphasized that the whole mighty edifice of mathematics is fundamentally based on simple numbers.

Animal bones dating back to 30,000 BC have been found with scratch marks which seem to indicate some form of early counting behaviour. This probably indicates a hunter recording his kills, or of early farmers counting livestock. It is known that shepherds frequently used pebbles to count their sheep (the word "calculate" derives from the Latin *calculus* which means "pebble"). Our natural acquaintance and use of the non-negative natural numbers for counting purposes — a direct connection with the physical world — might provide one explanation for our apparent affinity with certain natural numbers. For example, De La Soul would have been unlikely to sing "Minus five, that's the magic number".

Secondly, three is a *prime number*. It is the smallest odd prime number. A prime number cannot be divided precisely by any other number (apart from the number one). Other prime numbers include 2, 5, and 7. So clearly there are plenty of prime numbers distributed among the smaller numbers. However, the prime numbers become rarer as they get larger (because there is more likelihood of there being a smaller divisor number).

The ancient Greek mathematician Euclid proved that any natural number can be created by multiplying prime numbers together. This is called the *fundamental theorem of arithmetic*. For example, $20 = 5 \times 2 \times 2$. This reveals how the prime numbers might be considered the primordial elements from which all the numbers are constructed. Indeed, the words "prime" and "primordial" share the same root from the Greek word *primus* (meaning "first"), as does the word "primitive". This makes the prime numbers appear as if they are the fundamental building blocks of mathematics. The close link between mathematics and physics is well established. So, for this reason, we should perhaps not be surprised to find a prime number of spatial dimensions: we are dealing with one of the fundamental physical constants — the building blocks of Nature.

The fundamental nature of the primes was considered by Enrique Gracián in his book *Prime Numbers*: "In the same way that atoms combine to form molecules, prime numbers combine to form composite numbers."

Is there any reason why we might find the prime numbers intuitively more appealing? In 2014, the *Guardian* newspaper ran a poll to discover the "World's Favourite Number". After 44,000 people had voted, it was announced that the number seven was the most popular number, with the number three in second place. Both seven and three are prime numbers. Almost half the submissions were for the numbers between one and ten.

The least popular numbers were the numbers which were divisible by ten, i.e., numbers which finished with the digit zero. Perhaps those composite numbers were unpopular because they seemed rather clinical, calculated, and sterile. In contrast, the popularity of the prime numbers is possibly because they seem more fundamental, more "earthy". Indeed, in one of the quotes on the *World's Favourite Number* website (<http://tinyurl.com/numberwebsite>), one of the respondents said she deliberately chose the number seven because it was prime.

According to the mathematician Alex Bellos, who arranged the poll: "The point here is that we are always sensitive to arithmetical patterns, and this influences our behaviour — even if we are not conscious of it, and irrespective of our ability at maths."

So maybe that is the reason why De La Soul chose three to be their magic number.

The number of sufficient magnitude

Let us continue this examination of the role of the number three in our culture by examining how we express the number in our natural languages.

In his book *Receiving Aristotle in an Age of Crisis*, the professor of philosophy David Roochnik explores what he calls the "exceptional nature" of the number three: "In ordinary language, both Greek and English at least testify to the exceptional nature of the three. If my eyes hurt, and you ask me 'Which one hurts?' I will answer 'Both of them'

rather than 'All of them'. The word 'all' is first used when I have at least three items to count."

Roochnik is suggesting that three is the first number to be of sufficient magnitude to be considered as representing a significant number of objects. We find similar differences in terminology when we consider the difference between the *cardinal* numbers and the *ordinal* numbers. A cardinal number is the form of a number which is used for counting, such as one, two, three, etc. The ordinal version of the number refers to a position in a ranking system, such as first, second, third, etc. We can see that the cardinal and ordinal versions of the numbers one and two are very different: "one/first", "two/second". However, the cardinal and ordinal versions of numbers greater than two are similar: "three/third", "four/fourth", "five/fifth", etc. We find this similarity of cardinal and ordinal for numbers three (or greater than three) in other languages: French, German, and Italian. So, again, it appears that once we consider the numbers three and greater, we reach a milestone in that we are now considered to have a large multiplicity of numbers. The number three is the first number which represents a significant amount, and in language we treat it differently from the numbers one and two.

The number three certainly seems to play an important role in our culture. When a group photo is being taken, the photographer will often say "I will count to three and then take the photo", which seems to reinforce the idea that three is the first number of sufficient magnitude (counting to one or two would not provide enough time for everyone to get ready).

In baseball, three is the number of strikes before the batter is out, based on the notion that three should be a sufficiently large number of attempts for any batter. Similarly, the "Three strikes and you're out" principle has also entered the American legal system. Currently, twenty four states impose harsher sentences for a third offence. As an example, California requires a criminal who has committed three serious or violent felonies to go to prison for a minimum of 25 years (and could be as much as a life sentence). The principle behind these Three Strikes laws is that three chances are deemed to be a sufficiently large number of chances to give to any criminal. Again, we find the principle of three being a number considered to be of sufficient magnitude.

In association football (soccer) a player who scores three goals is said to have scored a *hat trick*, one of the most cherished achievements. The scoring of a hat trick is celebrated much more than the scoring of two goals or four goals, and the scorer traditionally takes the match ball home as a prize. Again, the hat trick celebration reinforces the idea of three being the first number of sufficient magnitude, and the achievement of three successes being regarded as exceptional.

This book is structured rather like a detective whodunnit. We will be considering the evidence, examining various theories, rejecting some theories while retaining some theories which show promise. And — even at this early stage — I think we have found a shred of evidence here. In many aspects of life, the number three is the smallest number which is considered suitable for performing many tasks.

In the final chapter of this book it will be proposed that one and two dimensions of space would not be sufficient to perform a particular requirement of Nature — and this will emerge as a potential solution to the question of why there are three dimensions of space.

Occam's razor

William of Ockham (or "Occam") was an 14th century English monk who was one of the major figures of medieval philosophy.



Surprisingly, one aspect of William of Ockham's work has remained influential even into the modern era. His modern fame and influence is based entirely on one phrase he wrote in Latin: *Entia non sunt multiplicanda praeter necessitatem*, which means "Entities should not be multiplied beyond necessity". This phrase is commonly known as *Occam's razor*.

So why is this particularly relevant to our attempt to discover why there are only three spatial dimensions? Well, it is relevant for the simple reason that three is certainly quite a small number. Out of all the infinity of possible numbers — some of which are inconceivably huge — why do we end up with just three dimensions? We might certainly imagine that Nature has applied Occam's razor: "Entities should not be multiplied beyond necessity."

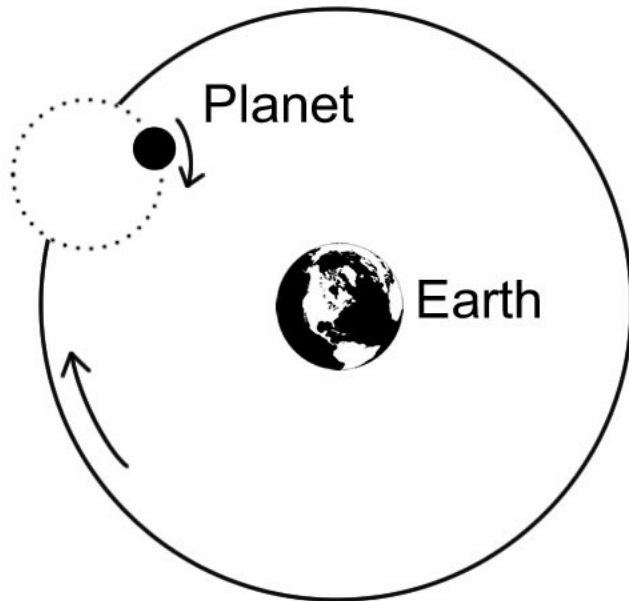
Essentially, Occam's razor is a statement in favour of simplicity. Another translation of the phrase (which is perhaps more relevant to our discussion) is: "Among competing hypotheses, the one with the fewest assumptions should be selected." Phrased in this way, Occam's razor becomes a form of guidance for physicists. It is not strictly scientific, it is not even always correct, but as a general rule it has been repeatedly shown to have value when judging the value of various hypotheses about Nature. Put simply, the simplest theory (which predicts the same results) is almost always correct. [\[1\]](#)

In many ways, physics could be seen as a drive towards simplicity. We seek the simplest explanations for the phenomena we observe. Simpler explanations reveal deeper underlying truth. And physics is (hopefully) a search for truth.

In his book *The Fabric of Reality*, David Deutsch describes how theories which are more fundamental can be both simpler and fewer in number. Deutsch says his motivation in physics is nothing less than the goal of "understanding everything". This might seem like an impossibly ambitious goal, but, as Deutsch explains, this does not mean he wants to "know everything" — Deutsch has no interest in memorizing all the facts of the world's encyclopaedias. Instead, he wants to **understand** all the reasons why the physical world works the way it does. Understanding a comparatively simple theory (for example, general relativity) can explain a multitude of facts (the precise motion and position of the stars and planets, for example). And, while it is certainly not possible to know all the facts about the world, it might be possible to know a few simple theories which explain those facts. As Deutsch says: "Confronted with this vast and rapidly growing menu of the collected theories of the human race, one may be forgiven for doubting that an individual could so much as taste every dish in a lifetime, let alone, as might once have been possible, appreciate all known recipes. Yet explanation is a strange sort of food — a larger portion is not necessarily harder to swallow. A theory may be superseded by a new theory which explains more, and is more accurate, but it is also easier to understand, in which case the old theory becomes redundant, and we gain more understanding while needing to learn less than before."

Deutsch then presents probably the classic example of this drive toward simpler theories: the move to a

heliocentric (Sun-centred) model of the Solar System. The ancient model developed by Ptolemy placed the Earth at the centre of the Solar System, and this *geocentric* model dominated for fifteen centuries. Because it was known that the motion of the planets was irregular (with the planets sometimes appearing to change direction) it was necessary to introduce the idea of *epicycles*, a smaller orbit contained within the planet's usual orbit around the Earth. Here we see a planet orbiting on its additional smaller epicycle:



The epicycle allowed the planet to sometimes move backwards when viewed from Earth. This geocentric model of the universe was dominant until the 16th century when the Polish astronomer Nicolaus Copernicus realised that the model could be greatly simplified by placing the Sun at the centre of the Solar System and having the planets (including the Earth) orbit the Sun.

Copernicus's model was simpler than the Ptolemaic model, and it not only explained the retrograde motions of the planets but it also explained why the Earth experienced the seasons as it orbited the Sun once a year. So a simpler model can explain more.

The adoption of the Copernican model was a classic example of the value of Occam's razor in practice. Its obvious simplicity when compared to the Ptolemaic model meant it was to be preferred as an explanation.

Theories can have another quality which is similar to "simplicity" and that is "beauty". Beauty is perhaps more associated with mathematical theorems, and Bertrand Russell once described mathematical beauty in the following words: "Mathematics, rightly viewed, possesses not only truth, but supreme beauty — a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show. The true spirit of delight, the exaltation, the sense of being more than Man, which is the touchstone of the highest excellence, is to be found in mathematics as surely as poetry."

The great physicist (and mathematician) Paul Dirac certainly believed in the importance of beauty in physics, as he wrote in 1939: "The research worker, in his effort to express the fundamental laws of Nature in mathematical form, should strive mainly for mathematical beauty. It often happens that the requirements of simplicity and beauty are the same, but where they clash the latter must take precedence."

Nobel Prize-winning physicist Frank Wilczek has recently written a book called *A Beautiful Question* in which he wonders why the world is apparently so beautiful.^[2] Is there any reason why that should be the case? Wilczek even compares the world to a work of art, and his lavishly-illustrated book compares human artworks with beautiful structures from physics.

I was fortunate to meet Frank Wilczek recently. I congratulated him on his excellent book, and I asked him whether "beauty" was rather a subjective concept. In reply, he felt that there were clear objective standards of beauty, which had remained consistent down the ages: everyone seems to agree on "great art". He had gained a very strong appreciation for renaissance art in particular. He felt that the discovery of perspective by renaissance artists

was an example of objectivity in art: "By understanding how the same scene can appear different, depending on the viewpoint from which it is perceived, we learn to separate the accidents of viewpoint from the properties of the thing itself. By treating subjectivity objectively, we master it."

Here is a photo of me with Frank Wilczek:



According to Frank Wilczek, Nature's "artistic style" has two obsessions:

- Symmetry — a love of harmony, balance, and proportion.
- Economy — satisfaction in producing an abundance of effects from very limited means.

The importance of symmetry — and especially balance — in fundamental physics was explored in my previous book. The importance of economy — "producing an abundance of effects from very limited means" — reflects the influence of Occam's Razor.

Beauty, however, still seems to me to be rather a subjective notion to evaluate possible theories: what you might find to be a beautiful theory, I might find ugly. However, that is not the case for simplicity, because, surprisingly, it is possible to obtain a quantitative measure of the simplicity of a theory.

A measure of simplicity can be found because simplicity is the opposite of *complexity*, and there is a large body of science which deals with complexity.

How can we measure complexity (how complicated something is)? Well, consider a pattern, say, a square of black and white dots, or maybe a binary sequence or zeroes and ones. How complex would you say the pattern is? How would you measure the complexity of the pattern? Or, imagine you have two patterns, two squares of black and white dots. Which pattern would you say is the most complex? How could you decide between the two patterns?

Well, it turns out that we can measure the complexity of the patterns quite objectively. There is a measure called *Kolmogorov complexity*, which sounds quite complex in itself but is actually quite a simple and clever idea. The Kolmogorov complexity of a pattern can be found on the basis that a computer program could be used to calculate the pattern, and print out the black and white dots. As an example, if a pattern of zeroes and ones is a repeating pattern then the computer program to print the numbers would be quite short: just a few lines, with the code probably featuring a loop. For example, the repeating pattern:

```
xyxyxyxyxyxyxyxyxyxyxyxyxyxyxyxy
```

which has 32 characters could be represented by the code "xy 16 times", which only has 11 characters. This shows it is possible to compress the pattern to a smaller length, while still retaining the same amount of information.

Alternatively, if the pattern of zeroes and ones is truly a complex pattern, then the computer program needed to print the pattern could be very long. In the extreme case — for the most complicated patterns — the computer

program would be as long as the pattern. In that case, it would not be possible to make the computer program any shorter than the original pattern. The minimum length of the computer program needed to print the pattern is called the Kolmogorov complexity of the pattern. We can see that the Kolmogorov complexity describes the *compressibility* of the pattern: if the pattern can be produced by a computer program which is shorter than the actual pattern, then we can say that the pattern can be compressed to a shorter length (it can be represented by a computer program with a shorter length).

So we see we can obtain an objective measure of the complexity — or, inversely, the simplicity — of any pattern. And that is very useful for our purposes because a physics theory is, after all, nothing more than a pattern of letters when it is written down. So we can objectively measure the simplicity of any theory. This idea is expressed by the mathematician Gregory Chaitin: "This idea of program-size complexity is also connected with the philosophy of the scientific method. You've heard of Occam's razor, of the idea that the simplest theory is best? Well, what's a theory? It's a computer program for predicting observations. And the idea that the simplest theory is best translates into saying that a **concise** computer program is the best theory. What if there is no concise theory, what if the most concise program or the best theory for reproducing a given set of experimental data is **the same size** as the data? Then the theory is no good, it's cooked up, and the data is incomprehensible, it's random. In that case the theory isn't doing a useful job. A theory is good to the extent that it compresses the data into a much smaller set of theoretical assumptions. The greater the compression, the better!"

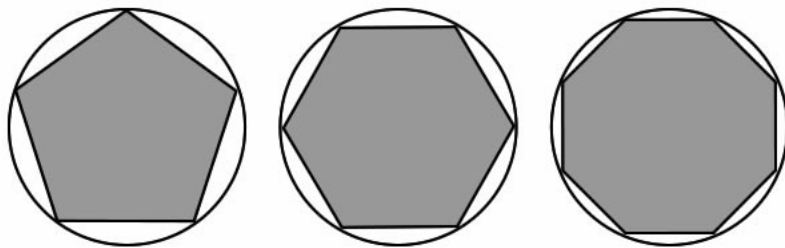
So whereas it is impossible to objectively measure the **beauty** of a physics theory (your idea of beautiful might be my idea of ugly), it is possible to objectively measure the **simplicity** of a theory.

The natural number

There are a many important constants (special numbers) in mathematics, some of which are quite famous. Perhaps the most famous of the mathematical constants is pi (π) which is the ratio of a circle's circumference to its diameter, and has the approximate value 3.14159. Other important mathematical constants include Euler's number (e) which has the approximate value 2.718, and the golden ratio which has the approximate value 1.618. For a full list of these constants, refer to the Wikipedia page on "Mathematical constants". [\[3\]](#)

If you consider the list of mathematical constants on the Wikipedia page, you might discover something surprising: almost all of the constants have a value quite close to one. The largest constant listed is the Feigenbaum constant which has an approximate value of 4.669. So none of the listed constants have large values of the order of 10,000, or several million. This is a known fact about the mathematical constants: they tend to be close to one. This is a very useful fact as far as physicists are concerned.

These mathematical constants can often be produced by an infinite series of calculations, each calculation producing a more accurate result. For example, in 250 BC the Greek mathematician Archimedes realised that pi could be approximated by fitting a regular polygon inside a circle, and then adding up the lengths of all the sides of the polygon. The more sides the polygon has, the closer to pi the approximation becomes:



So why are the values of these mathematical constants close to one? Well, if you consider the form of these infinite series used to calculate the mathematical constants, you will find that the first term in many of these series is the number one. For example, one infinite series which can be used to calculate pi is:

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} \dots$$

and an infinite series to calculate Euler's number, e , is:

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} \dots$$

and an infinite series to calculate the golden ratio, ϕ , is:

$$\phi = 1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \dots}}}$$

You will see that the first term in all of these infinite series is the number one (with the following terms becoming progressively smaller). So we can see how the mathematical constants are frequently derived from the number one, and so tend to have low values. This was described by Einstein in a letter to an old student friend, Ilse Rosenthal-Schneider (you will note how he refers to the calculation of Euler's number, e , using the infinite series we considered earlier): "I see from your letter that you did not grasp my hint about the universal constants of physics. I will therefore try to make the matter clearer. Basic numbers are those which, in the logical development of mathematics, appear by a certain necessity as unique individual formations. For example:

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} \dots$$

Einstein continues: "It is the same with π , which is closely connected with e . In contrast to such basic numbers are the remaining numbers which are not derived from 1 by means of a perspicuous construction. It would seem to lie in the nature of things that such basic numbers do not differ from the number 1 in respect of the order of magnitude, at least as long as consideration is confined to 'simple' or, as the case may be, 'natural' formations."

There are constants in physics as well, for example, the speed of light, or the gravitational constant. It is clear that these values can quite possibly have extremely huge (or small) numerical values depending on the units selected to express the constant. For example, the speed of light is the extremely large value of 3×10^8 m/sec. However, if we choose a different unit — for example, using kilometres as the unit of length instead of metres — then we get a smaller number: 3×10^5 km/sec (note the change of unit). So by choosing different units, we change the numerical value of the physical constant.

However, there are some constants in physics which are just plain numbers, i.e., they have no associated units.

One of the most famous is the *fine structure constant*, which is related to the strength of the electric charge and has the numerical value of $1/137$ (note: in this case there are no units involved — it is just a number). So these values always stay the same — irrespective of units (because they have no units). Even a civilisation of aliens in a different galaxy would calculate exactly the same numerical value for these constants. That makes them particularly interesting for a physicist as they seem to reflect very deep truths about Nature.

Because mathematical constants tend to be close to one, there is justification to expect the physical constants (which — at the lowest level — are surely derived from the mathematical constants in some way, via some mechanism) to also be close to one. (Remember: this is only true for physical constants which are not expressed in any particular units).

So we are entitled to expect any physical constants (which are not expressed in units) to be close to the number one. This principle is called *naturalness* (and the physical constants are then said to be *natural*).

This insight into the importance of naturalness is generally ascribed to Einstein, and it was described in his only publication on the subject in the German journal *Annalen Der Physik* in 1911: "The unit-free numerical factors, whose magnitude is only given by a more or less detailed mathematical theory, are usually of the order of unity. We cannot require this rigorously for why shouldn't a numerical factor like $(12\pi)^3$ appear in a mathematical-physical deduction? But without doubt such cases are rarities."

This extremely fortuitous principle has proven to be a useful tool for physicists. As John Barrow explains in his book *The Constants of Nature*: "In every formula we use to describe the physical world, a numerical factor appears ... which is almost always fairly close in value to 1 and they can be neglected, or approximated by 1, if one is just interested in getting a fairly good estimate of the result."

Conversely, if we encounter any physical constants which are very far from the value of one, then we should suspect that we are not at the fundamental level, and we are missing some deeper mechanism. Our formula is not describing a fundamental process. There is some additional fundamental behaviour which needs explaining because it is not being captured by our formula. We need to dig deeper.

And, of course, this entire book is based on one particular constant which requires no units, and that is the number of dimensions of space. The number three, used merely for counting in this way, is just a number. It is not three metres, or three seconds, or three kilograms. It has no units. It is just three. It is just a number. And, on the basis of Einstein's insight, this is precisely what we should expect to find. Three is a **natural** result for the number of dimensions. It is natural because it is a number close to one. The closer to one, the better, the more in line with our expectations.

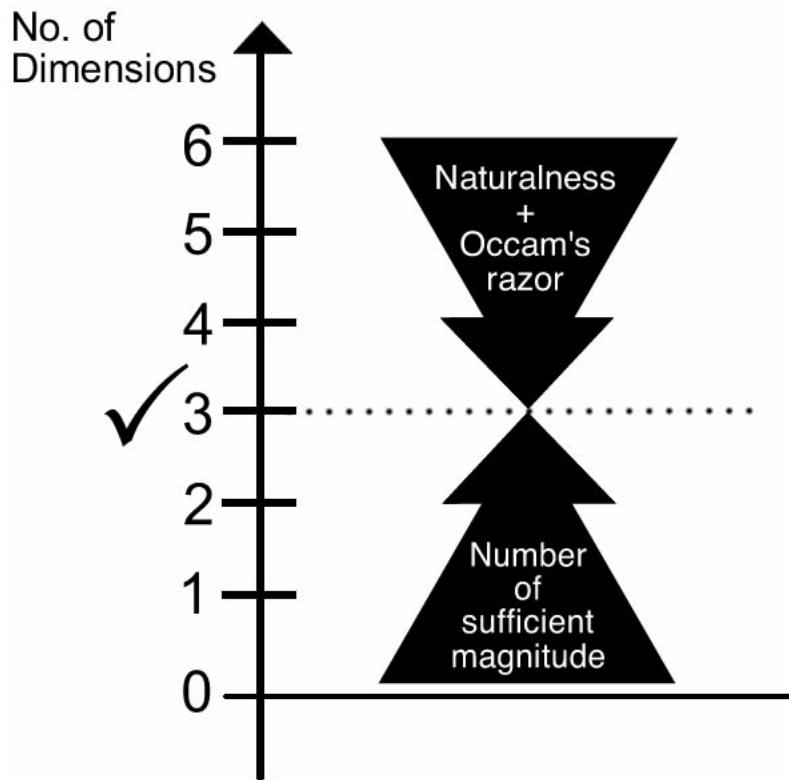
So, by arguments purely based on naturalness, we should not expect there to be 10,000 dimensions of space. We should not expect there to be 100 dimensions of space. It might be argued that we should not even expect to find ten dimensions of space.

However, even without knowing the precise underlying mechanism which generates the dimensions, we would expect there to be (approximately) three dimensions. Certainly, we would expect a number close to one. Our task is then to discover the fundamental mechanism which naturally produces that result.

The Standard Model of particle physics is our best model of the physical world and has been tested to remarkable accuracy. However, there remains approximately 20 unit-free constants in the Standard Model which appear to have arbitrary values which have to be set on the basis of experimental ("empirical") measurement. Einstein believed that the presence of these arbitrary constants reveals our theory is not truly fundamental: "In a reasonable theory, there are no unit-free numbers whose values are only empirically determinable. Of course, I cannot prove this. But I cannot imagine a unified and reasonable theory which explicitly contains a number under which the whim of the Creator might just as well have chosen differently, whereby a qualitatively different lawfulness of the world would have resulted."

So, how can these arbitrary constants be eliminated, thus creating a theory which is more fundamental? This is possible if we strive to create more natural theories. If all arbitrary constants in a theory have a value which is close to one, then those arbitrary constants effectively disappear (because multiplying by one is equivalent to not multiplying at all: the original term remains unchanged). So a natural theory is a simpler theory: it would have fewer arbitrary constants. We can therefore think of naturalness as arising from Occam's razor: the simplest theories are more natural. [\[4\]](#)

Occam's razor and the principle of naturalness are therefore closely related, and it appears that both act to drive down the number of spatial dimensions to a low value. Working in the opposite direction, we find the principle that three is the first "number of sufficient magnitude" to perform a certain task — which acts to drive up the number of spatial dimensions (as shown in the following diagram).



On that basis, our quest to discover why there are three dimensions becomes a quest to discover why one and two dimensions of space would not be sufficient to perform a particular requirement of Nature. We will be returning to this theme in the final chapter of the book.

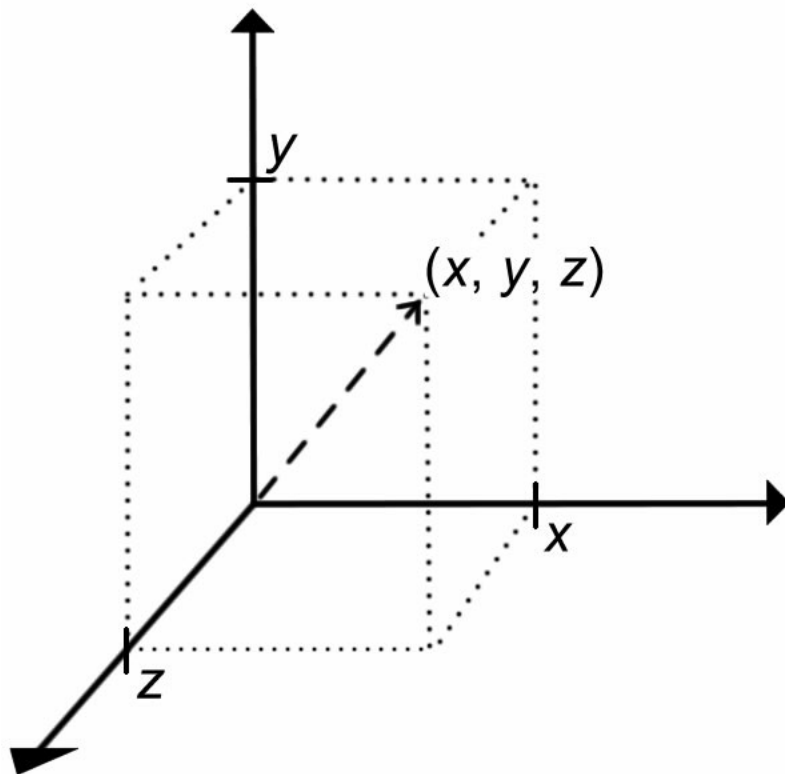
So is three really a magic number, as De La Soul suggested? Well, it's starting to look like, yes, De La Soul might have been onto something after all.

2

DIMENSIONS

When we say there are three dimensions of space, what exactly do we mean? What is a dimension? This question will be answered for the specific case of the spatial dimensions, but then a more general concept of a "dimension" will be introduced.

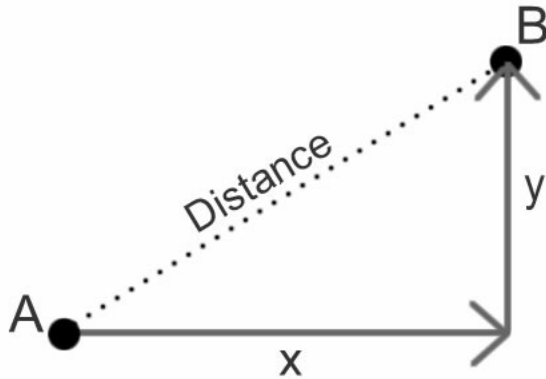
Put simply, the three spatial dimensions refer to the usual concepts of depth, width, and height. We can specify a position in three-dimensional space using three coordinates:



In the previous diagram, you will see that the dashed arrow points to a point in space which is a distance x along the horizontal axis, and is a distance y along the vertical axis, and a distance z along the axis which is coming out of the page. We can therefore define the position of the point by a list of its coordinates: (x, y, z) .

It is possible to consider spaces which do not have three dimensions. For example, position on a flat plane (such as graph paper) could be described by just two coordinates: x and y . Hence, a flat plane would represent a two-dimensional space. Position on a line could be represented by just a single coordinate: the length along the line. Hence, a line represents a one-dimensional space. We can see that the number of coordinates required to define a point determines the number of dimensions.

No matter what the number of dimensions, it is important to be able to measure the distance between two points. A formula which can be used to calculate distances is called a *metric*. Let us first consider space with just two dimensions, described by two coordinates: x and y . In that case, the following diagram shows that travelling from point A to point B necessitates travelling a distance x horizontally, and a distance y vertically:



This forms a right-angled triangle, so from Pythagoras's theorem we could calculate this distance as the square root of x^2 plus y^2 . So this gives us our metric on a flat two-dimensional plane:

$$d = \sqrt{x^2 + y^2}$$

As shown in the earlier diagram of three-dimensional axes, it is easy to extend this metric to three-dimensional space just by adding the extra z coordinate:

$$d = \sqrt{x^2 + y^2 + z^2}$$

Even though we cannot visualize spaces with more than three spatial dimensions, it is very easy to describe them mathematically: we simply add extra coordinates to our list which describes a point. For example, a point in a four-dimensional space might be described by (w, x, y, z) . Once, again, the number of coordinates determines the number of spatial dimensions.

The metric for that four-dimensional space is also easily generated by adding another coordinate:

$$d = \sqrt{w^2 + x^2 + y^2 + z^2}$$

OK, so that is a basic description of the concepts involved when we describe spatial dimensions. But we have not yet considered the crucial question ...

What is a dimension?

We all have an instinctive understanding of space which allows us to move freely, avoiding obstacles, and performing everyday tasks such as driving a car. Unfortunately, this very intimate connection we have with space — acquired over millions of years of evolution — makes it very difficult for us to stand back and be objective about the nature of space. We all live inside space — we cannot observe it from outside. So we find it very difficult to be objective when answering the question "What is a spatial dimension?"

However, one of the most important skills of being a good physicist is to be able to ignore our human

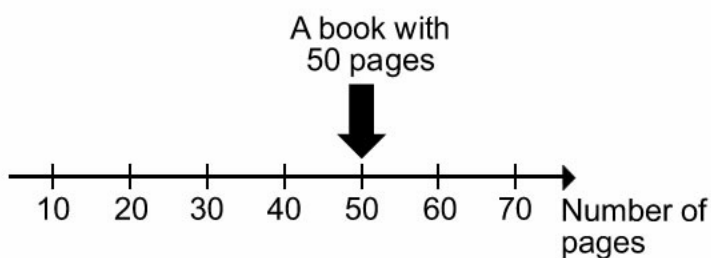
preconceptions and intuitions, and to have an open analytical mind, able to consider the data in an objective manner. And when we apply that objectivity to the subject of space and dimensions, we realise that the spatial coordinates of an object, (x, y, z) , just represent properties of that object, just as the colour of an object is another example of the property of an object. Each coordinate represents a dimension of space; each coordinate represents a way in which an object's properties can be modified. We may interpret variation of those spatial coordinates as "an object moving around in space", but that interpretation gains us nothing more than just considering the variation in the positional property of an object. If an object moves, its positional property varies. Likewise, if an object changes colour, its colour property varies.

I particularly like the following quote from the German philosopher Hans Reichenbach which makes it clear how all an object's properties can be treated as dimensions, with no distinction between space and colour: "Let us assume that the three dimensions of space are visualized in the customary fashion, and let us substitute a colour for the fourth dimension. Every physical object is liable to changes in colour as well as position. An object might, for example, be capable of going through all shades from red through violet to blue. A physical interaction between any two bodies is possible only if they are close to each other in space as well as in colour. Bodies of different colours would penetrate each other without interference. If we lock a number of flies into a red glass globe, they may yet escape: they may change their colour to blue and then be able to penetrate the red globe."

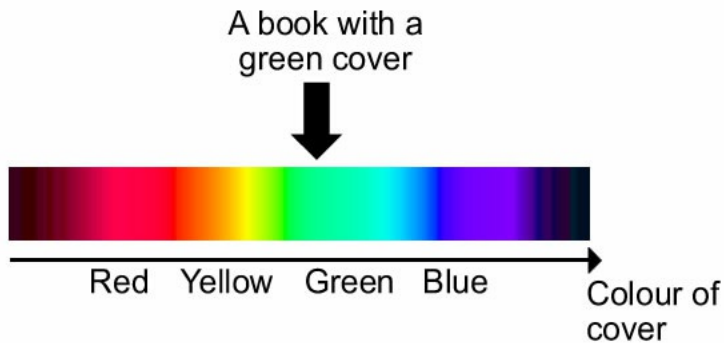
So, if we can treat a dimension as a range of property values, then we can also treat a range of property values as a dimension. For example, let us continue this theme of treating colour as a property which can be expressed as a dimension. It is the case that any colour can be generated by mixing together various amounts of red, green, and blue primary colours (this is how a computer monitor can generate any colour: each point on the screen is composed of microscopic red, green, and blue dots). So we can represent any single colour — yellow or purple, for example — as particular combinations of red, green, and blue. Hence, any colour can be represented as a point in a three-dimensional space, with the three axes of that space representing the three primary colours. As Frank Wilczek says in his book *A Beautiful Question*: "We can specify any perceived colour by saying how much red, how much green, and how much blue it takes to match it. This is completely analogous to how we can specify a place in space by saying how far it is in the north-south, east-west, and vertical directions. Ordinary space is a three-dimensional continuum, and so is the space of perceived colours."

Continuing this theme of treating property values as a dimension, Lisa Randall gives several examples in her book *Warped Passages*: "When you peg someone down as one-dimensional, you actually have something rather specific in mind: you mean the person has only a single interest." Lisa Randall presented the example of Sam, who sits at home all day watching sports on TV. The number of hours Sam watches TV could be represented as a point in a one-dimensional space.

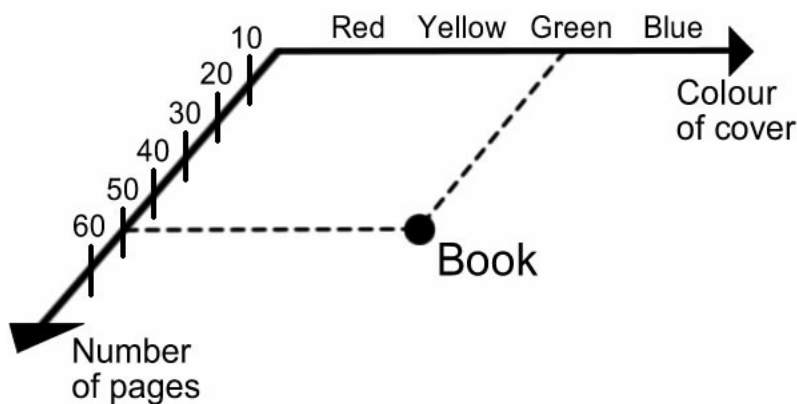
Let us consider a similar example. Let us consider a book with a certain number of pages. Again, the book can be represented as a point in a one-dimensional space:



Let us now consider a second book-related property: the colour of a book's cover. This can be represented as a point in a continuous spectrum of all possible colours. The following diagram shows a book with a green cover represented by a point in a different one-dimensional space:



There is clearly a unifying theme behind these two one-dimensional properties: they can both refer to a single book. So let us combine these two properties, forming a two-dimensional space:

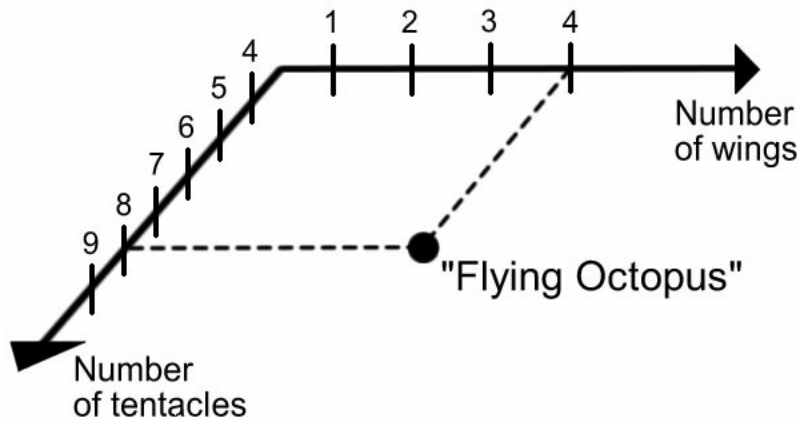


From the previous diagram, it can be seen how a book can now be completely described by a single point in a two-dimensional space (instead of previously being described by two separate points in two different one-dimensional spaces). From that single point in the previous diagram, you can see that we can determine that the book has fifty pages, and has a green cover.

So it is possible to unify two different descriptions by creating a higher-dimensional space, and we shall see later in this book how this method of unification has become very popular in physics.

Considering the book example, this is all well and good: the unification of page count and cover colour was based on a single underlying entity (a book), and so the unification made good logical sense. However, it is very easy to apply this technique to any two different descriptions — even if they have nothing in common! Mathematically, we can combine any two descriptions into a single higher-dimensional space, and the result will be valid. But, in physics, the big question is whether it is legitimate to perform the unification in this way. Does the unification represent a true underlying connection? Does there exist an object which logically combines the two descriptions? Or are we artificially "glueing" the two descriptions together, with no actual basis in reality?

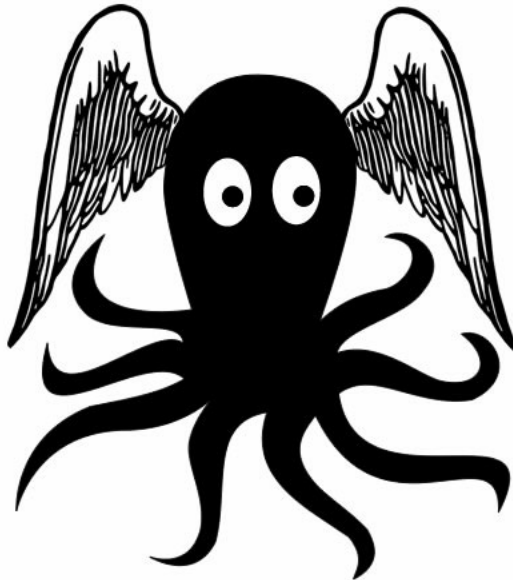
As an example, we might count the number of wings on an animal (for example, a bird has two wings, but a bumblebee has four wings), and we might count the number of tentacles on an animal (for example, an octopus has eight tentacles, but a jellyfish can have more than a hundred), and represent these two descriptions (wings and tentacles) as two points in two different one-dimensional spaces. However, we could then "glue" those two descriptions together to form a single point in a two-dimensional space. That single point would tell us the number of wings on a particular animal, **and** the number of tentacles on that animal — we have unified two apparently completely different descriptions!



That might appear to be a great achievement, however, this is a totally artificial approach as the combined two-dimensional object — a "flying octopus" — does not exist in Nature.

As we shall see later, this unification approach in physics using higher dimensions has become very popular. As we have just seen, it is an easy way of achieving an impressive result — almost too easy. Basically, we can unify any two properties using higher dimensions. But we have to ask ourselves, while the resultant unification might be valid mathematically, does it have physical relevance?

Or are we just making flying octopuses?



Spacetime

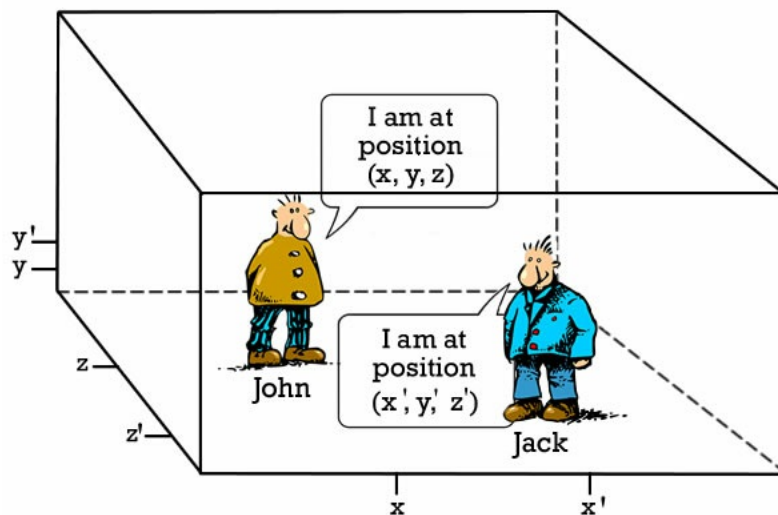
One example of this type of unification is the "glueing" together of three-dimensional space and one-dimensional time in order to produce a higher-dimensional four-dimensional *spacetime*. It was actually Einstein's former mathematics tutor at the Zurich Polytechnic — Hermann Minkowski — who realised that it made sense to combine space and time to form spacetime. Minkowski realised that his former pupil's theory of special relativity indicated that time and space were not independent entities, but in fact motion through space could affect motion through time (famously, the astronaut who flies away from Earth at a speed close to the speed of light will find — when he returns to Earth — that he has aged less than someone who remained on Earth).

As Hermann Minkowski said: "Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality."

The "glueing" together of the space and time dimensions to form a four-dimensional spacetime is valid because there exists a physical entity which must be described by **both** a point in space **and** a point in time. That physical entity is the *event*. We are used to dealing with events in everyday life: a public meeting might be advertised at occurring at a certain venue at a certain time. The meeting is therefore described by an event incorporating space and time. But even at the level of fundamental particle physics we have to deal with events: the decay of a particle can only be described by both the position of the particle and the time at which the particle decay occurred. So the concept of the event has genuine physical significance. Hence, we are most certainly not creating a "flying octopus" — a unification with no physical significance — when we glue together space and time.

Absolute space

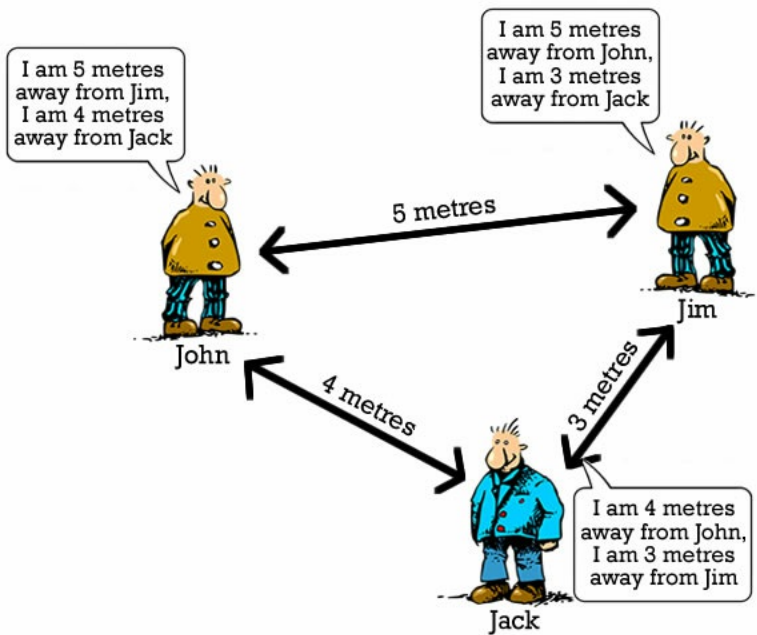
Let us now consider a concept which was introduced by Isaac Newton in the *Principia* which has implications for our quest to determine why there are three dimensions of space (or, equivalently, four dimensions of spacetime). As described in my first book, Newton was a firm believer in *absolute space*, the idea that space took the form of a permanent grid-like background inside which objects could move:



Essentially, absolute space represents a three-dimensional "box". Even if all the matter in the entire physical universe was removed, Newton believed absolute space would still exist as an entity in its own right. This certainly has consequences for our quest into the origin of three dimensions: is there a pre-existing three-dimensional "box"?

However, Newton's idea of absolute space has been categorically refuted. Instead, it is now accepted that individual observers — moving at constant velocity — can define their own *inertial frame of reference*, essentially defining their own set of coordinate axes. And the principle of relativity tells us that the laws of physics are the same for all observers — regardless of their velocity. Hence, every observer's frame of reference is equally valid: there can be no single definition of absolute space which can apply to all observers. An equivalent argument is that absolute space could be used to determine if an observer was absolutely stationary, but relativity tells us that there is no experiment which can distinguish between being stationary and moving at constant velocity.

Instead of absolute space, Newton's great rival Gottfried Leibniz proposed that space must be relative, with spatial positions emerging from the relationships between the objects within the universe:



In the model of relative space, space emerges from the properties of the objects **within** the universe. I believe this is an important clue in our quest to discover why there are three dimensions of space: we should expect three-dimensional space to **emerge** from the properties of the objects (fundamental particles) which compose the universe, rather than expecting the dimensions to already exist as some absolute background three-dimensional axes.

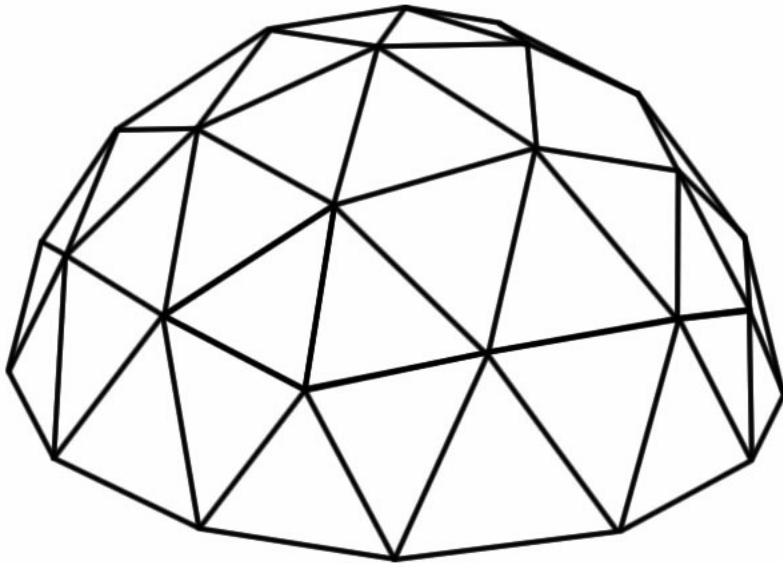
We will be returning to this theme in the final chapter.

3

THE GEOMETRY OF THREE DIMENSIONS

In this chapter, we will be considering the geometry of three-dimensional space. Is there anything particularly special about three-dimensional geometry? Does it possess any particular properties which are not shared by geometries in other numbers of dimensions?

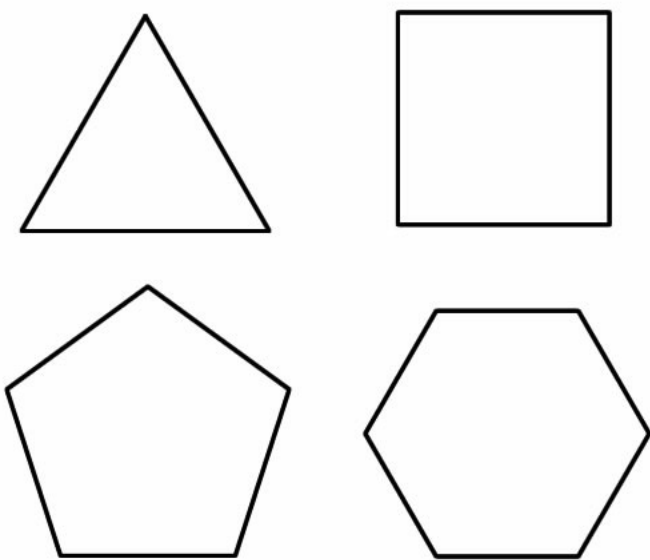
Let us start by considering *polygons*. A polygon is simply a shape composed of a connected sequence of straight lines forming a loop. A rectangle is an example of a polygon with four sides. The simplest polygon which can exist is the triangle with three sides (again: the magic number). Bearing this in mind, perhaps the number three is the smallest allowable number which can represent the existence of a physical body? A "number of sufficient magnitude"? The triangle is also the most stable physical shape which is widely used in construction and design, perhaps most notably in the *geodesic dome*. The geodesic dome is the most stable structure which can be produced from the least amount of materials.



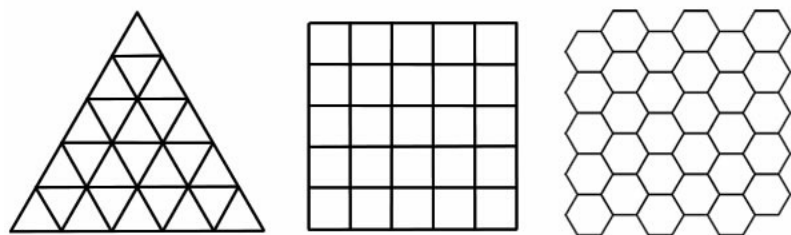
Does Nature take advantage of the strength of this triangle-based design principle? We will find out later.

Of particular interest are the *regular polygons*. These are polygons which have all sides equal, and all angles equal. A square is the regular polygon with four sides, and the equilateral triangle is the regular polygon with three sides.

The following diagram shows the regular polygons with three, four, five, and six sides (including the regular pentagon and the regular hexagon).



Interestingly, there are only three possible ways to tile a plane using regular polygons. The following diagram shows how this can only be achieved by using equilateral triangles, squares, and regular hexagons. Any other type of regular polygon (for example, a regular pentagon or regular octagon) cannot tile the plane.



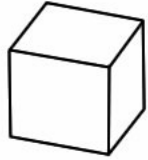
So there is that magic number again: the number three.

The Platonic solids

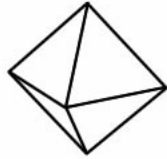
Let us now move from two dimensions into three dimensions. A three-dimensional object which is built from connected polygons is called a *polyhedron* (plural: *polyhedra*). As an example of a polyhedron, a cube can be constructed from six squares, one square on each face. A polyhedron which is constructed purely from regular polygons is called a *regular polyhedron*. Only five regular polyhedra exist in three-dimensional space. These are the tetrahedron, the cube, the octahedron, the dodecahedron, and the icosahedron. These five regular polyhedra are shown in the following diagram:



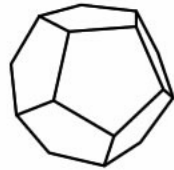
Tetrahedron
(4 faces)



Cube
(6 faces)



Octahedron
(8 faces)



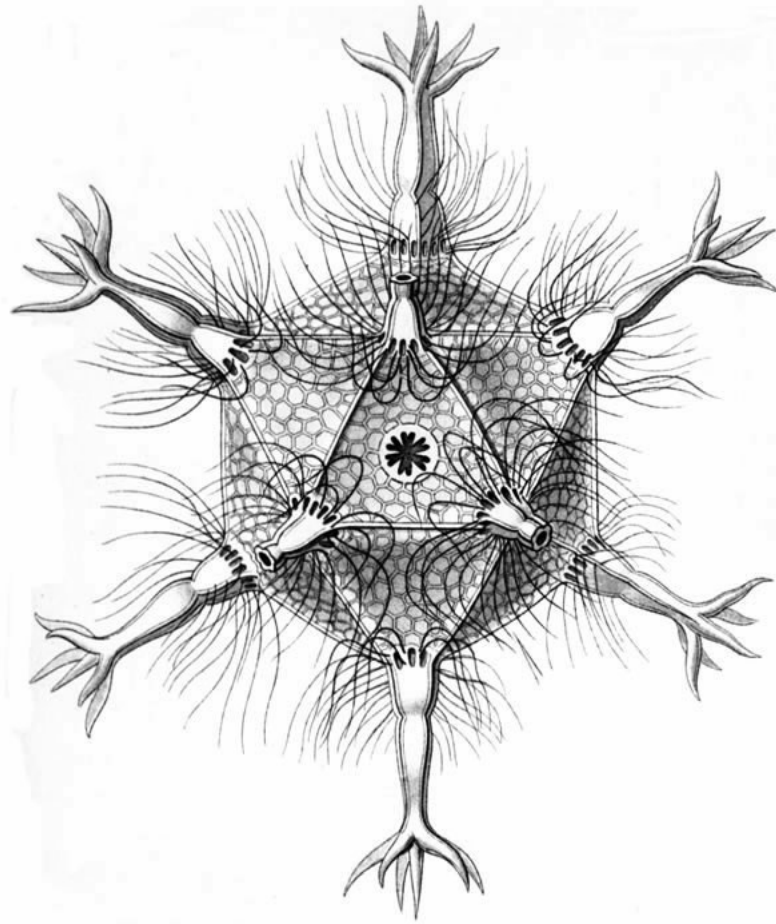
Dodecahedron
(12 faces)



Icosahedron
(20 faces)

These five regular polyhedra — the only regular polyhedra which exist — have been known since antiquity. They are more commonly known as the *Platonic solids*, named after the ancient Greek philosopher Plato. Plato considered these objects to be perfect forms, inhabiting a special realm of mathematical perfection. In contrast, all physical objects on Earth — such as balls and rough cubes — could only ever be approximations of these perfect mathematical forms.

Interestingly, Platonic solids appear in the natural world. As an example, the shape of *radiolaria* — single-celled marine life — can take the form of a regular icosahedron:



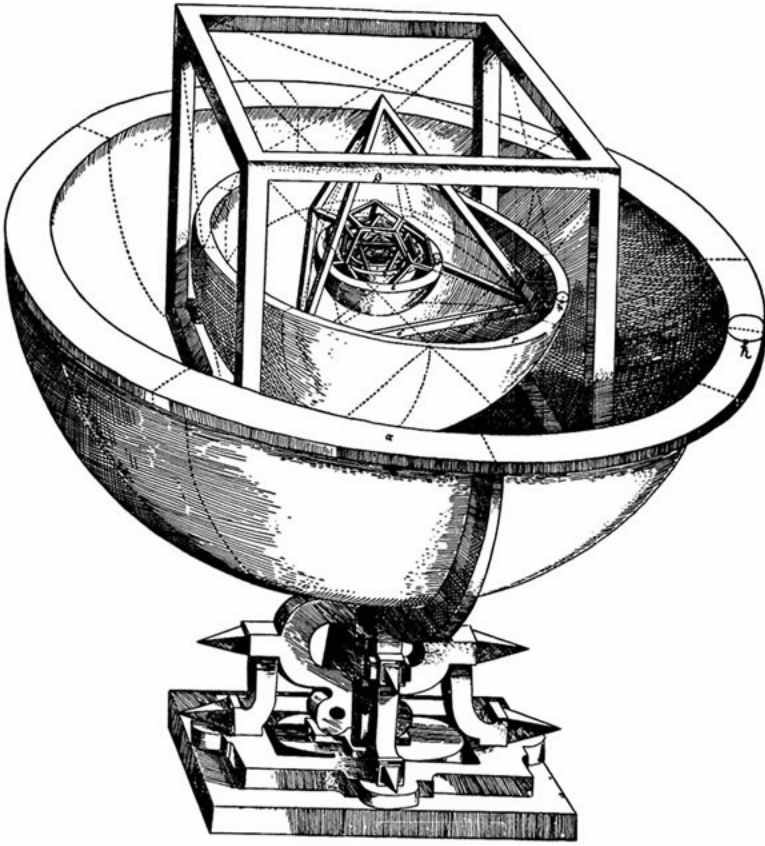
So, in radiolaria, we find an example of Nature taking advantage of the strength of a triangle-based design, just like the geodesic dome we considered earlier. In his book *A Beautiful Question*, Frank Wilczek considers the design of the herpes virus, which is another Platonic solid. He suggests that this is an example of the simplicity of Occam's razor: "This is a case of simplicity giving the appearance of sophistication, or more precisely of simple rules giving rise to apparently complex structures that on reflection become ideally simple. The point is that the DNA of viruses, which must instruct them in all facets of their existence, is very limited in size. To economise on the length of the construction manual, it helps to make your product from simple, identical parts, identically assembled. Because the part generates the whole, the virus does not need to know about dodecahedra, or icosahedra — but only about triangles, and a rule or two for latching them together."

Because all the faces of a Platonic solid are exactly the same, they are often used to make dice. As each face is identical, there is an equal chance of each face being selected. Hence, the dice are perfectly fair. You have surely seen a cube used to make dice, but the other four Platonic solids are also used to make dice for role-playing games:



As there are only five Platonic solids, there can only ever be these five fair dice.

In the 16th century, the German astronomer Johannes Kepler created a model of the Solar System in which the orbits of each of the then-known five planets related to one of the five Platonic solids. In Kepler's model, the Platonic solids were placed inside each other, and the outer edges of the solids was supposed to provide the correct orbital distance of the related planet. Again, this is based on Plato's idea of the Platonic solids representing some ideal form. The following diagram shows Kepler's model:



Kepler abandoned this idea as it was not accurate enough, but he did later calculate the formula for the correct motion of the planets, which was based on elliptical orbits.

The Platonic solids in higher dimensions

So far, we have considered geometry in two and three dimensions. However, as discussed in the previous chapter, we can consider the geometry of any number of dimensions. Of particular interest to us is the construction of Platonic solids in spaces with more than three dimensions. It is impossible to visualise such structures, but their construction follows the same rules as the construction of the Platonic solids in three dimensions: every side has to be a regular polygon, and every angle has to be the same.

What is particularly interesting is the number of Platonic solids which can exist in spaces with different numbers of dimensions. We have seen that only five Platonic solids exist in three-dimensional space. Perhaps it might be imagined that spaces with higher numbers of dimensions would permit greater numbers of Platonic solids to exist, but this is not the case.

We have just considered the three-dimensional case, with only five regular polyhedra — the Platonic solids — being possible in three dimensions.

As we move to consider greater than three dimensions, the polyhedra are now given the name *polytopes*. In four dimensions, it turns out that there are six regular polytopes. This is perhaps not very surprising: we have added another dimension, and discovered one extra regular polytope.

However, as soon as we go beyond four dimensions, the sequence changes completely. In five dimensions, there are only three possible regular polytopes. In six dimensions, there are — again — only three possible regular polytopes. In fact, for every number of dimensions greater than four, there are only three possible regular polytopes.

The mathematical physicist John Baez has considered the possible implications of this remarkable fact on his website: "You might think things would keep getting more complicated in higher dimensions. But it doesn't! Four

dimensional space is the peak of complexity as far as regular polytopes go. From then on, it gets pretty boring. This is one of many examples of how four dimensional geometry and topology are more complicated, in certain ways, than geometry and topology in higher dimensions. And the spacetime we live in just happens to be four-dimensional. Hmm." [5]

In that last sentence you can see that John Baez clearly considers it possible that this result has some significance as to why there are four spacetime dimensions. I also think this is a significant result, but only in a general sense. As John Baez says, it shows that the geometry of three and four dimensions has particularly interesting properties which are not shared by the higher dimensions. Cambridge University physicist John Barrow has published a comprehensive review paper entitled *Dimensionality* (a link is in the footnote[6]). In *Dimensionality*, Barrow examined the mathematical properties exhibited by the lower numbers of dimensions, "examining whether or not 3 and (3+1) dimensions lead to special results in pure mathematics. Remarkably, it does appear that low dimensional groups and manifolds do have anomalous properties."

We will be returning to consider the special geometrical properties of three-dimensional space in the final chapter, where we will be uncovering what I believe to be the truly important unique property possessed by three-dimensional space, and the reason why space must have three dimensions.

The stability of orbits

It is surprising that the three-dimensional geometry of space plays a central role in many equations in physics, in ways that are not immediately obvious. As an example, we can consider Newton's formula for the attractive gravitational force, F , between two masses, m_1 and m_2 :

$$F = \frac{Gm_1m_2}{r^2}$$

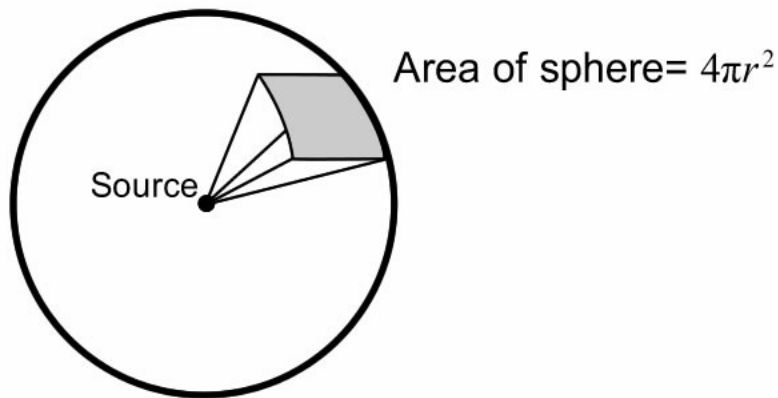
where G is the gravitational constant.

You will see that the distance between the two masses, r , is on the bottom line of the fraction. This means there is an inverse relationship between the strength of the gravitational pull between the two objects, and the distance between the two objects: if the objects are closer (the distance is smaller) then the force of attraction is larger, and if the objects are further away (the distance is larger) then the attraction is smaller. But what is particularly interesting is that in the equation, the distance r is squared.

In her book *Warped Passages*, Lisa Randall describes this effect: "It is known as an *inverse square law*, which means that the strength of gravity decreases with distance proportionally to the distance squared. For example, if you double the distance between two objects, the strength of their gravitational attraction goes down by a factor of four."

Why is the distance squared? In the case of inverse square laws we can see a very clear logic determining why these formulas have that form, and it is due to the three-dimensionality of space.

We can imagine a mass as being a "source" of a gravitational field, and a second mass will be attracted to that first mass of the basis of the strength of that field in the immediate locality of the second mass. We can also imagine a spherical region of space, with the source mass at the centre of that spherical region:



The gravitational attraction from the source mass is clearly going to be distributed evenly around the spherical region. As we move further away from the source mass, we can see that the spherical region will grow larger (the sphere will be larger). Hence, the influence of the source mass will become more and more diluted the further the distance from the source mass. So this is the true reason why gravity becomes increasingly weaker with distance.

The formula for the area of a sphere is $4\pi r^2$, where r is the radius of the sphere. So the sphere area — and hence the rate at which gravity weakens — is proportional to the square of the distance from the source mass (the square of the radius of the sphere). So now we see the true origin of the inverse square law of the force of gravity: it is caused by the dilution of the effect of the source as it radiates into three-dimensional space. And because of the purely geometrical nature of this effect, the inverse square law also applies to many other phenomena such as the weakening of an electric field, or light, or sound.

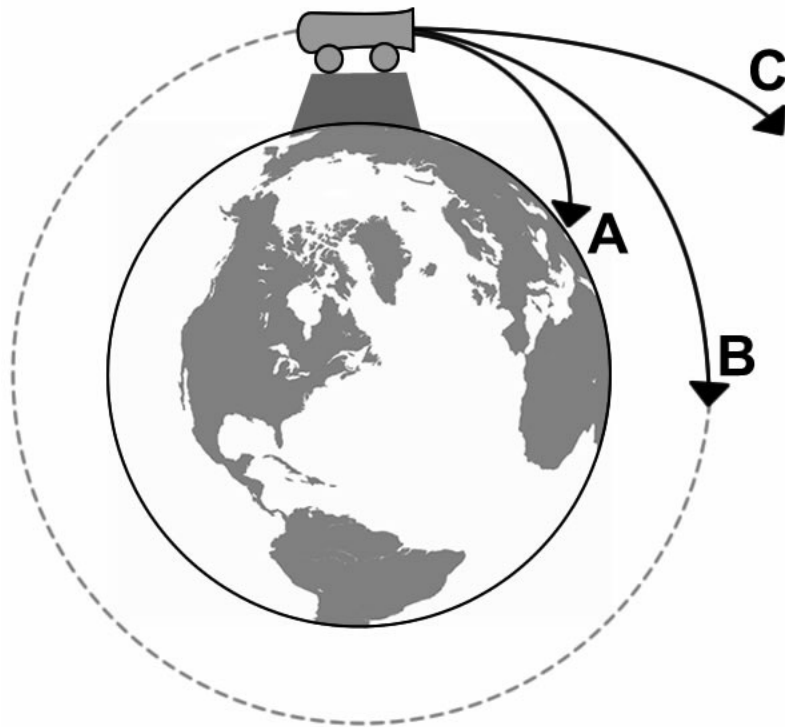
As Lisa Randall says in *Warped Dimensions*: "The way in which the gravitational force law depends on distance, which is encoded in Newton's inverse square law, is intimately connected to the number of spatial dimensions. This is because the number of dimensions determines how quickly gravity diffuses as it spreads out into space."

But what if there are more than three dimensions of space? For example, what if there were four dimensions of space? In that case, gravity would no longer be described by an inverse square law, instead it would be described by an inverse cube law. This would result in the force of gravity varying with distance at a greater rate: in four dimensions, gravity would become very much stronger if objects moved closer together, and would become very much weaker if objects moved further apart. This effect would become even more pronounced if there were more than four spatial dimensions. [7]

We will now consider the important consequences of this fact for the stability of the planetary orbits (such as the orbit of the Earth around the Sun).

It was Isaac Newton who first realised that objects could be placed into stable gravitational orbits. Newton came to this conclusion by considering an ingenious thought experiment which is now known as *Newton's cannonball*.

Newton imagined an enormous cannon on top of a very high mountain. The cannon is aimed in a direction which is perfectly parallel to the Earth's surface (see the following diagram). Newton realised that if the cannon fired a cannonball at a low speed then it would reach the surface of the Earth after having travelled just a few miles, following trajectory A in the following diagram. Newton also realised that if the cannonball was fired at a tremendously high speed then it would travel straight into space along trajectory C. Newton's great insight was that there had to be an intermediate speed between those two velocities which would result in the cannonball following trajectory B in the following diagram:



You can see from the diagram that if the cannonball follows trajectory B it will travel on a course which will take it completely around the Earth back to its starting point. Hence, that cannonball could be placed into a perpetual stable orbit around the Earth.

The speed at which the cannonball (or any object) must be fired to remain in that orbital path is called the *orbital velocity*.

Let us now consider the forces involved when an object is in orbit. Let us consider a satellite — for example, the International Space Station — in orbit around the Earth. I suspect it is generally believed that satellites such as the International Space Station stay in orbit in space because gravity is virtually non-existent in space, so satellites are weightless. This is most certainly not the case. The International Space Station is in orbit only 250 miles above the surface of the Earth. I live in the west of Britain, which is not a large country, but I am frequently nearer the International Space Station than I am to London. At that low height, the force of gravity is only slightly weaker than it is on the Earth's surface (the strength is actually 88% of the strength of gravity on the surface of the Earth). If you dropped an object from that height, it would most certainly fall toward the Earth at great speed.

No, the reason the International Space Station (and all other satellites) stay in orbit is because they are travelling so fast — as anyone who has seen the International Space Station shooting across the night sky will agree.^[8] The International Space Station is travelling at 17,100 mph. As you know, if you have a heavy bucket attached to a rope, and you swing the bucket around yourself, it will feel as if the bucket is pulling on the rope. This apparent outward force is called *centrifugal force*.^[9] It is this force which holds the satellite in orbit above the surface of the Earth. The formula for the value of the centrifugal force, F , is:

$$F = \frac{mv^2}{r}$$

where m is the mass of the orbiting object, v is the velocity of the object, and r is the orbital radius.

Now let us consider the stability of an orbit. What would happen if the International Space Station slowed

slightly, maybe after being hit by a rock? This would result in a considerable reduction of centrifugal force which, as we see from the formula, is proportional to the square of the velocity of the satellite. Gravity remains as strong as ever, so would this reduction in centrifugal force result in the satellite rapidly plummeting to the Earth, in an ever-accelerating descent? In other words, is the orbit unstable?

Well, the quick answer is no. And this is because of the law of conservation of angular momentum. The formula for angular momentum, L , is given by:

$$L = mvr$$

so:

$$v = \frac{L}{mr}$$

This formula shows that as the radius of the orbit gets smaller, the velocity increases (given that angular momentum is conserved: the value of the L term stays constant). This is the same principle as an ice skater spinning on the spot, who brings their arms in closer together in order to spin faster.



The smaller radius brings greater speed, and it is this greater speed which saves the International Space Station from plummeting to its doom.

Let us substitute this value of v into the earlier formula for centrifugal force to get:

$$F = \frac{m}{r} \left(\frac{L}{mr} \right)^2 = \frac{L^2}{mr^3}$$

This shows that the value of the centrifugal force varies as the inverse **cube** of the distance, r . But we know that gravity only varies as the inverse **square** of the distance. So as the satellite moves closer to the Earth, gravity

increases — but the centrifugal force increases quicker. Hence, at a certain distance, the value of the centrifugal force will increase so that it balances gravity again. The International Space Station will be saved!

This analysis has shown that orbits are stable: a slight variation in velocity will not result in a satellite plummeting downwards.

However, as explained earlier, the strength of gravity is strongly dependent on the number of spatial dimensions. So this result suggesting the stability of orbits is only applicable in three dimensions. As explained earlier, if there are more than three dimensions then gravity becomes very much stronger as objects move closer together. This effect would overwhelm the increase in centrifugal force, so nothing could prevent gravity from pulling the satellite to its doom.

In other words, orbits are only stable in three dimensions.

Anthropic theories

The stability of orbits might just be regarded as a fortuitous consequence of three-dimensional space. However, the stability of orbits also has a surprising interpretation: it appears to mean that life can only develop in three-dimensional space. As John Barrow said in *Dimensionality*: "If hundreds of millions of years in stable orbit around the Sun are necessary for planetary life to develop then such life might only develop in a three-dimensional world."

This restriction is also the case for fewer than three dimensions. Max Tegmark, a physicist at MIT, has suggested that intelligent life could not exist in only two dimensions of space because "two nerves cannot cross."^[10] This theme was continued in John Barrow's book *The Constants of the Universe* in which he considered the difficulties of life in two dimensions. For example, a two-dimensional creature would be split into two pieces by its digestive system:



If you are not convinced that the evolution of intelligent life requires the existence of planets in stable orbits, perhaps you might be convinced by the fact that the three-dimensional restriction also applies to the orbits of electrons around the atomic nucleus. Atoms simply could not exist if there were more or less than three dimensions of space. How could life develop in a universe with no atoms? With no chemistry? As John Barrow says: "If we assume the structure of the laws of physics to be independent of the dimension, stable atoms, chemistry, and life can only exist in fewer than four spatial dimensions."

Because of life's apparent requirement for three-dimensional space, in 1955, the English cosmologist Gerald Whitrow was the first to propose a radical idea.^[11] Whitrow considered the stability of orbits and realised that the evolution of life would have been impossible if the universe had not permitted stable orbits. For this reason, Whitrow proposed that the universe **had** to have three dimensions, for the simple reason that life could not have evolved in any other type of universe, and so we simply would not exist in order to observe the universe. Whitrow's

idea has come to be known as the *anthropic principle*.

It is the case that several other crucial fundamental constants — most notably the *cosmological constant* — appear to be set to life-friendly values. According to the basic form of the anthropic principle, we should not be at all surprised that that is the case. After all, it could be no other way.

In its most basic sense, the anthropic principle merely states the obvious: the universe clearly has to be amenable to life (with the fundamental constants set to life-friendly values) or else we simply would not exist, and so would not be observing the universe. It is virtually impossible to disagree with this form of the anthropic principle, which should be regarded as a tautology.

However, there is a complicating factor. As it appears to be the case that the fundamental constants could conceivably possess values which are not life-friendly, then the emergence of a life-friendly universe appears to be an extremely fortuitous coincidence. And physicists instinctively don't like coincidences. Coincidences appear to indicate some deeper — or external — unknown mechanism.

In an attempt to explain-away the coincidences, some physicists have proposed a particularly controversial version of the anthropic principle. It has been suggested that there are many separate universes — forming a *multiverse* — with the fundamental constants being set to different values in each individual universe. Hence, we should not be surprised to observe life-friendly conditions in our universe.

This version of the anthropic principle eliminates the coincidences: we just happen to inhabit one of many different universes, a universe which must have life-friendly conditions. But there is clearly a price to be paid in terms of the proposed (and unobserved) multiverse of many (possibly an infinity) different unobserved universes. For this reason, you might imagine that this strong form of the anthropic principle would be generally unpopular, generating little interest.

However, for many physicists, and in many particular areas of fundamental research, quite the opposite has happened. Not only has the strong anthropic principle been welcomed, but it is seen as being capable of providing an explanation for many intractable problems: "Why are there three dimensions of space? Because there are an infinity of universes with different numbers of dimensions of space, and humans could have only evolved in one of those universes which had three dimensions."

On that basis, the anthropic principle solves everything! We might as well retire from physics and spend the rest of our lives down the beach. There are no more problems to be solved.

However, I hope you realise that this forms a very unsatisfactory form of "explanation". Indeed, it does not really resemble an explanation at all, not in the true sense of conventional analytical physics. In his book *The Trouble with Physics*, Lee Smolin regrets the adoption of the anthropic principle by some physicists: "because it has been understood for some time that it is a very poor basis for doing science." Joseph Conlon includes a memorable criticism in his book *Why String Theory?:* "While the anthropic principle is not vacuous, it can be seductive. It offers the dangers of the open cookie jar at Fat Camp — the soft route of easy temptation. It also encourages a solipsistic attitude to science. For example, I could ask why the Cuban missile crisis did not end in mutual assured destruction, with a nuclear conflagration that destroyed the world. If I felt sufficiently brazen, I could respond that the answer is the anthropic principle. If a nuclear war had occurred in 1962, my parents are unlikely to have met a decade later, and I would never have been born in 1981. However, many would feel that the fact that I am right now contemplating the marvel of my own existence is not a satisfactory explanation for why Kennedy and Khrushchev managed to avoid taking their respective nations to war."

For this book, I conducted a survey of existing theories as to why there are three dimensions of space. And, unfortunately, I have to say that the anthropic approach dominates these theories. As well as the previously-discussed stability of orbits, other examples of these anthropic theories include:

- In space with four or more spatial dimensions, all stars either collapse into black holes, or disperse. And no stars means no people. [\[12\]](#)
- Only a three-dimensional universe would expand at a rate which would allow the formation of large-scale structures such as galaxies. [\[13\]](#)
- Waves only travel without distortion or reverberation in three-dimensional space. As John Barrow says in *Dimensionality*: "Three-dimensional worlds appear to possess a unique combination of properties which enable information-processing and signal transmission to occur via electromagnetic wave phenomena ... This situation has led many to suppose that life could only exist in an odd-dimensional world because living organisms require high-fidelity information transmission at a neurological or mechanical level." In other words, no information processing means no people.

I get the impression that anthropic theories such as these are invoked when a problem seems so difficult — so impossibly insurmountable — that it is hard to conceive of any conventional analytical solution. Anthropic theories could then be thought of as "theories of last resort". However, I would suggest it is best never to resort to such theories.

Instead, if we really want to solve the problem of why there are three dimensions of space, we are going to need the highest-quality science. Let us start with our best theory of the geometry of space ...

4

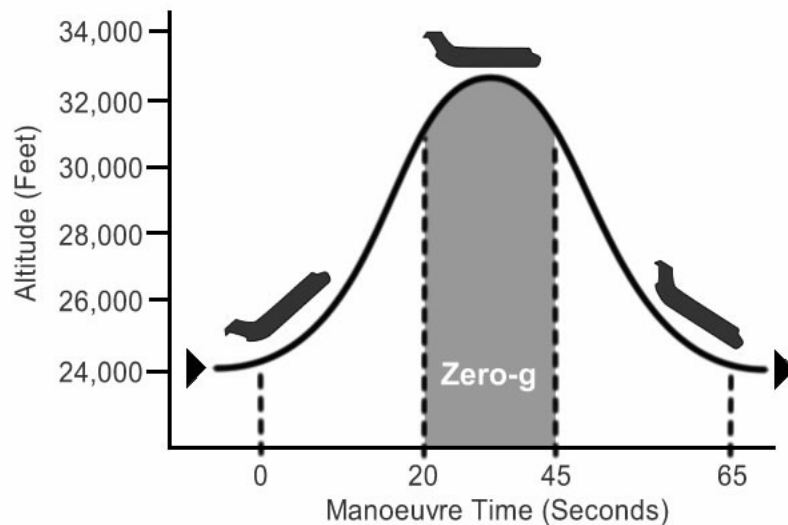
GENERAL RELATIVITY

In November 1907, Albert Einstein was sitting in a chair in the patent office in Bern where he worked as an assistant examiner. According to Einstein: "All of a sudden, a thought occurred to me. If a person falls freely, he will not feel his own weight." This was the thought which started Einstein on the eight-year road to formulating his great theory of general relativity. Later, he was to call this the happiest thought of his life.

In this book, we are considering clues as to why there are three dimensions of space. As general relativity remains our best theory of space and time — a hundred years after it was discovered — in this chapter we will consider general relativity in some depth.

The idea of a free-falling person not feeling their own weight may not seem to be a particularly surprising or inspiring thought. Indeed, it is a concept which seems so familiar to us that we would take it for granted, and think no more of it. However, as Nobel Prize-winning chemist Albert Szent-Györgyi said: "Scientific discovery consists of seeing what everyone else has seen, but thinking what no one else has thought."

Perhaps we can understand Einstein's insight by considering the modern-day equivalent of his falling man thought experiment, which would be a *reduced-gravity aircraft* flight. A reduced gravity flight gives its occupants (sometimes prospective astronauts, but more often simple thrillseekers willing to pay the \$5000 price) a brief experience of genuine weightlessness (approximate duration of 25 seconds). The flight involves a steep climb and then a rapid descent.



The force of gravity at the bottom of the hump is roughly twice as large as normally experienced. The plane then starts to climb and the sequence starts over again. There are typically 40-60 manoeuvres in a flight. This results in approximately two thirds of the passengers feeling nauseous. Hence, these aircraft have been nicknamed the "vomit comets".

The following NASA photograph shows Stephen Hawking's zero-g flight in 2007.



What the vomit comet (and Einstein's thought experiment) reveals is that it is possible to eliminate the force of gravity purely by placing objects in an accelerated environment. This appears to reveal a fundamental equivalence between gravity and acceleration. This so-called *equivalence principle* means that a passenger in a spaceship in a weightless environment in deep space will feel the force of gravity if the spaceship is accelerated (the passenger will be pushed into their chair).

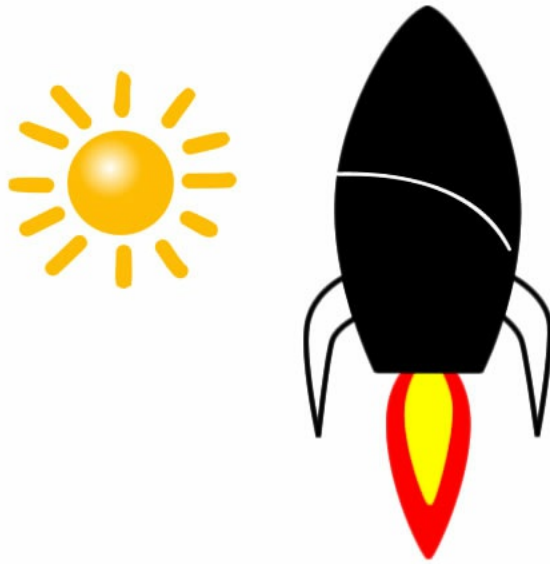
NASA are considering building a spaceship which generates its own artificial gravity by continuously rotating, rotation being a form of acceleration. However, the equivalence principle tells us that this is no "artificial" gravity — no, **gravity and acceleration are precisely the same thing**. There is nothing "artificial" about this artificial gravity — it genuinely is the force of gravity.

Einstein stated this equivalence principle in 1907: "We assume the complete physical equivalence of a gravitational field and a corresponding acceleration of the reference system."

The curvature of space

The equivalence principle means that if we consider a spaceship in deep space in a weightless environment, and if we then consider that spaceship being accelerated, then the effect on the objects inside that spaceship will be precisely equivalent to the force of gravity. So let us imagine that there is a small window in the side of the spaceship through which light from a nearby star is entering the spaceship. According to the point-of-view of a passenger in the spaceship, the beam of light entering through the window appears to curve to the floor as the spaceship accelerates (as the light crosses the spaceship, it moves closer to the floor as the spaceship accelerates upward).

The following image shows this curved beam of light inside the spaceship:



We know from the equivalence principle that this accelerated spaceship is effectively experiencing the force of gravity. So the light appears to be dropping to the floor under the influence of gravity. This is quite a revelation: the path of light is affected by the force of gravity. Indeed, it was the observed deflection of starlight around the Sun during a solar eclipse which provided the first confirmation of the accuracy of general relativity.

But we know that light always tends to travel in a straight line through space (in fact, as we shall shortly see, light is actually travelling the shortest distance between two points — which usually happens to be a straight line). So if light truly is continuing to travel in a straight line through space under the influence of gravity, then this implies that **space itself must be curved**.

This is the main message of general relativity: **the effect of gravity is caused by the curvature of space** (actually, the curvature of spacetime). We will see later in this chapter precisely how this curvature of space causes the forces we associate with gravity.

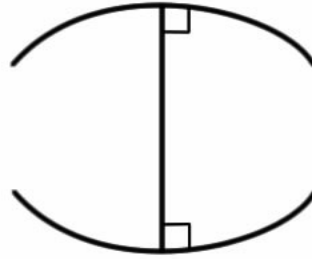
In the later years of his life, Einstein explained his thought processes to his youngest son Eduard. Describing his insight that gravity was the curving of spacetime, he said: "When a blind beetle crawls over the surface of a curved branch, it doesn't notice that the track it has covered is indeed curved. I was lucky enough to notice what the beetle didn't notice."

Tensors

Once Einstein realised that gravity was caused by the curvature of space, he was faced with the task of expressing that curvature mathematically (so it could be included in the eventual final equation). Einstein's mathematical skills were good, but he was not a professional mathematician, and he realised he needed help. So, in 1912, Einstein called on his old friend Marcel Grossman.

Grossman had taken the class notes when Einstein had missed the mathematics lectures at the Zurich Polytechnic. According to Walter Isaacson in his biography of Einstein, Einstein had scored 4.25 out of 6 in his geometry class at the polytechnic, while Grossman had scored a perfect 6.

Grossman was very excited when Einstein asked for his help to describe the curvature of space in a mathematical form. Grossman consulted the literature, and discovered that Einstein required *non-Euclidean geometry* to describe the curvature. Euclidean geometry is the conventional geometry taught in schools based on lines, squares, circles, etc. drawn on a flat plane. However, non-Euclidean geometry extends this geometry to consider shapes drawn on curved surfaces. The resultant geometry can appear very counter-intuitive. For example, the interior angles of a triangle can sum to more or less than 180° when drawn on a curved surface, and parallel lines can eventually meet.

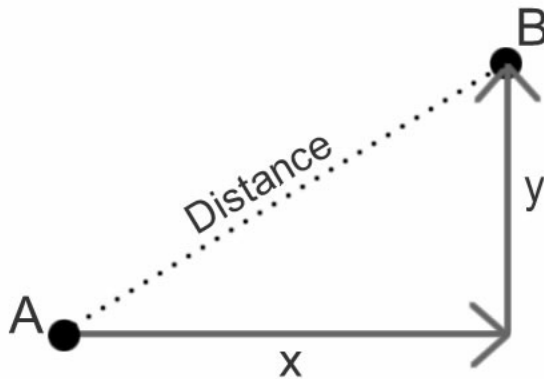


In the previous diagram, we might imagine the sphere as representing the Earth. We can then imagine two explorers at different positions on the Equator, and they both decide to walk in a straight line in a precisely northerly direction (along the lines shown in the diagram). The paths they take will gradually become closer together until they eventually meet at the North Pole. We might interpret this apparent attraction between the explorers as being due to the force of gravity, but really they are just following straight lines along curved space. It is the curvature of space which introduces gravity.

As we move off the two-dimensional plane and consider the possibility of non-Euclidean geometry in higher dimensions, the important factor for describing those spaces mathematically is how we measure the distance between two points. As we shall see, this is because — in curved space — the shortest distance between two points can be different from the distance in flat space.

As was described in Chapter Two, the mathematical formula for the shortest distance between two points is called the *metric*. Firstly, let us see recap how this metric is defined on a two-dimensional flat surface.

In the following diagram, imagine we want to travel from point A to point B via the shortest possible route (the shortest possible route between two points in geometry is called a *geodesic*). The shortest distance between the two points is shown by the dotted line. You will see that travelling from point A to point B necessitates travelling a distance x horizontally, and a distance y vertically:



This forms a right-angled triangle, so from Pythagoras's theorem we could calculate this distance as the square root of x^2 plus y^2 . So this gives us our metric on a flat two-dimensional plane:

$$d = \sqrt{x^2 + y^2}$$

However, this metric is not necessarily the same for curved surfaces. In order to see why that can be the case, consider an aircraft flying from Seattle to Zurich (see the following diagram). Clearly, the airline will want the

aircraft to take the shortest possible route (to save fuel). It so happens that Seattle and Zurich both lie at the same latitude (47° North), which implies that Zurich is precisely east of Seattle. We might therefore expect the aircraft to fly in a precisely easterly direction (which we might consider to be the horizontal x direction). On flat space, this would be correct: in the following diagram we would expect the aircraft to follow one of the many circular lines of latitude which are drawn in light grey around the globe:



However, because the surface of the Earth is curved, you will see on the diagram that the route the aircraft takes is not the easterly route along one of the lines of latitude. Instead, the aircraft takes a more northerly route, as far north as Greenland (the route is shown by the curved black line on the diagram). [\[14\]](#)

So, whereas on a flat surface, the shortest distance between Seattle and Zurich would simply have been the distance in the easterly (x) direction, the situation is more complicated for curved surfaces. On a curved surface, the shortest route might be very different.

Grossman realised that Einstein would need to use *tensors* to describe curvature in his eventual equation for general relativity. A tensor is similar to a *vector*, and vectors were introduced in my previous book. A vector is a column matrix — a matrix (a rectangular array of numbers) which has just one column:

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

In my previous book, we saw how vectors can be used for representing points in space. For example, the vector shown above could be used to represent the point with the coordinates (x, y, z) .


A tensor is the more general case of the vector. For our purposes, we can consider a tensor as being a two-dimensional array of numbers. For example, a flat surface is represented by the following *metric tensor*:

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

A metric tensor allows us to compute the distance between two points in any space.

So why is this the metric tensor which describes a flat surface? Well, let us imagine you are an aircraft pilot, and you want to know how far you will actually travel (and therefore how much fuel you will use) if you travel a certain distance in the easterly (x) direction, and a certain distance in the northerly (y) direction. On a flat surface, the formula which calculates the distance you will actually travel — the metric — is given by:

The metric tensor



$$d^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x^2 \\ y^2 \end{bmatrix}$$

This formula is in the form of a matrix multiplication (a tensor multiplying a column matrix), so let us perform the matrix multiplication and see what we get (the technique of matrix multiplication was described in my previous book).

When we multiply the matrices, we get:

$$d^2 = x^2 + y^2$$

which means:

$$d = \sqrt{x^2 + y^2}$$

which, as we saw previously is the metric for a flat two-dimensional plane (which we calculated previously from Pythagoras's theorem).

So we have, indeed, discovered the metric tensor for a flat surface, and it is:

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

But space has three dimensions. What if we want to calculate the distance travelled (and the fuel used) by the aircraft as it not only moves along the surface, but also flies up into the air? In that case, we have to consider a third (z) dimension, and our metric tensor becomes a 3×3 matrix:

$$d^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x^2 \\ y^2 \\ z^2 \end{bmatrix}$$

You will see the metric tensor for three-dimensional flat space has a similar form to the two-dimensional case (a *diagonal matrix*: all the elements which are not on the main diagonal are set to zero).

But Einstein knew that special relativity implied that the universe is not built on just the three dimensions of space — it is built on the four dimensions of spacetime. So Einstein knew that the metric tensor describing the curvature of four-dimensional spacetime would have to be a 4×4 matrix.

But, before we consider the necessary matrix, we have to ask the question: how do we actually measure distance in spacetime? Well, the distance travelled by an observer in spacetime can be measured simply as the elapsed time measured on a clock carried by that observer (this is called *proper time*).

This has an interesting consequence: even for an observer who is stationary in space, the clock will continue to show the passing of time, meaning that the observer is actually travelling in spacetime. As explained in my third book, even a stationary observer is actually moving at the speed of light in spacetime. This means that, if the clock of a stationary observer shows that a time t has passed, the observer will actually have travelled a distance ct in spacetime (where c is the speed of light).

There is an additional factor we have to consider. According to special relativity, an observer who travels at high speed (for example, close to the speed of light) will experience less time passing than an observer who remains stationary. This is the principle of *time dilation*. For example, consider an astronaut who flies off from Earth reaching nearly the speed of light. When that astronaut returns to Earth, he will have aged less than an observer who has remained on Earth. Special relativity has therefore revealed that the greater the distance you travel through space, the less distance you will travel through time — and vice versa. As far as the metric tensor is concerned, this means the element of the tensor which multiplies the time component must be the opposite sign (positive or negative) to the sign of the element which multiplies the space component.

To see this, the following diagram shows the metric tensor needed to describe flat (uncurved) spacetime. You will see that the single element in the tensor which multiplies the time component is positive (+1), whereas the three elements which multiply the space components are negative (-1): [\[15\]](#)

The metric tensor



$$d^2 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix} \begin{bmatrix} (ct)^2 \\ x^2 \\ y^2 \\ z^2 \end{bmatrix}$$

When we perform the matrix multiplication, we get:

$$d = \sqrt{(ct)^2 - x^2 - y^2 - z^2}$$

which is the correct formula for distance in a flat (uncurved) spacetime. For a curved spacetime, the metric tensor would be different and so the formula for spacetime distance would also be different. [16]

What is more, **all** observers — no matter how they are moving — will agree on the same measured spacetime distance, d . Einstein realised this property was essential: relativity tells us that all frames of reference should be considered equally valid. No observer can claim that his frame of reference (and any single set of coordinate axes) are preferred over any other observer's frame of reference (in Chapter Two it was explained how there can be no absolute time and space in the universe, no single reference for time and space). By using this tensor formulation, the equation would apply to all observers — no matter how they were moving. As we have just seen, it is possible for tensors to produce invariant values on which all observers can agree. Therefore, no single observer — and no single set of coordinate axes — is special or preferred in any way.

Einstein called this invariant property of tensors *general covariance*. Much of the eight years Einstein spent developing general relativity was spent ensuring his equation had this property of general covariance.

Tidal forces

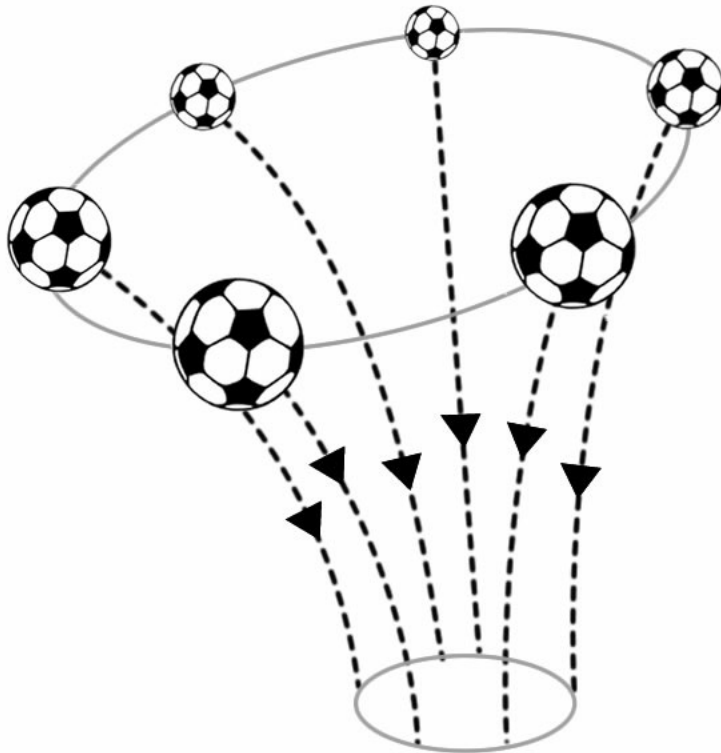
As we saw earlier in our discussion of the equivalence principle and the "vomit comet", it is possible to virtually eliminate the effect of gravity if an object is in free-fall. However, it is actually quite difficult (effectively impossible) to completely eliminate the effect of gravity. That is because space possesses curvature, and that curvature means objects never fall in precisely the same direction — even in a vomit comet. In other words, the geodesic lines of objects never point in exactly the same direction. It is very difficult to choose a region in which space is completely flat (uncurved). But by choosing a very small region — for example, the interior of a vomit comet — space will be approximately flat. To see why, consider a very small region on the surface of a sphere. A small region will be approximately flat (for example, we feel the Earth is flat when we inhabit just a small region of its surface), but there will still be a small degree of curvature present in that small region which can never be completely eliminated.

This ever-present curvature of space can never be completely eliminated in an accelerated frame. The

gravitational effects of this curvature are, therefore, the true effects of gravity, and it is these effects we want to consider. These effects are called *tidal forces*.

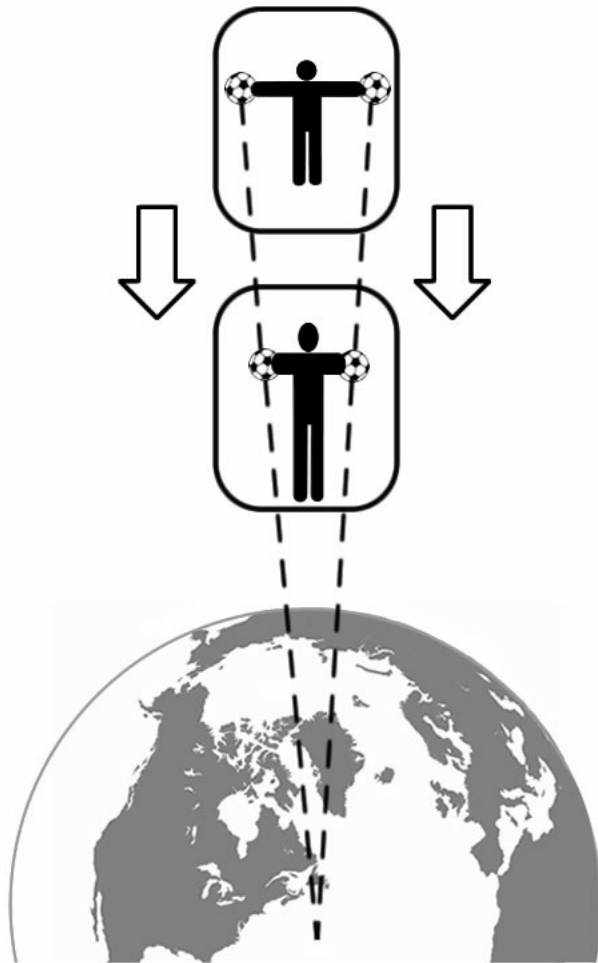
These tidal forces emerge when objects fall along lines (geodesics) which point in **different** directions — not the same direction. Hence the saying "gravity is caused by the **curvature** of spacetime".

In the following explanation of tidal forces, we will be considering the movement of a number of footballs (soccer balls) as they each follow their geodesic lines through space. The resultant deformation in the arrangement of the footballs will reveal the action of gravity on structures.



To see the effect of these tidal forces (due to curvature), we need to consider a larger region of space. So consider an observer inside an extremely large elevator, floating freely in space a few hundred miles above the surface of the Earth. Not only will the observer be floating in a weightless situation, but any objects with him in the elevator will also be floating. Imagine there are two footballs in the elevator with the observer. These are floating by the side of the observer, with the balls separated by a certain distance. As was explained earlier, by considering the motion of these footballs in free-fall, we can learn about the behaviour of gravity.

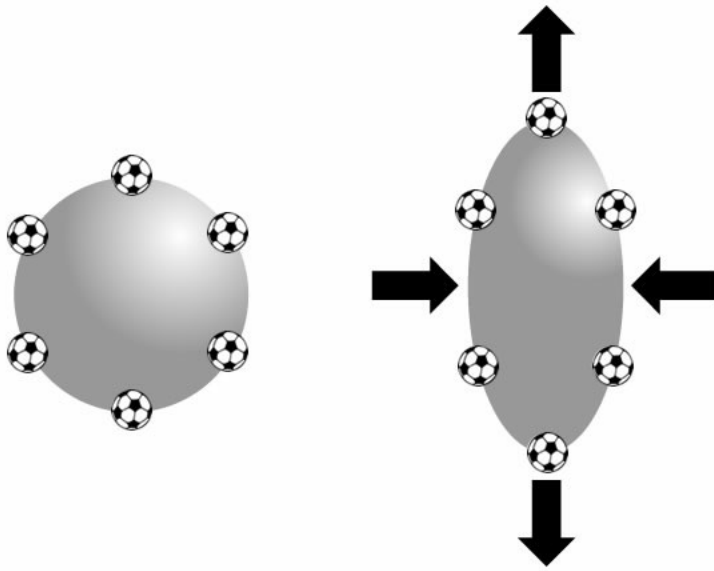
As the elevator continues on its free-fall journey toward the Earth's surface, both the observer and the footballs will be attracted toward the precise centre of the Earth. The footballs follow their geodesics towards the centre of the Earth. This will inevitably result in the paths of the balls slowly converging (see the following diagram — the geodesics of the footballs are denoted by dashed lines). From the point of view of the observer, he will see the balls floating on either side of him, and then he will see those balls slowly drifting together as they follow the converging geodesics:



As well as the balls slowly drifting together, there is also a stretching of the observer in the vertical direction (also shown on the diagram). This is due to the difference in the strength of gravity in the vertical direction. This stretching effect is called *spaghettification* and is the effect which will kill you if you are unlucky enough to fall into a black hole. Remember: in free-fall (falling into a black hole, for example) you do not feel the effect of gravity — you only feel the tidal forces, and it is those tidal forces which will rip you to shreds.

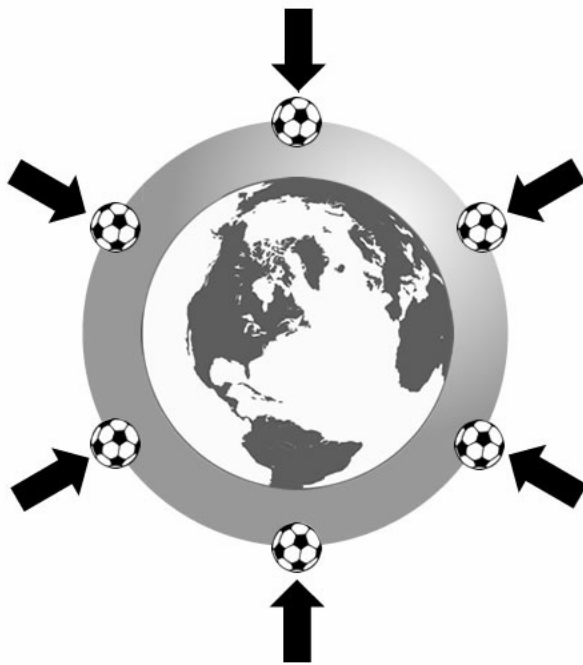
In order to discover the effects of these tidal forces on three-dimensional objects, let us replace our observer in the elevator with a very large rubber weather balloon. The footballs are now glued around the edge of the balloon, so that the movement of the footballs (in free-fall along their geodesics) controls the shape of the balloon.

As in the previous example with the observer, the effect of the tidal forces is to squeeze the balloon horizontally, while stretching it vertically. The balloon therefore forms an elliptical shape:



Crucially, even though the balloon forms this elliptical shape, **the volume of the balloon does not change**. Even though the balloon is squeezed around the middle, it is stretched at its ends, and the end result is a volume which is unchanged. Another crucial point is that there is nothing — no mass — inside the balloon (apart from air). So in this situation in which the balloon is empty, the volume of the balloon does not change due to the tidal forces.

Now let us put some mass in the balloon. In fact, we will put a lot of mass in the balloon. Imagine a balloon considerably larger than the Earth, and let us put the Earth inside the balloon. Again, some footballs are glued around the edge of the balloon so that — as the footballs fall along their geodesics — we can observe the effect on the shape of the balloon.



As you can see from the previous diagram, the footballs all fall along their geodesics (straight lines directed to the centre of the Earth). So, in this case, there **is** a volume reduction in the size of the weather balloon.

Einstein realised he would have to capture this volume-reducing effect of gravity (due to the presence of mass) in his equation for general relativity. The tensor which can be used to describe volume reduction of an element of space is called the *Ricci tensor* (pronounced "Reechy") which we will denote by $R_{\mu\nu}$.

The rate of volume reduction (described by the Ricci tensor) is then proportional to the mass inside that volume. The distribution of mass (and therefore also the distribution of energy via the conversion equation $E=mc^2$) is described by the *energy-momentum tensor*, $T_{\mu\nu}$. This gives us the following equation:

$$R_{\mu\nu} = k T_{\mu\nu}$$

where k is some proportionality factor. It turns out that k must be equal to $8\pi G$ (in order to agree with Newtonian gravity). So the equation then becomes:

$$R_{\mu\nu} = 8\pi G T_{\mu\nu}$$

This equation was Einstein's initial proposal for the general relativity equation. Essentially, what it is telling us is something quite simple: it is telling us that the curvature of space (spacetime) is proportional to the mass (and energy) contained within that volume of space.

However, Einstein realised there was a problem with this initial proposal for a general relativity equation. The problem was due to the law of conservation of energy. Let us first consider the right hand side of the equation, which deals with the distribution of mass and energy. The law of conservation of energy states that the amount of energy in a closed volume of space must remain constant over time. The right hand side of the equation satisfies this law because if we consider the derivative of the energy-momentum tensor (the derivative is the rate of change of a value over time) then we find that it is equal to zero: the amount of energy in the volume does not change over time, i.e., energy is conserved. We can express this as:

$$\nabla T_{\mu\nu} = 0$$

where the ∇ symbol represents the derivative. [\[17\]](#)

However, the derivative of the Ricci tensor is not zero, so Einstein's equation could not be correct (the derivative of the right hand side of the equation was zero, but the derivative of the left hand side of the equation was not equal to zero). Instead, the derivative of the Ricci tensor, is:

$$\nabla R_{\mu\nu} = \frac{1}{2} R \nabla g_{\mu\nu}$$

where R on the right hand side is called the *Ricci scalar* (it is derived from the Ricci tensor, and it is just a number which is not zero if the surface is not flat), and $g_{\mu\nu}$ is the metric tensor which we considered in the previous section.

Einstein realised he could take the right hand side of the equation over to the left hand side, changing its sign in the process, and taking the derivative outside the bracket (as it was a factor which was common to both terms):

$$\nabla(R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu}) = 0$$

We see we are now taking the derivative of the expression inside the bracket, and the result of that derivative is zero. We saw earlier that the derivative of the energy-momentum tensor is also equal to zero. So Einstein realised that these two terms (on which the derivative was being applied) were equivalent. This meant:

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} = T_{\mu\nu}$$

We also need to include the previous $8\pi G$ proportionality factor:

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} = 8\pi G T_{\mu\nu}$$

And that's it! That is Einstein's equation for general relativity, the derivation of which is generally considered to be the greatest scientific achievement in the history of humanity. It is called simply the *Einstein equation* (yes, that's correct, $E=mc^2$ is **not** the "Einstein equation").

So, although the equation looks rather daunting and mathematical, we can see from our earlier analysis that it is actually telling us something which is really quite simple. In a simplified form, it is telling us that an amount of mass (on the right hand side of the equation) will result in curvature of spacetime (the left hand side of the equation) around that mass. And that, basically, is the essence of gravity.

In his biography of Einstein, Walter Isaacson put Einstein's achievement into perspective: "Einstein had shown that the fabric of spacetime became not merely a container for objects and events. Instead, it had its own dynamics that were determined by, and in turn helped to determine, the motion of the objects within it. The curving and rippling fabric of spacetime explained gravity, its equivalence to acceleration, and, Einstein asserted, the general relativity of all forms of motion. In the opinion of Paul Dirac, the Nobel laureate pioneer of quantum mechanics, it was 'probably the greatest scientific discovery ever made'. Another of the great giants of twentieth century physics, Max Born, called it 'the greatest feat of human thinking about nature, the most amazing combination of philosophical penetration, physical intuition and mathematical skill.'"

On the largest of scales (which is where general relativity's modification of Newton's law becomes measurable), general relativity correctly predicted *gravitational lensing* (light bent around stars and galaxies), black holes, and the expanding universe.

The final confirmation of general relativity made global headlines recently. General relativity states that gravitational effects are not transmitted instantaneously (after all, nothing travels faster than light). Instead, gravity is transmitted across the universe in the form of *gravitational waves*. As an example, if the Sun disappeared instantaneously, the Earth would continue to orbit the position of the Sun for seven minutes until the bad news reached us in the form of gravitational waves.

Gravitational waves are predicted to carry energy, just like any other form of wave (you may have felt the force of waves in a rough sea). Unfortunately, gravitational waves are also predicted to be extremely weak and very difficult to detect. As an example of the weakness of gravitational waves, the largest source of gravitational waves in the Solar System is due to the orbit of Jupiter around the Sun, but the amount of energy emitted by Jupiter in the form of gravitational waves is only about that of a 40-watt light bulb.

However, despite their weakness, several teams of researchers have spent decades searching for gravitational waves using highly inventive experiments and sensitive detectors. The most sensitive is the Advanced LIGO project (Laser Interferometer Gravitational Wave Observatory) which consists of two observatories based in Livingston in Louisiana and Hanford in Washington State. The experimental equipment at the two sites consists of two four-kilometre long tubes oriented at ninety degrees. Laser beams are shone down both tubes, reflected at the ends 280 times (giving a combined distance of over 1,000 kilometres), before being combined back at the base station. As a gravitational wave passes, it is predicted to slightly shorten the length of one of the tubes while slightly lengthening the other (because the tubes are at ninety degrees). The difference in the path length of the laser beams would then result in an interference pattern when the two laser beams are recombined at the base station.

The following picture shows the LIGO observatory in Hanford. You can see the two tubes oriented at ninety degrees:

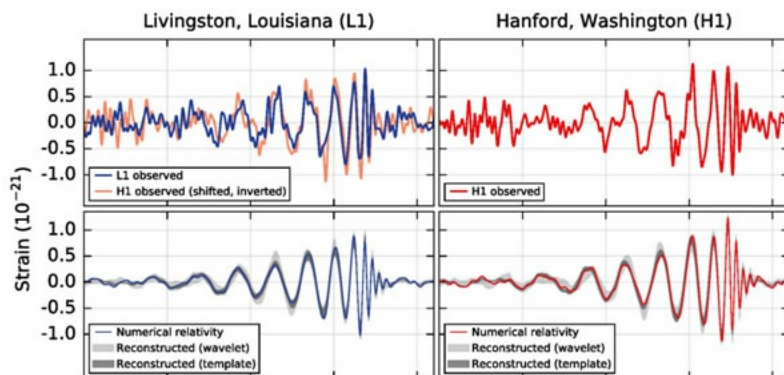


The search bore fruit at 9:50 a.m. on the 14th September 2015 when the two Advanced LIGO observatories independently detected a brief burst of gravitational waves from the collision and merger of two black holes. As the gravitational wave passed through the Earth, it changed the length of the four-kilometre LIGO tube by just ten thousandth of the width of a proton, equivalent to detecting a change in the distance to the nearest star by the width of a hair.

At its peak, the energy of the gravitational waves produced by this cataclysmic event was 50 times greater than the combined power of all the light radiated by all the stars in the observable universe. Effectively, the mass of three Suns was converted into raw energy.

If the energies involved were so huge, then why was the signal detected on Earth so weak? To put it simply, the black hole merger happened in a galaxy far, far away and a long time ago. The merger actually happened 1.3 billion years ago (in a galaxy 1.3 billion light years away, logically). At that time, the only life on Earth was composed of simple single cells floating in the oceans. The gravitational wave started its journey across space to be intercepted — 1.3 billion years later — by multi-cellular human beings which had fortunately evolved over that period.

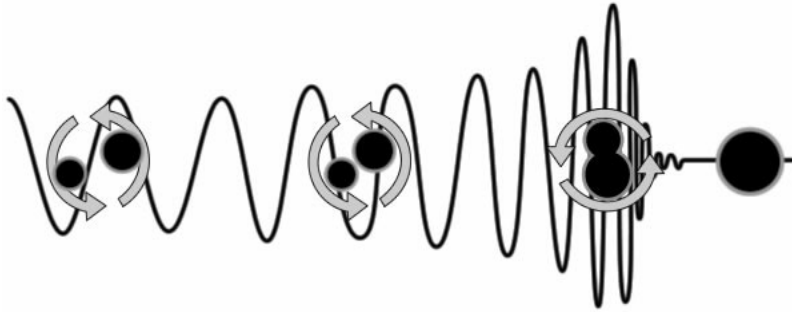
The following graphs show the "chirp" signal received from the black hole merger which lasted just 0.2 seconds — approximately the same time as the blink of an eye. The first column shows the signal received in Livingston, the second column shows the signal received in Hanford just seven milliseconds later (the time it takes for light to travel across the USA).



The lower graphs show how the signal was predicted to appear (including the so-called black hole "ringdown" after the merger), showing how well general relativity correctly predicted the nature of the event.

The following diagram shows how the merger of the two black holes related to the detected "chirp". Remember,

this whole process took just 200 milliseconds to complete. The black holes were orbiting each other at a distance at which they were only 350 km apart. Over the 200 millisecond period, the orbital velocity of the black holes increased from 30% of the speed of light to 60% of the speed of light.



This represented the first direct detection of gravitational waves, and is regarded as one of the most important discoveries in the history of science.

5

INTO THE FIFTH DIMENSION

When you have made the greatest scientific discovery of all time, the question then becomes: "How do I follow that?" That was surely the challenge facing Einstein after he discovered general relativity in 1915. However, his course of action probably appeared quite clear. Just as is the case today, there were a few fairly clear problems in fundamental physics which cried out for solutions. And, just as is the case today, these questions tended to revolve around the problem of unification.

As described in my first book, if we find we have two theories which explain two apparently different behaviours of Nature, we might find it possible to replace both those theories with a single theory which still manages to explain both of those behaviours. When this happens, the process is called *unification*. The resultant unified theory will be simpler than either of the two previous theories.

As was described in Chapter Two of this book, one way of combining two apparently different behaviours is to introduce extra dimensions (remember the "flying octopus"?). In this chapter we will be examining the first attempt at unification using extra dimensions.

Today, one of the greatest quests in physics is to find a unification between general relativity and quantum mechanics. These are the two dominant theories of the physical world, and the unification of these theories stands out quite clearly as a problem in urgent need of a solution.

In Einstein's time, there was also a very clear need for a unification, a unification between the theory of electromagnetism and Einstein's own theory of general relativity. In order to understand why this was such an important quest, we need to imagine travelling back in time to the early decades of the 20th century, and putting ourselves into the mindset of the physicists of that period.

In the 19th century, the greatest advance in physics since the time of Newton was achieved. This was the development of the theory of *classical* (i.e., non-quantum) *electromagnetism*. In 1820, French physicist Andre-Marie Ampère had shown that wires carrying electric current generated a magnetic field, and those wires were either attracted or repelled by the magnetic force between them, depending on the direction of the electric current. In 1831, Michael Faraday discovered the inverse of this result by demonstrating that a magnet moving through a coil of wire produces an electric current in that wire. So there was clearly a symmetry between electricity and magnetism. It was then left to the great Scottish physicist James Clerk Maxwell who, in 1862, formalised this unification between electricity and magnetism in mathematical form. Maxwell published four equations, now simply known as *Maxwell's equations*.

Of particular interest to Einstein had been the form of Maxwell's equations in a vacuum (empty space containing no electric charges or current). Maxwell had shown that his equations made the symmetry between electricity and magnetism clear:

- A changing magnetic field creates an electric field.
- A changing electric field creates a magnetic field.

Hence, the magnetic field can generate an electric field, and the electric field can generate a magnetic field. The result is a self-sustaining wave of alternating electric and magnetic fields called an *electromagnetic wave*. This wave was capable of traversing the vacuum, and the equations implied that the wave would travel at precisely the speed of light. From this, Maxwell deduced that light was a form of electromagnetic wave. What is more, the equations seemed to indicate that the speed of light would be independent of the speed of the observer. Einstein took this result as the basis for his theory of special relativity, with his landmark 1905 paper being called "On the **electrodynamics** of moving bodies". Hence, with special relativity Einstein was unifying Maxwell's new electromagnetic theory with the existing theories of mechanics at speeds close to the speed of light. This was a clear first sign of the need to unify the new results from electromagnetism with existing theory, a situation which only became more pronounced with the discovery of general relativity ten years later.

What is more, we have to realise that in 1915 the secrets of the atom (specifically, the forces contained within the nucleus of the atom) had not yet been revealed. So the electromagnetic and gravitational forces were the only two

forces known. The clear challenge was to unify electromagnetism with general relativity.

Einstein was particularly drawn to the idea of finding a geometrical explanation of the electromagnetic force. If gravity was simply the result of curvature of spacetime, might it be possible that the electromagnetic force also had a similar explanation? Einstein might even have suspected that the solution would be rather simple and intuitive (remember his simple idea of a free-falling person not experiencing the force of gravity?). Einstein explained his goal in his Nobel Prize acceptance speech: "The mind striving after unification cannot be satisfied that two fields should exist which, by their nature, are quite independent. We seek a mathematically unified field theory in which the gravitational field and the electromagnetic field are interpreted only as different components or manifestations of the same uniform field."

Unfortunately, Einstein's efforts were to end in failure. However, the effort to produce a unified theory introduced some new ideas which resonate to this day. One of those ideas has emerged as the dominant theme in fundamental theoretical physics over the last thirty years: the introduction of extra spatial dimensions. We will now consider the revolutionary theory which has formed the template for these higher-dimensional theories.

In other words, we will now consider the theory which formed the template for string theory.

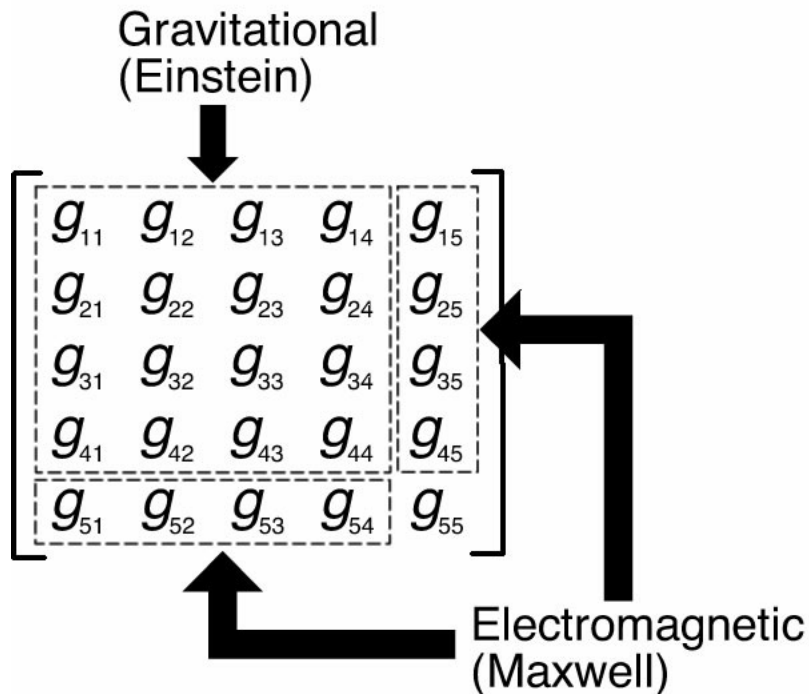
Kaluza-Klein theory

In 1919, Einstein received a letter from an obscure German mathematician named Theodor Kaluza. In today's world, the letter would probably have been dismissed as the ramblings of a "crackpot" — the central idea was so bizarre and apparently nonsensical. However, Einstein had a more open mind, and he gave serious consideration to the contents of the letter.

According to Brian Greene in his book *The Elegant Universe*: "Kaluza's suggestion has revolutionized our formulation of physical law. We are still feeling the aftershocks of his astonishingly prescient insight."

In the letter, Kaluza described an approach for unifying the gravitational force and the electromagnetic force. In order to achieve this, Kaluza had considered how gravity would behave if there were five spacetime dimensions instead of four dimensions. Yes, it sounds like a crazy idea — the universe surely only has four spacetime dimensions? However, the additional dimension seemed to introduce behaviour which was identical to the behaviour of electromagnetism. Could this really be the solution to unification? Does the universe really have five spacetime dimensions?

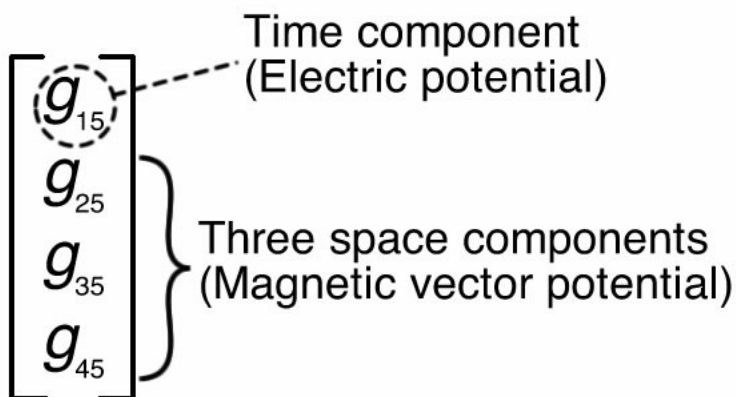
In order to achieve this apparent miracle, Kaluza did nothing particularly remarkable: he simply considered what would happen if another spatial dimension was added to Einstein's equation for general relativity. As we have seen in the last chapter, the metric tensor used in general relativity is a 4×4 matrix. With the addition of an extra space dimension, Kaluza, therefore, had to increase the size of the metric tensor to a 5×5 matrix (which could now be used for calculating distances in five dimensions):



You will see in the previous diagram that the old 4×4 matrix of Einstein's general relativity is retained (in the top left). However, the larger size of the new metric has introduced two new vectors containing four elements (a metric tensor is actually symmetrical, so these two new vectors are actually identical). [18]

Crucially, Kaluza discovered that this new vector represented the laws of electromagnetism. So it appeared that by expanding general relativity to four space dimensions, electromagnetism was automatically incorporated. Hence, the gravitational and electromagnetic forces would be unified if there were four spatial dimensions (five dimensions in total, when the time dimension is also included).

So where does this connection with electromagnetism come from? Well, let us consider what we have done. We have extended Einstein's metric tensor by adding an extra space dimension. We know that Einstein's metric tensor for general relativity described a universe with one dimension of time and three dimensions of space. We have added an additional dimension of space, and produced a vector with four elements. We would therefore expect just one of the elements in this new vector to be a time component (as was the case in the old metric tensor). And this is the case. The new vector has one time component, and three space components:



The structure (and behaviour) of this vector is well-known in electromagnetic theory and is called the *electromagnetic vector potential* (alternatively called the *electromagnetic four-potential*). The single time

component is a single number and this is called the *electric potential*. The three remaining components form a vector which is called the *magnetic vector potential*.

So clearly this vector combines both electric and magnetic behaviour in a single vector. In other words, it describes a combined **electromagnetism**. So we appear to have obtained a description of electromagnetism purely by extending general relativity to five dimensions.

And that, basically, is the principle behind Theodor Kaluza's unification of electromagnetism and gravity.

Can we get a deeper understanding of this connection between electromagnetism and gravity? Well, the connection appears to rely on the vector which was produced: the electromagnetic vector potential. That vector included the electric potential, and the magnetic vector potential. I hope you can see a common theme here: it is this property called **potential**, which keeps appearing.

It would appear that in order to obtain a deeper understanding of the connection between gravity and electromagnetism we will have to explore this property called "potential". In particular, we have to examine why it appears to suggest the existence of an extra dimension of space.

Potential

As a first step toward unification of electromagnetism and gravity, we might ask what they have in common. Well, both forces are transmitted via fields. It was Michael Faraday in 1849 who first suggested that the magnetic and electric fields were independent entities which spread through space. The movement of an object was then determined by the local magnitude and direction of the field at any point in space. Einstein applied similar reasoning in general relativity. Gravitational effects could not be transmitted instantaneously (as suggested by Newton). Instead, objects responded to the local strength of the gravitational field, and gravitational effects were transmitted through the field at the speed of light (gravitational waves).

So what determines the strength and direction of the field (electromagnetic or gravitational) at any particular point in space? To answer that question we need to consider energy.

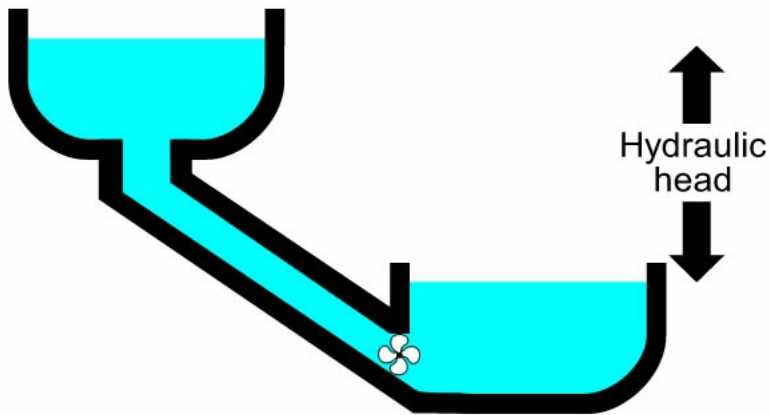
If we move an object against the natural direction of a field (for example, pushing two electrically-charged particles together, pushing two north poles of two magnets together, or lifting an object against the force of gravity) then we increase the *potential energy* of the object. If you then release the object (for example, dropping a rock you have lifted off the floor), the force will act to move the object back to its initial position. The potential energy of the object will then decrease. Because of the law of conservation of energy, energy can never be created or destroyed: it can only be converted into a different form of energy. Hence, the kinetic energy of the object will increase accordingly: the motion of the object will accelerate.

We can think of potential energy as being an energy difference between the current position of the object and the position the object would attain if it was released. The greater the difference, the greater the potential energy. For example, the gravitational potential energy of an object is proportional to the height the object is lifted off the ground. So potential energy is clearly an energy associated with the position of an object. And if an object is in a force field (gravitational or electric) then the potential energy of the object is related to the position of the object in that field.

We can therefore consider the field independently and say that a particular point in the field represents a certain amount of potential energy. We have to consider the potential energy which would be possessed by an object with a mass of just one unit (or electric charge of just one unit) at that particular position in the field. We can then say that a particular point in the field has a certain *potential*.

But we want to discover what determines the strength and direction of the force experienced by the object. We will now show that objects will tend to move from points in the field which have high potential to points which have low potential.

To illustrate this, we shall consider a very useful analogy between the flow of electricity and the flow of water under the influence of gravity. Let us consider the potential energy of water in a hydroelectric plant. Water from a reservoir or river flows down a tube to a lower height, until it hits a turbine at the bottom of the tube. The force exerted by the water is sufficient to turn the turbine and generate electricity.



As any civil engineer will know, the force (pressure) exerted by the water on the turbine is proportional to the height difference between the top surface of the water in the lake and the height of the turbine. This is called *hydraulic head*. Hydraulic head is equivalent to the potential energy of the water. And, as we have just discussed, there is a direct connection between potential energy and the potential of the underlying field (in this case, the gravitational field). We can see that water will flow from points with high gravitational potential to points with low potential.

In this respect, there is a perfect analogy with electricity. This is because another name for electrical potential difference is *voltage*. Electricity flows from high potential to low potential, from high voltage to low voltage. So, in our quest to unify electromagnetism with gravity, here we have another similarity between the electromagnetic force and the gravitational force: both forces tend to move objects from high potential to low potential.

In our discussion of the hydroelectric plant, we can see that the only important factor which determines the strength of the force is the potential **difference** (the difference in the height of the water). This seems to indicate that it is the **relative** change in potential which is important — not the **absolute** value of the potential.

As an example, it has been mentioned that another name for a difference in electrical potential is **voltage**. So let us consider a typical 1.5 volt battery:



When you buy a battery you are, of course, buying a battery with two terminals: a positive terminal and a negative terminal (shown in the previous diagram). The 1.5 volts refers to the potential difference between the two terminals.

So let me ask you a question: what is the voltage of the positive terminal? You might say, "positive 1.5 volts". Are you sure? Well, if you're sure then I will just remove the negative terminal altogether and sell you a battery with only the positive terminal. After all, the 1.5 volts of electricity provided from the positive terminal should be enough to power your device:



I hope you will be very happy with your new battery. I will even sell it to you for half price.

Of course, this is a nonsense. Your new battery with its "1.5 volt terminal" is now incapable of powering anything. A battery with one terminal is useless — it no longer has a voltage. Remember, a voltage is a potential difference. When you buy your battery, you are buying a potential **difference**, and a difference requires two terminals.

If the only important factor is the potential difference then that implies that the absolute value of the potential does not matter. To return to our water analogy, it implies that the absolute height of our hydroelectric power station is irrelevant: the only important factor is the difference in the height of the water, not the absolute value of the height of the water. Hence, we could locate our hydroelectric power station at ground level, or at the top of a mountain, or at any height in between: the potential difference of the power station would be unchanged, and hence the output of the power station would be unchanged.

As that is the case, then imagine you are provided with the value of the output from a particular power station on the mountain. It is clear that there is no clue in the output value as to the absolute height of the station which provided the power. In fact, if the only information available to us is the power output of the station, then this freedom of motion of the station in the vertical direction would be effectively hidden from us. In other words, there is a freedom of motion of the absolute value of the potential: the absolute value of the potential is hidden from us.

Similarly, because the electromagnetic force is also dependent on potential **difference** (voltage) there is also a freedom of the **absolute** electromagnetic potential which is fundamentally hidden from our eyes: it is unobservable.

As was discussed in Chapter Two, it is possible to express the variation of any property value as movement in a dimension. On that basis, it is possible to describe the freedom of variation of absolute electromagnetic potential as movement in a dimension. And, as variation in the absolute value of potential is fundamentally hidden from our eyes, this has to be movement in a **hidden dimension**.

So now we can see the connection between potential and motion in a fourth dimension of space, which was revealed by Kaluza's theory. If you remember back to the discussion earlier in the chapter, Kaluza made the radical suggestion that this motion of absolute electromagnetic potential in a hidden dimension actually represented motion in a real dimension of space! Kaluza showed that it was possible to extend general relativity to five spacetime dimensions, in which case the extra dimension of space behaved like electromagnetic potential. We can now see that this additional fourth dimension of space would be hidden from our eyes.

But what form might this dimension take? How can there be an extra dimension of space which we are fundamentally unable to observe?

The circular dimension

Remember that even though Kaluza's theory was intriguing, there was still absolutely no evidence of a fourth spatial dimension. Theodor Kaluza was a firm believer in the power of theory (he taught himself to swim by reading a manual and jumping into the sea), but in this case theory did not appear to match reality.

However, in 1926 Felix Klein came up with a proposal which not only described the shape of the additional spatial dimension, but also explained why it was hidden from our eyes.

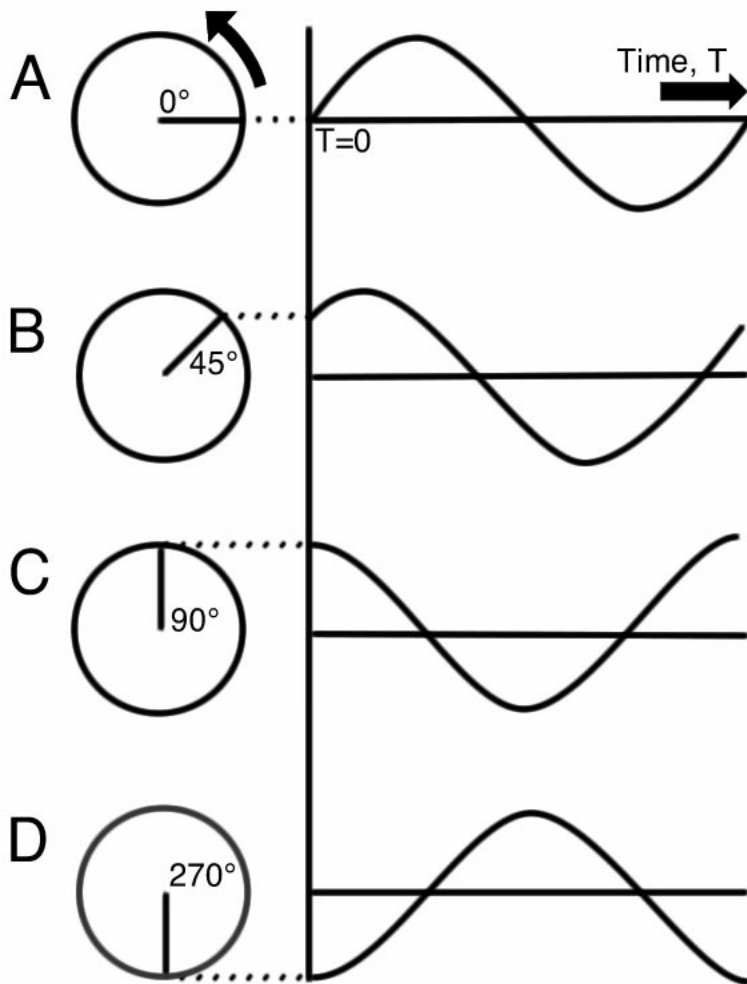
What Klein managed to do was identify the true nature of the connection between the gravitational force and the electromagnetic force indicated in Kaluza's theory. They are both an example of a *gauge theory*. Those of you who read my previous book will already be aware of gauge theory. It is currently believed that all four fundamental forces (gravity, electromagnetic, and the weak and strong nuclear forces) are examples of gauge theory.

Gauge theories arise from symmetry in Nature. A symmetry occurs when you transform an object in some way, but the transformation leaves the original object unchanged. For example, a snowflake has rotational symmetry: if you rotate a snowflake by sixty degrees then the transformed snowflake remains identical to the original snowflake, and that represents a symmetry. The gravitational force is the force which describes the behaviour of space and time, and we find symmetries in both space and time: if we move an experiment to a different location in the universe, we find we get the same result. This is called *space translation invariance* (it is the freedom we have to locate our power station anywhere in the vertical direction). And if we perform an experiment at a different time, we also find we get the same result (this is called *time translation invariance*). [19]

But what symmetry does the electromagnetic force represent? Well, once again the answer was described in my previous book. We will now discover that the symmetry represented by the electromagnetic force is the rotational symmetry of a circle.[20] To understand why this is the case, we need to consider quantum mechanics.

Quantum mechanics tells us that an electrically-charged particle (such as an electron) is described by a *wavefunction*. A wavefunction — as the name implies — has a shape like a wave. And, like any wave, the wavefunction has an associated *phase*. The phase of a wave determines where the peaks and troughs of the wave lie.

As you can see in the following image, we can imagine a wave being created by a point on a revolving wheel (the revolving wheel is shown on the left in the following image):



The phase of the wave is then defined as the angle of the wheel when time (on the horizontal axis) equals zero, as shown in the previous diagram.

You will see that the last two waves, waves C and D, have phases of 90° and 270° respectively. Hence, there is a 180° difference in their phases. If these two waves were to combine then they would cancel each other out (destructive interference) because the peaks and troughs of one wave would be precisely the opposite of the other wave.

Quantum mechanics tells us that if we have a group of particles — and their wavefunctions — then we can increase or decrease the phase of all the wavefunctions by a constant angle without changing the overall situation. This is because all that matters is the difference of the phases of the wavefunctions, not the absolute values of the wavefunctions. The difference between phases is important because it can create interference patterns (as in the double-slit experiment in which two particles create an interference pattern). So the absolute value of the phase is effectively unobservable — the only thing we can observe is the difference between the phases. [21]

So all we can measure is a difference — the absolute value is unobservable. This is therefore very similar to the earlier discussion of electromagnetic potential (voltage). In our discussion of electromagnetic potential, we saw that it was only the difference of the potential that mattered — the absolute value of the potential was irrelevant (in fact, it was unobservable). We have therefore now made a remarkable connection between electromagnetic potential (voltage) and the phase of the wavefunction of a charged particle: only differences matter — absolute values are unobservable.

This connection is not a coincidence. Instead, this reveals the very deep connection between the phase of the wavefunction of a charged particle (such as an electron) and the absolute value of the electromagnetic potential of the underlying field. As Bruce Schumm says in his book *Deep Down Things*: "The quantum-mechanical requirement

of local phase invariance, miraculously, just matches the freedom of choice one has in specifying the electromagnetic potential function for those fields."

Now remember that we considered the unobservable motion of the electromagnetic potential as being motion in a hidden dimension, the hidden fifth dimension in Kaluza's theory. So Felix Klein now made the connection between the varying phase of the wavefunction (motion around a circle) and the motion in Kaluza's hidden fifth dimension. Hence, Klein came to a remarkable conclusion: the fifth dimension must be in the form of a circle. According to Klein, electromagnetism — as experienced in our four dimensions of spacetime — came from motion around this hidden circular fifth dimension.

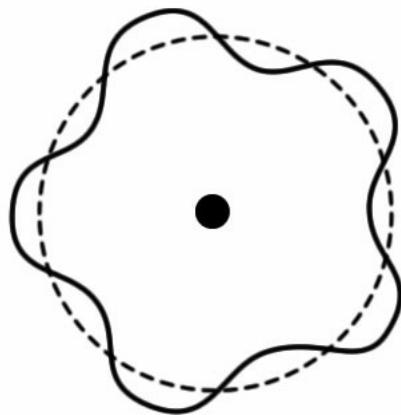
But can we really make the leap from rotational gauge symmetry of the electromagnetic force to the suggestion that this represents an additional dimension of space? The physicist Juan Maldacena appears dubious: "In physics, we do not know whether this circle is real. We do not know if indeed there is an extra dimension. All we know is that the symmetry is similar to the symmetry we would have if there was an extra dimension. In physics we like to make as few assumptions as possible. An extra dimension is not a necessary assumption, only the symmetry is." [22]

Remember back to the discussion in Chapter Two of how unification can be achieved by "glueing" together two different dimensions into a higher-dimensional space. Well, Maldacena's quote is suggesting that this is a classic example of that approach. The two dimensions being "glued" together is four-dimensional spacetime and the one-dimensional symmetry of the electromagnetic force. Yes, as Maldacena suggests, there is a common element: they both exhibit symmetries. However, does the combined higher-dimensional space represent an actual physical entity, or are we merely creating another "flying octopus"?

Microscopic dimensions

Nothing in our discussion so far has explained why we are unable to detect this supposed circular fifth dimension. We can clearly detect motion in the three dimensions of space, and we can also detect motion in time, which is the fourth dimension (we can detect motion in time simply by using a clock). So how can this circular fifth dimension be hidden? Where is it?

To explain the missing dimension, Klein came up with a bold and — as it turns out — extremely influential idea. Remember, this was 1926, and Klein decided to incorporate some of the ideas from the newly-discovered quantum mechanics. In particular, he used the result discovered by Louis de Broglie which stated that a particle also acts like a wave (this was the complementary result to Einstein's discovery of the photon: Einstein showed that a wave could act like a particle, de Broglie showed that a particle could act like a wave). If you read my previous book you will know that Niels Bohr used this result of de Broglie to suggest that only a whole number of electron wavelengths could fit in an orbit around the nucleus of an atom:



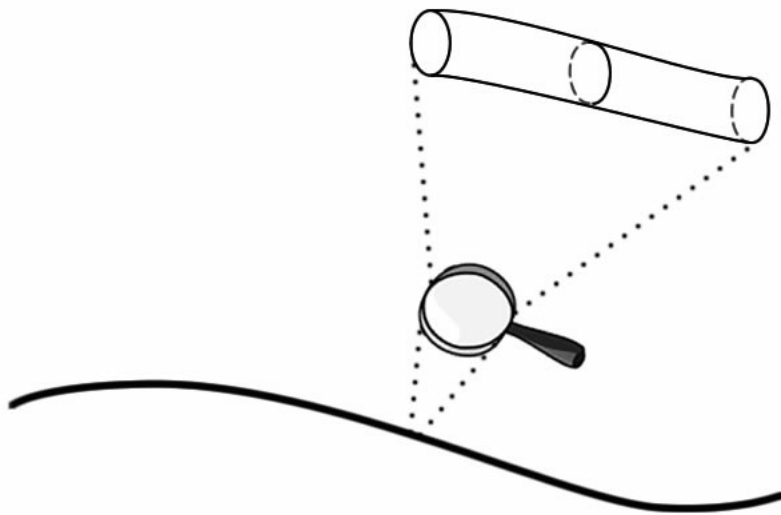
Klein did a very similar thing to Bohr, but instead of suggesting that only a whole number of wavelengths could fit around the nucleus of an atom, Klein suggested that only a whole number of particle wavelengths could wrap around the circular fifth dimension. So how long would those wavelengths be? Well, Klein used de Broglie's formula for the wavelength of a particle:

$$\lambda = \frac{h}{p}$$

where λ is the particle wavelength, p is the momentum of the particle, and h is Planck's constant. Because h is such a small value (6.63×10^{-34} joule seconds) the formula predicts an extremely small value for particle wavelength (which explains why we never normally see particles — or matter — acting like a wave). In fact, because of the small value of h , de Broglie's formula predicts a wavelength for the fifth dimension which is an extraordinarily small distance — close to the Planck length, which is the smallest distance we can meaningfully measure (the Planck length is a thousandth of a millionth of a billionth of a billionth of a metre).

So this provided an explanation of why the circular fifth dimension was hidden from our eyes: it was wrapped in incredibly small circles, a smaller distance than any current instrument can probe.

This implies that each point in our four-dimensional spacetime is actually represented by a circle, or loop, in the microscopic fifth dimension. Another way of looking at it is that a one-dimensional line is actually a cylinder (a series of loops). The following diagram shows a section of an apparently one-dimensional line being magnified to reveal it is actually a microscopic cylinder (being formed of a series of loops):



So, if we were sufficiently small, then as well as travelling up and down the line (in one dimension), we could also travel in a circular direction around the cylinder (adding another dimension).

This process — by which higher-dimensions are looped and are too small for us to detect — is called *compactification*.

These two combined theories of Theodor Kaluza and Felix Klein — suggesting that electromagnetism is a result of a microscopic circular fifth dimension of space — is called *Kaluza-Klein theory*.

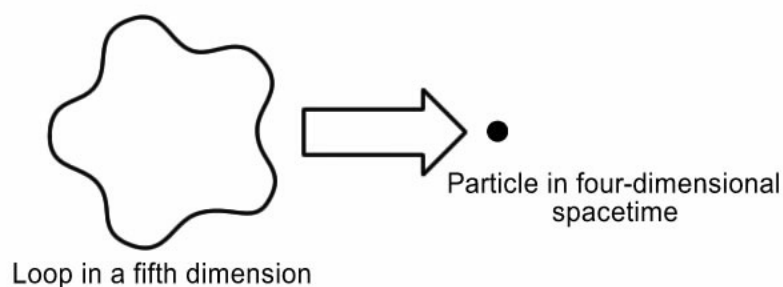
And, if you are a regular reader of popular science books, you might now be suspecting that this idea of Kaluza-Klein — microscopic loops in higher dimensions — sounds strikingly similar to string theory. In that case, you would be absolutely correct: Kaluza-Klein theory is now recognised as an important precursor to string theory.

6

STRING THEORY

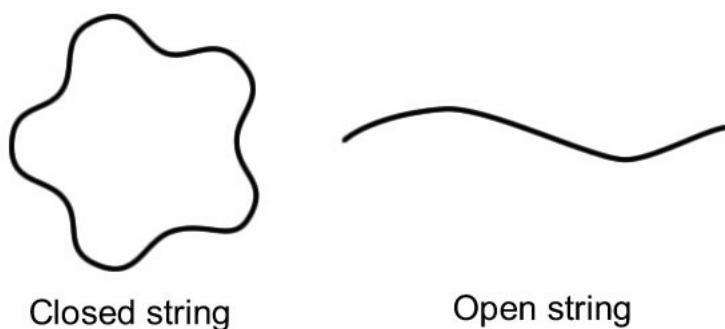
The last thirty years of fundamental physics research has been highly unusual in its nature. It has been dominated by a single theory — *string theory* — which was conceived in the early 1970s. The theory is particularly relevant to this book as it predicts a universe with a large number of hidden compactified dimensions.

In our study of string theory, let us first return to consider an implication of Kaluza-Klein theory. We have seen that the fifth dimension is proposed to be circular and microscopic. We have also seen how the addition of a fifth dimension has the effect of introducing the electromagnetic field in four-dimensional spacetime. But we know that the electromagnetic field is composed of billions of photons (the particles of electromagnetic radiation — such as light). So let us now imagine that the fifth dimension is completely empty of all matter. If that is the case, then it appears that a photon (a field particle) has been produced purely by a loop of fifth-dimensional space. In other words, a particle has been produced purely by a loop in space: a particle purely from geometry!



String theory generalises this result. String theory says that a particle is not produced by an empty loop of a higher-dimensional space, but there is actually a physical object which loops around in that higher dimension. Fairly obviously, this is called a *string*, and it gives the name to string theory. The string is not "made" of anything else — it is fundamental.

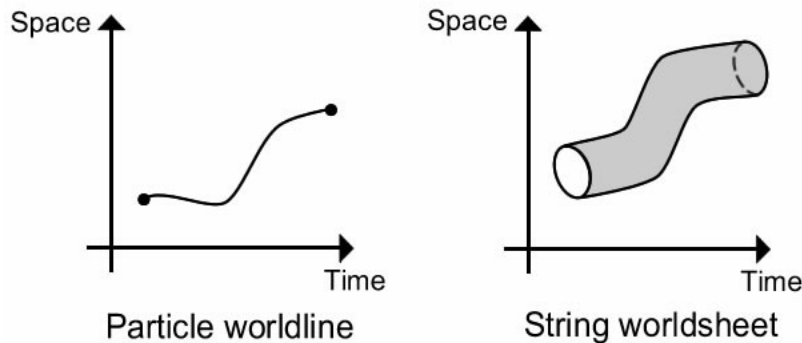
By introducing a physical object, this introduces the possibility of new structures and modes of behaviour — we are no longer restricted to considering just a simple closed loop. As an example of this, some string theories allow the possibility of *open strings* as well as *closed strings*:



In string theory, therefore, particles are considered as being strings in higher dimensions. Because these higher dimensions are so small, the strings actually appear like microscopic particles. So, according to string theory, elementary particles such as electrons and quarks are not pointlike particles at all but are actually microscopic strings. These strings are so small that they even appear like pointlike particles under the highest magnification currently available: we would need accelerator energies a million billion times more powerful than our current particle accelerators to be able to observe these strings.

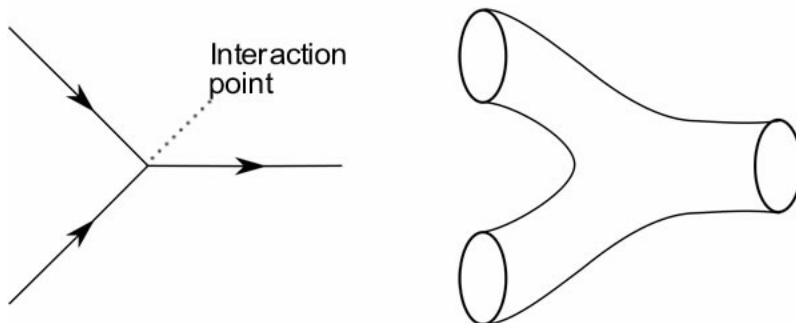
There are some theoretical advantages from considering particles as being strings. In order to understand why, we

need to consider how particles exist in spacetime. As a particle naturally moves forward in time (time passes), it is clearly able to move in space as well over that period. The following diagram shows both space and time plotted in a diagram — a *spacetime diagram*. Note that only one dimension of space is shown along the vertical axis (it is not possible to plot more than one dimension of space in these diagrams as the other axis represents the time dimension). In the diagram on the left you can see how a particle plots a curved line in a spacetime diagram as it moves in space (on the vertical axis) as time progresses (along the horizontal axis). This traces the position of the particle at each moment in time. For a particle, this line is called a *worldline*:



Strings, however, are clearly not infinitely small point-particles. We have seen how strings can be looped structures, so as these loops move through time they actually plot a two-dimensional *worldsheet* (as shown on the right in the previous diagram).

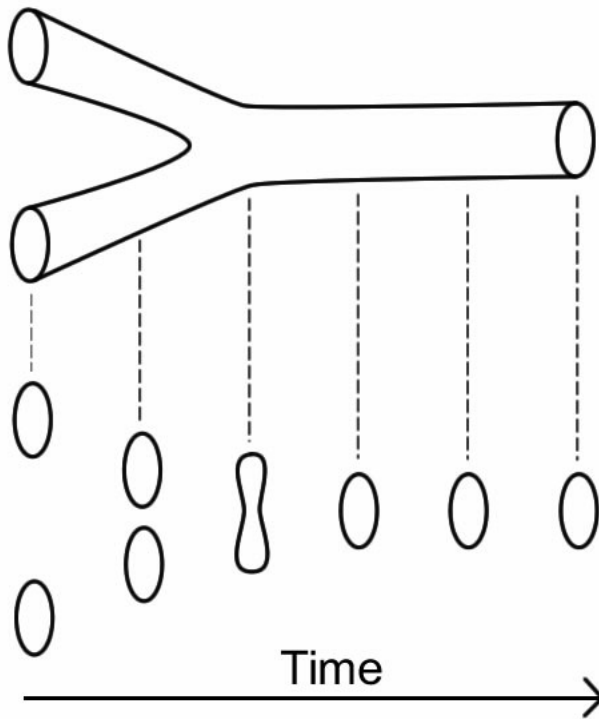
So, bearing in mind that a particle plots a worldline whereas a string plots a worldsheet, let us now examine the spacetime diagram for particle interactions. In the following diagram, the diagram on the left shows two particles colliding to produce a third particle (for example, this might be an electron and a positron annihilating to produce a photon):



You will see there is a clearly-defined *interaction point* where the two particles meet. Having such a clearly-defined infinitely small interaction point for the two particles introduces problems: unavoidable infinities enter the equations describing this interaction, and infinities must be avoided in any accurate model of the natural world (it is the apparently zero distance between the particles at the interaction point which leads to the infinities).

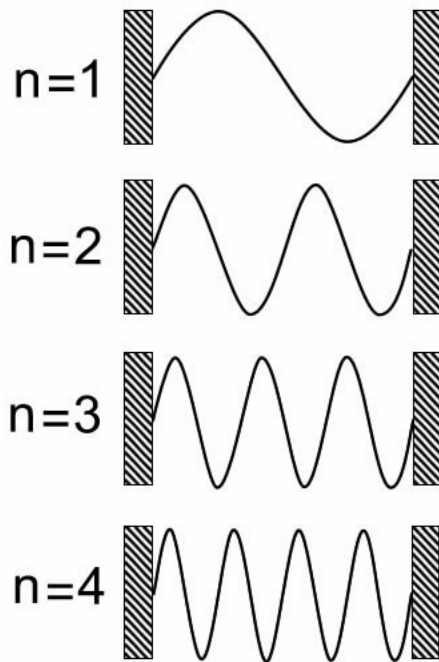
However, the diagram on the right in the previous diagram shows the same interaction but this time the particles are represented by string loops. So instead of the particles plotting a one-dimensional worldline on the spacetime diagram, the strings now plot two-dimensional worldsheets. As you can see on the diagram, this now avoids there being any clearly-defined interaction point — the strings have the effect of spreading the interaction. The zero-distance problem — and hence the undesirable infinities in the equations — can be avoided.

By taking slices through the worldsheet at different instances of time we can see how the worldsheet represents two string loops (two particles) interacting to produce a third particle. In the following diagram, you can see the interactions of the string loops underneath the worldsheet. You can see that two string loops (coming in from the left) representing two different particles interact to produce a single string loop (a single particle). Notice how smooth the interaction has become:

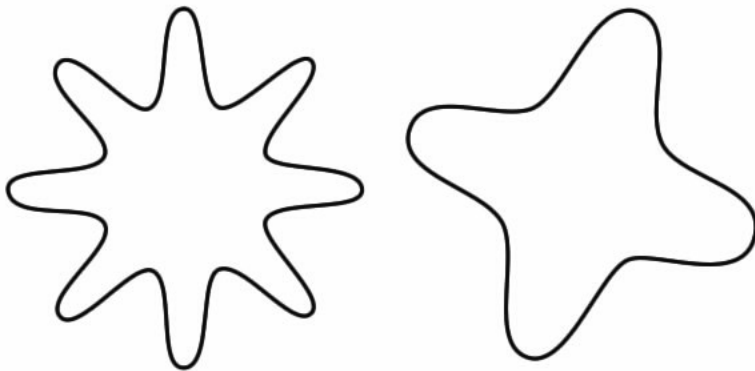


The music of strings

One of the most surprising features of string theory is that the strings are modelled very much as if they were everyday strings — in fact, just like a guitar string. Yes, string theory really is a theory of physical strings! And, just like a guitar string, a string in string theory can oscillate at a certain frequency. If we imagine a guitar string fixed at both ends, we can see that only particular frequencies are possible:



Considering the diagram above, you can see that it is possible for the two ends of the guitar string to loop back round and connect to each other, thus forming a closed loop with a discrete (integer) number of wavelengths allowed:



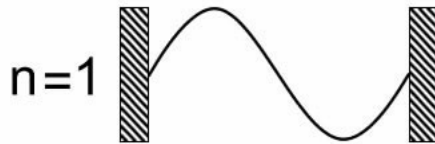
(This might remind you of the whole number of electron wavelengths fitting in orbit around the Bohr model of an atom).

Just as with a guitar string, we can think of these different *modes* of vibration as representing different musical "notes". So what do these different vibrational modes represent? Well, intuitively, we can think of the shorter wavelengths as representing more energetic motion, so the higher the wavelength, the greater the energy of the string. You might also be reminded of Planck's result which linked the energy of a photon to the frequency of the electromagnetic radiation carried by that photon in which, again, higher frequencies (shorter wavelengths) mean more energy. And, through $E=mc^2$, if a string has more energy then that means it must have more mass. So the pattern of vibrations of a string determines the mass of that string and, therefore, the mass of the elementary particle which the string represents.

This is a major departure from the usual way in which we think about the mass of particles. We usually think of particles as being fundamentally different, made of different "stuff", so to speak. However, if string theory is correct, then all particles are made of exactly the same thing: a string, and the only thing which differentiates the particles is

the particular mode of vibration of that string. The mass of the particle is determined by the vibration of the string.

Let us now consider the lowest mode of string vibration, with the lowest possible frequency and therefore the lowest possible mass:



If the value $n=1$ is entered into the formula for string mass, then the formula gives a value of zero, which means the associated string would have no mass. This appears to indicate the presence of an unknown massless particle, and this was initially considered to be a failed prediction of string theory. However, in 1974, Joel Scherk and John Schwarz suggested that this massless particle might well be the *graviton*, the particle which is proposed to carry the force of gravity (the graviton would have to be massless to transmit the force of gravity across the entire universe via gravitational waves).

We have already seen that string theory can predict the photon, the particle which transmits the electromagnetic force. String theory now appeared to predict gravity, another of the fundamental forces. At a stroke, string theory changed from a theory with limited interest to potentially being able to unify the four fundamental forces. From this point on, string theory emerged as the leading contender to be a potential "theory of everything".

The best-kept secret in mathematics

I hope you have enjoyed this gentle introduction to string theory. Unfortunately, nothing so far in this chapter on string theory has been directly relevant to this book and its central theme of the number of spatial dimensions, which is what we will consider in this section.

In this discussion of the basic principles of string theory I hope the theory has appeared reasonable, with nothing remotely astonishing or bizarre. This has been quite a deliberate approach on my part, because things are about to get seriously weird!

We are about to derive the number of spacetime dimensions predicted by string theory.

If someone was to tell you that the sum of all the numbers was minus one twelfth I suspect you might imagine the person was mildly crazy. Well, this is actually an established mathematical fact: the sum of all the numbers is minus one twelfth (or, in decimals, -0.083). Let me be more precise about what, specifically, is being stated here. We are actually referring to the sum total of all the natural numbers. We discussed the natural numbers in Chapter One: they are the numbers used for counting: 1, 2, 3, etc. So what is actually being stated here is that the infinite sum of $1+2+3+4 \dots$ comes to minus one twelfth.

Let's write that out:

$$1 + 2 + 3 + 4 + 5 + \dots \infty = -\frac{1}{12}$$

We can express this infinite sum in mathematical notation by the following mathematical expression, which is taken directly from Joseph Polchinski's popular and authoritative textbook on string theory which is called, simply, *String Theory*:

$$\sum_{n=1}^{\infty} n \rightarrow -\frac{1}{12}$$

On the left hand side of the expression, you will see the Greek letter sigma (Σ) which represents a sum. You will see that in this case it represents a sum of the variable n as n takes all the values from 1 to infinity (so this is just a mathematical way of representing the infinite series $1+2+3+4 \dots$). The right hand side of the expression shows that this series will indeed eventually take the value minus one twelfth.

You might not believe this is true: how can an infinite sum of positive numbers ever result in a finite negative value? I'll admit, this is a difficult result to understand, but I can only repeat that this is a generally-accepted important result in mathematics and physics, and is absolutely central to string theory. It is central to string theory because this result is used by string theory to predict the number of spatial dimensions.

We will now derive this result. I have to say that this derivation can also be found in an excellent video on YouTube in which two physicists from the University of Nottingham explain it in a very entertaining manner. I can highly recommend you watch the video:

<http://tinyurl.com/sumofallnumbers>

The video went viral and currently has four million views on YouTube, which I am sure is a record for a video about string theory. Well done to those physicists.

There is also a *New York Times* article which considers the result: <http://tinyurl.com/timesinfinity>

In that *New York Times* article, Edward Frenkel, a mathematics professor from Berkeley, says: "This calculation is one of the best-kept secrets in mathematics. No one on the outside knows about it."

I would suggest that four million YouTube viewers might now disagree with the professor.

OK, so now let us proceed with this amazing derivation (as I said, the YouTube video of the Nottingham physicists is perhaps a clearer version of this). Let us start by writing out that infinite sum of natural numbers, and let us call the result of the infinite sum S :

$$S=1+2+3+4+5+6+\dots$$

Remember, we want to calculate the value of S .

Now let us consider a second infinite sum. Let us define the sequence $S1$ as:

$$S1=1-1+1-1+1-1+1\dots$$

Note that the signs alternate from minus to plus on each number. What is the total value of $S1$? Well, you will see that if we stop the sequence after a $+1$ then the sequence $S1$ will have the value $+1$. Alternatively, if we stop the sequence after a -1 then the sequence $S1$ will have the value 0 . So what possible single numeric value can we give the sequence if the sequence extends to infinity? The only value which makes any sense is an average of $+1$ and 0 , which means the value of the infinite sum $S1$ must be 0.5 .

Now let us consider a third infinite sum, $S2$:

$$S2=1-2+3-4+5-6+7\dots$$

Let us now calculate the value of the sum $S2$ multiplied by two. We can do this by adding $S2$ with itself, but we will shift this second version of $S2$ by one place to the right:

$$\begin{array}{r}
 S2=1-2+3-4+5-6+7\dots \\
 S2= \quad 1-2+3-4+5-6\dots \quad + \\
 \hline
 \quad 1-1+1-1+1-1+1\dots \\
 \hline
 \end{array}$$

If you consider the sums of each number vertically you can see that the result of this addition is the infinite sum of $1-1+1-1+1-1+1-1$ which is just the sequence $S1$. And we already know that $S1$ has the value 0.5. Therefore:

$$2 \times S2 = 0.5$$

which means that $S2$ has the value 0.25.

Now let us consider what we get when we subtract the sequence $S2$ from sequence S (in the following subtraction, remember that subtracting a negative number turns it into a positive number):

$$\begin{array}{r}
 S = 1+2+3+4+5+6\dots \\
 S2=1-2+3-4+5-6\dots \quad - \\
 \hline
 \quad 4+0+8+0+12\dots \\
 \hline
 \end{array}$$

so we get the infinite sum $4+8+12+16\dots$ which is the series S multiplied by four. Therefore:

$$S - S2 = 4S$$

We already know that $S2$ has the value 0.25, so this means:

$$S - 0.25 = 4S$$

Subtracting S from both sides gives:

$$-0.25 = 3S$$

so therefore:

$$S = -\frac{1}{12}$$

and that's it! The sum of the infinite sequence S , which is $1+2+3+4\dots$ is minus one twelfth!

You might find this hard to believe, but I can assure you that this is an established and accepted result in mathematics, and it was rigorously proved by the great mathematician Leonhard Euler in 1749. The result is also used in physics in a formula which is completely unconnected with string theory and gives completely accurate experimentally-verified predictions about the behaviour of Nature.[\[23\]](#) So this is a correct result!

The recently-released film *The Man Who Knew Infinity* tells the story of the Indian mathematician Srinivasa Ramanujan. Ramanujan was born in 1887. He came from a background of extreme poverty and had no formal

training in mathematics, but he had a tremendous natural talent and instinct for the subject, with a particular talent for constructing infinite series. Ramanujan sent some of his original work to the mathematician G.H. Hardy at Cambridge University. Hardy was amazed at Ramanujan's skill and original methods. Hardy invited Ramanujan to study at Cambridge, and Ramanujan eventually became a Fellow of the Royal Society.

Ramanujan's story is relevant to this chapter because he also derived the result that the infinite sum of the natural numbers is equal to minus one twelfth. Ramanujan's method was very similar to the method described earlier and shown on YouTube. After calculating this amazing result, Ramanujan wrote to Hardy: "Dear Sir, I am very much gratified on perusing your letter of the 8th February 1913. I was expecting a reply from you similar to the one which a mathematics professor at London wrote. I told him that the sum of an infinite number of terms of the series $1+2+3+4\dots = -1/12$ under my theory. If I tell you this you will at once point out to me the lunatic asylum as my goal."

Ramanujan's derivation is shown below in his own handwriting:

Another way of finding the constant is as follows - 41
 Let us take the series $1+2+3+4+5+\dots$. Let C be its constant. Then $C = 1+2+3+4+\dots$
 $\therefore 4C = 4+8+12+\dots$
 $\therefore -3C = 1-2+3-4+\dots = \frac{1}{(1+1)^2} = \frac{1}{4}$
 $\therefore C = -\frac{1}{12}$

I would suggest that this is one of the most remarkable results in the whole of science.

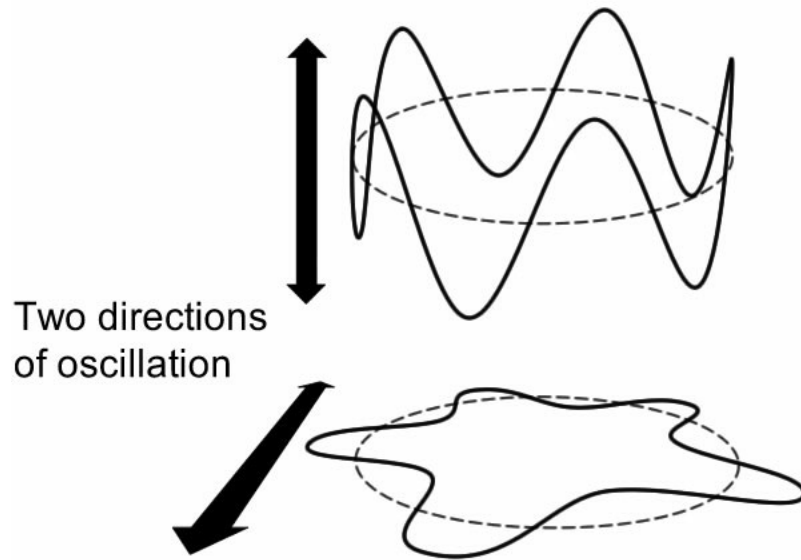
So what has this got to do with string theory? Well, we have already seen that there are an effectively infinite number of modes of oscillation for a string ($n=1, n=2$, etc.). So the total number of modes in which a string can oscillate will be an infinite sum of all these modes:

$$\sum_{n=1}^{\infty} n$$

So the infinite sum of all the natural numbers appears in the equation giving us the number of modes in which a string can oscillate. We now see that our earlier apparently crazy piece of infinite arithmetic has relevance to string theory. What is more, our crazy piece of arithmetic has tamed the infinities! As was explained earlier, the mass of a string (and, therefore, its energy) depends on all the modes of vibration. If the sum of all the modes of vibration had been an infinite number, then the energy of a string would be infinite and string theory could not possibly be a correct theory of reality (we do not see infinities in the physical world). However, our apparently crazy arithmetic has produced a finite result, so string theory can be a *finite* theory. This is a vital feature of any theory.

For the next part, we need to consider the number of directions in which a string can oscillate. This is described by Joseph Conlon in his book *Why String Theory?*: "A string can be plucked, and can oscillate, in every direction transverse to its length. A string living in two spatial dimensions has one direction it can oscillate in; a string in three spatial dimensions has two directions it can oscillate in; a string in twenty-five spatial dimensions has twenty-four directions it can oscillate in."

On that basis, a string in three dimensions of space (four dimensions of spacetime) can oscillate in two perpendicular directions — transverse to its length — and this is shown in the following diagram:



This reasoning implies that, in D dimensions of spacetime, a string is able to oscillate in $(D-2)$ directions. To calculate the total energy of a string, we have to consider the infinite sum of all the modes in which a string can vibrate, and multiply that sum by the number of directions in which the string can vibrate. Hence, the sum of all energies of the string is given by:

$$(D - 2) \sum_{n=1}^{\infty} n$$

Using this result, we are now in a position to calculate the number of dimensions, D , predicted by string theory. Without going into details, the actual equation we need to solve to find D is: [\[24\]](#)

$$\frac{1}{2}(D - 2) \sum_{n=1}^{\infty} n = -1$$

We have just shown that the infinite sum in this equation is equal to minus one twelfth. So let us replace the sigma term in the equation with the value minus one twelfth, which results in:

$$\frac{1}{2}(D - 2) \times -\frac{1}{12} = -1$$

Multiplying both sides of the equation by -24 gives:

$$D - 2 = 24$$

which means $D=26$. Therefore, string theory predicts 26 dimensions of spacetime! In other words, string theory predicts one dimension of time, and 25 dimensions of space.

I think the immediate response of most people on discovering a theory predicts 25 dimensions of space would be a feeling of disappointment shortly followed by a rejection of the theory for being incorrect. As Lee Smolin says in his book *The Trouble with Physics*: "The world does not appear to have twenty-five dimensions of space. Why it is that the theory was not just abandoned then and there is one of the great mysteries of science." However, the theory was most certainly not abandoned. With string theory, I think the phrase "putting a positive spin on things" takes on a whole new meaning. A direct quote from one of my string theory textbooks provides an example of how this apparently negative outcome is frequently presented as a positive feature: "Since the dimension of spacetime is uniquely selected by the requirement of consistency, we can say that string theory predicts the dimension of spacetime!" [25]

Well, I suppose that predicting a finite integer number of spacetime dimensions must be considered some kind of an achievement. It is just a shame that it is the wrong finite integer number of spacetime dimensions.

The hidden dimensions of string theory

So far we have seen that string theory is able to predict the existence of the photon and the graviton, in other words string theory can predict the particles which transmit the forces. If you read my previous book, you will know that these intangible particles are called *bosons*. For this reason, the version of string theory we have considered so far is called *bosonic string theory*.

Bosonic string theory was the original version of the theory developed in the early 1970s and might be considered to be the core of string theory. However, if you read my previous book you will know that all particles are divided into one of two groups: they are either bosons, or they are *fermions*. Whereas bosons are the intangible particles (which form a light beam, for example), fermions are the particles which make matter. So fermions are the particles which form a chair, a car, a human, for example. And the trouble with bosonic string theory is that it cannot be used to produce fermions. Hence, bosonic string theory on its own cannot be a realistic theory.

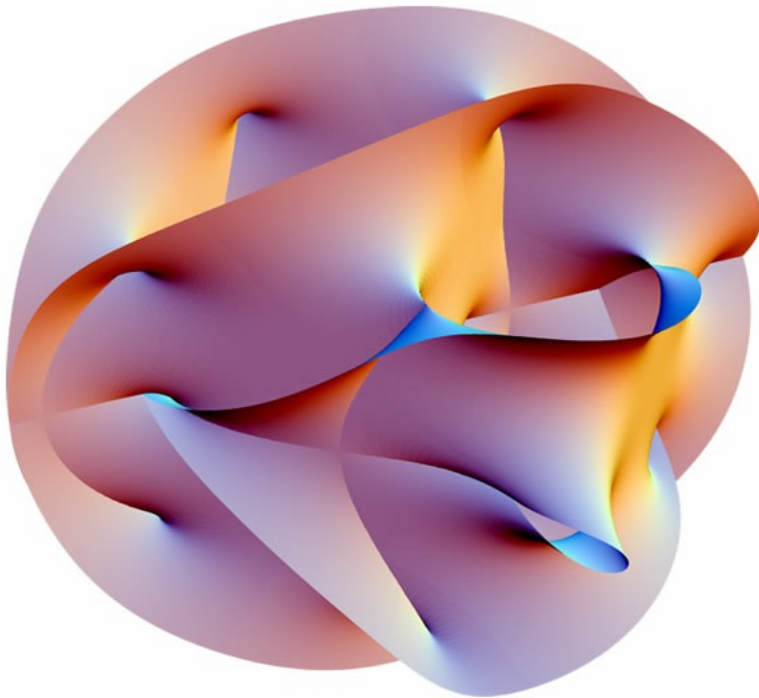
A solution to this problem emerged in the 1970s in the form of *supersymmetry*. Supersymmetry predicts a symmetry in which bosons can be exchanged for fermions. So incorporating supersymmetry into string theory produced a complete theory which could now predict the existence of fermions.

String theory which incorporates supersymmetry is called *superstring theory*. One attractive side-effect of superstring theory is that the predicted number of spacetime dimensions was reduced to ten. It is clearly still not correct, but it might be regarded as a step in the right direction.

Supersymmetry also predicts the existence of a huge range of additional undiscovered particles called *superpartners*. By incorporating supersymmetry, superstring theory has made itself something of a hostage-to-fortune to the discovery of these additional particles. If the superpartner particles are not discovered, then it would deal a fatal blow to superstring theory. So far, the Large Hadron Collider at CERN has not discovered any supersymmetric particles. This is bad news for supersymmetry and, therefore, bad news for superstring theory.

By the late 90s, string theory was not in the best of shape having splintered into five variations. However, in 1998, Ed Witten (the effective leader of the superstring theory field) announced that it might be possible to unify these five theories into a single theory (which he called *M-theory*). Unfortunately, this unification was achieved by the usual method of introducing an additional dimension of space. String theorists greeted the M-theory proposal with great excitement — despite the newly-predicted eleven dimensions of spacetime being even more inaccurate than the previous ten-dimensional prediction.

Whichever variation of string theory you consider, one feature is clear: the theory will predict considerably more than four spacetime dimensions. The problem then arises: where are these extra dimensions, and why do we not see them? The proposed solution is based on the Kaluza-Klein idea that the extra dimensions are compactified — too small to detect. A particular structure — called the *Calabi-Yau space* — has been suggested as a way in which six spatial dimensions might be compactified (much like the single spatial dimension is compactified into a circle in Kaluza-Klein theory). The following diagram shows a projection (in two-dimensions, obviously) of the six-dimensional Calabi-Yau space:



Unfortunately, it appears there are many tens of thousands of different Calabi-Yau spaces, and string theory does not indicate which is the correct one. What is more, each different Calabi-Yau space — each different folding of the extra dimensions — would result in different laws of physics, and a different set of elementary particles. If string theory is unable to select one particular Calabi-Yau space then it would appear that string theory is unable to predict a unique set of laws of Nature.

It has even been suggested that there might be a vast "landscape" of possible universes with different Calabi-Yau foldings in each universe. This represents another form of the anthropic argument in which virtually any outcome is possible. As a result, string theory has been criticised as being untestable and potentially unscientific.

For these reasons, it appears that string theory research is moving away from an attempt to find a fundamental theory of quantum gravity. Instead, the field appears to be splintering, with some researchers more interested in string theory purely because of the new mathematical techniques that have been developed.

7

WHY THREE DIMENSIONS?

OK, this is the last chapter, so let's have a bit of fun.

If you have read my previous books, you will know I like to include some of my own original ideas in the later stages of my books, and this book is no exception. So far, we have considered several of the main hypotheses as to why there are three spatial dimensions, and in this chapter I will present my own idea. So bear in mind that the material presented in this chapter should be considered speculative (however, all the material in this book — with the exception of the chapter on general relativity — should be considered speculative as absolutely no one knows the real reason why there are three dimensions of space).

The solution which will be presented here is particularly appealing because it includes principles from almost every area of fundamental physics: relativity, quantum mechanics, particle physics, and thermodynamics. It will also include several of the "fundamental principles" which have been considered in my previous books.

I had several guidelines in mind when I developed this theory:

- The theory would have nothing to do with anthropic reasoning. Therefore, it could include no reliance on unseen parallel universes. Instead, a unique solution would have to emerge from clear logical reasoning. As Joseph Conlon says about anthropic theories in his book *Why String Theory?*: "The argument lacks the redeeming precision of cut-and-dried mathematical argument." We will be searching precisely for a cut-and-dried argument, and we will even be ending up with a simple equation which gives us the answer we seek: the number three.
- The theory would clearly and unambiguously have to predict three spatial dimensions. Not ten dimensions — three dimensions. This is in line with the naturalness argument (considered in Chapter One) which suggests a number of dimensions close to the value of one, and it is also in agreement with every observation which has ever involved counting the number of spatial dimensions.
- As explained at the end of Chapter Two, we should not expect to find three-dimensional space as a pre-existing absolute background. Instead, we should expect three-dimensional space to **emerge** from the properties of the fundamental particles which compose the universe. This principle was described by Einstein in the *New York Times* in 1919: "Till now it was believed that time and space existed by themselves, even if there was nothing — no Sun, no Earth, no stars — while now we know that time and space are not the vessel for the universe, but could not exist at all if there were no contents, namely no Sun, no Earth, and other celestial bodies." Einstein repeated this insight that time and space emerged from the behaviour of matter in the *New York Times* in 1921: "Up to this time the conceptions of time of time and space have been such that if everything in the universe were taken away, if there were nothing left, there would still be left to man time and space." Einstein had realised that if there is no matter, there is no space. To find our solution, we need to consider the behaviour of matter.
- The theory would have to be simple. We are dealing with the most fundamental of physical entities: the number of dimensions of space. It is a firm belief of all my books that, as we approach the fundamental level, our theories should get simpler — not more complicated.

The proposed solution presented in this chapter will be composed of five simple parts:

1. A bit of relativity.
2. A bit of thermodynamics.
3. A bit of particle physics.
4. A bit of quantum mechanics.
5. Why three dimensions?

OK, let's get started ...

Part 1: A bit of relativity

As explained earlier in this book, Hermann Minkowski realised that special relativity suggested that time and space should be combined into a higher-dimensional combined spacetime. And it is this spacetime model which provides us with a simpler way of looking at special relativity. This simplification is described by Brian Greene in his excellent book *The Fabric of the Cosmos*: "The combined speed of any object's motion through space and its motion through time is always precisely equal to the speed of light." In other words, it can be considered that all objects travel through spacetime at the speed of light. As mentioned in Chapter Four earlier in this book, even an object which is stationary, i.e., is not moving in space, is clearly still moving through time (a watch, for example, clearly shows the passage of time). For the complete details of why this speed through spacetime is necessarily the speed of light, see my third book.

This principle allows us to understand special relativity in a simpler form. As Brian Cox and Jeff Forshaw explain in their book *Why Does $E = mc^2$* : "This newfound way of thinking about how things move through spacetime can help us get a different handle on why moving clocks run slow. In this spacetime way of thinking, a moving clock uses up some of its fixed quota of spacetime speed because of its motion through space and that leaves less for its motion through time."

This interpretation of special relativity provides us with a simpler way of understanding the time-travelling astronaut. An astronaut who flies away from the Earth at nearly the speed of light before returning to the Earth will have travelled a greater distance through space than his friend who stayed on Earth. However, because the astronaut will have travelled a greater distance through space, he will have travelled a smaller distance through time (as everything travels at the same speed in spacetime). In other words, he will have aged less.

So special relativity provides us with the first principle we need on our quest to understand why there are three dimensions of space: everything travels through spacetime at the speed of light.

Part 2: A bit of thermodynamics

The nature of time still remains something of a mystery to us. This is because — certainly down to the atomic level — all physical processes appear to be reversible with time.^[26] For an example from Newtonian mechanics, consider a movie of a moving ball colliding with a stationary ball. The first ball would stop and the second ball would move off at speed. If the movie was played backwards, the events would still make sense according to the laws of physics. This time, though, the second ball would come in reverse, strike the stationary first ball, and the first ball would then move off in reverse. Everything would happen perfectly in reverse, and it would look as though it was happening in the forward time direction.

So if the laws of physics are time-symmetrical, why do so many processes exhibit a so-called *arrow of time* in the forward time direction? For example, we might see an egg breaking (in the forward time direction), but we never see a broken egg reforming itself — so clearly that is not a process which is time-symmetrical. The answer as to why there is an arrow of time comes from the increase in *entropy*, which can be regarded as the amount of disorder in a system. It is known that the amount of entropy in a system will always tend to increase with time, in other words a system will become more disordered over time. Hence, we see cars rusting (their molecules becoming more disordered), but we do not see rusting cars becoming new again. This principle that the entropy of a closed system increases with time is called the *second law of thermodynamics*.

But entropy is a statistical property which can only be measured from a group of particles. It therefore makes no sense to talk about the entropy of a single particle — a single elementary particle has no internal parts, so it can never get disordered, or fall to bits over time. In a similar fashion, it makes no sense to talk about the temperature or pressure of a single particle (temperature and pressure are also statistical properties of a group of particles). As Joseph Conlon says in his book *Why String Theory?*: "The concept of temperature requires many particles."

So — if this is the case — then how does a single elementary particle experience time? If it is not subject to increasing entropy then it is not subject to the usual arrow of time. However, we know that elementary particles do experience time because of experimental observations. For example, when protons from space hit the upper atmosphere of the Earth, they produce *muons*, which are a heavier form of electron. Because the muons are heavy, that means they rapidly decay to lighter particles: the average lifetime of a muon is 2.2 microseconds. In that very

short period of time, even muons travelling at close to the speed of light will only travel 660 metres before they decay. This means very few muons should actually reach the surface of the Earth. However, in practice, many more muons reach the Earth's surface. This is because of time dilation predicted by special relativity: the particles are travelling at close to the speed of light, so time passes slower for the muons. Hence the muons "age slower" and it takes them longer to decay.

It is also well known from particle accelerator experiments that elementary particles take longer to decay when they are moving close to the speed of light. This was described by Luboš Motl in a blog posting entitled *The world as seen by the LHC protons*: "All the processes occurring 'inside' the moving particle are slowed down due to time dilation. That's true for the 'ageing process' of the particle, too." [\[27\]](#)

But if an elementary particle has no internal structure, it can have no internal clock. And if it has no internal parts then it has no entropy and is therefore not subject to the usual entropy-based arrow of time. So how do elementary particles experience time? How do elementary particles "age"? This is a very fundamental question.

We will shortly be returning to this question as we shall see it possibly holds the key as to why there are three dimensions of space.

Bear with me ... we are getting there!

Part 3: A bit of particle physics

The world of particle physics can seem a very confusing place. However, if you read my previous book you will know that all particles can be placed in one of two simple categories: a particle is either a *fermion* or it is a *boson*.

Fermions resist being in the same state as other fermions. It is this tendency which causes fermions to be the particles which form atoms. Electrons are fermions, and they orbit the atomic nucleus (composed of quarks, which are also fermions) in clearly-defined shells. The clearly-defined electron shells prevent two electrons from being in identical states.

Because fermions resist being in the same state, an object composed of fermions will resist our touch, feeling solid. Hence, fermions are the particles which form matter: trees, cars, gases, tables, and humans.

The other category of particles are the bosons. A photon (a particle of light) is an example of a boson. In contrast to the behaviour of fermions, bosons like to be in the same state. Hence, billions of photons will congregate to produce a beam of light. Because photons do not mind being in the same state, bosons feel intangible: a light beam does not resist our touch. Hence, bosons are not suitable particles for forming matter.

This distinction between fermions and bosons is vital for our quest to determine why there are three dimensions of space. This is because of our human bias when considering questions about space (considered in Chapter Two). We are made of fermions. The objects we manipulate are made of fermions. The objects we have to avoid when we navigate space are made of fermions (we generally don't have to avoid a beam of light). Atoms are made of fermions, and galaxies are made of fermions. In fact, it could be said that we define space in terms of fermionic matter.

This is important for our quest to understand why there are three dimensions of space. To see why, let us ask the hypothetical question: how many dimensions would we experience if we were made of light? Special relativity tells us that an object ages slower as its speed approaches the speed of light. An object made of fermions has mass, and can never reach the speed of light. However, light is composed of massless bosons and is therefore able to travel at ... well ... the speed of light. Light, therefore, does not experience time. Harry McLaughlin, one of the top contributors on the *Quora* website, describes the experience of light quite beautifully: "Imagine watching a sunset. A photon is emitted from an atom in the solar photosphere and journeys across space until it reaches your eye and is absorbed by a molecule in your retina. From your point-of-view, this photon had a lifespan of about eight minutes. However, for the photon, its own emission and absorption is a single event. There are no defined notions such as 'happening', 'process', or 'experience'. For a photon, time is non-existent and meaningless."

With this in mind, let us return to our hypothetical question: how many dimensions would we experience if we were made of light? From the previous discussion it is clear that if we were made of light we would not even be asking the question "Why does the universe have four spacetime dimensions?" because we would not experience four spacetime dimensions. Just like light, we would not experience the time dimension. In other words, we would have lost a dimension!

And I think this is a vital point: the number of dimensions of the universe depends on your viewpoint. Is your universe defined by bosons or fermions? This makes it very clear that — to repeat a point made in Chapter Two — the dimensions emerge from the behaviour of matter in the universe. The spatial dimensions do not form a pre-existing system of axes. Newton's idea of absolute space has been refuted. There is no absolute "box" of spatial axes

"outside the universe" which would remain if all the matter in the universe was removed. Instead, the dimensions come from the behaviour of that matter: the dimensions emerge from the behaviour of particles.

So, if we truly want to understand why there are three spatial dimensions, we need to consider the behaviour of particles. Specifically, we need to consider the behaviour of fermions, because that is how we define our space.

Part 4: A bit of quantum mechanics

In the first two decades of the 20th century, physics was rocked by the two major developments of quantum mechanics and relativity. However, the incompatibility of these two developments posed (and still does pose) a major challenge for physicists.

If you read my previous book, you will know that in 1928 the British physicist Paul Dirac made a major breakthrough by successfully combining quantum mechanics with special relativity for the first time. In his famous Dirac equation, he managed to accurately describe the quantum mechanical behaviour of an electron which incorporated the rules of special relativity. He achieved this by using a *matrix*. A matrix is a rectangular array of numbers which can be used to transform one set of coordinates into another set of coordinates (for example, a rotation of an object can be described by a matrix). So, in his equation, Dirac used a matrix to transform spatial coordinates into time coordinates — according to the rules of special relativity. This resulted in a description of how the electron behaved in combined spacetime. [28]

So, what did the Dirac equation reveal about the electron? Amazingly, it revealed the electron had to spin. It was already known that an electron possessed the property of spin, but for the Dirac equation to predict the necessity for spin was an extraordinary achievement.

How are we to interpret this necessity for electron spin? Well, perhaps we should not be too surprised. Paul Dirac introduced the rules of special relativity into quantum mechanics, and we know from our earlier discussion that special relativity has a simple interpretation: everything travels at the speed of light in spacetime. If we consider a stationary electron, how can it possibly continue to move through spacetime at the speed of light? The simple answer is: it has to spin. Remember in our earlier discussion of entropy, the question was asked how can an elementary particle move through time? An elementary particle has no internal parts, so increasing entropy cannot explain the arrow of time for a single particle. Instead, perhaps we can consider the necessity for a particle to spin as representing the only way a stationary elementary particle can continue to travel through spacetime. How does a stationary elementary particle travel through time? The only way it can: it spins. [29]

But if particle spin represents a particle's speed through spacetime, at what speed should we expect it to spin? You might be able to guess: we would expect it to spin at the speed of light — the same speed that everything travels through spacetime. This was suggested by Paul Dirac in his Nobel Prize-winning lecture in 1933: "It is found that an electron, which seems to us to be moving very slowly, must actually have a very high frequency oscillatory motion of small amplitude superposed on the regular motion which appears to us. As a result of this oscillatory motion, **the velocity of the electron at any time equals the velocity of light**. This is a prediction which cannot be directly verified by experiment, since the frequency of the oscillatory motion is so high and its amplitude is so small."

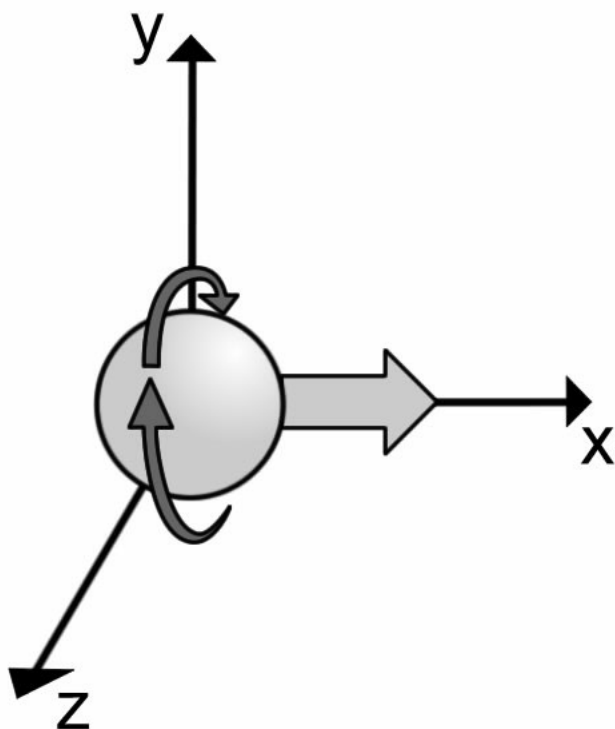
However, even though it is impossible to experimentally measure the electron spinning at the speed of light, it is possible to perform a simple calculation to show that this is likely to be the case (the calculation is included in the Appendix).

But, really, the details of this are irrelevant. The only two things we need to know are that our reality is defined in terms of fermions, and that a fermion must spin. Those two facts alone are enough to determine that space must have three dimensions — as we shall now see ...

Part 5: Why three dimensions?

Congratulations — we have made it! This is the last step on our quest to discover why space has three dimensions.

On the basis of what we have just discovered, the solution is very simple. Because of our human bias, our space is defined in terms of fermions. A fermion with mass, travelling slower than the speed of light in the x direction, needs to spin. Spin requires a plane in two dimensions, so an additional two dimensions — y and z , shown in the following diagram — perpendicular to the direction of motion are required:



So three dimensions arise from the fermion's need to satisfy the rules of special relativity. And, as we define our reality in terms of fermions, our space therefore must have three dimensions, three degrees of freedom.

Referring back to Chapter One, the idea of three being a "number of sufficient magnitude" was introduced. We can now see how that principle is applicable: one or two dimensions of space would not be enough as the fermion would not be able to spin. Three dimensions is the smallest number of dimensions which allows spin perpendicular to motion, thus allowing the fermion to satisfy special relativity.

But, you might protest, this still does not specifically identify three dimensions of space. OK, one or two dimensions would not be enough, but surely this would still be possible in four dimensions of space, or five or six or any other large number of dimensions? Well, rather wonderfully, it turns out that three-dimensional space has a unique characteristic in this regard (as described in the discussion of three-dimensional geometry in Chapter Two, it is often the case that spaces with low number of dimensions can possess unique characteristics which are not shared by higher-dimensional space). John Barrow explains this unique characteristic in *Dimensionality*: "There is one simple geometrical property unique to three dimensions that plays an important role in physics: universes with three spatial dimensions possess a unique correspondence between rotational and translational degrees of freedom. Both are defined by only three components."

This is going to require some explanation.

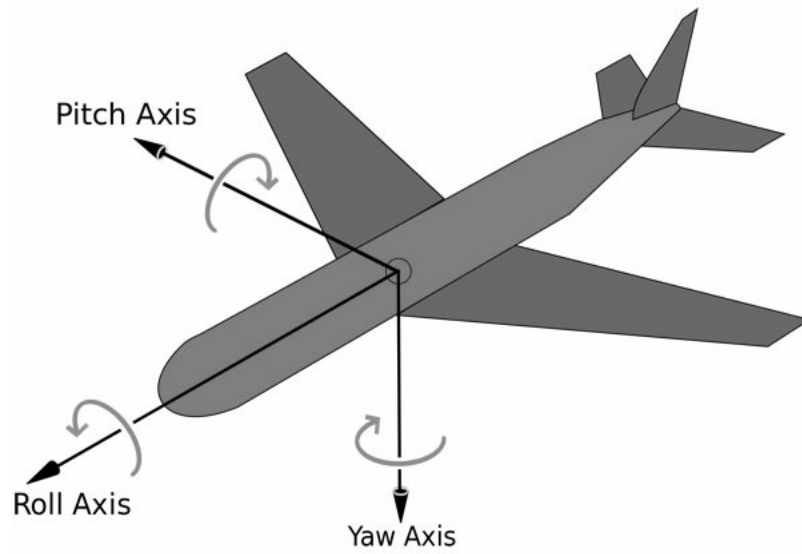
Imagine a two-dimensional plane: a flat desert. And on that flat desert there is a car. The car is free to drive anywhere on the desert, so the car can move anywhere across that two-dimensional space. In other words, the car has two translational degrees of freedom. But how free is the car to rotate? The car rotates around the vertical axis when it turns left and right — when the driver turns the steering wheel. So the car has only one rotational degree of freedom (hence, the car has only one steering wheel — a steering wheel being required for each rotational degree of freedom).

To sum up, in two-dimensional space there are two degrees of translational freedom, but only one degree of rotational freedom. So, in two dimensions, the number of translational degrees of freedom is not equal to the number of rotational degrees of freedom.

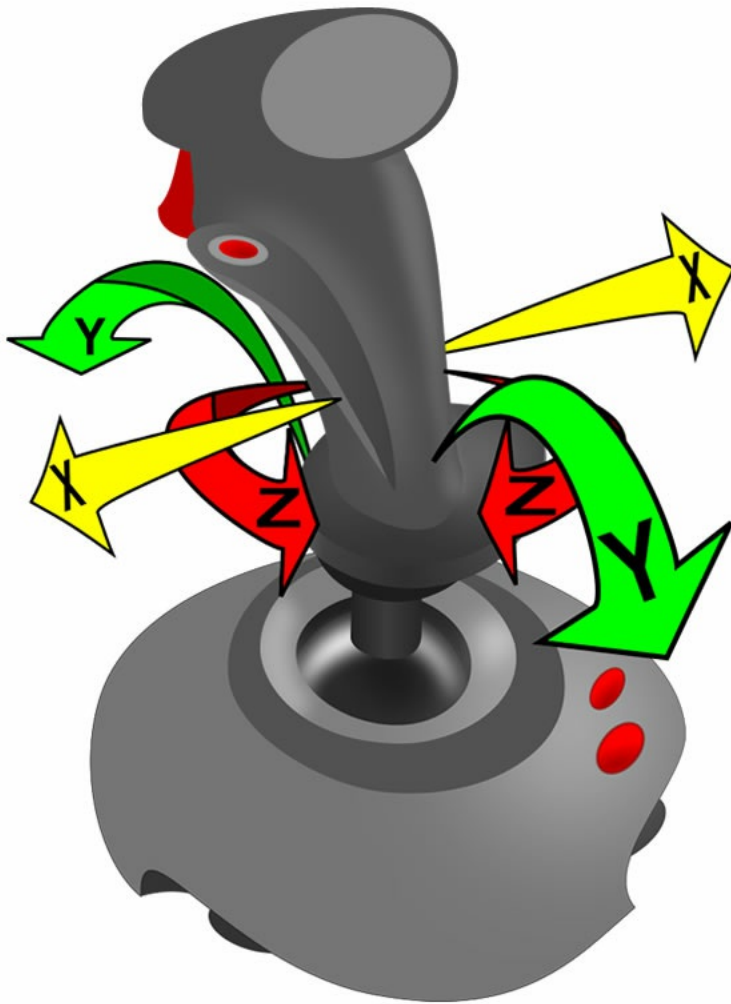
Now let us consider the situation in three-dimensional space.

Unlike a car — which is restricted to movement in two dimensions — an aeroplane is free to move in a straight line in any direction in three-dimensional space: forward/back, up/down, left/right. So an aeroplane has three translational degrees of freedom. But how free is the aeroplane to rotate? It turns out that there are also three

rotational degrees of rotation available to the aeroplane, and these are called *roll*, *pitch*, and *yaw*:



So an aeroplane has three rotational degrees of freedom. For this reason, an aeroplane effectively needs three steering wheels — one for each rotational degree of freedom — and these are incorporated into a joystick:



Just to make it clear, a car or boat is able to move in two dimensions, but only needs one steering wheel (it is only able to rotate around one axis). An aeroplane can move in three dimensions and needs three steering wheels (it is able to rotate around three axes). As John Barrow said, in three dimensions — and three dimensions only — the number of rotational degrees of freedom is equal to the number of translational degrees of freedom.

There is a formula which gives the number of "steering wheels" (number of rotational degrees of freedom) in n dimensions of space, and that formula is:

$$\frac{1}{2}n(n-1)$$

Try calculating the result of this formula for various values of n , such as $n=1$ or $n=2$.

- For $n=1$ (one-dimensional space — a line) you will find the formula gives the value 0. This is because you cannot rotate in one-dimensional space, you can only move forwards and backwards along the line, so no "steering wheels" are required. So, in the case of one-dimensional space, the number of steering wheels, 0, is clearly not equal to 1, the number of dimensions.
- For $n=2$ (two-dimensional space — a plane) you will find the formula gives the value 1. This is the case of the car or the boat which can travel in two dimensions but are only able to rotate about a single axis — so only have one steering wheel. So, once again, the number of steering wheels is clearly not equal to the

dimensionality of the space.

- For $n=4$ you will find the formula gives the value 6, which is clearly not equal to 4.

However, for $n=3$ you will find the formula gives the value 3. So three steering wheels are required to navigate three-dimensional space. And, crucially, it can be shown that this is only true for $n=3$. No other number of dimensions will satisfy this formula.

Effectively, we are solving the magic equation:

$$n = \frac{1}{2} n(n - 1)$$

You might like to use a bit of high-school algebra to calculate the value of n from that equation yourself. You will find that putting $n=3$ satisfies the equation, which is clearly the correct answer for the number of spatial dimensions. [\[30\]](#) This makes it clear what an important role is played by spin (rotation) in defining the number of spatial dimensions.

So that is my proposal for why there are three dimensions of space.

To recap, we define our space in terms of fermions, which are the matter particles such as electrons. A fermion has to comply with the rules of special relativity (is said to be *Lorentz invariant*) and hence requires a plane of rotation in order to spin. But only in three-dimensional space is a single plane of rotation uniquely specified which is perpendicular to the particle's direction of motion.

And that is why I believe three is the magic number.

Thank you.

APPENDIX

This appendix presents a simple calculation to show that a particle spins at the speed of light (a similar calculation was performed in the early days of quantum mechanics).

In my previous book, it was stated that elementary particles are considered as being infinitely-small pointlike particles. But if the radius of a particle is truly zero, then how can we measure the speed at which a point on the surface of the particle spins? Well, quantum mechanics introduces an element of uncertainty into all measurements due to the Heisenberg uncertainty principle. Because of wave/particle duality, every particle can be thought of as having a wavelength as well. In the following calculation, the radius of the particle will be given by this wavelength, the *Compton wavelength*, which is equal to:

$$r = \frac{h}{mc}$$

where m is the mass of the particle, c is the speed of light, and h is Planck's constant. We will be modelling a particle by a spinning disk which has an angular momentum, L , equal to:

$$L = \frac{mvr}{2}$$

where v is the velocity with which the particle is spinning.

Replacing the value of r in this equation with the value of the Compton wavelength gives:

$$L = \frac{mv}{2} \left(\frac{h}{mc} \right)$$

Replacing the value of angular momentum with the spin angular momentum, $h/2$, gives:

$$\frac{h}{2} = \frac{mv}{2} \left(\frac{h}{mc} \right)$$

You will see that the h , and the m , and the 2 all cancel, leaving us with $v=c$. In other words, the particle spins at the speed of light.

FURTHER READING

A Beautiful Question by Frank Wilczek

A lavishly-illustrated book, containing some very deep and interesting ideas. Includes sections on the Platonic solids, and beauty in Nature.

The Constants of Nature by John Barrow

Includes chapters on naturalness, the anthropic principle, and dimensions.

Warped Passages by Lisa Randall

A speculative account of hidden dimensions.

Why String Theory? by Joseph Conlon

Not an easy read, quite technical, but accurately reflects the current state of the field.

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NOTES

[1] I have often wondered why Occam's razor is called a "razor". Surely it does not have anything to do with shaving? Well, in the true spirit of Occam's razor, the simplest solution (and our first guess) is correct: it does indeed have something to do with shaving. Occam's razor is said to "shave" away unnecessary assumptions, cutting away the complexity.

[2] Frank Wilczek was the joint-discover of asymptotic freedom in the strong force.

[3] http://en.wikipedia.org/wiki/Mathematical_constant

[4] I believe this apparent connection between naturalness and simplicity is the reason for the current popularity of naturalness as a guiding principle in developing new theories — even though it might not always be applicable to all areas, such as particle physics. See Sabine Hossenfelder for a discussion: <http://tinyurl.com/sabinenaturalness>

[5] John Baez, *Platonic Solids in All Dimensions*, <http://tinyurl.com/johnbaez>

[6] J.D. Barrow, *Dimensionality*, <http://tinyurl.com/barrowdimensionality>

[7] So here we find a reason for the mysterious naturalness of the physical constants (discussed in Chapter One). The value of the numerical constants in our formulas is heavily-dependent on the dimensionality of space (see Chapter Ten of John Barrow's book *The Constants of Nature*). So because the number of dimensions of space is natural (three is a small dimensionless constant) this ensures that the other constants are also natural: the physical constants are natural because space is natural.

[8] It is quite easy to see the International Space Station at night: it is the third brightest object in the sky and it is amazing to see it passing overhead at great speed. There is a website which tells you when you can see the station: <http://iss.astroviewer.net/observation.php>

[9] The tendency of the bucket is to fly off in a straight line. So the only force actually acting on the bucket is the tension in the rope (this inward force is called the *centripetal force*). So the apparent outward centrifugal force you feel is considered to be a *fictitious force*.

[10] Max Tegmark, *On the dimensionality of spacetime*, <http://arxiv.org/pdf/gr-qc/9702052v2.pdf>

[11] Gerald Whitrow, *Why Physical Space Has Three Dimensions*, British Journal for the Philosophy of Science, vol. 6, No. 21, 1955.

[12] John Bechhoefer and Giles Chabrier, *On the fate of stars in high spatial dimensions*, American Journal of Physics 61, 460 (1993).

[13] M. Gasperini, *The cosmological constant and the dimensionality of space-time*, Physics Letters B, Volume 224, June 1989, pp. 49-52.

[14] This flight pattern — which goes so far North — is called a *great circle*. Unfortunately, the *Titanic* hit an iceberg because it was following a northerly great circle route (the fastest route to New York) which took it into an ice field.

[15] This sign convention (+---) is sometimes called the *West Coast metric*. This is to distinguish it from the (-+++ sign convention which is sometimes called the *East Coast metric*. Some would say either convention is equally valid, but the West Coast metric clearly makes more sense to me as it applies to objects with a *timelike* world line, i.e., objects which cannot move faster than light (which is the case for all objects). In contrast, the East Coast metric applies to events with *spacelike* separation.

[16] Actually, this formula — which measures spacetime distance as the time measured by a travelling clock — means that objects move so as to **maximise** their distance through spacetime, not **minimise** their distance. This is because objects moving along a geodesic will show the maximum time on their clock (whereas as astronaut who deviates from the geodesic — by travelling to Jupiter and back, for example — will show less time passing, less spacetime distance, on his clock when he returns). But the end result is the same: objects tend to travel along geodesics.

[17] More precisely, this represents the *divergence*, which is a measure of how quickly a property "spreads out" from a point in space.

[18] You will also notice a g_{55} element in the bottom right corner. This represents an undiscovered particle called a *dilaton* and is a known problem with Kaluza's theory. Theodor Kaluza ignored it, and so shall we.

[19] These are examples of *global symmetries* because the same symmetry transformation is applied at every point in the universe. Gauge theory arises from *local symmetry* in which different transformations can be applied at each point in the universe.

[20] Technically, this is called *U(1) symmetry*, which means "rotation in one complex dimension". For more

information, see the book *Deep Down Things* by Bruce Schumm.

[21] Why is the phase of a wavefunction unobservable? Because quantum mechanics can only tell us the probability of an event occurring, for example, the probability that a particle will be at a certain position. If you read my fourth book you will know that the German physicist Max Born showed that the value of the **square** of the wavefunction represented the probability that the electron is found at a particular location. But when we square the wavefunction, we lose all the phase information (the phase being represented by a complex number). So the phase information is fundamentally unobservable — we can only measure the probabilities.

[22] Juan Maldacena, *The symmetry and simplicity of the laws of physics and the Higgs boson*, <http://arxiv.org/abs/1410.6753>

[23] It is used in the calculation of the *Casimir effect*. If two plates are placed just a few nanometres apart in a vacuum, there will be a small attractive force between the plates due to the vacuum energy of the electromagnetic field. The $-1/12$ value explains why summing over all the possible vacuum energy states does not result in an infinite value. The minus sign explains why the Casimir force is attractive.

[24] The expression on the left-hand side actually represents the sum of the lowest energies of each oscillator mode (the so-called *zero-point energies*). The $\frac{1}{2}$ term comes from the standard result for the lowest energy of a quantized harmonic oscillator (a vibrating string is a harmonic oscillator). The -1 term on the right-hand side represents the fact that the ground state energy is not zero, but has a small negative value called the *Casimir energy* (the value is the negative of the $n=1$ lowest-energy state).

[25] Chapter 12 of *A First Course in String Theory* by Barton Zwiebach.

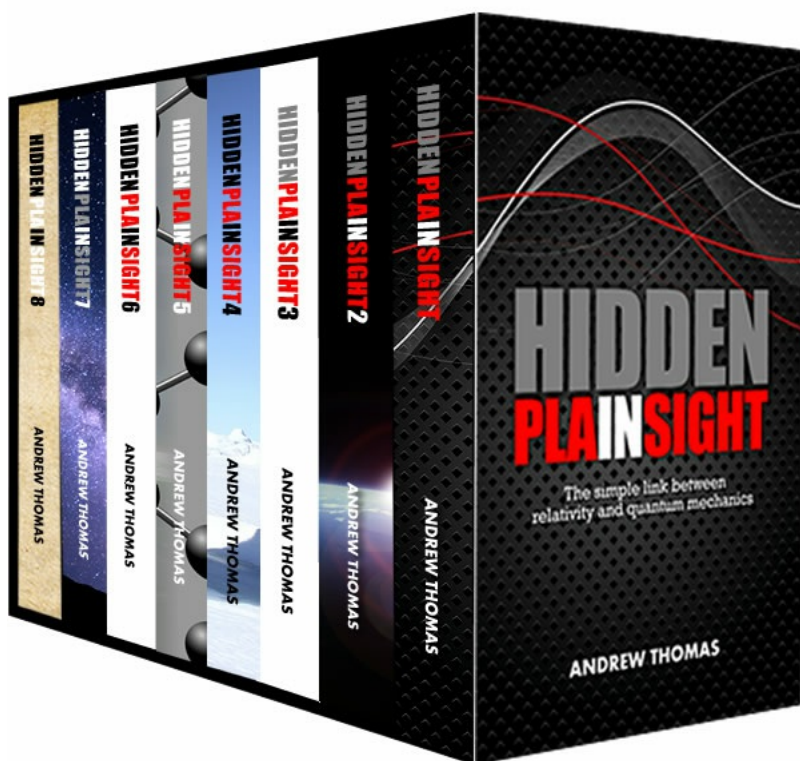
[26] At the level of individual particles, the interactions of the weak force do not appear to be completely symmetric with respect to time. However, according to *CPT symmetry*, if the charge of a particle (C) and the parity of a particle (P) and time (T) are all reversed then all physical interactions are indeed reversible — even interactions due to the weak force.

[27] <http://tinyurl.com/lhcprotons>

[28] The resulting description of the electron is said to be *Lorentz invariant*, meaning that the description of the electron does not depend on how the observer is moving, i.e., the description conforms to the rules of special relativity.

[29] In accordance with the energy-momentum relation in special relativity, translational momentum in the space dimension transforms into angular momentum — spin — in the time dimension (if you are protesting that the intrinsic spin of a particle does not represent actual rotation, please refer to my previous book in which it is argued that it does, indeed, represent actual physical rotation).

[30] $n=0$ is the other — not very interesting — solution.



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Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

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The secret of time

Hidden In Plain Sight 4

The uncertain universe

Hidden In Plain Sight 5

Atom

Hidden In Plain Sight 6

Why three dimensions?

Hidden In Plain Sight 8

How to make an atomic bomb

Hidden In Plain Sight 9

The physics of consciousness

Hidden In Plain Sight 10

How to program a quantum computer

Hidden In Plain Sight 11

The logic of consciousness

Hidden In Plain Sight 12

Consciousness and the steam engine

HIDDEN
IN PLAINSIGHT 7
The fine-tuned universe

ANDREW THOMAS

HIDDEN IN PLAIN SIGHT 7

The Fine-Tuned Universe

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CONTENTS

PREFACE

1) THE ANTHROPIC PRINCIPLE

[The six numbers of Martin Rees](#)
[How to predict the winner of every horse race](#)
[The selection effect](#)
[The weak anthropic principle](#)
[The strong anthropic principle](#)

2) BAYES' THEOREM

[Smallpox — or not?](#)
[Putting numbers into the equation](#)
[The usual form of the equation](#)
[How Bayes' theorem won the war](#)
[The controversy over prior probability](#)
[The Bayesian fine-tuning equation](#)
[The probability of life](#)

3) THE FERMI PARADOX

[6EQUJ5](#)
[The Fermi paradox](#)
[Exoplanets](#)
[The habitable zone](#)
[Is the Earth special?](#)
[Implications for fine-tuning](#)

4) THE COSMOLOGICAL CONSTANT

[The priest](#)
[The return of the cosmological constant](#)
[Naturalness](#)
[The naturally-flat universe](#)

5) QUANTUM FIELD THEORY — PART ONE: EVERYTHING IS FIELDS

[A brief refresher on quantum mechanics](#)
[The Dirac revolution](#)
[Fock space](#)
[Everything is fields](#)

6) QUANTUM FIELD THEORY — PART TWO: THE FEYNMAN APPROACH

[The totalitarian principle](#)

[Feynman diagrams](#)

[The fine structure constant](#)

[The Higgs mechanism](#)

[The hierarchy problem](#)

7) THE WEAKNESS OF GRAVITY

[The Randall-Sundrum model](#)

[The true strength of gravity](#)

[The laws of physics do not change over time](#)

[The early universe](#)

[Why is gravity so weak?](#)

[The fine-tuned universe](#)

EPILOGUE

PREFACE

I am pleased to say that the subject of this book is the hottest topic in fundamental physics research today. Physics blogs and forums are buzzing with discussions about "fine-tuning" and the related subject of "naturalness".

These questions have taken increased priority after experiments at the Large Hadron Collider did not reveal any of the "Beyond the Standard Model" (BSM) physics which many particle physicists hoped would appear. With little new data to analyse, many particle physicists fear for their jobs. Does this represent the beginning of the end of fundamental physics research?

The LHC discovered the Higgs boson, but the mass of the Higgs boson has emerged as something of a puzzle in its own right. As we shall see later in this book, we have no idea why the Higgs mass is so small. Is the value "natural", or is it "fine-tuned"? Is the universe itself fine-tuned for life?

As you can see, these are seriously big questions. Though I have also included several side-stories to keep you entertained.

Once again, thank you for your support.

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2017

*"As I looked out into the night sky,
at all those infinite stars,
it made me realize how insignificant
they really are."*

- PETER COOK, BRITISH COMEDIAN

1

THE ANTHROPIC PRINCIPLE

In 1973, Brandon Carter, an Australian-born theoretical physicist, had just written a scientific research paper containing an idea which he knew was potentially explosive. Carter, who was studying at Cambridge University at the time, was unsure about the wisdom of publishing such a controversial paper. However, a young Stephen Hawking was intrigued by Carter's work and encouraged him to present his idea to the world.

By one of those strange twists of fate which sometimes occur, 1973 also happened to mark the 500th anniversary of the birth of Nicolaus Copernicus, the great Polish mathematician and astronomer. It was Copernicus who first proposed the theory that the Earth was not the centre of the universe, but, in fact, the Earth orbited the Sun. Previously it had been believed that the Earth held a very special position in the universe. But according to the Copernican principle, the Earth was nothing more than just another mediocre planet, and humanity was nothing more than some unremarkable chemical compound smeared over the face of the planet.

But now, for the first time in 500 years, the science of Brandon Carter was about to challenge Copernicus.

To mark the anniversary of the birth of Copernicus, a conference was being held in the Polish town of Krakow where Copernicus had studied. The timing was perfect for Carter. If Carter wanted to create a big stir in the audience, he certainly managed it. He picked just the right occasion to maximise the impact of his paper.

Carter's important and influential paper is available here:

<http://tinyurl.com/carterpaper>

Carter agreed with Copernicus that our position in the universe was not special or central in every way. However, Carter realised that this did not mean that our position could not be special in **any** way. Indeed, in some ways it was clear that our position **was** privileged. As an example, the Earth orbits the Sun at a comfortable distance so that its surface is not boiling hot like Venus, or freezing like Neptune. As another example, the strength of the Earth's gravity has the perfect value to retain a thick atmosphere, while not being too strong to crush any complex lifeforms which might emerge. It does seem fairly inarguable that our position — as far as the emergence of life is concerned — **does** appear to be privileged to some extent. Take a trip to Venus if you don't believe me.

But Carter went even further.

Carter had realised that not only was the Earth uncannily suited for life, but also that the laws of physics and the values of the fundamental constants seemed to have forms and values which appeared particularly suited for the emergence of life. If some of the values were only slightly different then it appears that the emergence of life in the universe might well have been impossible. It was almost as if the universe was "fine-tuned" for life.

As the great physicist John Wheeler said: "It is not only that man is adapted to the universe, the universe is adapted to man. Imagine a universe in which one or another of the fundamental dimensionless constants of physics is altered by a few percent one way or another. Man could never come into being in such a universe."

The six numbers of Martin Rees

It turns out that there is quite an extraordinary number of these "life-friendly" coincidences. Martin Rees has written a book called *Just Six Numbers* in which he considers just six of these remarkable numbers. According to Martin Rees: "The nature of our universe is remarkably sensitive to these numbers. If you can imagine setting up a universe by adjusting six dials, then the tuning must be precise in order to yield a universe that could harbour life."

Here are the six numbers of Martin Rees:

1. The value of N , which is the ratio of the strength of the electromagnetic force to the gravitational force. N has the value approximately equal to 10^{40} , which is 10,000,000,000,000,000,000,000,000,000,000.

Put simply, this means that the force of gravity is extraordinarily weaker than the electric force. However, unlike the electric force — which can be either attractive or repulsive — gravity is always attractive. So, even though gravity is extremely weak, the attractive force accumulates and becomes dominant for large masses. In

fact, gravity becomes so strong that any planet larger than Jupiter would become crushed by gravity — so the Earth is very lucky that gravity is not stronger. Not only would the Earth be crushed, but all life on Earth would be crushed as well.

Similarly, as gravity becomes stronger for larger masses, this means that stars must necessarily be huge in order to overcome the tremendous outward pressure generated by the fusion reactors in their core. It was the American physicist, Robert Dicke, who first realised that stars are so big because gravity is so weak. If gravity was stronger then stars would be very much smaller, and their lifetimes would then be too short to allow the evolution of complex life.

The strength of gravity will be considered in detail in the final chapter of this book.

2. The value of ϵ , the Greek letter *epsilon*, which represents the amount of energy released by the nuclear fusion reaction inside stars. The main fusion reaction combines hydrogen atoms to form helium atoms. The nucleus of a hydrogen atom is formed of a single proton, whereas the nucleus of a helium atom is formed out of two protons and two neutrons. But the nucleus of a helium atom weighs only 99.3% as much as the two protons and the two neutrons out of which it is made. The remaining 0.7% is released as energy during the fusion reaction, the energy coming from the loss of that small amount of mass according to $E=mc^2$. Hence, the value of epsilon is 0.7%, or 0.007.

Martin Rees then considers the case if the value of epsilon was 0.006 instead of 0.007. This would be the case if the strong nuclear force holding the protons and neutrons together was slightly weaker. As a result of this weakening of the force, protons could not be bound together during fusion and we would be left with a universe composed entirely of hydrogen. There would be no chemistry in such a universe — and no life.

Rees then considers the alternative situation in which epsilon was 0.008 instead of 0.007. This would represent a strengthening of the strong nuclear force. In that case, all the hydrogen would have disappeared from the universe shortly after the Big Bang, quickly fused into helium. There would then have been no fuel for stars, no water, and no life.

So, according to Martin Rees: "If epsilon were 0.006 or 0.008, we could not exist."

3. The value of Ω , the Greek letter *omega*, which represents the ratio between the total amount of mass and energy in the universe, and the *critical density* of the universe (the formula for the critical density was derived in my second book). The value of omega determines the eventual fate of the universe. If the total mass and energy contained within the universe is too small (less than the critical density), then the force of gravity will be too small to pull the universe back together again, and the universe will expand forever (this situation is called an *open* universe). Conversely, if the total mass and energy contained within the universe is larger than the critical density, the universe will eventually get pulled back together again by gravity (this situation is called a *closed* universe).

Observations of the universe indicate that the value of omega is close to one (indicating a *flat* universe, rather than open or closed). This appears to represent another case of fine-tuning of the value of omega: if the value of omega was much less than one, the universe would have expanded too fast to allow galaxies and stars to condense, and there would be no chance of life. Conversely, if the value of omega was much greater than one, the universe would have collapsed into a "Big Crunch" too quickly for stars to form. According to Martin Rees: "It looks surprising that our universe was initiated with a very finely-tuned impetus, almost exactly enough to balance the decelerating tendency of gravity. It's like sitting at the bottom of a well and throwing a stone up so that it comes to a halt exactly at the top — the required precision is astonishing."

There are, however, a couple of caveats to this apparent fine-tuning coincidence. Firstly, the popular inflation hypothesis predicts a flat universe — without the need for fine-tuning (though it has been suggested that inflation itself requires additional fine-tuning^[1]).

Secondly, this entire discussion is based on the behaviour of gravity at the largest of scales: will gravity pull the universe back together, or will gravity be too weak to prevent continual expansion? If our knowledge of gravity at the scale of the entire universe is wrong then it will have to be replaced by a theory of *modified gravity*. In that case, the fine-tuning requirement might be avoided. This possibility will be considered later in this book.

4. The value of Λ , the Greek letter *lambda*, which represents the *cosmological constant*.

We now know that the expansion of the universe is accelerating. This is due to a phenomenon which has been called *dark energy*. Dark energy is often suspected to be the vacuum energy present in empty space. However, our best estimate of the value of the vacuum energy is wildly inaccurate, and it appears that the

actual value must be fine-tuned to an incredibly small value.

We will see later how Leonard Susskind has described the apparent fine-tuning of the cosmological constant as a "cataclysm" for physics. The cosmological constant will be considered in detail in Chapter Four of this book.

5. The value of Q , the size of the initial "ripples" in the structure of the universe which seed the growth of all cosmic structures.

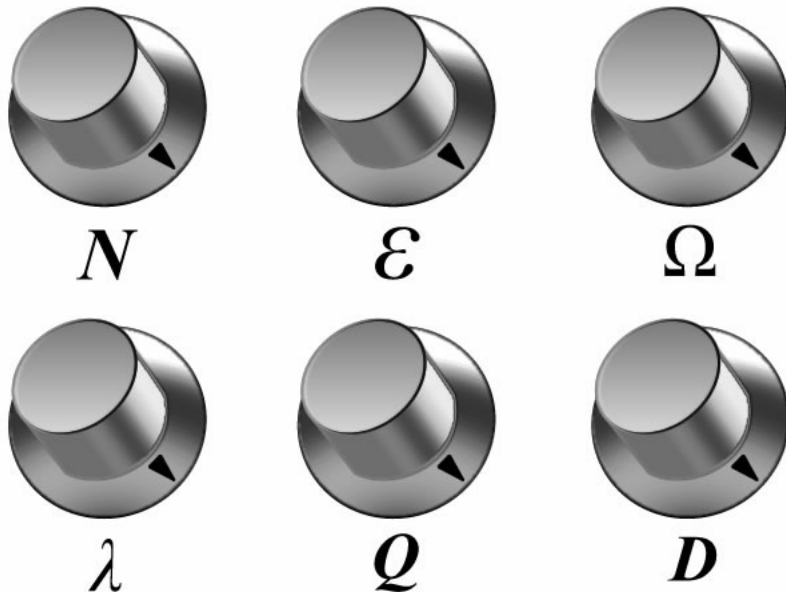
Martin Rees explains the importance of these initial irregularities being sufficiently large: "If the universe had started off completely smooth and uniform, it would have remained so throughout its expansion. It would be cold and dull: no galaxies, therefore no stars, no periodic table, no complexity, certainly no people." However, if the ripples had been too large then massive chunks of matter would have congealed into vast black holes. There seems to be some conflicting opinion over the problems introduced by a large Q , though there seems to be agreement over the necessity that Q should not be too small.

6. The value of D , the number of spatial dimensions of the universe — which is obviously set to three dimensions.

The number of spatial dimensions was the subject of my previous book. As I explained there, life could not exist if D was equal to two or four. However, in my book I came to the conclusion that this number was unlikely to be a fine-tuned coincidence. Any integer value close to one is likely to have a "natural" explanation (we shall be considering *naturalness* again later in this book). There is likely to be a simple mechanism which generates the number of dimensions, such as the simple mechanism which was proposed in my previous book.

With his listing of six arbitrary numbers, Martin Rees presented an analogy of six dials which have to be turned to particular values. As Martin Rees said: "The nature of our universe is remarkably sensitive to these numbers. If you imagine setting up a universe by adjusting six dials, then the tuning must be precise in order to yield a universe that could harbour life."

Here are Martin Rees's six numbers represented as dials:



There are more than just six arbitrary numbers, however. The Standard Model of particle physics requires the setting of the value of 25 fundamental constants — which would require a lot of dials! [2]

So Brandon Carter's 1973 paper really did cause a stir, the implications of which are still being felt to this day. But what made Carter's paper so controversial was that he also proposed an explanation for the fine-tuning coincidences.

To understand Carter's explanation, we will need to spend a day at the races ...

How to predict the winner of every horse race

Derren Brown is one of the most impressive performers currently on British television. His main act is that he is a mentalist, which means he appears to read people's minds. His mind reading act is so impressive that you become convinced he must have special powers. Brown can also get people to perform crazy feats through mind control. For example, he once convinced a group of old age pensioners to commit an art robbery — purely by mind control (the gallery was made aware of the impending theft).

What makes Brown's act so appealing is that he obviously has a good grasp of the science behind his technique, and he mixes scientific and mathematical techniques in with his magic. Sometimes it is difficult to tell where the science ends and the magic begins.

On British television in February 2008, Brown presented what is often regarded as his masterpiece. It was, quite simply, a way of predicting the winner of every horse race.



The show was called *The System*. Here is a description of the system in Brown's own words as he stands in the crowds of Sandown Park Racecourse at the start of the programme: "I have developed a guaranteed system for winning at the horses. This system allows me to predict — 24 hours in advance — which horse will win in big, high-profile races. Now, to prove this, six weeks ago I took a woman — a random member of the public — and I told her which horse was going to win in a certain race. It did win. She was intrigued. I then did it again, and again, and again. She started to bet larger and larger amounts of money. Now today, that woman has scraped together every last penny that she can find, and she is risking it all on one final race."

Ok, to clarify: this was a woman who was genuinely selected as a random member of the public. This was a single mother, a charming lady called Khadisha, who was working two jobs and who Derren Brown thought could most benefit from the winning money. Brown sent her a series of anonymous tips via email for several weeks. Because of Brown's apparent infallibility at picking winners, Khadisha was persuaded to bet large amounts of her own money on high-profile races. On the first race, Khadisha won £28. The second race went to a photo finish and there were a few tense minutes before it was announced that Khadisha's horse had won again. This time Khadisha won £360.

The fifth race proved particularly exciting with the predicted winner lying a long way back in third place going into the final jump fence. However, at the final fence the two leading horses both fell, so Khadisha's horse was then able to stroll through to an easy victory. Khadisha won just under a thousand pounds. Her only regret was that she had not betted more money so that she could have retired on the winnings.

So Derren Brown persuaded Khadisha to raise £4,000 (including £1,000 borrowed from her father) to bet on the sixth and final race. In the final race, the predicted horse won again (after a bit of classic showmanship from Brown) and Khadisha took home £13,000.

The entire video of *The System* is available on YouTube at the following link:

<http://tinyurl.com/derrenbrownssystem>

If all else fails, the following link to the video should always work:

<http://tinyurl.com/derrenbrownbackup>

At this point, it might be a good idea to put down this book and go and watch the video, and try to work out how

such a remarkable feat could have been achieved. I guess the solution would be called an example of lateral thinking — it is quite ingenious. I can tell you that I managed to work out the secret before Brown explained how he did it at the end of the video. See if you can do the same.

At about the nine-minute mark of the video, Brown announces that he is going to perform another seemingly impossible feat: "Part of what makes the System seem so impossible is that it defies our understanding of probability. I'm going to show you something now which is impossible in exactly the same way. I am going to toss a coin, fairly, ten times in a row and have it come up heads every time."

As Brown said, this was to be filmed under controlled conditions with multiple cameras running continuously which would not cut away, and it was a genuine coin with heads on one side and tails on the other. But then Brown said something more: "I want you to watch this (the coin tossing) and try and work out how it can be possible. Because the key to understanding this is the key to understanding the System."

Indeed, it was after Brown had performed this second seemingly-impossible feat that I worked-out the basic secret of how Brown was going to achieve his feat of predicting the winners of the horse races. Because, while there could be an element of skill in predicting the results of the horse races (by possessing expert knowledge of the horses, the jockeys, and the conditions), there could be no such skill which would help you throw a coin and get ten heads in a row.

There was only one possibility, and that is we were not being told the whole story.

The selection effect

Warning: spoilers ahead.

At about the 29-minute mark of the video, Derren Brown explains how the System works.

He starts by considering a similar example, an example of a person who takes a homeopathic remedy (homeopathic medicine is generally regarded as being unscientific) but finds it to be an effective cure: "You might have a viral infection, you might take the homeopathic remedy, you might then feel better and decide, therefore, that it must be an effective cure. The point is, it works for you — what more proof could you need? The trouble is that when these things are tested properly over thousands of people they are shown to have no effect whatsoever. The trap that people fall into is that they do not realise how limiting their own perspective can be. Khadisha believes in the system — she is convinced by it — because she is only looking at it from her own perspective. Now it is time to force a change in perspective, and to look at the bigger picture."

So why is all this relevant to the theme of this book, trying to decide whether or not the universe is "fine-tuned" for our existence? Well, it is precisely because we can only ever consider the problem from our own perspective — and that can be deceptive. We might interpret our existence as being the result of an impossibly improbable sequence of events, just as it was deceiving Khadisha picking her impossibly improbable sequence of winning horses (Derren Brown calculated that the probability of picking the sequence of winning horses correctly was one in 1.48 billion).

As Derren Brown said: "To work out the System, you need to understand that we can only know what comes from our own limited experience. And our experience can often be very far from the truth."

To explain the secret of the System, Derren Brown then returns to consider his feat of predicting ten correct coin tosses in a row: "To predict a run of ten heads in a row, and then make it happen, is hugely unlikely: the chance of it happening is about one in a thousand. However, if you flip a coin thousands of times, and record the results, then somewhere along that line of heads and tails then a line of ten heads is actually very likely to appear."

So that is how Derren Brown did his coin trick. What we saw — Brown tossing ten heads consecutively — represented only the final minute of what he called "an excruciatingly long day". Brown and his team filmed for over nine hours, with Brown tossing the coin continuously until he threw a consecutive sequence of ten heads. As Brown says: "the impossible became the inevitable".

So only the last minute of Brown's long day was selected for broadcast. But from our very limited viewpoint, it appeared that Brown had simply thrown ten heads in a row. What appeared to be an incredible coincidence was actually an inevitability.

Then Derren Brown explains how the horse racing trick was done. It was based on a similar principle to the coin

tossing trick in that we only got to see a very small part of the bigger picture. Initially, 8,000 people were contacted by email — not just Khadisha. Each of those 8,000 people received different tips as to which horse would win the first race. After the race, apologies were sent to all the people whose horse did not win and their bets were refunded. Khadisha happened to be in the group of people who had a winning horse in the first race.

The remaining people were then given different tips on a second race. Again, apologies (and refunds) were sent to the losers, and only the winners (including Khadisha) progressed to the next race.

By the time of the sixth race, there were only six people left, and they were each assigned a different horse in the final race. Of course, one of them **had** to win — the impossible became inevitable. It just happened to be Khadisha who received winning tips for all six races, and it was only Khadisha's story which was broadcast.

So what we have here is a large group of initial data (a large group of people) and only a small sample was taken from that group (a single person). But there was clear bias in the selection process as only the person who won all six races was ever going to be chosen as the representative sample.

Let us now consider another example of selection bias.

Let us imagine we want to determine the percentage of the population who have access to a telephone. The way we might decide to determine this is to conduct a poll: to pick a small sample of the population, see how many of them have a telephone, and then extrapolate that result to determine the percentage of the general population who have telephones. However, the way we decide to select our sample is via a phone poll: we ring up 1,000 people at random. I am sure you can anticipate the problem here. Out of that 1,000 people, we find that 100% of them have telephones. We then extrapolate that result to decide that everyone in the general population has a telephone. But, of course, there was clear bias in the way we selected our sample: only people who had a telephone in the first place could have been contacted via our phone poll. So of course it appeared that everyone had a phone.

When there is bias in the selection of a sample from a larger population, the misleading result is called a *selection effect*. It has been suggested that the apparent life-friendly coincidences in our universes could be a result of selection effects — in which case the apparent fine-tuning of the universe would be nothing more than an illusion. Let us now consider this suggestion.

The weak anthropic principle

In our previous discussion of selection effects, we have seen that any form of selection bias in a sample of data can lead to misleading conclusions being made. In particular, it can appear that uncanny coincidences have occurred, when, in fact, no such coincidences exist. With this in mind, when we consider the nature of the universe — to discuss whether or not it is fine-tuned — we can see that our existence as a form of intelligent life acts as a form of selection bias.

This is fairly obvious, after all, if conditions in our particular part of the universe were not amenable to the emergence of life then we would not be here to observe the life-friendliness of the universe — we simply would not exist. So, just like the previous example of the phone poll, if we ask the opinions of a privileged few people (people with telephones, or intelligent life living in comfortable regions of the universe) then you are going to get a false impression. On the basis of the responses, the universe is going to seem like a privileged environment, uncannily friendly and comfortable for life (with plenty of telephones as well).

So life is only ever going to be found in regions of the universe which are amenable to life. And any intelligent lifeform is then going to interpret the universe as being life-friendly. As Derren Brown pointed out, we can only ever consider the problem from our own perspective — and that can be deceptive. This tendency of intelligent life to interpret the universe as life-friendly is a selection effect and is fairly obvious. It should therefore be regarded as a tautology or truism.

In his book about the anthropic principle called *The Goldilocks Enigma* (also known as *Cosmic Jackpot*), Paul Davies makes this point: "Nobody can be at all surprised by this simple tautology. It merely says that observers will find themselves located only where life can exist. It could hardly be otherwise."

This fairly obvious principle is called the *anthropic principle*. The anthropic principle was presented for the first time (and given its name) in Brandon Carter's seminal 1973 paper, which was linked earlier but I will repeat here:

<http://tinyurl.com/carterpaper>

Specifically, this simple version of the anthropic principle which explains life-friendly coincidences as selection effects is called the *weak anthropic principle*.

As an example of the weak anthropic principle, we might look at the surface of Venus through a telescope and see

frightening conditions: towering volcanoes over a lava surface, with surface temperatures over 700 degrees Celsius as heat is trapped by its 95% carbon dioxide atmosphere (it is actually the worst-case scenario for the greenhouse effect). On the plus side, it does rain occasionally — but the rain is composed of sulphuric acid.

Now, when we observe the surface of Venus, our naive reaction might be to think: "What an awful place! Isn't it lucky we don't live there? It is surely an uncannily fortunate coincidence that we live on comfortable Earth and not horrific Venus."

But, of course, the weak anthropic principle explains this apparent lucky coincidence as a mere selection effect: intelligent life is only ever going to be found in life-friendly environments. It is no coincidence we are based on Earth and not Venus: human beings could never have evolved on the surface of Venus.

The weak anthropic principle states that if conditions vary with location throughout the universe, then life will only emerge in locations in which those conditions are amenable for life. That selection effect might then result in intelligent life naively interpreting the universe as being uncannily life-friendly, i.e., "fine-tuned".

So the weak anthropic principle is really fairly obvious, and could be regarded as common sense. Unfortunately, like any fairly-obvious common sense idea, the weak anthropic principle does not provide us with any particularly powerful insights about life or the universe. The weak anthropic principle should be regarded as a truism, and the Google definition of "truism" is: "a statement that is obviously true and says nothing new or interesting" — which is a perfect description of the weak anthropic principle. It is called "weak" for a very good reason. All the weak anthropic principle really does is act as a warning that we should be careful not to be fooled by some fairly obvious selection effects.

In particular, while the weak anthropic can explain some very simple naive fine-tuning problems (e.g., "Why is the surface of the Earth just the right temperature for life?") it cannot solve the fine-tuning problems we are really interested in. To be precise, the weak anthropic principle cannot be used to explain why the laws of physics and the values of the fundamental physical constants are apparently life-friendly. If we want to use the anthropic principle to explain these deeper coincidences, then we are going to have to take a deep breath and consider a much more controversial and contentious principle.

We are going to have to consider the strong anthropic principle.

The strong anthropic principle

In the previous discussion of the weak anthropic principle we have considered properties which are important to life (such as temperature, abundance of chemical elements) which vary with location throughout the universe. In that case, our interpretation of conditions as being life-friendly can be explained as a simple selection effect. So, if conditions vary with time or space, the weak anthropic principle can explain the apparent life-friendliness of our environment.

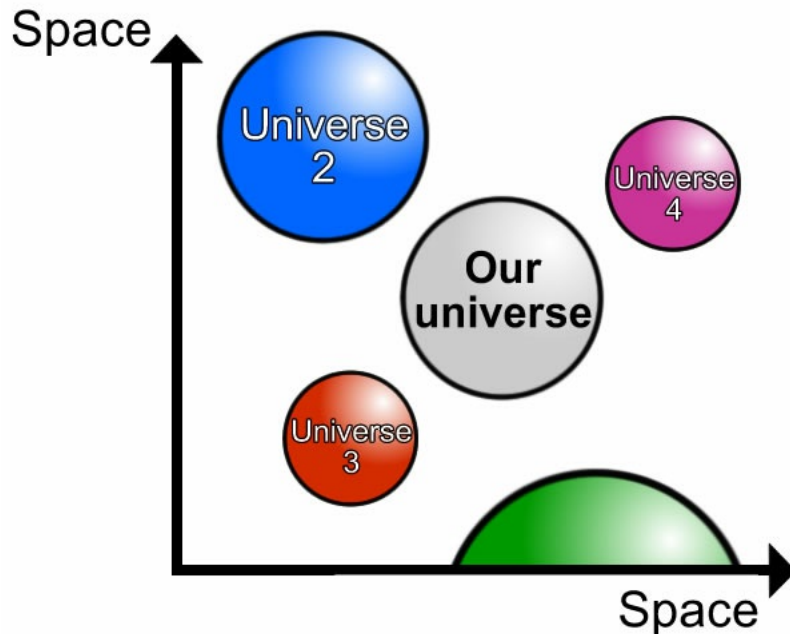
However, in this book we are interested in whether or not the laws of physics and the values of the physical constants are fine-tuned for life, and it appears that the laws of physics and the values of the physical constants have not changed with time and do not change with location. If we observe deepest space with our most powerful telescopes, the same laws of physics seem to apply in deepest space as in our local laboratory. Also, the value of the fundamental constants are not believed to have altered over time.

So the weak anthropic principle cannot explain the apparent fine-tuning of the universe. But there is a more powerful version of the anthropic principle which attempts to do just that.

The *strong anthropic principle* (again, described for the first time in Brandon Carter's 1973 paper) considers the situation in which the laws of physics and the value of the constants **do** vary with location. In that case, once again, the life-friendliness of the universe can be explained merely as a series of selection effects. But how can the laws of physics possibly change with location? This is only possible if we take a highly-speculative leap into the unknown.

It is only possible for the laws of physics to change with location if we imagine there to be other "bubble universes" located outside our own observable universe. The laws of physics, and the value of the fundamental constants, might then be set to different values in each universe.

The following diagram shows our universe surrounded by various other bubble universes. The total collection of all these bubble universes is called the *multiverse*. So, as we vary our location throughout this multiverse, we find the laws of physics varying:



This is called the *multiverse hypothesis*.

If the multiverse really exists then the strong anthropic principle can be used to explain anthropic coincidences as mere selection effects.

What is more, if there really is a multiverse then, as Brandon Carter suggested for the first time in his 1973 paper, we can use it to provide an explanation as to why the laws of physics take the form they do. The laws of physics would take the form we observe simply because we happen to inhabit the particular universe in which the laws of physics and the fundamental constants are set to those particular values. If we happened to inhabit a different universe, we would observe the laws of physics and the values of the constants set to different random values.

The strong anthropic principle is finding a new-found popularity at the moment due to its apparently unlimited explanatory potential: it can explain anything — the form of the laws of physics can be explained as random selection effects. This idea was first proposed in Section Five of Brandon Carter's paper which I linked earlier (he refers to the multiverse as a "world-ensemble"): "It is of course philosophically possible — as a last resort, when no stronger physical argument is available — to promote a **prediction** based on the strong anthropic principle to the status of an **explanation** by thinking in terms of a 'world-ensemble'."

This idea first presented by Brandon Carter in 1973 has become highly influential over the last ten years. As progress in fundamental physics has stalled, the strong anthropic principle appears to present an easy and attractive means of "explaining everything". I considered anthropic reasoning in detail in my fourth book when I repeated the common criticism that a theory which predicts everything predicts nothing. I returned to this theme in my previous book when I suggested that we should consider anthropic theories to be "theories of last resort" — just as Brandon Carter suggested in his previous quote.

What is more, the whole multiverse hypothesis is frequently criticised as being unscientific as it cannot be tested or disproved.

At the end of his paper, Brandon Carter presented his own concerns about the use of the strong anthropic principle to determine the values of the physical constants: "The acceptability of predictions of this kind as explanations depends on one's attitude to the world-ensemble concept. The idea that there may exist many universes, of which only one can be known to us, may at first sight seem philosophically undesirable. I would personally be happier with explanations of the values of the fundamental coupling constants etc. based on a deeper mathematical structure."

Paul Davies agrees with this viewpoint in his book *The Goldilocks Enigma*, stressing that the promotion of the strong anthropic principle undermines the efforts of physicists who are attempting to develop conventional analytical methods for understanding the universe: "For those theoretical physicists hard at work trying to formulate a unique final theory, the multiverse comes across as a cheap way out. Transforming cosmology into a messy environmental science looks a shabby let-down when set alongside the inspiring magnificence of a unique final

theory that would explain everything. Randomness plus observer selection strikes many physicists as an ugly and impoverished explanation compared with an overarching mathematical theory."

I hope in this discussion I have managed to convey the impression that the anthropic principle is really not a very useful tool for explaining anything: the weak anthropic principle is too weak, and the strong anthropic principle is too speculative and too unscientific. What is more, as we have discussed, anthropic reasoning based on the strong anthropic principle threatens to undermine the whole process of doing good physics.

In short, the anthropic principle is bad news all round.

But the anthropic principle has certainly had a wide influence. In my experience, there is a tendency in the educated wider public (and many physicists) to dismiss **all** life-friendly coincidences as merely selection effects, influenced by the weak or strong anthropic principle. Certainly my friends I have talked to about this subject seemed to think like that — they seemed to be under the impression that the fine-tuning problem had already been explained as a simple selection effect, perhaps unknowingly invoking the anthropic principle. However, as this discussion has shown, it is unjustified to dismiss these coincidences as selection effects. If we try to explain the apparent fine-tuning of the laws of physics and the fundamental constants as mere selection effects then we have to introduce highly-speculative and controversial ideas, such as the multiverse hypothesis.

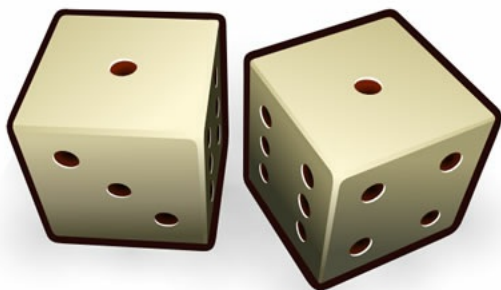
Instead, the message which I will be presenting in this book is that we need to follow a different, more scientific approach to explaining the life-friendly coincidences in the universe. Basically, instead of jumping to embrace simple solutions, we need to acknowledge that these problems are difficult — and rise to the challenge.

2

BAYES' THEOREM

Essentially, the question of whether or not the universe is fine-tuned comes down to a question of probability. If it is the case that the universe is fine-tuned, then that is equivalent to saying that the fundamental constants have surprising, improbable values. In that case, if the values are improbable, then we would not normally expect to encounter them by pure chance — something strange is happening. Conversely, if the universe is **not** fine-tuned, then that is equivalent to discovering that the fundamental constants having highly-probable, highly-likely values.

So, the fine-tuning question is really a question about probability, and in this chapter we will be considering the science of mathematical probability. We will be seeing if the universe really is — as has been suggested — "Unlikely. Very unlikely. Deeply, shockingly unlikely." [3]



As human knowledge advances relentlessly, it is very comforting to imagine that we will eventually know everything — though that might prove to be an impossible goal. There might always be some pockets of ignorance. The casinos of Las Vegas rely on that ignorance for their income. For example, we are completely ignorant of the outcome when we roll a pair of dice. Will we roll a seven, or ten, or five? We are simply ignorant. However, if we roll the dice multiple times then we can detect a pattern in the results, and though we still cannot predict the result of an individual throw, we can predict the probability of how many times a certain result will appear over time. For example, if we throw the dice one hundred times, we can calculate how many times we would expect to roll a seven.

Probability is expressed as a number between zero and one, with a probability of zero indicating a result is impossible, and a probability of one indicating a result is certain.

So mathematical probability gives us a way of moving from an effect (the throwing of the dice, for example) to predicting a likely cause (the result of the throw). Hence, probability moves from cause to effect. Probability allows us to deal with our ignorance when we have knowledge about the cause, but we are ignorant about the result.

But what about the reverse situation? What happens if we have ignorance about the cause, but we have knowledge about the result? For example, if we are presented with a series of numbers (one, thirteen, seven, etc.) resulting from a series of dice throws, can we tell **purely from the results** whether or not the dice were fair, or if they were loaded towards a particular result? In other words, instead of moving from cause to effect (as in probability) can we move in a backward direction from the effects backwards to consider the cause? This is called the *inverse probability problem*.

The solution to the inverse probability problem is far from intuitively obvious. Consider an example relating gun homicide to gun ownership. If we consider police records of every murderer who committed their crime using a gun, we might find that in 95% of those cases a gun was later found in the house of the murderer. So there is a probability of 0.95 that a murderer will have a gun in their house.

Now let us consider the inverse probability: what is the probability that if we find a gun in a house, then the owner will be a murderer? Our first thought might be that the probability in the reverse direction would be the same as in the forward direction, and therefore suggest that there is a 95% chance that the owner will be a murderer. But clearly, this is nonsense: gun ownership is widespread in America, and only a tiny fraction of those owners will ever turn out to be murderers.

So how do we calculate the inverse probability correctly? The solution to the inverse probability problem is provided by *Bayes' theorem*, named after the 18th century English statistician Thomas Bayes.

Bayes' theorem explains how we can calculate probability in the backward direction, from effect to cause. We can use Bayes' theorem to calculate a probability that the cause has a certain form: for example, are the dice loaded or not? Is the gun owner likely to be a murderer? By considering the result which we can see — the *evidence* — we can infer the nature of the cause. In our previous examples, we would consider the evidence to be the results of the dice throws, or whether or not a gun has been found in a house.

Bayes' theorem is applicable to many different areas of life — not just science. It is this widespread use of Bayes' theorem which has made it something of a modern sensation, as we shall see later in this chapter.

Smallpox — or not?

The best way to understand Bayes' theorem is to consider an example. In his tutorial book of Bayes' theorem, James Stone presents an example involving a nasty case of smallpox. Let us consider the example.

One morning, you wake up and discover your face is covered in spots. You go to the doctor, and the doctor tells you that 90% of people with smallpox are found to have spots on their face. This news terrifies you, because smallpox is a potentially lethal disease. However, you swiftly realise that this is a strange thing for a doctor to say: the doctor is giving you a probability in the forward direction — from cause (smallpox) to effect (spots). This is no use to you because you want the doctor to give you a probability in the inverse direction. You want the doctor to examine the evidence (the spots) and tell you the probability that you have smallpox.

However, as we saw in the earlier example about gun ownership, it is not obvious how to calculate probability in the reverse direction: just because 90% of people with smallpox have spots, it most certainly does not mean that 90% of people with spots have smallpox.

So how can we use Bayes' theorem to calculate the inverse probability, thus determining the probability that you have smallpox?

Well, in order to use Bayes' theorem, the first thing we need to have is some sort of initial belief about the "way things are" — a belief about the state of the world. We call this our *hypothesis*. In the smallpox example, our hypothesis might be "The patient has smallpox". The probability that our hypothesis is true is initially generated before we consider any evidence (before we examine the patient and see the spots). However, we already know that smallpox is extremely rare in the general population, so we would expect the initial probability that our hypothesis is true — in the absence of any supporting evidence — to be extremely small.

Bayes' theorem then tells us how we should update our belief in our hypothesis on the basis of new evidence which becomes available.

So how can we use Bayes' theorem to update our confidence in our hypothesis? Well, we have to examine the evidence: we see the spots on the patient. It would then seem to make sense that we should increase our confidence in our hypothesis (the probability that our hypothesis is correct) if it is highly likely that a patient with smallpox will have spots. In the following equation this value is called the "Probability of the evidence appearing if the hypothesis is true". In other words, it is the probability of spots appearing if the patient has smallpox. In the equation, we multiply our initial probability by this term.

We are almost there, but not quite. We have to take another factor into account. We have to account for the general tendency for spots to appear in the population. If spots are common generally (for less serious diseases such as chickenpox and acne), then it would clearly weaken our hypothesis that the patient has smallpox. So we have to divide by this term: the "Probability of the evidence appearing in general". So we end up with the following equation:

$$\text{Updated probability} = \text{Old probability} \times \left[\frac{\text{Probability of evidence appearing if the hypothesis is true}}{\text{Probability of evidence appearing in general}} \right]$$

And that is the famous Bayes' theorem!

It really is surprisingly simple, and we have generated the theorem purely by an intuitive approach. If you consider the term in the square brackets in the equation, you will see it will be greater than one if the top half of the fraction has a greater value than the bottom half of the fraction. You will see that this will be the case if the evidence is more likely to appear if the hypothesis is true than in the general case. Hence, in that situation, your updated probability (your new belief in your hypothesis) will be greater than your old belief in your hypothesis: finding the evidence has increased your belief in your hypothesis.

But even though it is extremely simple, the implications of Bayes' theorem are extraordinary. In fact, it has been said that "It does not seem an exaggeration to consider Bayes' theorem as significant in our times as the Darwinian theory of natural selection." [\[4\]](#)

In this chapter we will be discovering how this incredibly simple equation is not only responsible for filtering junk email into our spam folders — but it might also have won the Second World War.

Putting numbers into the equation

In order to see how valuable Bayes' theorem can be in updating our beliefs, let us put some numbers into the equation. I will be using the same values which James Stone used in his smallpox example.

Firstly, as described earlier, our initial belief that the patient has smallpox is generated before we examine the evidence — before we see that the patient has spots. So all we can do at this early stage is to treat the patient like any other person and set this initial probability that the patient has smallpox equal to the probability that anyone in the general population has smallpox. Therefore, we should consider the public health statistics to determine the probability that anyone in the general population has smallpox (this initial knowledge — before we even start to use Bayes' theorem — is called the *prior probability*). Because smallpox is rare, this is clearly going to be a small probability. According to James Stone: "Public health statistics may inform us that the prevalence of smallpox in the general population is 0.001."

As described earlier, the next term we have to consider is the "Probability of the evidence appearing if the hypothesis is true". In other words, it is the probability of spots appearing if the patient has smallpox. The doctor has already told us that 90% of people with smallpox have spots, so we set this value equal to 0.9.

Finally, as discussed earlier, the last term we have to consider is the "Probability of the evidence appearing in general", in other words, the general tendency for spots to appear in the population (including less serious diseases). This term acts to undermine faith in our hypothesis, so we have to divide by this term. James Stone uses a value of 0.081 for this term.

Let us put these numbers into the previous formula. We find that the final probability that the patient has smallpox (the "updated probability" generated by Bayes' theorem) is equal to:

$$0.001 \times \left[\frac{0.9}{0.081} \right]$$

which, if you calculate the result, is equal to 0.011. This is clearly very much smaller than the value of 90% which the doctor first suggested, so you are greatly relieved.

Bayes' theorem might not quite have saved your life, but you will sleep happier tonight.

The usual form of the equation

Before we move on to consider the interesting uses of Bayes' theorem, let us briefly consider the form in which the theorem is usually presented. Bayes' theorem is usually presented as an equation in a short-hand form which uses very few characters:

$$P(H | E) = \frac{P(H) \times P(E | H)}{P(E)}$$

I would say this form is less descriptive and more difficult to understand intuitively than the version I presented earlier. However, just for the record, this is what the various terms of this equation mean:

- $P(H)$ is the "old probability" that the hypothesis, H , is true. This is the prior probability based on existing information.
- $P(E|H)$ is called a *conditional probability*. It is what I have called the "Probability of the evidence appearing if the hypothesis is true".
- $P(E)$ is what I have called the "Probability of the evidence appearing in general".
- $P(H|E)$ is called the *posterior probability*, and is the updated probability that the hypothesis is true.

This is a form of the equation which I find very hard to remember — there are simply too many "E"s and "H"s — whereas I can remember the longer, more descriptive, version of the equation I presented earlier.

How Bayes' theorem won the war

Throughout the Second World War, Germany relied on an encryption method to encode orders for its army, air force, and navy. The German *blitzkrieg* high-speed attack, for example, was heavily-reliant on coded radio messages to coordinate artillery, airplanes, and tanks. Most crucially, German U-boats relied on encrypted messages in order to learn the positions of Allied merchant shipping.

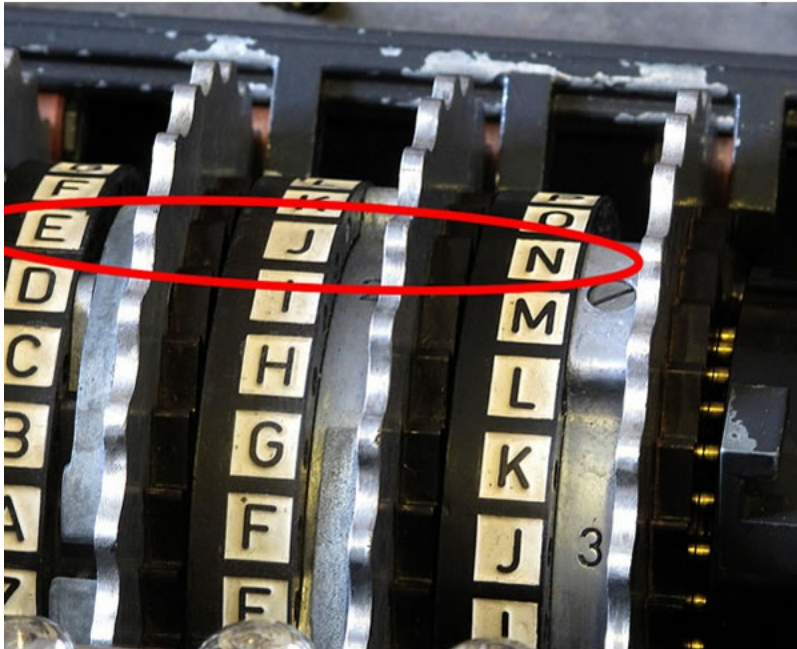
The encryption method was highly-sophisticated and extremely difficult to break. Messages were encoded by a device called an *Enigma machine*, which resembled a typewriter encased in a wooden box. Above the typewriter keyboard was a lampboard with a light for each letter of the alphabet.

The following photograph shows an Enigma machine in use in 1943:



There were three wheels inside an Enigma machine. Each time the operator typed a key, one of the three wheels advanced a notch. The typed letter was enciphered, and the resultant encoded letter was illuminated on the lampboard. The complete message was then transmitted in Morse code.

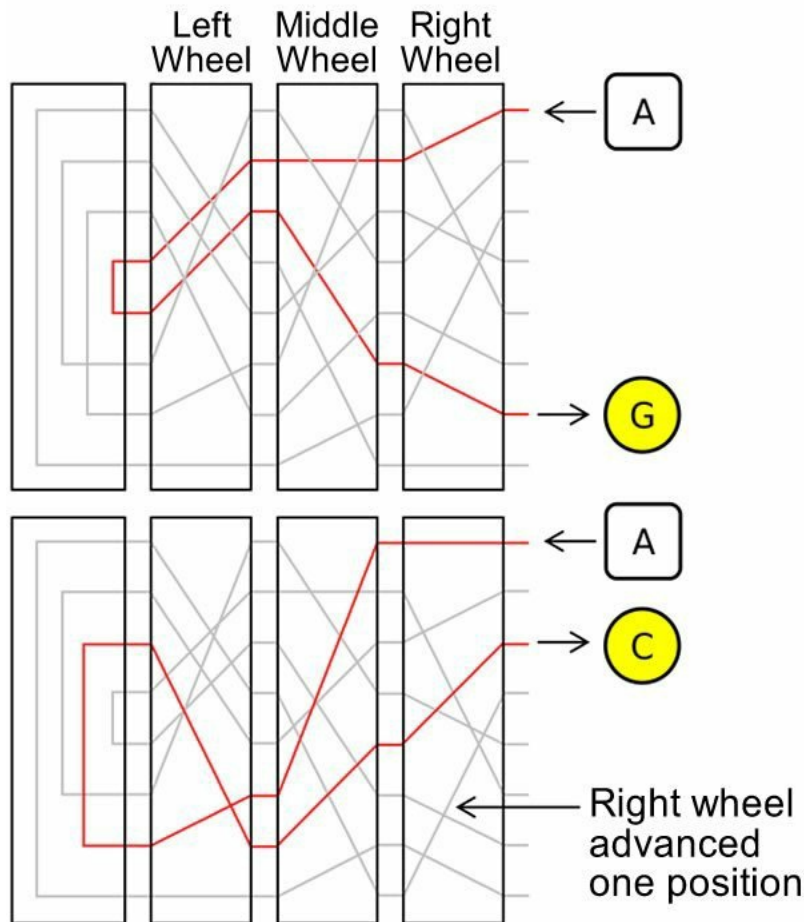
The following diagram shows the three Enigma wheels. At the start of each day, the wheels were initialised by setting the top letter of each wheel according to a codebook. For example, if the codebook stated that the day's keyword was "EJN" then the top letters on each wheel would be set according to the following photograph:



The task for the codebreakers was therefore to determine the Enigma wheel settings for each day. They only had 24 hours to do this as the settings changed at midnight to the next day's settings.

The Enigma code was a *substitution cipher*, in which a single letter in a message (for example, the letter "A") was replaced by another letter (for example, the letter "G"). The following diagram explains how the Enigma wheels

operated to perform this encoding:



In the diagram, you will see the three Enigma wheels: left, middle, and right. In the top half of the diagram, you will see the letter "A" entering the wheels (on the right), tracing a path through the three wheels, and emerging as the encoded letter "G".

However, the next time the letter "A" was encoded in a message, the right wheel would have advanced one position. So you can see that the letter "A" would then be replaced by a different letter: in this case, the letter "C". Because this made it hard to recognise common sequences of letters, this made the code much more difficult to break.

Another advantage of this structure of the Enigma machine is that the same settings allowed a single machine to act as both an encoder and a decoder. For decoding, the path is just retraced through the wheels in the opposite direction. If you consider the top half of the previous diagram, you will see that entering the letter "G" again will be traced back to the original letter "A". Though the Germans were very attracted to this feature of the machine, it actually introduced a weakness into the coding technique. This is because you will see that this mechanism never lets the same letter be encoded into itself: the letter "A" can never be encoded into the letter "A", for example. This provided a vital clue to the codebreakers.

The British codebreakers were based in Bletchley Park, a Victorian mansion located 50 miles northwest of London. I recently took a trip to Bletchley Park. The complex is no longer a working military facility, but instead the whole area has been turned into a fascinating museum. But this is no theme park — this is real history.

Here I am standing in front of the mansion:



The team were led by the brilliant computing pioneer Alan Turing. Turing realised that the Enigma code could be broken by employing Bayesian techniques. The process of coding a message is from cause-to-effect (the Enigma machine produces a coded message), whereas the process of decoding the message is in the reverse direction from effect-to-cause (analysing the "evidence": the many thousands of encoded messages). Hence, a message could be decoded by using Bayesian techniques and solving the inverse probability problem.

Sharon McGrayne has written a book about the history of Bayes' theorem called *The Theory That Would Not Die*. The book contains a detailed account of the effort to use Bayes' theorem to decrypt the Enigma code. According to McGrayne: "Finding the Enigma settings that had encoded a particular message was a classic problem in the inverse probability of causes."

Once Turing had decided to use Bayes' theorem, it was Bayes' theorem which determined the radically new decoding method which had to be used. Remember, Bayes' theorem operates by considering the evidence in order to decide if a particular hypothesis is correct. In the case of the Enigma decoding, the sheer weight of evidence (all major German communications) had to be analysed in order to find the likeliest hypothesis (one of 159 million million possible settings of an Enigma machine). This meant that manual decoding was infeasible. Instead, a new decoding technique would be required, capable of handling such a huge amount of information in a short time. Alan Turing realised that an automated system would be required. As David Leavitt says in his biography of Turing, what was required was "a machine built for the specific purpose of defeating another machine."

To achieve this goal, Alan Turing and the team at Bletchley Park — including Tommy Flowers and Max Newman — used electronic equipment for the first time to break codes. In doing so, they created the first programmable electronic digital computer, which was called Colossus.

Instead of modern transistors, Colossus used 1,500 glass valves (vacuum tubes) to switch current on and off (to signify binary zeroes and ones). The computer was so fast that sometimes Bletchley Park were reading the deciphered messages even before their German counterparts. The power of Colossus was so great that it could break the stronger and more sophisticated Lorenz code which was used by Adolf Hitler himself.

Here is a photograph of me inspecting the Colossus rebuild at Bletchley Park. It was the world's first electronic digital computer. Just wow:



Looking at that photograph, it is almost beyond comprehension that it was built in 1944. It looks like a modern server farm! But it's all valves!

You can see more of my super Bletchley Park photographs in my Bletchley Park album:

<http://tinyurl.com/andrewbletchley>

Later in 1944, Colossus decoded an encrypted message from Hitler to Field Marshal Erwin Rommel, who was his commanding officer in Northern France. Hitler ordered Rommel not to move his troops for five days if there was an invasion in Normandy. This was because Hitler believed a Normandy invasion would be intended as just a diversion from the true invasion force which would attack the ports along the English Channel. When General Eisenhower — the Supreme Commander of the Allied Forces in Europe — received the decoded message from Colossus, he announced "We go tomorrow". That was to be the morning of June 6th 1944, which was to become better known as D-Day.

Eisenhower later estimated that the Bletchley Park codebreakers shortened the war by at least two years.

The story of Alan Turing's attempt to break the Enigma code was dramatised in the movie *The Imitation Game*. The movie featured a splendid Oscar-nominated performance by Benedict Cumberbatch as Alan Turing. Although the film received some criticism over a few minor inaccuracies, the plot is generally accurate and presents a gripping account of the work at Bletchley Park. The film was a major critical and commercial success, making over \$200 million at the box-office.

If you ever find yourself in London, I can recommend Bletchley Park as a great day out. Bletchley Station is just a forty-minute train journey from Euston Station. Walking out of Bletchley Station, turn right, and Bletchley Park is just 50 yards up the road.

The controversy over prior probability

Bayes' theorem now plays a huge role in all our lives — even though most people are completely unaware of it. Remember, Bayes' theorem works by updating the probability that a hypothesis is correct on the basis of received evidence. Hence, Bayes' theorem can act as a form of classification, assigning objects to groups on the basis of that evidence. Here are just a few examples of Bayes' theorem working in this way:

- It is Bayes' theorem which filters our junk email into spam folders.
- It is Bayes' theorem which controls the (sometimes very annoying) autocorrect feature when we type on a

mobile phone, selecting the best fit from a range of possible words.

- It is Bayes' theorem which selects adverts which appear on web pages, selected to be of interest to us (the "evidence" controlling the selection process controversially being obtained from our browsing history).
- There is software based on Bayes' theorem which can automatically process your CV and decide whether or not to call you for a job interview.
- It was Bayes' theorem which first connected lung cancer with smoking.
- Richard Feynman used Bayesian techniques to determine that the O-rings were the most likely cause of the *Challenger* space shuttle disaster.
- During the Cold War, the U.S. military think-tank RAND used Bayesian techniques to calculate the probability of a thermonuclear device exploding accidentally (answer: it's a worryingly large probability).
- The designers of Google's self-driving car are using Bayes' theorem to recognise objects and make decisions.
- Perhaps most impressive of all, you can even see Bayes' theorem on Sheldon Cooper's whiteboard in an episode of *The Big Bang Theory*. [\[5\]](#)

In fact, in almost every place where a decision must be made on the basis of statistical data, you will now find Bayes' theorem being used.

Bayes' theorem has proved itself to be so useful and permeates so many aspects of our lives that it may be surprising to hear that until quite recently — the second half of the twentieth century — Bayes' theorem was treated with mistrust and even revulsion by most statisticians. In order to understand the problem, let us remind ourselves how Bayes' theorem is defined:

$$\text{Updated probability} = \text{Old probability} \times \left[\frac{\text{Probability of evidence appearing if the hypothesis is true}}{\text{Probability of evidence appearing in general}} \right]$$

The "Old probability" in this equation is a crucial — and controversial — term. This is the probability which is set before we examine any evidence and before we perform the Bayes' theorem calculation. This probability is the prior probability of the hypothesis being true (often called simply the *prior*). This has proven to be a very controversial term since Bayes' theorem was first proposed, and is the reason why the theorem has been met with so much resistance from statisticians.

If we have access to a large volume of existing data then we can obtain an accurate value of the prior probability with confidence. For example, in the smallpox example considered earlier, it was explained how the prior probability could be calculated from the public health statistics, informing us that the prevalence of smallpox in the general population is 0.001.

However, if we only have very limited access to existing data — or no relevant data at all — there are still other ways to obtain a value for prior probability. Specifically, human experience and judgement can be used to generate a value for prior probability. Though this might appear to be very subjective, it is still valuable information which we should not ignore in our decision process.

So sometimes the value which is used for the prior probability might appear to be no more than an educated guess. Indeed, Thomas Bayes originally referred to this term as a "guess" when he proposed his theorem. This is often called the initial *belief* that the hypothesis is true.

And now perhaps you can see why statisticians have been so unimpressed with Bayes' theorem: what place is there for "belief" in mathematics? As Sharon McGrayne says in her book: "The heart of the Bayesian controversy is

the fact that, when only a few data are involved, the outcome of a Bayesian computation depends on prior opinion. In such a case, Bayes' theorem can lead to a subjective, rather than an objective, assessment of a situation."

However, a wonderful feature of Bayes' theorem is that it really doesn't matter which method we employ to generate our prior — as long as we have access to plenty of evidence. As each additional piece of evidence appears and is processed by Bayes' theorem, then an updated — and more accurate — probability of the hypothesis being true is generated. As long as there is plenty of evidence then the final probability is guaranteed to converge on an accurate value. So as each piece of evidence is added, the importance of the value of the initial prior becomes progressively reduced. As Sharon McGrayne says in her book: "with large samples the prior did not matter".

In her book, McGrayne further explores how this tendency of Bayes' theorem to close in on the truth explains how scientists with different initial opinions manage to eventually come to agreement over which hypothesis is correct. McGrayne presents a quote from the statistician Jimmie Savage: "If prior opinions can differ from one researcher to the next, what happens to scientific objectivity in data analysis? Well, as the amount of data increases, subjectivists move into agreement, the way scientists come to a consensus as evidence accumulates about, say, the greenhouse effect or about cigarettes being the leading cause of lung cancer. When they have little data, scientists disagree and are subjectivists; when they have piles of data, they agree and become objectivists. That's the way science is done."

So we can see how Bayes' theorem closely matches the scientific method, and even matches our individual thought processes when it comes to examining evidence and making difficult decisions. Because such a simple rule has such wide application, Bayes' theorem is almost treated less as a simple tool and more as a guiding philosophy for life by its passionate advocates.

The Bayesian fine-tuning equation

So now let us return to the main subject of this book, and ask: "How can we use Bayes' theorem to determine if the universe is fine-tuned or not?" To determine this, we have to evaluate the probability that the hypothesis — that "the universe is fine-tuned" — is true. Bayes' theorem requires us to obtain evidence to support our hypothesis, and, in this case, the evidence which we observe is the existence of life in our universe.

So let us update our definition of Bayes' theorem (which was presented earlier) with these new values for the hypothesis and the evidence:

$$\text{Probability universe is fine-tuned} = \text{Prior probability universe is fine-tuned} \times \left[\frac{\text{Probability of life appearing if the universe is fine-tuned}}{\text{Probability of life appearing in general}} \right]$$

I am going to call this equation the "Bayesian fine-tuning equation".

On the right-hand side of this new equation, the term "Prior probability universe is fine-tuned" represents the prior probability we have just discussed in the previous section. It is this value which is going to be updated by Bayes' theorem to generate an updated probability that the universe is fine-tuned (on the left-hand side of the equation). The available methods for arriving at a prior probability were discussed in the previous section. In the absence of pre-existing data, the value of this term is going to be heavily-reliant on the experience, knowledge, and intuition of physicists.

The question to be asked to generate the prior probability would be: "On the basis of our existing knowledge as physicists, do we currently think the universe is fine-tuned or not?" I would suspect the majority of physicists would currently respond in the negative, though there would also be quite a few who would take the opposing view. Fortunately, as discussed in the previous section, Bayes' theorem is perfectly capable of handling incomplete and contradictory subjective opinions. As the amount of received data increases, the Bayesian fine-tuning equation would update its probability that the universe is fine-tuned, moving toward the correct hypothesis (either "Yes" or "No"). The tendency would then be for scientists to move into agreement about the correct hypothesis — and that is how the Bayesian scientific method works.

So it would appear that the value of the selected prior probability is not crucial. What is crucial is the value of the fraction contained in the square brackets, so let us consider it next.

The probability of life

Let us now consider the two terms inside the square brackets.

On the top of the fraction in the square brackets is the term "Probability of life appearing if the universe is fine-tuned". I think we would have to consider this as being a fairly large value: if the universe was fine-tuned for life, creating an environment highly-amenable to the emergence of life, we would surely expect life to spontaneously emerge somewhere in that vast universe — even if it takes billions of years to emerge. So it appears reasonable to set that term to a large value.

But the bottom term of the fraction is not so easy to calculate. And this is a term which is absolutely crucial to our analysis.

You will see that the bottom of the fraction in the square brackets in the Bayesian fine-tuning equation is the term: "Probability of life appearing in general". This represents the probability of life emerging in all cases — including situations where the hypothesis is not true. So this term represents the probability of life emerging in all possible universes — even in universes which are not fine-tuned.

In order to calculate this probability of life, it appears we would have to consider whether or not we would expect life to emerge in any arbitrary universe, even if the physical constants were set to random values in that universe. Maybe the resultant form of life would be quite unrecognisable to us, not resembling human life at all. Basically, the question being asked here is "Does life emerge easily?" or, equivalently "Would we expect to find life in all possible universes?"

If life is common, and emerges easily in all universes, the value inside the square brackets will be small, and so the corresponding probability that the universe is fine-tuned will also be small. This makes sense: if life is robust and emerges freely, then it has no need of additional helpful fine-tuning. Conversely, if life does not emerge easily, the value inside the square brackets will be large, and the probability that the universe is fine-tuned will be high. Again, this makes sense: if life is delicate and rare then it needs all the help it can get from fine-tuning in order to emerge.

So it appears that all we have to do is determine the probability of life emerging in general, and then we will be able to instantly determine whether or not the universe is fine-tuned.

Unfortunately, it is not at all easy to obtain an accurate value for the probability of life emerging. Ideally, we would need to examine a set of different, independent universes, with the fundamental constants set to different random values in each universe, and then see how often life emerges in those varied universes. Well, of course, this is something we can't do: we don't have access to a convenient set of universes on which we can experiment. It appears our cause is hopeless.

However, perhaps there is a second-best option. While we don't have a set of universes with different conditions, there are regions of our own virtually-infinite universe with wildly-different conditions. How likely is life to emerge in these extraterrestrial breeding grounds?

So, let us now consider what we know about the possibility of extraterrestrial intelligence, to see if that can give us some clues about the probability of the emergence of life.

3

THE FERMI PARADOX

In April 1960, the American astronomer Frank Drake did something quite extraordinary. It was also — as far as his scientific career was concerned — highly risky. Drake turned the radio telescope at the National Radio Astronomy Observatory in West Virginia to point at two stars which resembled our Sun. Drake was attempting to listen for signs of extraterrestrial intelligence. This represented the first attempt to intercept extraterrestrial communication, and it made Frank Drake a pioneer of the search for extraterrestrial intelligence (SETI).

In 2010, Frank Drake was interviewed for a BBC documentary to discuss the search for extraterrestrial intelligence. The documentary was entitled *The Search for Life: The Drake Equation*, and this is what Frank Drake said: "In 1960, the National Academy of Sciences asked me to convene a meeting to discuss this whole subject, and to ground it in good sound science. So I did that. I invited everyone in the world who I knew was interested in the subject to a meeting — all twelve of them! Just twelve people who I knew were interested in extraterrestrial life. So I thought through what it is you need to know to predict how many civilisations it might be possible to detect in our galaxy. And I realised that the number of civilisations depended on seven factors. And you can even use those factors to form an equation. So I did."

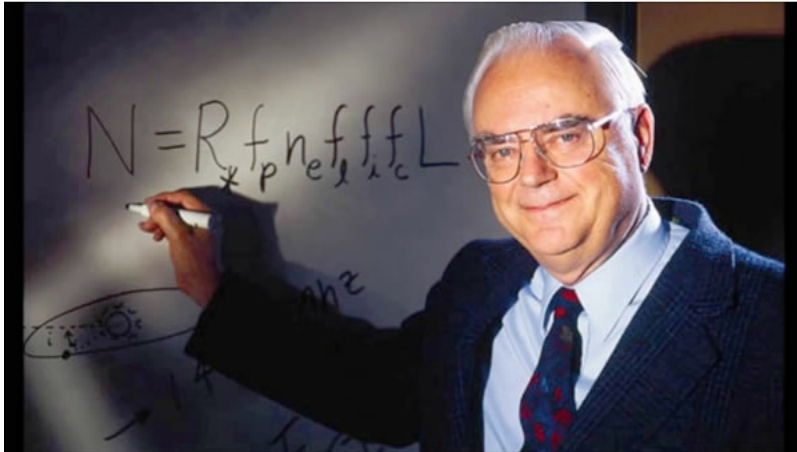
By creating his equation, Frank Drake transformed the random guesswork of predicting the existence of advanced extraterrestrial life into a theoretical framework which could be studied and analysed. The *Drake equation* can be used to calculate the number of detectable intelligent communicating civilisations, N , in our Milky Way galaxy, and is given by:

$$N = R_* \times f_p \times n_e \times f_l \times f_i \times f_c \times L$$

where:

- R_* is the number of stars formed every year.
- f_p is the fraction of those stars which have planets.
- n_e is the average number of habitable planets around those stars.
- f_l is the fraction of those habitable planets on which life emerges.
- f_i is the fraction of those lifeforms which become intelligent.
- f_c is the fraction of those lifeforms which develop into technologically-advanced civilisations capable of transmitting radio signals.
- L is the average lifetime of a communicating civilisation.

Here is Frank Drake standing in front of his eponymous equation:



While it is obviously difficult to estimate precise values for all the terms of the Drake equation, there is no obvious reason why any of the terms should be particularly small. Indeed, with more than 300 billion stars in our Milky Way galaxy it is hard to imagine why the Drake equation should produce a small value for the number of intelligent civilisations in our galaxy. In 1974, Carl Sagan used the Drake equation to predict that there were a million civilisations in our galaxy.

If that was the case, then the race was on to be the first to make contact with extraterrestrial intelligence ...

6EQUJ5

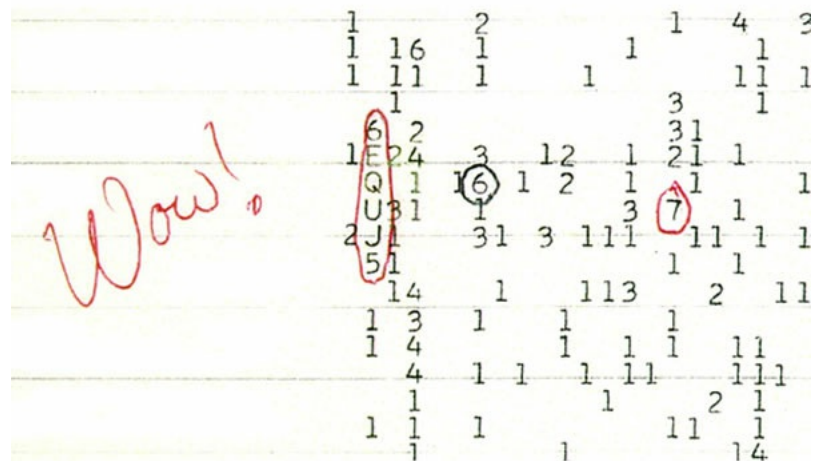
In 1977, the American astronomer Jerry Ehman was sitting in his kitchen laboriously sifting through sheets of computer printouts. The data represented signals received from the Sagittarius constellation by the Ohio State University radio telescope. The telescope was also known as "Big Ear" because it was the size of three football pitches.

The Big Ear telescope formed a part of the search for extraterrestrial intelligence (SETI) pioneered by Frank Drake. The basis for the search was the idea that a technologically-advanced extraterrestrial civilisation might have broadcast a decipherable radio message in order to make themselves known to other advanced civilisations in the universe.

The printouts were of dull numeric data: sometimes a blank space, sometimes the number one, sometimes the number two. The prevalence of the ones and twos showing a low received signal strength. If you were lucky, the number three might make an appearance. And it was all repeated endlessly over countless sheets.

Most of the data was uninteresting, however, one remarkable string of six characters on the printout caught the attention of Ehman. It even looked like a word! The string of characters was "6EQUJ5". Was this a signal from an alien civilisation?

The vertical "6EQUJ5" string can be seen in the following image, a photograph of the actual printout. Ehman was so surprised at the appearance of the message that he famously wrote the word "Wow!" in the margin of the printout:



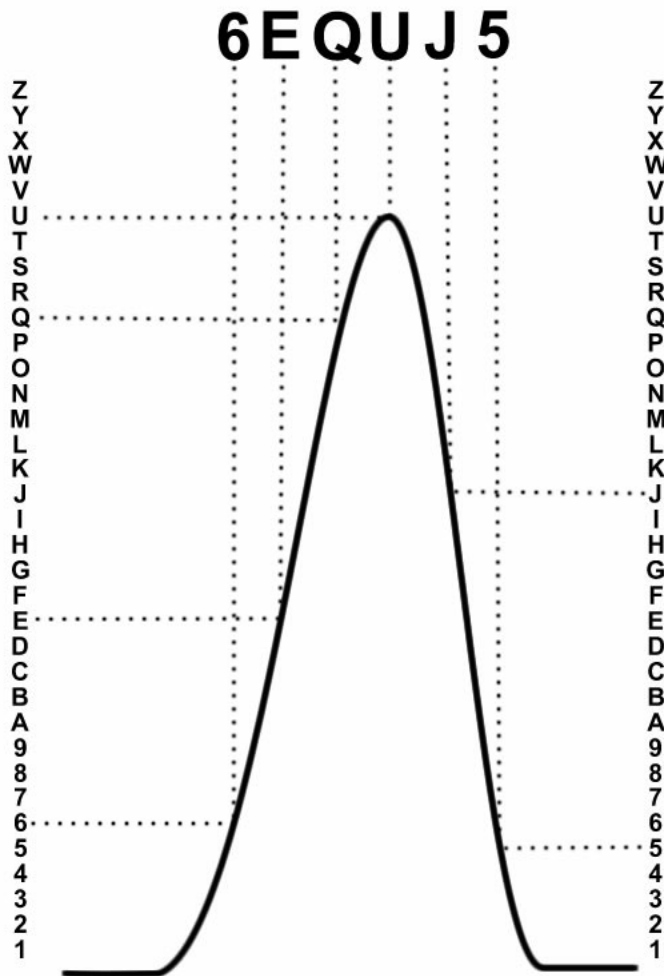
Ever since, this has come to be known as the Wow! signal.

So what does "6EQUJ5" stand for? Any Scrabble aficionado will tell you that if you get a letter Q without a letter U then you are in big trouble. So is the positioning of the U after the Q significant? If this is a message from an alien civilisation, then what are they trying to tell us? That they are good Scrabble players?

The Wow! signal became something of a cultural phenomenon. There is even a range of geeky 6EQUJ5 T-shirts available (just perform a Google image search for "6EQUJ5 T-Shirt").

Unfortunately, when you dig a bit deeper, you find all is not what it seems.

It emerges that the letters and numbers (which compose the "6EQUJ5" message) merely correspond to the strength of the signal, with the letter Z representing the highest signal strength, and the number 1 representing the lowest signal strength. This is clear in the following graph, with the coded letters and numbers on the vertical axis. You will see from the graph that when the 6EQUJ5 message is plotted it produces a very smooth curve: a normal bell-shaped distribution, a perfectly smooth "blip". All evidence of intelligent Scrabble-playing aliens has disappeared:



In that respect, the much-publicised 6EQUJ5 "message" appears to be rather misleading — it would have been more accurate to display the signal strength in the above graphical form rather than in alphanumeric characters. Simply put: to convert a perfectly smooth blip into a pseudo-English character string seems rather misleading.

Surely if alphanumeric characters had not been used, or if Jerry Ehman had written "This deserves further investigation" instead of "Wow!" then the signal would have gained nowhere near as much fame.

Paul Davies has written a book about extraterrestrial intelligence called *The Eerie Silence*. In that book, he examines the Wow! signal and suggests that maybe the blip is a message sent from an extraterrestrial beacon — like a flashing signal from a lighthouse. However, as Paul Davies goes on to explain, if the signal was truly a beacon then we would expect it to repeat at regular intervals — just like a lighthouse. Unfortunately, the Wow! signal has never been detected again. [6]

The Wow! signal is generally accepted to be our best candidate for a radio signal from an extraterrestrial civilisation. Given the rather misleading nature of the printout format, it is not impressive evidence. Unfortunately, the importance of being able to differentiate between accuracy and hype will be something of a theme of this chapter.

Other attempts to detect extraterrestrial life have been based on sending robotic probes to the planets of our Solar System. Ever since H.G. Wells introduced the idea of a Martian invasion in *The War Of The Worlds*, the public has been fascinated by the possibility of life on Mars. Mars has long been regarded as the planet in our Solar System which might be most suited for life, so it was no surprise that the first robotic probe was sent to Mars as part of the Viking program of the 1970s.

Unfortunately, the Viking mission revealed the surface environment of Mars to be extremely hostile to life, with bitter cold, a thin atmosphere, and lethal ultraviolet radiation. As a result, the recent Curiosity rover — which landed

on Mars in 2012 — was equipped with a drill to take soil samples from beneath the surface. Curiosity continues to send back stunning photographs from the Gale crater on Mars (as shown in the following image).



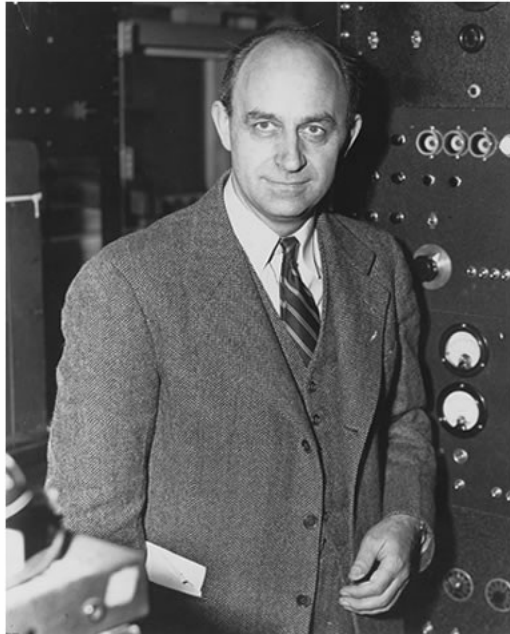
So, apart from a rather misleading "alphanumeric string" from deep space, we have so far detected absolutely no evidence of life anywhere in the universe apart from on Earth.

SETI has drawn a blank.

The Fermi paradox

Enrico Fermi was one of the giants of 20th century physics. Fermi created the world's first nuclear reactor in Chicago in 1942 and has been called the "architect of the nuclear age". If you have read my fifth book, you will know that Fermi predicted the existence of the neutrino. You will also know that the matter particles in the universe are called *fermions*, named after Enrico Fermi. When all the matter particles in the entire universe are named after you, that's when you know you've made it big.

Here is a photograph of Enrico Fermi:



In 1944, Fermi joined the Manhattan Project based in Los Alamos, New Mexico, which was developing the world's first atomic bomb. Fermi observed the Trinity bomb test in 1945, and accurately estimated the explosive power of the bomb by dropping strips of paper into the blast wave.

After the war, in 1950, Fermi returned to Los Alamos as a consultant. It was about the time that flying saucer mania was sweeping America. Legend has it that during one lunchtime in Los Alamos, during a conversation about the flying saucer craze, Fermi suddenly asked his colleagues: "Where is everybody?" Fermi's question seemed out-of-the-blue, but his colleagues laughed because everyone instantly knew what he was talking about. Fermi was wondering why we had not received clear visitations from aliens — after all, the galaxy was supposed to be teeming with alien life.

Though Fermi's observation was not treated too seriously at the time, it is not easy to find a solution. It might be imagined that the distances involved in the galaxy are too large for extraterrestrial travellers, but this is almost definitely not the case. In 1975, Michael Hart calculated that even if it takes thousands of years to travel from one star to the other, the age of our galaxy — at least ten billion years old — should ensure that life would have spread throughout the galaxy within a million years or so. This viewpoint is also expressed by Paul Davies in *The Eerie Silence* who suggests that colonisation of the galaxy would have occurred in stages, one star at a time. On that basis, the colonisation of the galaxy by one of the many supposed alien civilisations in the galaxy would appear to be inevitable, and would surely have happened by now. As Paul Davies says: "It takes only **one** such community somewhere in the galaxy to present us with Fermi's awkward conundrum."

Fermi's question has achieved considerable fame, and is now called the *Fermi paradox*.

Fermi is regarded as one of the archetypal geniuses, and we have to take his objection seriously. While it is not easy to find an answer, it does seem that many astrobiologists are now coming to something of a consensus about the likeliest solution to the Fermi paradox. To solve the Fermi paradox, it appears that we must examine the regions in our galaxy where life might possibly develop ...

Exoplanets

A planet which orbits a star other than the Sun (i.e., a far distant planet outside of the Solar System) is called an *exoplanet*. As exoplanets are small, dark, and very distant, they are very difficult to detect. Because they orbit a star, the light from the star will drown out any light emitted or reflected from the exoplanet. Hence, exoplanets are not usually observed directly, but are instead detected via indirect methods.

One indirect method for detecting exoplanets is based on the principle that an orbiting exoplanet will very slightly

pull the star from its central position. This slight deviation in the star's motion can be detected by considering modifications in the wavelength of the light emitted by the star due to the Doppler shift. This is the same principle which causes a siren on a car to sound higher in pitch when the car is approaching, and lower in pitch when the car is receding. Extremely small variations in the star's velocity — as little as one metre/second — can be detected by this method, which is called the *radial velocity* method.

Exoplanets are certainly not rare in the universe, and several thousand have already been detected. The exoplanets which have been detected so far have been classified into several groups. The first group to be detected were the *Hot Jupiters*, which are extremely large gas giants — like the planet Jupiter. However, unlike Jupiter, these exoplanets orbit close to central stars (and therefore have very high surface temperatures). These exoplanets travel at high orbital speeds, maybe only taking a few days to complete an orbit. The large masses of the Hot Jupiters, in combination with their tight fast orbits, explains why they were the first exoplanets to be discovered in the mid-1990s using the radial velocity method (high mass and speed causing the central star to wobble).

NASA's Kepler Space Telescope was launched in 2009 with the specific task of detecting Earth-sized exoplanets. The detection method used by the Kepler mission was different from the radial velocity method. Instead, the detection method was based on the principle that the brightness of a star will dip slightly when an exoplanet passes in front of it. This is called the *transit* method for detecting exoplanets. According to NASA, Kepler "launched the modern era of planet hunting".

The Kepler telescope is trained on a narrow region of space, roughly the size of your fist held at arm's length. In that region of space, Kepler detects the amount of light emitted from approximately 150,000 stars. Any repeated temporary reduction in the brightness of one of those stars is interpreted as the transit of an exoplanet passing in front of the star.

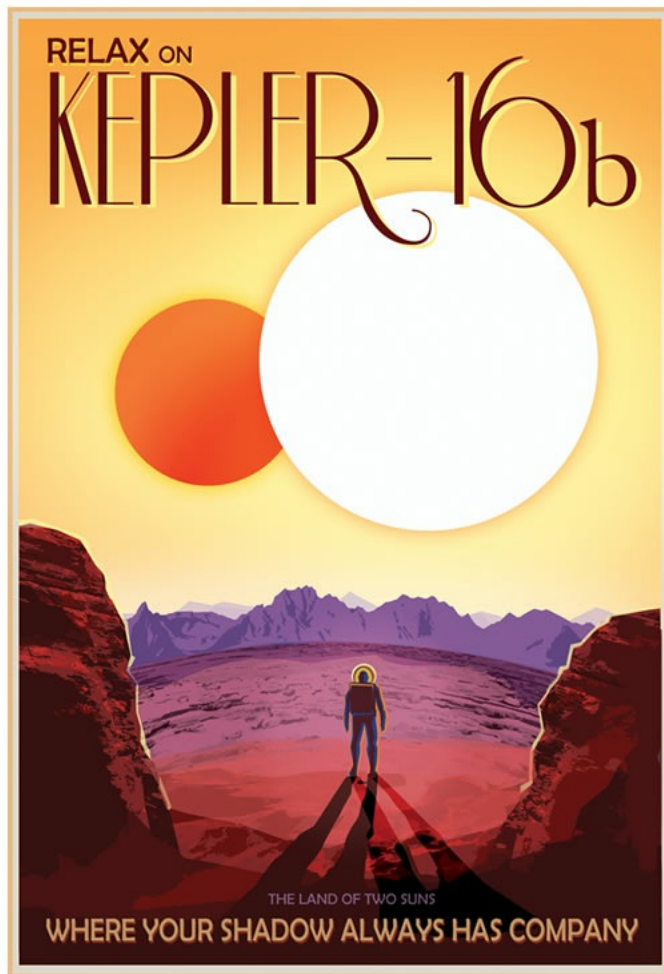
From examining the Kepler data, it is clear that exoplanets are far from rare in our galaxy. In fact, it would appear that there is the staggering number of between 100 billion and 400 billion exoplanets in our Milky Way galaxy. That means that, on average, there is one exoplanet for each star in the sky. So when you look up into the night sky, remember that each of those stars is likely to have a planet orbiting it.

The transit method used by Kepler is able to detect smaller exoplanets than the older radial velocity method, and is able to detect Earth-sized exoplanets. The Kepler mission was able to detect another grouping of exoplanets called the *super-Earths*. The super-Earths are *terrestrial* planets (which means they are rocky like the Earth, as opposed to gaseous) but can have masses up to ten times larger than the Earth.

Exoplanets have tremendously variable characteristics. In his book *The Copernican Complex*, Caleb Scharf considers the varied properties of the super-Earth exoplanets: "Many appear to have huge atmospheres, possibly containing lots of hydrogen. Some of these bulky objects are likely covered in vast quantities of water. They may be frozen solid. They may also be awash in a global ocean that reaches to almost unimaginable depths — tens, even hundreds of miles — with pressures and temperatures such that the physical and chemical behavior of water becomes unlike anything we experience on Earth. Others may have a modest splash of water, or none at all. But many should be persistently volcanic."

A theme we get from these exoplanets is that there is a tremendous diversity. Exoplanets have a huge range of different sizes, orbits, chemical composition, and surface conditions. Some exoplanets have rings of dust or ice, like Saturn, while others have moons.

NASA has released a range of imaginative travel posters from the fictional "Exoplanet Travel Bureau" which advertise travel to a variety of known (genuine) exoplanets. The posters emphasise the various attractive characteristics of each exoplanet, hopefully persuading you to take a holiday there. As an example, one of the advertised exoplanets is Kepler-16b, and its featured characteristic is that it orbits a pair of stars, like Luke Skywalker's planet Tatooine in *Star Wars*. As NASA say, "the movie's iconic double-sunset is anything **but** science fiction":



The habitable zone

There may be billions of exoplanets in our galaxy, but what we are really interested in is how many of those exoplanets possess the right conditions for life. A key mission objective of Kepler is to determine how many exoplanets have the properties which are believed to be essential for life to develop.

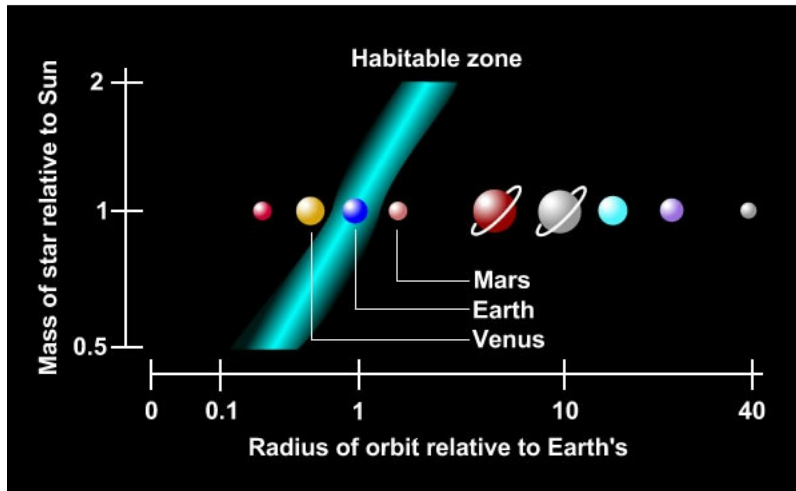
What properties are considered essential for life? Well, in 2009 the highly-popular BBC TV show *Top Gear* sent its three presenters on a road-trip across Bolivia. At one point, Jeremy Clarkson, Richard Hammond, and James May found themselves driving along the only road across the Atacama Desert. The Atacama Desert is quite beautiful. You could have a perfectly pleasant day out in the Atacama Desert. The scenery is stunning, and the temperature is not overwhelming. You could take a deckchair and a book and enjoy yourself. However, if you did that, you would be the only form of life of any kind for many miles in any direction. As Clarkson said: "We were in the Atacama Desert, where there is no life at all — not even on a cellular level. Richard Hammond was the smallest living organism for miles."

There is absolutely no life at all in the Atacama Desert: no plants, no insects, no bacteria. Absolutely nothing. And yet you could enjoy a very pleasant day sitting in the desert. How can that be the case? It is because the Atacama Desert lacks just one property which is absolutely essential for life: no rain ever falls on the Atacama Desert. It has no water.

As water appears to be essential for life, one of the most important factors in determining if an exoplanet could support life is the climate of the exoplanet. Is it too hot or too cold? A planet which is either too hot or too cold to support liquid water would appear unable to support life.

The temperature of a planet is dependent on the orbital distance of the planet from the central warming star. In our own Solar System, the planets Mercury and Venus orbit too near the Sun to support liquid water: water could only exist as vapour, whereas Mars is now too cold for liquid water. The Earth lies within those two orbits, with surface temperatures allowing the continual presence of liquid water. There is a similar orbital range around all stars within which liquid water could exist on a planet. This band is called the *habitable zone*.

The following diagram shows how the Earth is the only planet in the Solar System to lie in the narrow habitable zone band:



You will see that the habitable zone band is at an angle, showing that a smaller central star would produce less heat, and so the habitable zone would lie closer to the star.

At the moment, it seems almost every month there is the announcement of the discovery of an "Earth-like" habitable exoplanet which could potentially support life. But how accurate are these claims?

As an example, during the writing of this book, there was a major announcement of a discovery by the European Southern Observatory (ESO) telescope in the dry Atacama Desert (because lack of water vapour in the air and no clouds allows great astronomy). The discovery was of an exoplanet with a mass between 1.3 and three times as much as Earth, found in the habitable zone of our nearest star, Proxima Centauri. The exoplanet was given the name Proxima Centauri b (also known as Proxima b).

Proxima b orbits its central star quite closely, at only 5% of the distance between the Earth and the Sun. However, the central star — Proxima Centauri — is a type of star called a red dwarf, which is a smaller, dimmer, and cooler type of star than the Sun. Hence, even though Proxima b has a close orbit, it still lies within the habitable zone of the star.

The ESO announcement came complete with an artist's impression of the surface of Proxima b. Coming over the horizon in the distance you will see the red dwarf star, Proxima Centauri, around which the exoplanet is orbiting:



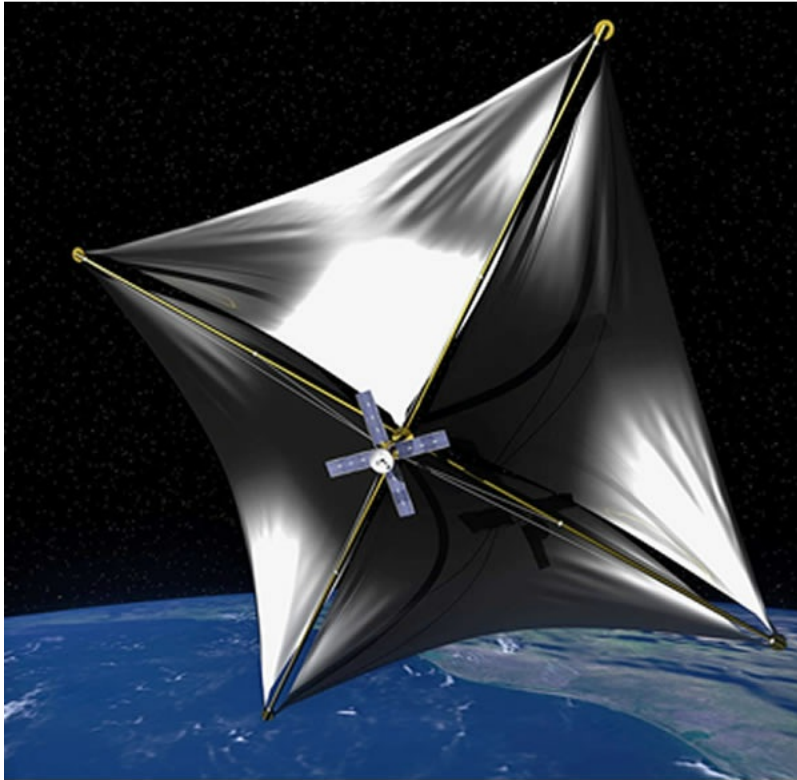
The announcement generated enormous media coverage. As an example, the front page story of *New Scientist* magazine (27th August 2016) proclaimed "We've found an Earth-like planet around our nearest star". The headline in the *Times* newspaper was "New planet could be our home away from home".

So much media excitement has been generated that there is now a plan to send an unmanned spacecraft to Alpha Centauri to investigate (Alpha Centauri is the three-star system which includes the star Proxima Centauri around which the exoplanet Proxima b orbits). But, in order to travel four light years, this can be no ordinary spacecraft.

The Russian billionaire Yuri Milner is funding a project called *Breakthrough Starshot*, the aim of which is to send a tiny laser-powered spacecraft to Alpha Centauri. Actually, the spacecraft is so small — a lightweight electronic wafer not much larger than a postage stamp — that it is called a *nanocraft*.

The nanocraft will be attached to a three-metre sail which will provide the propulsion. But the sail will not be powered by wind — it will be powered by light. As described in my third book, although light has no mass, it has momentum. Therefore, light beams can be used to exert pressure onto an object, so light shone onto the sail can provide the motive power for the nanocraft. However, the amount of force applied by a beam of light is extremely small, which explains why the nanocraft must be so lightweight.

The following image shows an artist's impression of the light sail and the small nanocraft to be used in Breakthrough Starshot. The sail is intended to be three metres across, which gives you an impression of the small size of the nanocraft (shown in the middle):



The aim is to power the craft by shining powerful Earth-bound lasers at the sail. The intended power of the lasers would accelerate the spacecraft to a fifth of the speed of light in just an hour, by which time, the nanocraft would have reached Mars. After that initial "kick", the nanocraft would reach the Alpha Centauri system in less than twenty years.

If all of this sounds crazily ambitious, that's because it **is** crazily ambitious. The required total laser output power would be 100 gigawatts, which is equal to the total electrical power consumption of France. It would be extremely difficult to focus such a powerful beam of light through the Earth's turbulent atmosphere. Also, travelling at a hundred million miles an hour (yes, it really would be travelling that fast!), even a fleck of interstellar dust would be enough to destroy the nanocraft.

So is the plan to send a nanocraft to investigate Proxima b overly-ambitious? The project is clearly going to generate some eye-catching headlines: "Spacecraft to travel at near speed-of-light to nearest Earth-like planet". But does this accurately reflect the reality of the scientific situation, or is it merely designed to generate publicity?

With this thought in mind, let us return to consider the "Earth-like" exoplanet, Proxima b. The artist's impression of the surface (shown earlier) is certainly beautiful, but is it accurate? When you start to dig deeper, you find things are not all they seem.

The artist's impression shows a rocky surface, but we know nothing about the actual surface of Proxima b. The exoplanet was detected indirectly via the radial velocity method (deflection of the central star) which tells us nothing about the chemical composition of the exoplanet. This assumption of a rocky surface is purely based on the observation of planets of a similar mass in our Solar System. But without direct observation of the exoplanet surface, we cannot be sure what it is like.

Because the exoplanet is so relatively close, direct observation might be possible using a space telescope. This would pin down the mass, size, and density of the planet. Because of the great distance, and the corresponding high resolution which would be required, this would only be possible using the large James Webb Space Telescope, which is NASA's replacement for Hubble and is due to launch in 2018. Even then, the exoplanet is so small and distant it would only appear as a single pixel of light in the telescope. Hence, in the absence of direct imaging, we do not know if Proxima b has an atmosphere, or if it has any water.

So, clearly, calling Proxima b an "Earth-like planet" in sensationalist newspaper headlines seems premature. This

is certainly the case when we consider additional data which makes Proxima b seem definitely unlike the Earth.

Proxima b, like so many exoplanets, orbits so close to its central star that it is constantly bombarded with deadly ultraviolet and X-ray radiation from the star. The intensity of the X-ray radiation from a red dwarf is 400 times greater than that experienced by the Earth.

Also, because Proxima b is so close to its central star it is likely to be tidally-locked to the star, which means that gravity pulls the planet so tightly that the same side of the planet always faces the star — just as the same side of the Moon always faces the Earth. Hence, one side of the planet would be permanently baked by the heat from the star, while the other side of the planet freezes in the darkness of space.

There is a fictional (and scientifically accurate) example of the difficulty in finding an exoplanet which is suitable for life. In the movie *Interstellar*, astronauts leave Earth in order to colonize a new planet to ensure the survival of humanity. However, the first two exoplanets they inspect are certainly not suitable, in fact, they are completely hostile to life. The first exoplanet turns out to be covered with a ocean which experiences kilometre-high tsunamis, while the second exoplanet turns out to be completely frozen with an atmosphere of toxic ammonia. It appears that this is a more realistic picture of what we might actually expect to find on these exoplanets.

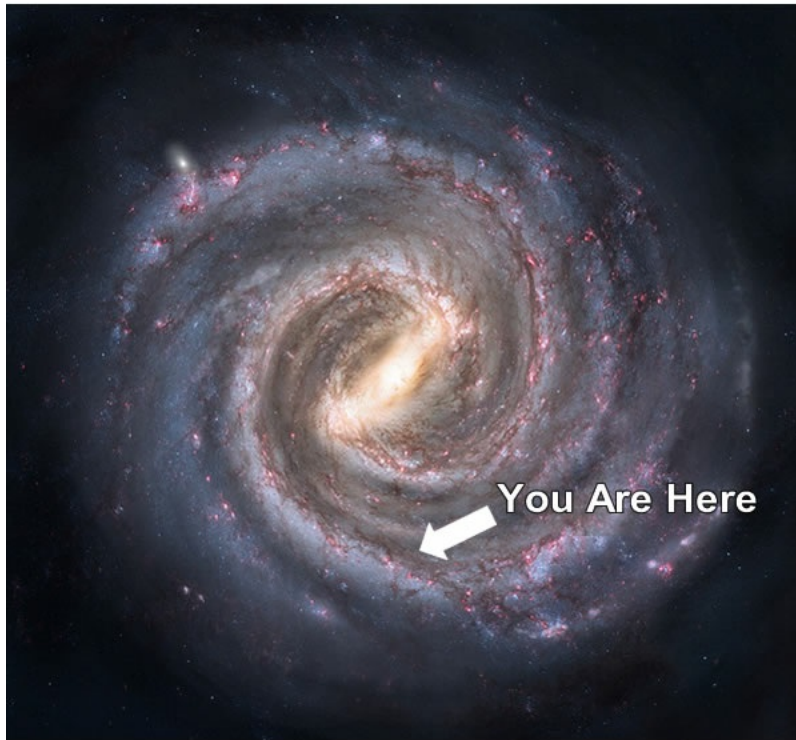
So, once we cut through the hype, this discussion appears to raise an important question ...

Is the Earth special?

Peter Ward is Professor of Geological Sciences and Donald Brownlee is Professor of Astronomy, both at the University of Washington in Seattle. They are acknowledged experts in their fields. In the year 2000, Ward and Brownlee published a book called *Rare Earth* which, it has been said, "hit the world of astrobiologists like a killer asteroid".

In *Rare Earth*, Ward and Brownlee listed many other additional requirements for any habitable planet, leading them to the conclusion that the Earth might well be the only planet suitable for advanced life in the galaxy. Ward and Brownlee called this the *Rare Earth Hypothesis*: "Ever since Polish astronomer Nicholas Copernicus plucked it from the center of the universe and put it in orbit around the Sun, Earth has been periodically trivialized. We have gone from the center of the universe to a small planet orbiting a small, undistinguished star in an unremarkable region of the Milky Way galaxy — a view now formalized by the so-called Principle of Mediocrity, which holds that we are not the one planet with life but one of many. Various estimates for the number of other intelligent civilizations range from none to ten trillion. If it is found to be correct, however, the Rare Earth Hypothesis will reverse that decentering trend. What if the Earth, with its cargo of advanced animals, is virtually unique in this quadrant of the galaxy — the most diverse planet, say, in the nearest 10,000 light years? What if it is utterly unique: the only planet with animals in this galaxy or even in the visible universe?"

In one of their proposals, Ward and Brownlee extended the idea of the habitable zone of a planet orbiting a star to suggest that there is also a habitable zone in each galaxy, a certain distance from the galactic centre. The region near a galactic centre is star-packed, and the constant upheaval from stellar collisions and supernovae explosions might not allow the billions of years of relative calm for advanced life to develop. At the other extreme, the outer regions of galaxies have fewer stars and would lack the heavy elements used to build rocky planets (because heavy elements are generated by fusion in the interior of stars). Our Solar System happens to be located at just the right distance from the centre of our Milky Way galaxy to allow life to develop:



It is clear that combining the two habitable zone requirements — around a star and also around the galactic centre — places severe restrictions on the number of habitable planets in a galaxy.

Ward and Brownlee also stress the importance of a stable environment for the development of life. It is known that the Sun is becoming brighter with time, and it is now 30% brighter than it was when the Earth was formed. About four billion years from now, the Sun will expand rapidly to become a red giant, its brightness increasing over five thousand times. At that point, the radius of the Sun will have expanded until it reaches the orbit of the Earth — extinguishing all life on the planet.

However, all that bad news lies in the far distant future. The Sun has been an unusually stable — and safe — source of energy for the Earth for approximately four billion years. It is known that biological evolution requires vast periods of time: probably billions of years. Hence, the stability of the Sun has allowed plenty of time for life to develop on Earth. However, stars larger than the Sun become brighter much faster. A star 50% more massive than the Sun would have become a red giant too quickly for life to evolve on any orbiting planet.

The stability — and safety — of the Earth over billions of years has also been ensured by the presence of Jupiter and Saturn orbiting outside the Earth. This is because it is believed that another requirement for the development of intelligent life is that there is a necessity for a planet to be protected from continual violent collisions with comets or asteroids. Stephen Hawking has said that a collision with a comet or asteroid greater than twenty kilometres in diameter would result in the mass-extinction of complex life. It is now believed that the gravity of massive Jupiter and Saturn located outside the orbit of the Earth acts to catch many asteroids and comets entering the Solar System before they can collide with the Earth. As an example, the comet Shoemaker-Levy 9 was observed colliding with Jupiter in 1994, leaving a scar on its surface.

Ward and Brownlee also emphasise the importance of *plate tectonics* in creating a habitable Earth. Plate tectonics is the movement of the crust of the Earth. This creates mountain ranges (where two continental plates crush together) and volcanoes. Volcanic activity appears to be particularly important because of the volume of carbon dioxide which is released into the atmosphere by volcanoes. Carbon dioxide is a greenhouse gas which captures outgoing infrared radiation and raises the temperature of the surface of the Earth. It is believed that the release of greenhouse gas was responsible for saving the Earth from previous ice ages which would have resulted in the irreversible freezing of the entire Earth. It is the temperature-mediating properties of greenhouse gases which has allowed liquid water to reside on the surface of the Earth for four billion years. As Ward and Brownlee say in *Rare Earth*: "Greenhouse gases are keys to the presence of fresh water on this planet and thus are keys to the presence of

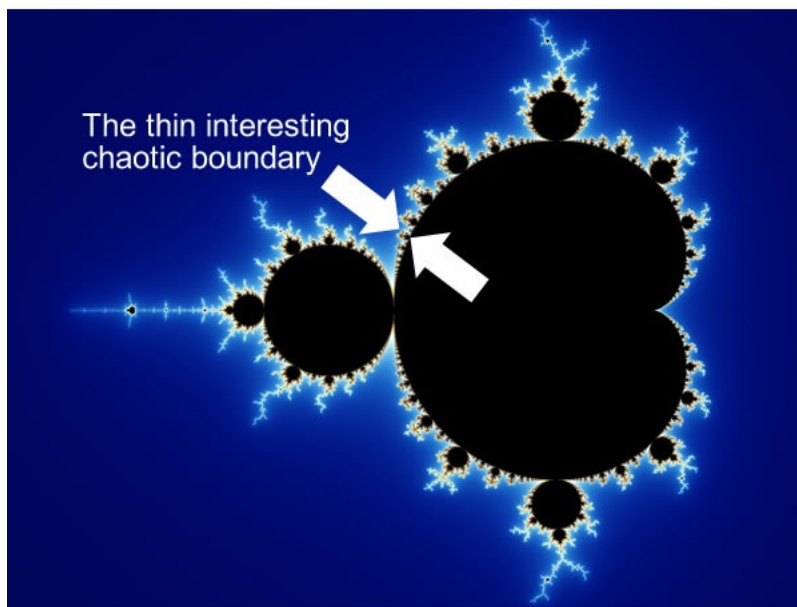
animal life." We would perhaps be wise to remember that if it wasn't for greenhouse gases the Earth would not be habitable at all. Global warming is not always a bad thing!

While other planets — such as Mars — have high, isolated volcanoes, only the Earth has long mountain ranges at the edge of continental plates. For this reason, it is believed that Earth is the only planet in the Solar System with tectonic plates, and plate tectonics might be extremely rare in the universe as a whole.

The metallic core of the Earth also plays an important role by generating a magnetic field which protects the Earth from lethal solar radiation. The optimistic analysis of exoplanet habitability does not take into account whether or not the exoplanet has a similar protective field. The situation is summed-up by Prof. Don Pollacco from the University of Warwick who is an expert on exoplanets: "As we learn things about what makes the Earth habitable, things like the magnetic field become really important. We can't measure the magnetic field of an exoplanet, so we just forget about it." [7]

Caleb Scharf is the director of Columbia University's Astrobiology Center. In his recent book *The Copernicus Complex*, Scharf starts by reminding us of the Copernican revolution in science, where the picture of the Earth as the centre of the universe was replaced by a model in which the Earth is nothing special: an unremarkable planet orbiting an unremarkable star. However, as Scharf realises: "While we cannot be at the center of what we now know to be a centerless universe, we appear to occupy a very interesting place within it — in time, space, and scale."

As Scharf suggests, there does appear to be something special about the Earth in terms of its position and its size. With this in mind, whenever I read about the habitable zone for exoplanets — the thin band of space in which life is supposedly possible — I am always reminded of the mathematical construction known as the *Mandelbrot set* (considered in my fourth book). The Mandelbrot set is constructed from a very simple iterative formula, producing a value which is defined for every point in the two-dimensional plane. Hence, it is possible to generate a rectangular image representing the Mandelbrot set, and this turns out to be a very pretty image which has been used in many posters and computer backgrounds. However, perhaps what is not widely realised is that the only truly pretty part of the Mandelbrot set is the very thin, crinkly boundary of the set:



To my mind, this thin, interesting, chaotic boundary has obvious parallels with the habitable zone around stars (and galaxies): it is where everything interesting happens. And, what is most interesting from the point of view of the discussion in this book, the interesting boundary is extremely thin. The vast, empty regions of the image are not interesting. Does the Earth lie on the equivalent of that extremely thin Mandelbrot boundary? Is the Earth special in that regard?

There is a famous quote from Stephen Hawking in his book *A Brief History of Time*: "We have developed from the geocentric cosmologies of Ptolemy and his forebears, through the heliocentric cosmology of Copernicus and Galileo, to the modern picture in which the earth is a medium-sized planet orbiting around an average star in the outer suburbs of an ordinary spiral galaxy, which is itself only one of about a million million galaxies in the

observable universe." In that quote, Stephen Hawking is suggesting the Earth is nothing special — completely mediocre. And, to the extent that he describes, he is obviously correct. However, with all due respect to Stephen Hawking, I believe in this case he misses the point. It is now being realised that it is this very mediocrity that makes the Earth special. The Earth is completely and perfectly middling: it lies in the narrow habitable zone. The Earth is not the biggest, it's not the smallest. It's not the hottest, it's not the coldest. It lies in a relatively safe planetary system where nothing very exciting ever happens, no planetary collisions or extinction-level asteroid strikes. At first glance, nothing about the Earth appears to be remarkable — apart from the fact that it is the only place in the universe that we know of where life exists. Ironically, it is the perfect mediocrity of the Earth which makes it special.

As Caleb Scharf says in *The Copernicus Complex*: "Life is a collection of phenomena at the boundary between order and chaos. Too far away from such borders, in either direction, and the balance for life tips toward a hostile state. Life like us requires the right mix of ingredients, of calm and chaos — the right yin and yang. There are obvious parallels to the concept of a habitable zone, which proposes that a temperate cosmic environment for a planet around a star exists within a narrow range of parameters."

The Copernican principle quite correctly proposed that the Earth orbited the Sun — just like any other planet. But this message of the Copernican principle — that the Earth is mediocre, "just another planet" — has then been incorrectly applied to infer that all other planets must be like the Earth. Hence, the Copernican principle has been used to predict an abundance of life on all exoplanets in the universe. However, we are now moving beyond the domain of application of the Copernican principle. As an example, chaos theory was only discovered in the nineteenth century, exoplanets were only discovered in the twentieth century, so we should no longer be relying on a sixteenth century principle (the Copernican principle) to determine the probability of extraterrestrial life. Science does advance.

Caleb Scharf believes our place in the universe is special, and the raw Copernican Principle is no longer sophisticated enough to capture the whole truth: "The Copernican Principle may have reached the end of its usefulness as an all-encompassing guide to certain scientific questions. The Copernican Principle is both right and wrong, and it's time we acknowledge that fact."

So we now see we have discovered perhaps the most likely solution to the Fermi Paradox. Earlier in this chapter it was described how it might seem likely that every term in the Drake equation has a large value, in which case the predicted number of advanced civilisations in our galaxy would be huge: Carl Sagan used the Drake equation to predict a million civilisations in our galaxy. However, there is of course a different way of interpreting the Drake equation, as explained in the *Rare Earth* book: "Any factor in the equation that is close to zero yields a near-zero final answer, because all the factors are multiplied together."

In other words, it only takes one of the factors in the Drake equation to be small in order to send the number of predicted civilisations to come crashing down. And, from our discussion in this chapter, it would appear it is the n_e term in the Drake equation which is small (the n_e term is the average number of **habitable** planets orbiting a star) and that is the reason why we do not observe a universe teeming with life.

As Matthew Cobb says in the recently-released book *Aliens* (edited by Jim Al-Khalili), our current knowledge "leads us to the conclusion that the answer to the Fermi paradox is that its starting point is probably wrong. There are no alien civilisations."

But, even if all the interesting processes (life) occur within a narrow, chaotic band, we still need that vast uninteresting expanse of the rest of the universe in order for the Earth to be so interesting. It is not the Earth that is mediocre — it is the rest of the universe that is mediocre. The Earth is, quite frankly, an amazing place. As Ward and Brownlee say in *Rare Earth*: "Earth seems to be quite a gem".

Are we alone in the universe? It appears that might well be the case.

I am reminded of a humorous quote by the great British comedian, Peter Cook: "As I looked out into the night sky, at all those infinite stars, it made me realise how insignificant ... they really are."

Implications for fine-tuning

Finally in this chapter, let us return to the question of whether or not the universe is fine-tuned for life. How has this discussion of extraterrestrial life affected the likelihood of that hypothesis being true?

If you remember, at the end of the Bayesian analysis in the previous chapter, it was suggested that if we want to calculate whether or not the universe is fine-tuned, we only need to get a definitive answer to the "probability of life appearing in general". Remember, if life emerges easily in all universes, then it has no need of additional helpful fine-tuning. Conversely, if life does not emerge easily, then life is delicate and rare and it needs all the help it can get

from fine-tuning in order to emerge.

Because of the convincing evidence of the Fermi paradox — and its likely resolution in the form of the Rare Earth Hypothesis which suggests that life requires very particular and unusual circumstances in order to emerge — I am going to suggest that the "probability of life appearing in general" should be set to a low value, certainly a lower value than has been suggested in the past by astrophysicists such as Carl Sagan. This might appear to be a controversial conclusion, but it seems to be in line with the recent conclusions of many astrobiologists.

And, if you remember back to the Bayesian fine-tuning equation presented in the previous chapter, a low value for the "probability of life appearing in general" lends support to the fine-tuning argument. As Caleb Scharf says: "There are signs that we inhabit a somewhat unusual place, and there is a hint of an expansion to the notion of cosmic fine-tuning."

The apparent fine-tuning problems are many and varied. Some may not be true problems at all: it is possible that life would still be possible even with considerable variation in the values of the parameters. However, while some parameter limits might be loosened, it appears that many limits still remain. From our discussion of the Fermi paradox, it appears that even a failure to produce liquid water would prohibit the emergence of life. It has also been suggested that life might be possible in a completely different form if the physics of the universe was completely different. One example is the possibility that silicon-based life might emerge in a universe which is unable to produce carbon.

However, life based on alternative chemistry does nothing to avoid the fundamental fine-tuning problems. Considering silicon-based life, for example, silicon is just another heavy element (like carbon) which can only be produced in the interior of stars by fusion reactions. The fine-tuning coincidences on which heavy-element production depends are just as relevant for silicon as they are for carbon. As John Barrow says in his book *The Constants of Nature*: "The argument is not really changed if beings are possibly based upon silicon chemistry or physics. All the elements heavier than the chemically inert gases of hydrogen, deuterium and helium are made in the stars like carbon and require billions of years to create and distribute."

Another criticism of silicon-based life is presented by Paul Davies in *The Eerie Silence*: "There has been some speculation that silicon could substitute for carbon, a conjecture that got as far as an episode of *Star Trek*, but it hasn't been pursued very seriously by biochemists because silicon can't form the extraordinary range of complex molecules that carbon can."

As another example, the chemistry of a simplistic alternative universe might only allow the existence of hydrogen and helium. However, as Caleb Scharf says: "It does seem hard to imagine how a universe of just hydrogen and helium could give rise to structures with the complexity seen in carbon-based life."

So it appears that there is a real problem here, and we need to find a solution.

I believe that, in order to solve the many fine-tuning problems, we need to avoid approaches such as the strong anthropic principle, which promise simple and easy solutions to difficult fine-tuning questions. There is no substitute for good physics. We will have to rely on our talent, ingenuity, and hard work to solve these problems.

On that basis, I can assure you that the remainder of this book will be based on conventional theoretical physics. There will be no multiverses, no anthropic reasoning, and no *Star Trek* silicon-based lifeforms in sight.

And, once we start using conventional theoretical physics to analyse these problems, we find another possible alternative to fine-tuning emerges. Maybe the laws of physics are unique, and completely determine the values of the fundamental constants to be suitable for the emergence of life? Paul Davies makes this point in his book *The Goldilocks Enigma*: "We have no idea whether the various parameters of interest are actually free and independent, or whether they will turn out to be linked by a more comprehensive theory, **or possibly even determined completely by such a theory.**" This is in line with Einstein's famous quote: "What I am really interested in is whether God could have made the world in a different way; that is, whether the necessity of logical simplicity leaves any freedom at all."

If it is the case that the laws of physics, and the values of the fundamental constants, could take no other conceivable form then the universe would not be fine-tuned because **no fine-tuning of the values would be possible**. In that case, we would have solved the fine-tuning problem.

Might it be the case that the laws of physics are uniquely determined to have values which are suitable for life? Is life inevitable?

We are going to have to consider some theoretical physics ...

4

THE COSMOLOGICAL CONSTANT

In the first two decades of the 20th century, our view of the universe was a lot smaller than it is today. The existence of other galaxies was not certain, so all the stars were believed to lie within our own Milky Way galaxy. What is more, the position of the stars appeared to be fairly stable. There was certainly nothing to suggest that the universe might be rapidly expanding.

So when Einstein published the theory of general relativity in 1915, he was left with something of a conundrum. The theory suggested that a stable universe was not possible as gravity would eventually pull all the matter together. How could Einstein resolve this conflict between observations and the prediction of his theory? Unusually for Einstein, he rejected the prediction of his elegant and revolutionary theory, and tried to "fudge" the result in order to produce a stable universe.


In order to understand what Einstein suggested, let us consider the equation for general relativity (which was derived in my previous book):

$$\begin{array}{ccc} \text{The curvature} & & \text{Mass-energy} \\ \text{of spacetime} & & \text{distribution} \\ \underbrace{R_{\mu\nu} - \frac{1}{2}R g_{\mu\nu}} & = & \underbrace{8\pi G T_{\mu\nu}} \end{array}$$

You will see that the equation actually predicts something quite simple. It states that the curvature of spacetime (on the left-hand side of the equation) is dependent on the distribution of mass and energy. It is perhaps best described by a famous quote by John Wheeler: "Spacetime tells matter how to move; matter tells spacetime how to curve."

To preserve a stable universe, Einstein added a factor, Λ , to his equation which was effectively a form of repulsive gravity. This acted to move the stars apart to balance the inward contraction. Einstein called this additional term the *cosmological constant*:

$$R_{\mu\nu} - \frac{1}{2}R g_{\mu\nu} + \Lambda g_{\mu\nu} = 8\pi G T_{\mu\nu}$$


Cosmological constant

It is interesting that Einstein placed his correction factor on the left-hand side of the equation, thus modifying the curvature of spacetime. He might have chosen to place his correction on the other side of the equation, thus modifying the predicted energy of space. As we shall see later, this latter approach is the one favored in modern cosmology.

The priest

Georges Lemaître was a Belgian physicist who is now regarded as one of the most important physicists and cosmologists of the 20th century. Surprisingly, however, Lemaître was not a physicist by profession. Instead, in 1923, he was ordained as a Roman Catholic priest and remained in the priesthood for his entire life.

Lemaître always managed to keep a distance between his personal beliefs and his scientific research, even once arguing with the Pope over the Pope's interpretation of Lemaître's own Big Bang theory. That disagreement did not stop Lemaître from eventually becoming the president of the Pontifical Academy of Sciences.

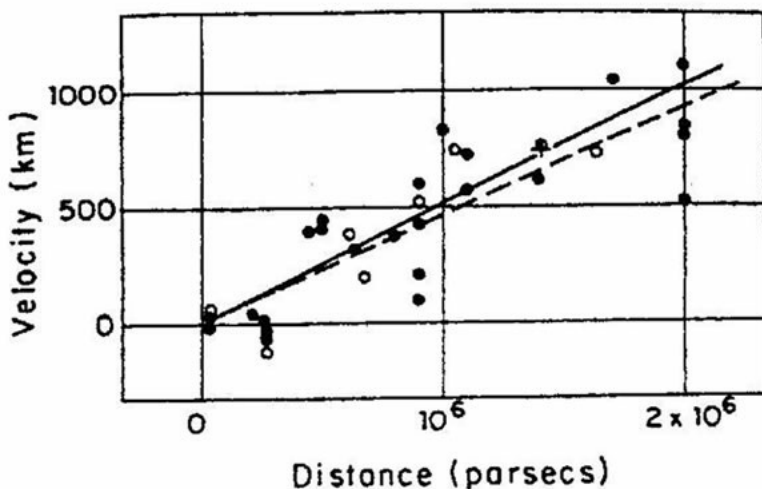
In 1924, Lemaître realised that Einstein's cosmological constant would not be sufficient to produce a stable universe. Like a pencil balancing on a point, the apparently stable universe would actually be unstable. Even the slightest variation between the amount of matter in the universe and the value of the cosmological constant would result in a universe which either contracted to a point or expanded forever. A pencil cannot stay balanced on its point forever.

Lemaître's 1924 paper also predicted that if the universe really was expanding then the expansion could be measured by astronomical observations. Light from receding galaxies would be shifted towards the red end (longer wavelength) of their spectrum because of the Doppler effect. Lemaître realised that general relativity predicted a linear relationship between the distance of faraway galaxies and their redshift.

In 1927, the American astronomer Edwin Hubble decided to check this predicted relationship between distance and velocity. Hubble calculated the distance of galaxies by measuring their brightness, and relied on his assistant — Milton Humason — to measure the spectra of the galaxies.

By January 1929, Hubble and Humason had distance and spectra data for twenty-four distant galaxies. Hubble plotted the data on a graph, with distance on the x axis and velocity (calculated from the redshifts) on the y axis. The scatter of points lay close to a straight line, indicating a linear relationship between distance and recession velocity — just as Lemaître had predicted.

The following image shows Hubble's actual graph from his 1929 paper (which never credited the work of Humason) in the Proceedings of the National Academy of Sciences:



When he read about Hubble's discovery, Einstein realised his blunder in horror. An expanding universe had no need of a cosmological constant to keep it static. Einstein realised he could have predicted the expanding universe from general relativity before Hubble discovered it from observation. Einstein was later to call his introduction of the cosmological constant the "biggest blunder" of his life.

Einstein had lost the initiative and the leadership. From now on, for the rest of his career, Einstein was always playing catch-up in physics.

The return of the cosmological constant

With Hubble's discovery, it appeared to be the end of the role of the cosmological constant which was duly

removed from the general relativity equation. However, in 1998, a surprising astronomical observation brought the cosmological constant back to centre stage once again.

After the initial explosion of the Big Bang, general relativity predicted that the expansion of the universe would slow down due to the gravitational attraction between the masses in the universe. The question to be answered was at what rate was the expansion slowing?

In order to answer this question, two international teams of researchers attempted to measure the rate of expansion of the universe. The teams measured the brightness of supernova explosions, which tended to all be of similar brightness and were therefore termed *standard candles*. This provided a measure of the distance to the supernova. The speed at which the supernova was receding could be calculated from its redshift.

By combining these two results, both teams discovered something remarkable: the expansion of the universe was accelerating, not slowing-down as predicted. This came as a complete surprise, and the cause of the expansion was unknown. However, it was realised that resurrecting Einstein's cosmological constant provided a possible solution. Remember, Einstein introduced the cosmological constant into his equation to provide a form of repulsive gravity needed to counterbalance the contraction of the universe. It could be this repulsive gravity which was now powering the accelerating expansion of the universe.

What was more, there was an obvious candidate for the energy required to power the expansion. In the next chapter on quantum field theory we will be examining how particles (together with their equivalent antiparticles) can be produced if enough energy is packed into a sufficiently small volume. Even in empty space, the uncertainty principle can introduce the possibility that a particle pair might be produced for an extremely short time, before annihilating each other. As a result, even in empty space, in which all particles have been removed, there will be a seething froth of these so-called *virtual particles*. There will be a corresponding energy due to the presence of the virtual particles called the *vacuum energy*, or the *zero-point energy*.

The suggestion was made that it might be this vacuum energy which was driving the accelerating expansion of the universe, with the vacuum energy playing the role of the cosmological constant in Einstein's equation. This mysterious energy was given the name *dark energy*. However, a problem arises when we try to calculate the expected value of the vacuum energy by adding all the quantum contributions from the virtual particles: we find we get an infinite result. Why is this the case? Well, quantum mechanics tells us that every particle can also be considered as being a wave (*wave-particle duality*), with shorter wavelengths representing particles with higher energy. But when we consider the vacuum energy of a volume of space, there is nothing to stop us including the contributions of particles with ever-smaller wavelengths, which represent ever-increasing energies — potentially up to infinity. The only way we can get a meaningful finite result is to have a cut-off wavelength, and not consider the contributions from any wavelengths which are shorter than the cut-off.

The logical cut-off wavelength is provided by the *Planck length*, an extremely small distance (about 10^{-20} times the diameter of a proton) which represents the shortest measurable length. Unfortunately, when we use the Planck length as the cut-off wavelength, the value of the vacuum energy is calculated to be the huge value of about 10^{93} grams per cubic centimetre. In his book *The Goldilocks Enigma*, Paul Davies calculates that this is "implying that a thimbleful of empty space should contain a million trillion trillion trillion trillion trillion tonnes!" This is larger than the necessary value for dark energy by a factor of 10^{120} . According to Stephen Hawking, this outrageous value represents "the biggest failure of physical theory in history".

As a result, the only way that vacuum energy can be the cause of the accelerating expansion of the universe is if there is some cancellation effect from different types of virtual particles, greatly reducing the estimate to the observed small value. But this would represent fine-tuning to a truly incredible degree.

What is more, if the extremely small value of the cosmological constant had a much larger value then it would have stopped galaxies and stars from forming, and life would have been unable to evolve. This has driven some physicists to consider desperate measures. According to Leonard Susskind: "The notorious cosmological constant is not quite zero, as it was thought to be. This is a cataclysm and the only way that we know how to make any sense of it is through the reviled and despised anthropic principle." [8]

But surely we can do better?

Naturalness

In order to understand the fine-tuning problem more clearly, it is useful to consider the principle of *naturalness* (considered in depth in my previous book).

In physics, there are some fundamental physical constants which seem to play particularly important roles in

describing the universe. Most of these constants have associated units, for example, the speed of light is 3×10^8 metres/second (with the units in that case being metres per second). Note that we could change the numeric value of the constant merely by changing the units. For example, it is also correct to say that the speed of light is one foot per nanosecond. Or, equivalently, 328,000 football pitch lengths per second. Or maybe 46 Great Walls of China per second. Or even 1.6×10^8 giraffes' necks per second.

So it is clear that when we are dealing with constants that have associated units, the actual numeric value of the constant is completely dependent on the units we choose.

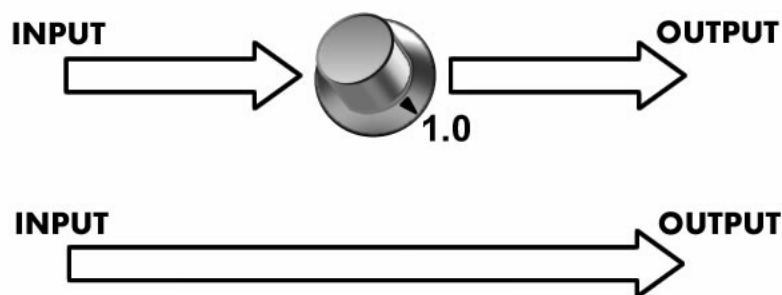
This is not the case for a particular group of constants which do not have associated units. These are called the *dimensionless* constants. As an example, later in this book we will be considering the fine structure constant which has a value of approximately $1/137$ — with no associated units. Because the dimensionless constants have no units, even an alien civilisation based on Alpha Centauri would calculate exactly the same numeric value for these constants. Hence, the numeric values of these constants are particularly interesting as they seem to capture some deep truth about the workings of the universe.

It was Albert Einstein who first noticed a particularly interesting feature about the dimensionless constants: their values tend to be close to one. This tendency has proven to be a useful tool for physicists. As John Barrow explains in his book *The Constants of Nature*: "In every formula we use to describe the physical world, a numerical factor appears ... which is almost always fairly close in value to 1 and they can be neglected, or approximated by 1, if one is just interested in getting a fairly good estimate of the result."

Why should it be the case that the values of the dimensionless physical constants tend to be close to one? Well, if we had complete knowledge about the underlying physical mechanism, we might imagine that we could write down a mathematical formula that accurately describes that mechanism, and produces the value of the constant as a result. In that case, it actually becomes difficult to imagine a simple mechanism which could produce values which are many orders of magnitude greater than one. This is because most of the fundamental mathematical constants we would use in our formula (such as pi) also tend to have values very close to one. In that case, how could a simple mechanism produce a numeric value of the order of 10^{40} , for example? It is not easy to imagine how that could happen. [9]

There is another very good reason for expecting the values of the dimensionless constants to be close to one: it is because this would represent a situation which is considered *natural*. As described in Chapter One, we might imagine the universe as being described by Martin Rees's six dimensionless numbers, and we might also imagine those numbers as being the settings on six dials. It would then appear that there is a considerable amount of "arbitrariness" in the universe, in that those dials might well have been set to other values than the observed values. This seems to indicate that the universe could take other forms based on other settings of the dials. In that case, no particular form of the universe appears to be favoured over any other form, and we are left with the question as to why the universe takes the form it does.

However, there is one setting of the dials which seems to be special. If a dial is set to the value 1.0, then we can effectively eliminate that dial without affecting the behaviour of the system (because multiplying or dividing by 1.0 leaves the original number unchanged). The following diagram shows a system in which a dial set to the value 1.0 can be removed without affecting the output of the system:



So a system which has all its arbitrary "dials" set to 1.0 could potentially have all its dials removed. The resulting system would not only be simpler, it would also have no arbitrariness — the system could not be modified (as it has no dials). Such a system would then be called *natural*. It represents the system in its unmodified state, with no tinkering. This also represents the situation in which it is not possible to modify the system, that is, if the state of the system arises from logical necessity. As Einstein said: "What I am really interested in is whether God could have

made the world in a different way; that is, whether the necessity of logical simplicity leaves any freedom at all."

This principle that we should expect the values of the dimensionless constants to be close to one is called *naturalness*. It is a principle which is rather controversial at the moment as some physicists have raised doubts about the range of applicability of the principle. However, I think it is hard to argue with the very general description I have presented here. If we pursue naturalness, then we are eliminating arbitrariness from our solutions. In a completely natural universe, the form of the universe would arise from the structure of our equations, not the setting of arbitrary constants.

It might be the case that the state of the universe does not arise as a logical necessity, in which case we might be forever left with the question of why the universe takes the form it does. In that case, the only answer to why the constants take the values they have would be "that's just the way it is". That rather unsatisfactory answer will always encourage the proponents of the strong anthropic principle to suggest that parallel universes are the solutions to all our problems. But until we reach that end-of-the-road scenario, naturalness seems to be a valuable guide.

I don't think we should be giving-up on naturalness yet.

The naturally-flat universe

As an example of how a natural solution avoids any arbitrariness, let us consider the apparent fine-tuning of one of Martin Rees's "six numbers". In Chapter One it was explained how the value of Ω , the Greek letter omega, represents the ratio between the total amount of mass and energy in the universe, and the critical density of the universe. The value of Ω appears very close to one, which results in a flat universe. This was described as being another example of fine-tuning: if the value of omega was much less than one, the universe would have expanded too fast to allow galaxies and stars to condense, so life could not have evolved. Conversely, if the value of omega was much greater than one, the universe would have collapsed into a "Big Crunch" before stars could have formed.

However, on the basis of our discussion of naturalness, we can see that a value of 1.0 for omega would be a natural value, a value that requires no fine-tuning. It would be the value we should expect. The mystery then becomes the mystery of why our theories do not predict that value. Perhaps there is no fine-tuning — the failing might be in our theories to accurately capture the behaviour of Nature.

Without going into detail, my second book presented a hypothesis of modified gravity which resulted in a naturally-flat universe, and hence an apparent value of 1.0 for omega. There was no arbitrariness in the theory, no adjustable parameters — and no need for inflation. It would be an example of the power of the principle of naturalness.



Let us now examine some more of the deepest fine tuning problems. We will need to consider our most accurate current theory of fundamental physics ...

QUANTUM FIELD THEORY — PART ONE: EVERYTHING IS FIELDS

We are often told that quantum mechanics is a "revolutionary theory" and is the "the most successful theory in the history of physics", representing "our best theory of very small scales". However, as we shall see in this chapter, quantum mechanics cannot be a complete theory of reality at the fundamental level. We will find that a new theory is required.

We will see that this new theory has implications not only because it represents a more complete picture than quantum mechanics, but also because it completely reshapes our view of reality — in a way which is not widely realised or appreciated. We will see that this new theory is far more "revolutionary" than quantum mechanics ever was. We will see that this new theory forces us to give up our notion of a universe made of particles and instead consider a universe composed entirely of *fields*, which we can never directly feel or observe. These fields are continuous, and stretch from one end of the universe to the other. They are about as far from our intuitive notion of reality as it is possible to imagine.

However, we will also see that when we accept a universe made of fields and not particles, then concepts which seem so confusing in quantum mechanics suddenly start to make a lot more sense.

So, welcome to the theory called *quantum field theory*.

All of this might come as something of a shock, and I suspect it is not generally realised by the general popular science audience. However, while quantum field theory (generally known as QFT) might sound shocking and revolutionary, the accuracy of QFT has been thoroughly confirmed experimentally. QFT is now regarded as being our premier theory of fundamental physics.

As Roger Penrose says in his book *The Road to Reality*: "Quantum field theory constitutes the essential background underlying the Standard Model of particle physics, as well as practically all other physical theories that attempt to probe the foundations of physical reality. In fact, QFT appears to underlie virtually all of the physical theories that attempt, in a serious way, to provide a picture of the workings of the universe at its deepest levels."

QFT may be mind-altering, and revolutionary, but it is also the accurate description of how the universe works.

A brief refresher on quantum mechanics

The material presented in this chapter will be heavily-based on material contained in my fifth book, which was an introduction to particle physics and quantum mechanics. It is highly-recommended that you read my fifth book in order to get sufficient background for the material presented in this chapter. As I do not like to repeat material covered in my earlier books, I am afraid the phrase "As explained in my fifth book ..." is going to appear rather often in this chapter.

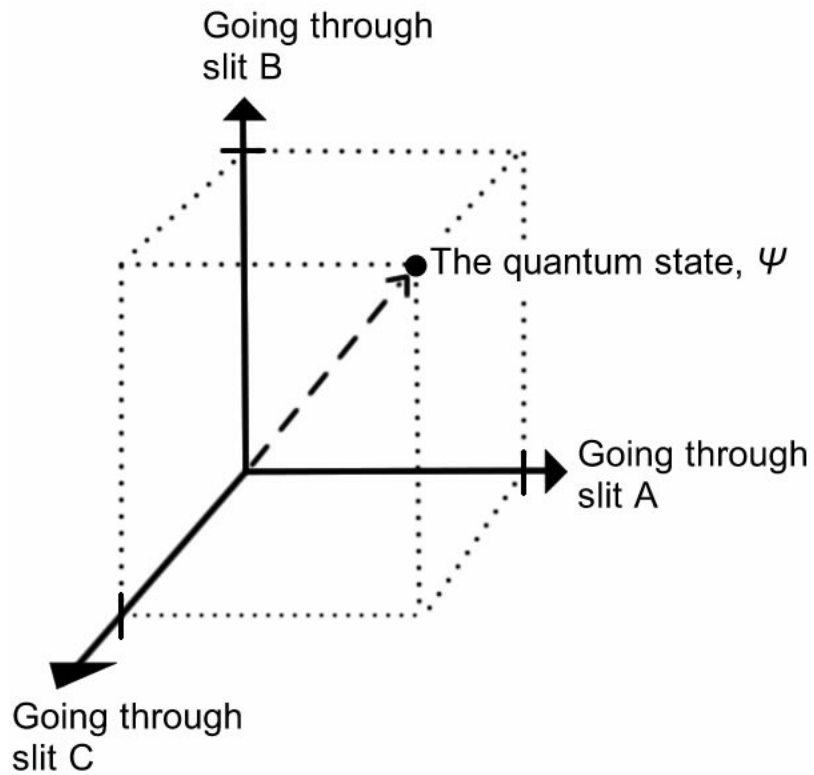
However, a very brief refresher on some of the concepts of quantum mechanics will be presented here — even though they have already been covered in greater detail in my fifth book.

According to quantum mechanics, before we observe some property of a particle, for example, its position or spin, we must consider the particle to be in a strange *superposition* state of all possible particle properties. The classic example of the double-slit experiment is often presented in which a particle appears to travel through two slits **at the same time** before making a mark on screen.

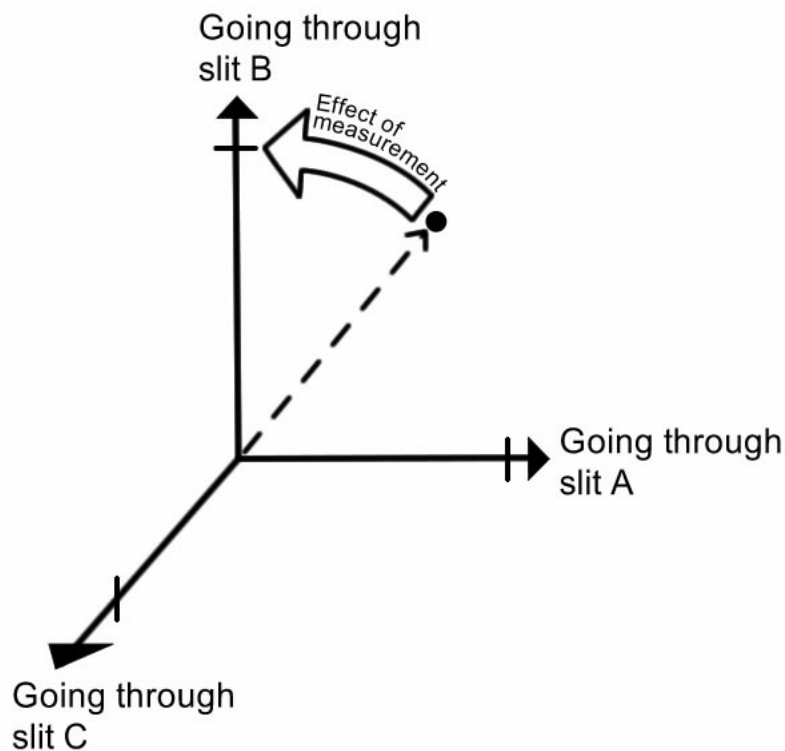
So that is the situation **before** we observe the particle. But **after** we observe the particle, we find the value of the observed particle's property must take only one of a number of certain allowed values. These allowed values are called *eigenvalues*, and the state of the particle must then lie in one of the allowed *eigenstates*.

This whole quantum measurement process can be described mathematically, or by the equivalent graphical description — which we shall now consider. The following diagram shows an extension to the double-slit experiment in which another slit is added (to convert it into a triple-slit experiment). In the diagram, the quantum state of the particle is shown by a vector (the dotted arrow).

The diagram shows the situation before measurement, i.e., before the particle hits the screen. Before measurement, you will see that the quantum state of the particle is in a superposition state: a combination of all three possible slits. Hence, it appears as though the particle is travelling through all three slits:



This form of graphical representation in which the quantum state is depicted as a vector is called a *Hilbert space*. So what happens after we make a measurement? In other words, what happens when the particle hits the screen and reveals its true position? In that case, the particle leaves its superposition state and takes a single well-defined state. As an example, when we try to detect the position of the particle in our triple-slit experiment, we find it only passing through one slit. As you will see in the following diagram, this is represented by a rotation of the quantum state vector from its previous superposition state to one of the well-defined single states (in this case, going through slit B):



These three slits through which the particle can pass would then represent the eigenstates of the system — the only allowable states we will find when we observe the position of the particle.

Mathematically, this rotation of the quantum state is achieved by the application of an *operator* (just denoting the application of a mathematical operation).

Which brings us to the end of this very brief refresher on quantum mechanics.

The Dirac revolution

The highly-introverted physicist Paul Dirac is regarded as one of the key physicists of the 20th century. If anything, Dirac's reputation has only increased in the years since his death, and his work seems more central than ever.

Legend has it that Dirac's great moment of inspiration came in 1928 when he was staring into the fireplace at Cambridge University. Dirac realised how it was possible to combine quantum mechanics with special relativity. The result was that Dirac derived his famous equation for an electron which is known as the *Dirac equation* (the derivation of which was presented in my fifth book, together with more insights about the life and work of Paul Dirac).

The Dirac equation made some extraordinary predictions. It predicted the spin of an electron, which was quickly realised to be a perfect match with experiment. But, most extraordinary of all, the Dirac equation predicted new types of particles which we now know as *antimatter*. It is now known that all particles have an antimatter equivalent.

It was the discovery of antimatter which was to have such a revolutionary effect in quantum mechanics. If a particle of matter meets its antimatter equivalent then both particles disappear in a flash of energy (potentially quite destructive energy). The reverse process is also true: if enough energy can be confined to a small space then a particle can be created together with its antimatter equivalent (a process known as *pair production*). It is possible to make particles! This means that the number of particles in the universe is not a fixed number.

This development is described by Roger Penrose in his book *The Road to Reality*: "The key property of an antiparticle is that the particle and antiparticle can come together and annihilate one another, their combined mass being converted into energy, in accordance with Einstein's $E=mc^2$. Conversely, if sufficient energy is introduced

into a system then there arises the strong possibility that this energy might serve to create some particle together with its antiparticle. Thus, our relativistic theory certainly cannot just be a theory of single particles, nor of any fixed number of particles whatever. Indeed, according to a common viewpoint, the primary entities in such a theory are taken to be the quantum fields, the particles themselves arising merely as 'field excitations'."

Pay particular attention to Roger Penrose's last sentence which suggests that the "primary entities" are the fields — not the particles. We will be returning to this idea shortly.

Fock space

At this point, our theory of quantum mechanics hits something of a problem. Quantum mechanics is, essentially, a more complete update of classical mechanics (the mechanics of Newton). Hence the use of the word "mechanics". So, like classical mechanics, quantum mechanics is basically a theory of how things move, the "things" in this case being particles. To see the problem, let's consider an example from classical mechanics.

Imagine you are pushing a heavy wheelbarrow up a hill. If we want to analyse the motion, and calculate how hard we have to push, we can use classical mechanics and Newton's laws of motion to calculate the forces involved. We can therefore create a perfectly accurate mechanical model of the situation.

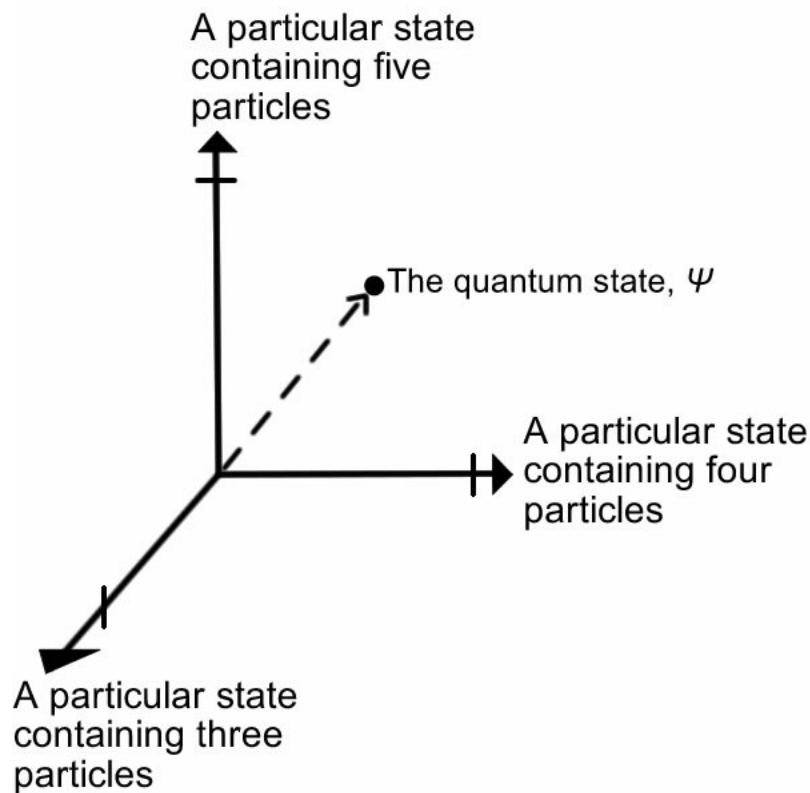
But, all of a sudden, something very surprising happens: the wheelbarrow completely disappears into thin air. This poses a serious problem for our mathematical model: there is nothing in Newton's laws of motion which says anything about objects disappearing. Likewise with quantum mechanics, which is just an update on classical mechanics: there is no way in quantum mechanics to model objects which just suddenly decide to disappear.

As Leon van Dommelen says in his excellent web-based book *Quantum Mechanics for Engineers*: "The quantum formalism in this book cannot deal with particles that appear out of nothing or disappear. A modified formulation called quantum field theory is needed." [\[10\]](#)

So when Paul Dirac revealed that it was possible for particles to appear and disappear, this went beyond the capabilities of the Hilbert space representation. A new mathematical representation is needed for quantum field theory. We have to move from the Hilbert space representation to the *Fock space* representation.

Fock space looks rather similar to Hilbert space in that the coordinate axes represent eigenstates of the system (the allowable states which can be observed after measurement). Let us consider the Fock space for a number of identical particles contained in a box. The eigenstates on each axis of the corresponding Fock space will represent one possible combination of the particles in the box.

As the axes of the Fock Space represent **all** possible combinations of the particles in the box, it is necessary to consider the situation when some particles appear and disappear. Hence, the axes of Fock space can even represent different numbers of particles, as shown in the following diagram of a particular Fock space:

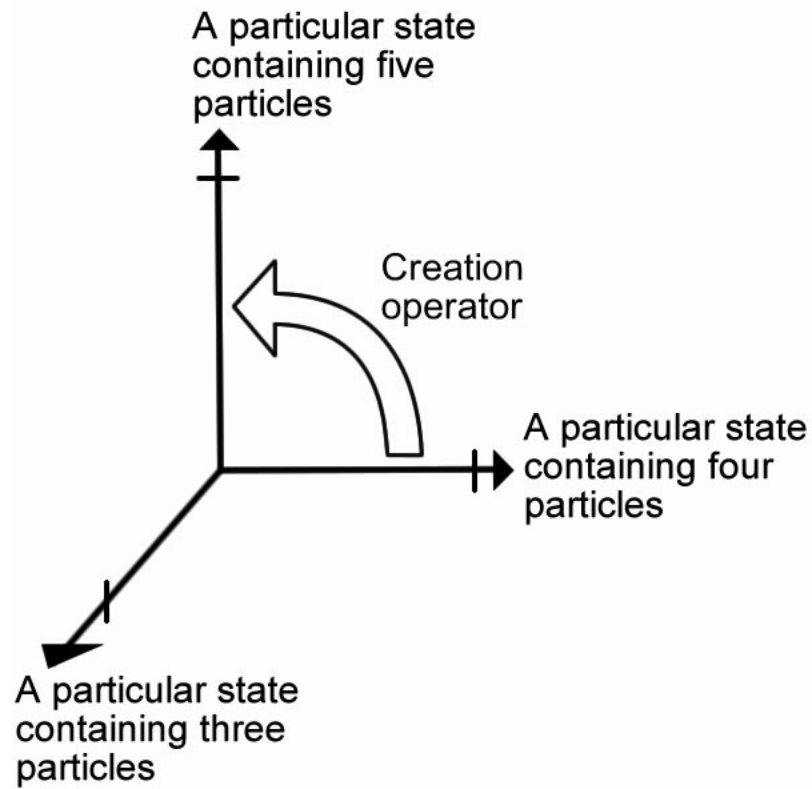


Note that each axis of the Fock space can represent the case of a different numbers of particles in the box (five particles, four particles, etc.).

A bit of terminology for you: when we move from classical mechanics to the Hilbert space representation it is called *first quantisation*. Then when we move from the Hilbert space representation to the Fock space representation (the QFT representation) it is called *second quantisation*. A crucial point is that in the Hilbert space representation, not every situation can be represented (e.g., when the wheelbarrow disappears), whereas Fock space can mathematically represent **absolutely everything that can possibly happen**. This is a crucial feature of second quantisation in QFT, and we will be returning to consider this feature in the next chapter.

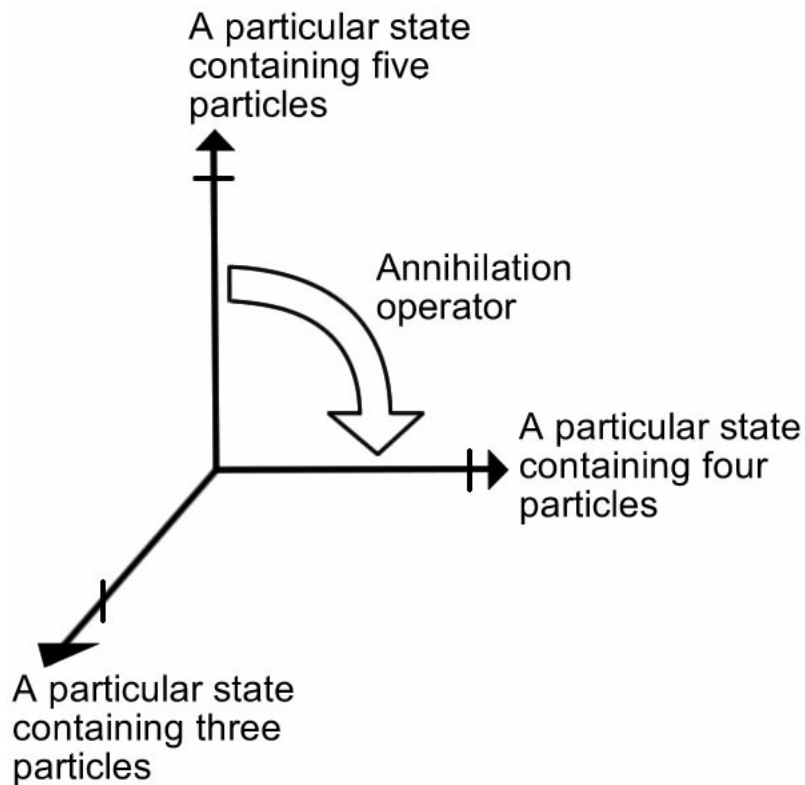
Looking at the axes of the Hilbert space and the Fock space, it is clear that there is a similarity between the two representations, with different eigenstates on each axis. And, just as in the Hilbert space representation, it is possible in the Fock space representation to apply different operators to rotate the current quantum state to different eigenstates (which would represent the state of the system when we open the lid of the box and count the particles).

As an example, the following diagram shows the result of a *creation operator* when applied to a box containing four particles:



You will see that the result of applying the creation operator has been to rotate the quantum state of the system from a state which has four particles to a state which has five particles. Hence, this represents the creation of a particle.

Similarly, it is possible to define an *annihilation operator*:



You will see that the result of applying the annihilation operator has been to rotate the quantum state of the system from a state which has five particles to a state which has four particles. Hence, this represents the disappearance of a particle.

You could apply the creation operator to the quantum state repeatedly, each time adding a new particle inside the box (and generating a new quantum state in the process). Or you could apply the annihilation operator repeatedly, each time removing a particle from the box (until there were no more particles left to remove).

Everything is fields

We have to be careful when applying these creation and annihilation operators, because we have to make sure we do not do something which is forbidden by Nature. This is because all particles can be categorised into one of two groups: they are either *bosons* or *fermions*. Bosons like being in the same state (as described in my fifth book, this is due to the wavefunction of a boson being *symmetric*). As an example, a beam of light is composed of many billions of photons in the same state (photons are bosons). It is therefore possible to use the creation operator to create as many bosons in the same state as you wish. It is then said that those particles are *indistinguishable*.

However, two fermions cannot exist in the same state due to the *Pauli exclusion principle* (as described in my fifth book, this is due to the wavefunction of a fermion being *antisymmetric*). So we cannot use the creation operator to create two fermions (for example, two electrons) in the same state. For this reason, it is said that those particles are *distinguishable*.

However, in the Fock space representation, all we see is numbers of particles on each axis. In other words, in Fock space there is nothing to distinguish one particle (fermion or boson) from any other particle. This is a crucial point: in Fock space, and therefore in QFT, **all** particles (of the same type) are indistinguishable.

What is implied by the fact that all particles are identical in QFT? It has been suggested that it implies something extraordinary: there are not multiple particles, there is only the one field. As an example, **all electrons are identical because they are not actually separate objects, they are merely different parts of a single electron field which covers the entire universe.**

This principle is described well by Leon van Dommelen: "There is a field of electrons, there is a field of protons (or quarks, actually), there is a field of photons, etc. Some physicists feel that is a strong point in favor of believing that quantum field theory is the way Nature really works. In the classical formulation of quantum mechanics, the (anti)symmetrization requirements under particle exchange are an additional ingredient, added to explain the data. In quantum field theory, it comes naturally: particles that are distinguishable simply cannot be described by the formalism."

This principle is also described on the Wikipedia page for quantum field theory, under the section "Physical meaning of particle indistinguishability".^[11] Again, note that the crucial factor in QFT is that all particles (of the same type) are indistinguishable: "The second quantization procedure relies crucially on the particles being identical. From the point of view of quantum field theory, particles are identical if and only if they are excitations of the same underlying quantum field. Thus, the question 'why are all electrons identical?' arises from mistakenly regarding individual electrons as fundamental objects, when in fact it is only the electron field that is fundamental."

So it is now believed that we live in a universe in which everything that exists is a field. Every particle is just a part of a single field for that particle type. Every field stretches the length and breadth of the universe.

How does the single field sometimes appear like particles? It is because particles emerge in the field like waves in the ocean — they are not actually separate from the field, just like a wave is not separate from the ocean. These particles emerge when enough energy is transferred to a small region of the field, like a rock dropped into the ocean.^[12] Particles are often referred to as "excitations" of the field (see Roger Penrose's earlier quote). As an example, this is how the Higgs boson was generated from the Higgs field by the high-energy collider at the LHC.

Sean Carroll has an excellent talk on YouTube filmed at Fermilab called *Particles, Fields, and the Future of Physics* in which he emphasises this idea that everything is a field: "That particle stuff is overrated. Actually, everything is made of fields. You don't need to separately talk about matter made of particles and forces made of fields. All you need are fields."

Here is a link to Sean Carroll's talk:

<http://tinyurl.com/seancarrolltalk>

Here is another quote from Sean Carroll's talk. This is certainly a guiding principle behind the writing of this book: "To working physicists, quantum field theory is the most important thing we know. But when we talk about physics to non-physicists, when we popularise it, we never mention quantum field theory. We talk about particle physics, we talk about relativity, we talk about quantum mechanics. Heck we even talk about string theory and the multiverse and the anthropic principle. But we think quantum field theory is too much to bother about."

Another populariser of the "Everything is Fields" philosophy is the retired physicist Rodney Brooks. Brooks is no longer working in academia, but in the 1950s he was taught by Julian Schwinger who was one of the founders of QFT, and Brooks has made it his retirement project to raise awareness and understanding of QFT in the general public. He is very much an evangelist of the idea that fields are everything, and everything is fields: "No particles, only fields".

Brooks has created a video in which he explains his views on QFT:

<http://tinyurl.com/rodneymrooks>

Brooks also appears to be on a mission to increase awareness of his tutor, the Nobel prize-winning Julian Schwinger. Schwinger's field-based approach to QFT lost in the popularity stakes to the particle-based approach to QFT which was easier to understand and calculate and was popularised by the more charismatic Richard Feynman (who we will be considering in the next chapter). Here is a photograph of Schwinger, who undoubtedly deserves more recognition as one of the most important figures of 20th century physics:



In his video, Brooks mentions how Richard Feynman said it was impossible to understand the counter-intuitive behaviour of quantum mechanics. Brooks then explains how an understanding of QFT can explain effects which seem so puzzling in quantum mechanics: "In quantum field theory, the uncertainty principle becomes trivial. A field is spread-out. An electron is a particle which might be here, it might be there, might have this momentum, might have that momentum — that doesn't make sense. Feynman is correct. But a field that is spread out is not just 'could be here' or 'could be there' — it's here, and here, and here. So that problem, for example, is resolved."

I would agree with Brooks's explanation of the uncertainty principle: uncertainty about position makes a lot more sense when you consider fields rather than point-particles. Also, quantum entanglement — a connection between particles over great distances — also makes more sense when we consider fields extended through space rather than point-particles. And at the 28-minute mark of his aforementioned video, Sean Carroll also explains how a field (or wave) approach can provide a simple explanation for the interactions between particles.

However, so far we have only considered isolated particles in fields in which particles can appear and disappear (so-called *free fields*) but do not interact with each other. In the next chapter we will consider the significant problems which arise when we introduce the possibility of interactions between particles.

QUANTUM FIELD THEORY — PART TWO: THE FEYNMAN APPROACH

We have seen in the previous chapter how quantum field theory appears to describe the lowest level of reality. But it was not this field-based picture which made QFT such a success. Instead, it is a particle-based version of QFT developed by Richard Feynman which dominates QFT calculations. We will be seeing that this approach involves generating a large number of *Feynman diagrams* which describe particle interactions. This version of QFT has been proven to be incredibly accurate, and a powerful tool for physicists. But we will also see that the mathematics behind this approach has been criticised for lacking rigour and elegance.

Julian Schwinger certainly was rather unimpressed by this contrasting approach to QFT. Schwinger felt Feynman diagrams encouraged students to think in terms of particles instead of fields. However, Schwinger also had to reluctantly admit: "Like the silicon chips of more recent years, the Feynman diagram was bringing computation to the masses."

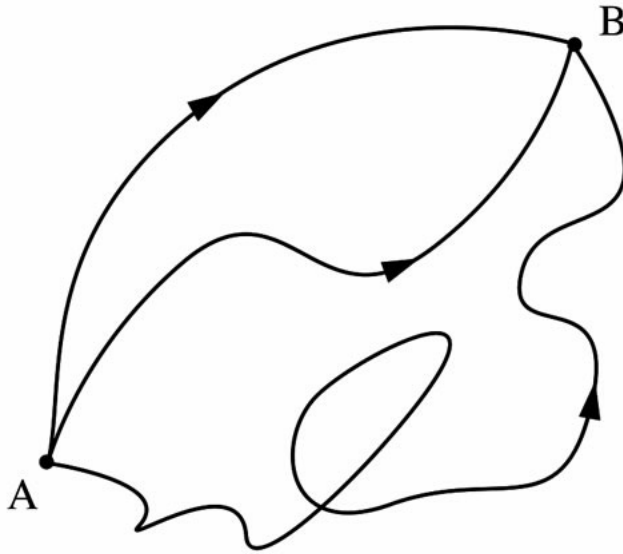
The totalitarian principle

In the previous chapter, it was explained how any successful theory of QFT has to be able to capture the possibility that "absolutely anything can happen", including particles being able to appear and disappear. This principle lies at the heart of QFT, and this behaviour was succinctly described by Murray Gell-Mann in his so-called *totalitarian principle*: "Everything not forbidden is compulsory".

The totalitarian principle was certainly the guiding principle in the approach to QFT which was developed by Richard Feynman. As mentioned earlier, Feynman's approach was particle-based rather than field-based. To understand Feynman's approach, consider a particle moving in space from a point A to a point B. In classical mechanics, this is obviously straightforward: we can see a large object — a train, for example — as it proceeds on its journey between two points. For particles, however, things are not so clear cut. For a particle moving from point A to point B, we can only observe the particle when it sets off on its journey (at point A) and when it arrives at its destination (at point B). We have no information about what the particle is doing in between those two points. Crucially, we can have no information about the **route** the particle is taking between those two points. We are **fundamentally forbidden** from knowing the route. This is basically the principle behind the double-slit experiment: we do not know which slit the particle passes through.

But — you might argue — why can't we just observe the particle in between the two points, thus revealing its path? Well, the only way we could do that would be to arrange for the particle to collide with a secondary particle, for example, to be observed by a photon of light. But if we create an interaction in that manner, then we are inevitably altering the path of the particle under observation: we have modified the experiment we wished to observe. There is no way round it: we are fundamentally forbidden from being certain of the path the particle is taking in order to get from point A to point B.

So Richard Feynman considered the problem of a particle travelling between two points and he applied the totalitarian principle quite literally. Feynman stated that in order to calculate the probability of a particle travelling between two points, we have to sum the probabilities of the particle travelling along **all possible paths** between those two points. And when Feynman said "all possible paths" he most certainly meant **ALL** possible paths. We even have to consider the possibility of the particle taking an apparently crazy route — such as detouring via the Moon, or even the Andromeda galaxy!



This approach is called the *Feynman path integral* (an "integral" is just a summation of lots of smaller elements, like the summing of the small path elements along the curve). To be precise, if we consider the particle as moving in some field of force, then we have to integrate the *Lagrangian* along the path (the Lagrangian was described in my second book, and is equal to the particle's kinetic energy minus its potential energy due to the field of force). The integration process involves dividing the path up into infinitely small pieces and then adding all of those pieces together.

However, a problem arises when we have to add all of the possible paths together as there are infinitely many possible paths. We now see the problem of infinities in QFT: how can we possibly add together an infinite number of objects and still arrive at a finite result? This problem arises because — as was stated earlier — in QFT we have to consider **absolutely anything that can possibly happen**. As we shall soon see, the challenge for any computational technique in QFT is to avoid the infinities which are introduced.

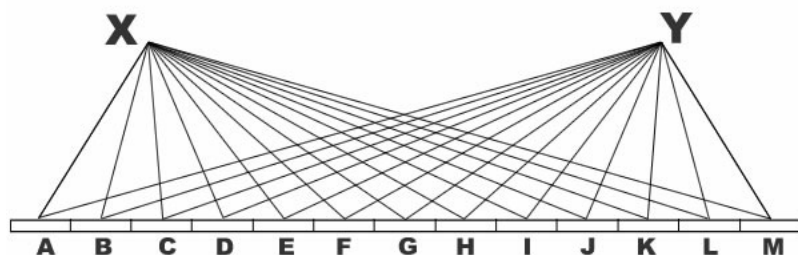
Fortunately, for the case of the Feynman path integral, there is a relatively straightforward reason why the final result is not infinite. Remember, we are dealing with quantum particles, and the position of a quantum particle is always governed by probability. In particular, when the particle travels between two points its position is determined by a wave — a *wavefunction* — and the probability that the particle is in a certain position can be calculated from the square of the wavefunction at that position.

So a quantum particle acts like a wave. And, like any wave, it has an associated angular *phase*. If we add two waves and the phases are the same, then the result will be a large value (this is called *constructive interference*). However, if the phases of the two waves are opposite (pointing in opposite directions) then the waves will cancel (this is called *destructive interference*).

Fortunately, in the Feynman path integral, the more crazy paths — such as travelling to Andromeda or travelling to the Moon — tend to point in various unrelated random directions and so tend to cancel each other due to destructive interference. We are left with the most direct route from point A to point B being the route taken by the particle. This would be the same classical route we would expect a large object to take, such as a ball. As Brian Greene says in his book *The Elegant Universe*: "No matter how absurd nature is when examined on microscopic levels, things must conspire so that we recover the familiar prosaic happenings of the world experienced on everyday scales. To this end, Feynman showed that if you examine the motion of large objects — like baseballs, airplanes, or planets, all large in comparison with subatomic particles — his rule for assigning numbers to each path ensures that **all paths but one cancel each other out** when their contributions are combined. In effect, only one of the infinity of paths matters as far as the motion of the object is concerned. And this trajectory is precisely the one emerging from Newton's laws of motion."

In his book of lecture notes called *QED: The Strange Theory of Light and Matter*, Richard Feynman considered a photon reflecting off a mirror. We would intuitively imagine the path taken by the photon to be the same as that of a bouncing ball, with the angle of incidence being equal to the angle of reflection off the mirror. However, Feynman described how the actual quantum process underlying the behaviour of the photon is far from intuitive.

The following diagram shows a photon of light being reflected off a mirror. The photon is emitted at point X, is reflected off the mirror (shown by the long thin rectangle along the bottom of the diagram), and is detected at point Y:



You will see that Feynman divided the long rectangular mirror into small segments and denoted those segments by letters, from A to M. The mid-point of the mirror is segment G. Intuitively, we would imagine the photon simply being emitted at point X, being reflected off segment G, and being detected at point Y. We would certainly not expect any of the other segments of the mirror — from A to F, or from H to M — to have any involvement in the reflection process. As Feynman says in his book: "We would expect that all the light that reaches the detector reflects off the middle of the mirror, because that's the place where the angle of incidence equals the angle of reflection. And it seems fairly obvious that the parts of the mirror out near the two ends have as much to do with the reflection as with the price of cheese, right?"

However, Feynman then proceeds to apply his path integral technique to this example, and surprisingly reveals that even segments of the mirror which are far away from the midpoint play an important role in defining the reflection. Remember, the Feynman path integral says that we have to consider the photon taking **all possible routes** from point X to point Y. This means that we have to consider the photon also reflecting off segments which are far away from the middle of the mirror, such as segment A and segment M. In fact, we have to consider the photon reflecting off **all** the segments.

Fortunately, though, when we add up all the probabilities of all the different possible paths, we once again find that the apparently crazy paths — reflecting off the segments near the ends of the mirror — tend to cancel out. We are left with the route of the photon reflecting off the middle segment G.

However, I hope this has shown that effects which we intuitively consider to be common sense — such as a bouncing ball, or a reflecting ray of light — are actually products of quantum effects which involve taking **all possible routes**.

Feynman diagrams

Richard Feynman's greatest achievement was the joint development of the theory of *quantum electrodynamics* (also known as QED) which is the quantum field theory of the electromagnetic force. As mentioned in the previous section, Feynman wrote a very accessible book based on his lecture notes on quantum electrodynamics called *QED: The Strange Theory of Light and Matter*. As Feynman says in his book in his usual conversational style: "What I'd like to talk about is a part of physics that is **known**, rather than a part that is unknown. People are always asking for the latest developments in the unification of this theory with this theory, and they don't give us a chance to tell them anything about one of the theories that we know pretty well. They always want to know things that we don't know. So, rather than confound you with a lot of half-cooked, partially analyzed theories, I would like to tell you about a subject that has been very thoroughly analyzed. I love this area of physics and I think it's wonderful: it is called quantum electrodynamics, or QED for short. My main purpose in these lectures is to describe as accurately as I can the strange theory of light and matter — or more specifically, the interaction of light and electrons."

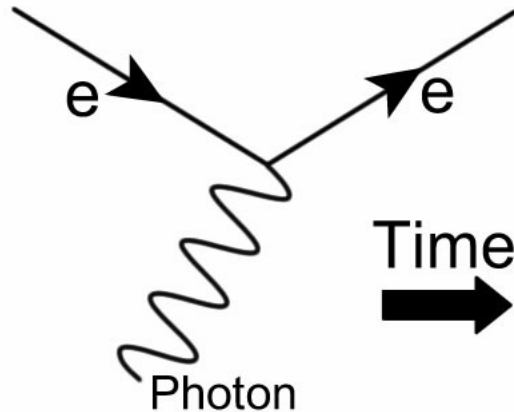
As Feynman said in the previous quote, his particle-based approach to quantum field theory meant that his version of QED was a theory of the interactions between electrons and photons (which are the field particle of the electromagnetic force). As a result, in the examples in this section we will be considering the interactions between electrons and photons.

Perhaps Feynman's most significant contribution to quantum field theory came from his introduction of *Feynman diagrams* which were based on his path integral formulation. Feynman diagrams are simple representations of the interactions between particles. Once again, their ability to represent **absolutely anything that can possibly happen**

makes them perfect for calculations in quantum field theory.

A Feynman diagram is a spacetime diagram, with space along one axis, and time along the other axis. Even though space is three-dimensional, only one dimension of space is included on the diagram.

The following diagram is an example of a Feynman diagram. Note that time increases along the horizontal axis (they are sometimes drawn with time on the vertical axis). The diagram shows an electron coming in from the left of the diagram, and colliding with a photon which changes the path of the electron:

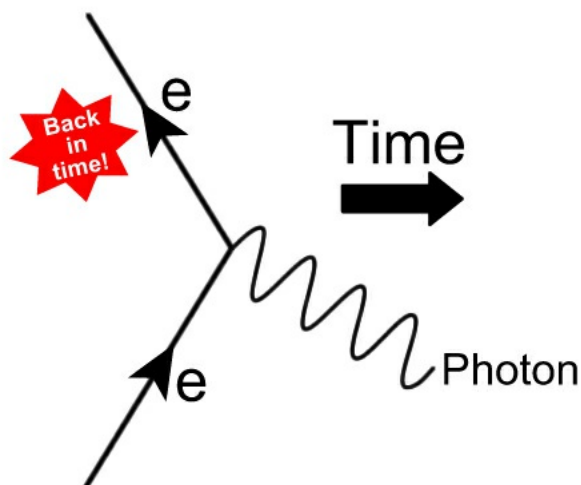


You will notice that the electron is denoted by a straight line (all fermions are denoted by straight lines) while the photon is denoted by a wavy line (all bosons are denoted by wavy lines). Each line — together with its associated mathematical probability — is called a *propagator*.

This very simple Feynman diagram is called the *minimal interaction vertex* (a *vertex* is the point where the lines meet on the diagram). Rather wonderfully, we can create all of the Feynman diagrams for the electromagnetic force just by glueing together these minimal interaction vertex diagrams — as we shall soon see. As David Griffiths says in his textbook *Introduction to Elementary Particles*: "All electromagnetic phenomena are ultimately reducible to this elementary process." Bruce Schumm makes the same point in his book about particle physics *Deep Down Things*: "It is the general electron-photon vertex that we should look to as the fundamental component of the electromagnetic force."

So remember what the minimal interaction vertex looks like: it is the junction of two electron paths and one photon path. You will be recognising this arrangement again soon.

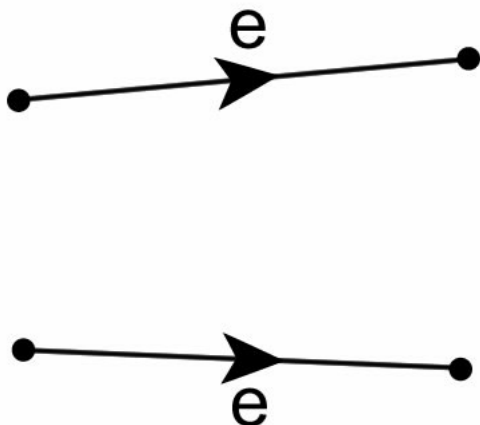
To show the amazing power of the minimal interaction vertex, let us consider what happens when we rotate the diagram. Relativity tells us that we can treat time as just another dimension — just like the three dimensions of space. So there is complete freedom to rotate Feynman diagrams (converting space into time, and vice versa) and the resulting interaction will still be valid. As an example, the following diagram shows the previous minimal interaction vertex rotated 90° anticlockwise:



There is now a remarkable interpretation possible for this diagram. You will see that it appears that the electron is travelling backward in time on the second half of its path (denoted by the star on the diagram). Also, if we temporarily ignore the arrows on the paths of the electrons, we could interpret the left-hand side of the diagram as representing two electrons coming together and annihilating each other — producing a photon as the result. We could therefore interpret this as an electron and a *positron* (the antimatter equivalent of the electron) annihilating each other and producing "pure energy". In which case, that would mean a positron is actually an electron travelling backward in time (as shown in the star on the diagram). It was this definition of a positron which Feynman often used in his diagrams.

Let us now examine how Feynman diagrams can be used in quantum field theory calculations.

Firstly, in the following diagram, let us simply consider two separate electrons moving through spacetime and ending up at two different points. The simplest way that this can happen is shown here:

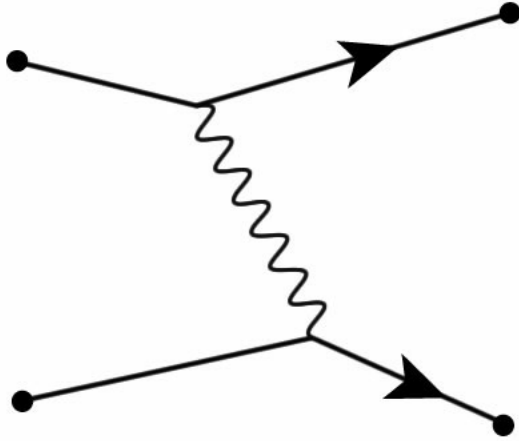


What we are interested in is calculating the probability that this situation shown actually happens (i.e., both electrons move as shown in the diagram). Fortunately, we know precisely how to do this as we can use the Feynman path integral technique which was explained earlier in this chapter. If you remember, the path integral technique gives the probability of a particle moving between two points, so it is just what we need here.

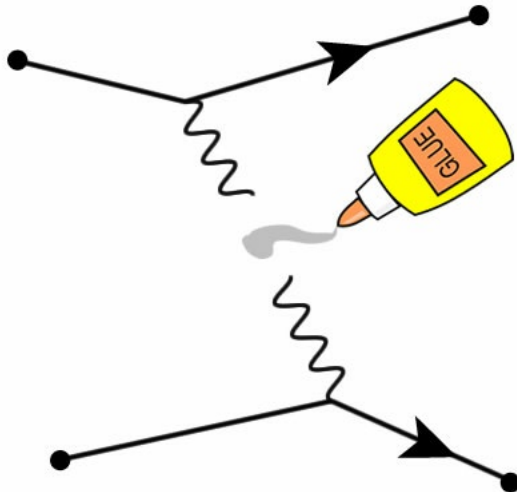
Then, to calculate the complete probability of the situation shown in the previous diagram, we need to calculate the probability of the first electron moving along its path, and then **multiply** that probability by the probability of the second electron moving along its separate path (according to basic probability theory, we have to multiply the probabilities together because **BOTH** event one **AND** event two have to happen to provide the correct result).

But there is another way that the two electrons could get to their endpoints. As shown in the following Feynman

diagram, during their journey they could transfer a photon between each other, modifying their trajectories in the process:



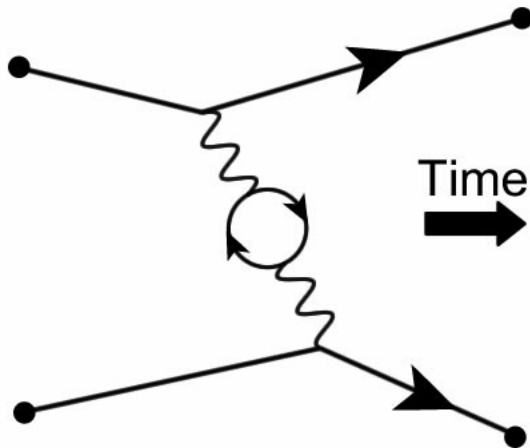
How do we know this is a valid interaction? We know it is valid because we can create this Feynman diagram by glueing together two minimal interaction vertices ("vertices" being the plural of "vertex"):



If you remember, a minimal interaction vertex is a junction of two electron paths and one photon path. So you can see that the previous diagram represents two minimal interaction vertices glued together. Everything fits together like Lego! And the golden rule is that if you can create a Feynman diagram by glueing together minimal interaction vertices, then it is a valid Feynman diagram, and you have to consider it in your calculations.

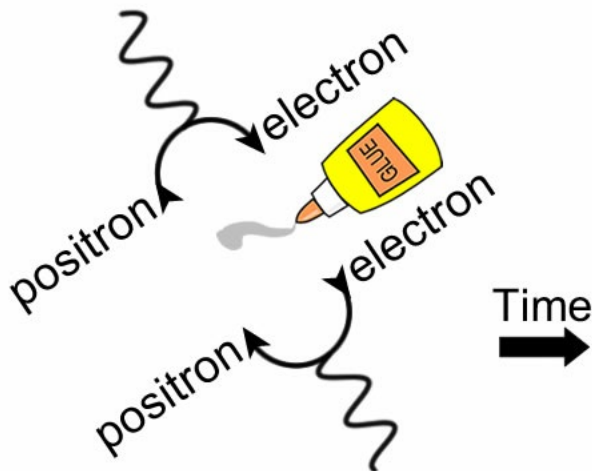
So that gives us two different ways for the electrons to move to their two separate endpoints. If we want to calculate the probability of the two electrons moving to their endpoints we have to **sum** the probabilities of these two separate diagrams (according to basic probability theory, we have to sum the probabilities because **EITHER** diagram one **OR** diagram two would provide the correct result).

But that's not the end of it. It is possible for the photon to convert into an electron/positron pair for a very short period of time. The electron and the positron can travel a short distance before annihilating each other to produce the photon again. This is shown by the loop in the photon's path in the following diagram:



In the previous diagram, we can consider the loop as being made of the paths of two particles which are shown by the two arrows in the loop. You can see that one particle is travelling forward in time and is therefore an electron, whereas the other particle is travelling backward in time and is therefore a positron.

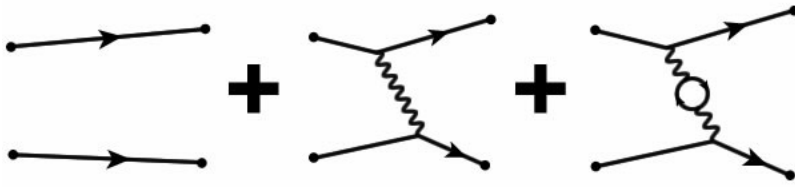
How do we know this new Feynman diagram is valid? Well, we know it is valid because we have merely added two new minimal interaction vertices, as shown in the following diagram:



You can see that all we have done is glue together two more minimal interaction vertices (don't be confused by the curved lines rather than straight lines). Once again, everything fits together like Lego.

The electrons and photon in the previous diagram only appear in internal lines in the Feynman diagram. These particles which only appear on internal lines (particles which appear only to rapidly disappear again) are called *virtual particles*.

So now we have a total of three different Feynman diagrams to add together to find the probability of two electrons simply moving to two separate endpoints. Here are the three diagrams we must add:



And it doesn't stop there! We can keep going forever, dividing lines, and adding new minimal interaction vertices. With each new diagram, our estimate of the probability of the interaction becomes more accurate. This repeated approach is called *perturbation theory*.

Unfortunately, it appears inevitable that we are going to end up with an infinity of Feynman diagrams which we have to add together just to calculate the probability of two electrons moving. Once again we end up with the problem of how to handle the infinities when making calculations in quantum field theory. How on earth can we add up an infinite number of Feynman diagrams and still get a finite answer?

The fine structure constant

As described earlier in this section, in order to calculate the probability of an entire Feynman diagram, we have to multiply **all** the probabilities contained within that diagram. We can calculate the probability of a particle moving along a path using the Feynman path integral technique. However, that method does not account for all the probabilities in the diagram: we also have to consider the probability of an electron emitting a photon. And we will now see that it is the particular value of this probability which saves us from the dreaded infinities entering our calculations.

Rather simply, the probability of an electron emitting a photon is just a fixed number. The number reflects the strength of the electromagnetic force. There are four fundamental forces, and they each have a characteristic number which reflects the strength of each force. The number for each force is called the *coupling constant*. For the example of the electromagnetic force, which interests us in particular, we will now see how this value is calculated.

Let us consider the strength of attraction between two electric charges a distance r apart. According to *Coulomb's law*, the force, F , is given by:

$$F = \frac{e^2}{4\pi\epsilon_0 r^2}$$

where e is the elementary charge carried by a single electron (1.6×10^{-19} coulombs), and ϵ_0 is the permittivity of free space (8.85×10^{-12} farads/metre).

If you read my previous book then you will know that the r^2 term arises purely from the fact that there are three dimensions of space (the effect of a force dilutes as it extends into space according to an *inverse square law*). So the r^2 term is not specific to the electromagnetic force — it applies to all forces. Hence, in our analysis we should remove the term: we are only interested in the strength of the force in terms of fundamental constants.

As a result, we find the strength of the electric force is then characterised by:

$$\frac{e^2}{4\pi\epsilon_0}$$

If we consider the units (dimensions) of this expression then we find it has units of energy times distance. As

explained in Chapter Four, we do not want to have a term with units as its numerical value will change if we choose different units. We want to find a dimensionless number (i.e., a plain number without units). We can change this term into a dimensionless number if we divide the expression by the product of two fundamental constants, $\hbar c$, a term which also has dimensions of energy times distance (\hbar is the *reduced Planck constant* which is equal to the Planck constant divided by 2π , and c is the speed of light).

We then end up with a mathematical expression describing the strength of the electromagnetic force which is called the *fine structure constant*, and is often denoted by the Greek letter α (alpha):

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c}$$

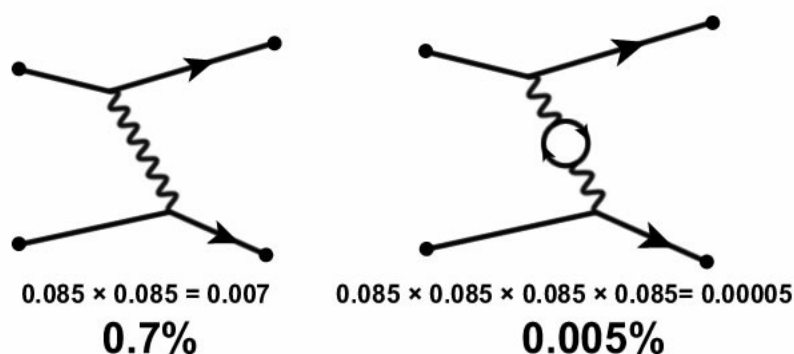
The fine structure constant is a famous number in physics and, if you substitute the correct values (given earlier) into the formula, you will find it has a value approximately equal to $1/137$. The fact that this vital constant has such an interesting value has made it a target for numerologists who have attempted to derive its peculiar "137" value from various combinations of other constants. Most physicists would regard these attempts as being unscientific (randomly throwing numbers together and hoping to come up with the correct solution shows a lack of understanding).

What makes the fine structure constant so interesting from the point of view of our Feynman diagrams is that it represents the probability of an electron emitting a photon (hence it determines the electric force between two electrons). To be more precise, the fine structure constant represents the probability of a **pair** of electrons emitting and absorbing a photon (because an electron/photon interaction always requires two vertices: one electron to emit the photon, and a second electron to absorb the photon). But what really interests us is the probability of one vertex: a single electron emitting a single photon, so that value is provided by the **square root** of the fine structure constant (because when the value is then squared by multiplying it by itself due to the pair of interactions it will result in the fine structure constant).

Richard Feynman makes this point in his book: "There is a most profound and beautiful question associated with the observed coupling constant, the amplitude for a real electron to emit or absorb a real photon. It is a simple number that has been experimentally determined to be close to 0.08542455. My physicist friends won't recognize this number because they like to remember it as the inverse of its square: about 137.03597. It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it."

What makes this coupling constant so vital from the point of view of our Feynman diagrams is that its value is less than 1.0. If you remember, when we calculate the probability of a Feynman diagram we have to multiply all of the probabilities of all the interactions contained within that diagram. If the probability of an electron/photon vertex is just 0.085 then the overall probability of a Feynman diagram will reduce rapidly for each vertex we add.

This reduction in probability is shown in the next diagram. For Feynman diagrams with two electron/photon vertices there is only a probability of 0.7% that the event described by the diagram will actually occur. For Feynman diagrams with four electron/photon vertices there is only a probability of 0.005% that the event will occur (a less than one in ten thousand chance).



As you can see from the previous diagram, because the value of the coupling constant is less than 1.0, this means that Feynman diagrams with multiple vertices will have a very low probability and can be safely ignored by our calculations. Hence, we do not have to add an infinite number of Feynman diagrams together in order to calculate a sufficiently accurate result: the value of the fine structure constant has saved us. Another infinity has been avoided!

However, this is not the case for all forces. The strong force has a coupling constant of 1.0, so this will not become progressively less important as more diagrams are added. Hence, perturbation theory using Feynman diagrams cannot be used to perform calculations involving the strong force.

Interestingly, this probability-based approach gives us another way of thinking about the "strength" of a force. A force with a larger coupling constant simply means there is a greater probability of more force-carrying bosons being produced — and that translates into a stronger force between particles. As Bruce Schumm says in his book about particle physics *Deep Down Things*: "The stronger the coupling, the more quanta are exchanged in a given interaction." Considering an analogy to skaters on ice throwing a ball between themselves, Schumm says: "A stronger force would correspond to a greater likelihood, in any given instant, that a ball would be exchanged between them."

The Higgs mechanism

One of the fields which crosses the entire universe is called the *Higgs field*. The behaviour and structure of the Higgs field is notably different from the other fields. The Higgs field is responsible for giving mass to elementary particles. [\[13\]](#)

The way the Higgs field gives mass to fermions is rather different to how it gives mass to bosons. Firstly, let us consider how the Higgs field gives mass to fermions.

Unsurprisingly, there is a particle which is associated with the Higgs field (it was explained in the discussion of quantum field theory in the previous chapter how every field has an associated particle which can be produced by an excitation of the field). The particle associated with the Higgs field is the famous *Higgs boson*. As a fermion travels through the Higgs field (which permeates the entire universe) it interacts with a sea of Higgs bosons. The result is that the particle slows down as if it is being pushed through a vat of sticky molasses (another common analogy is of a popular person trying to cross a room in a crowded party). As mass is defined as "resistance to acceleration", we interpret this slowing as the particle gaining mass.

To understand how the Higgs field gives mass to bosons, let us first consider the difference between particles which have mass (*massive* particles) and particles which do not have mass (*massless* particles).

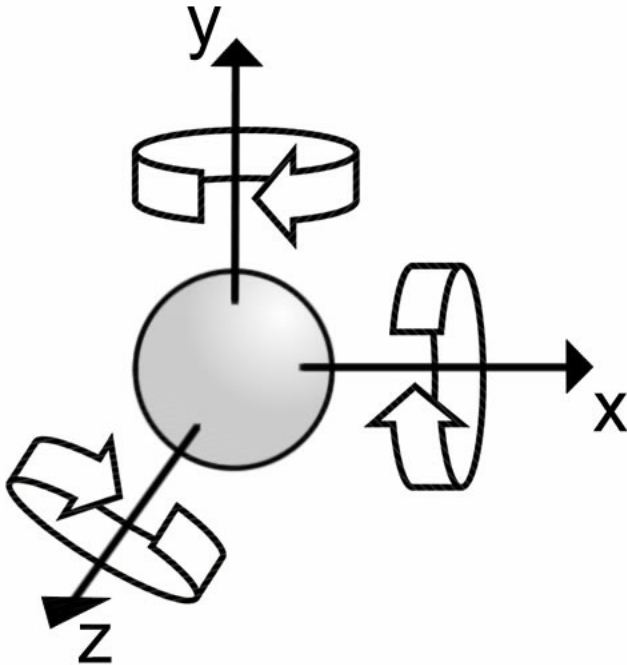
The theory of special relativity states that if we try to accelerate an object up to the speed of light, the mass of that object will progressively increase. At the speed of light, the mass of the object would become infinite. In other words, it is not possible for an object with mass to move at the speed of light. This is a principle which applies to all massive particles such as electrons: electrons have to move at less than the speed of light.

However, a photon is an example of a massless particle. And if a particle has no mass, then it has no mass to increase as the speed of the particle approaches the speed of light. It is therefore possible for a massless particle to move at the speed of light. After all, a photon is a particle of light, so it obviously has to move at the speed of light.

Put simply, all massless particles move at the speed of light, and all massive particles have to move at less than the speed of light.

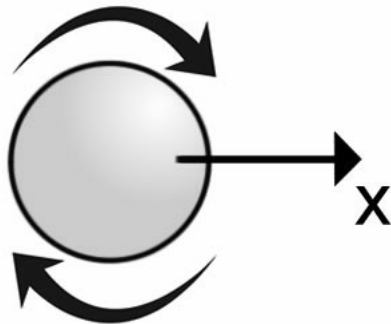
This principle has implications for the spin of massive and massless particles. If we consider a particle in three-

dimensional space, it is clear that there are three axes about which it can spin (the z-axis is coming out of the page):



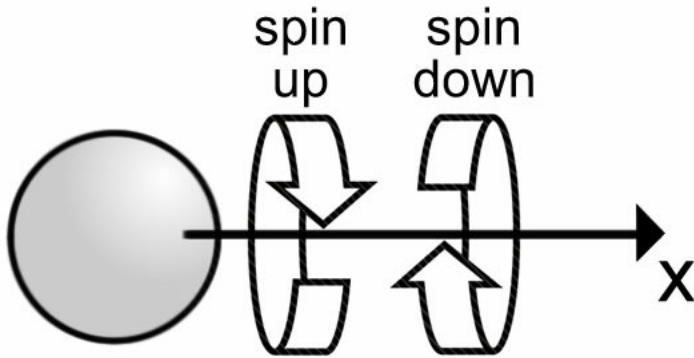
Each of these spin axes is called a *degree of freedom*, with each degree of freedom representing an independent way in which the particle can move. However, if we consider a massless particle, i.e., a particle which is moving at the speed of light, then we encounter a problem.

To understand the problem, consider the following diagram which shows a massless particle moving at the speed of light in the x direction. You will see from the diagram that if the particle is also rotating about either the y or z axis then there would always be a part of the particle which would be moving faster than the speed of light (the top semicircular arrow would be moving faster than light, while the bottom arrow would be moving slower than light):



This is obviously forbidden, so the massless particle is forbidden from rotating about its y or z axis.

This is not a problem if the particle is rotating about its x axis because then the plane of rotation would be perpendicular to the particle's motion along the x axis. So a massless particle is allowed to rotate in a plane perpendicular to its direction of motion. On that basis, the following diagram shows a massless particle moving at the speed of light in the x-direction, while also rotating about that x axis:



It is clear from the previous diagram that the particle can spin in either direction around the x -axis, and we call these directions *spin up* and *spin down* (as shown on the previous diagram). Hence, the massless particle has two rotational degrees of freedom. These two states are called the *polarization* of the particle, and it is the reason why light (which is composed of massless photons) has two directions of polarization. This is the basis for polarized sunglasses (one of the two directions of polarization — the horizontal glare from road surfaces — is filtered-out).

Now let us consider what happens when the massless particle interacts with the Higgs boson — the particle of the Higgs field.

When the massless particle combines with the Higgs boson, it gains one additional degree of freedom which is possessed by the Higgs boson. This additional degree of freedom becomes a freedom of motion along the x axis, the direction in which the particle is moving. And if the particle has a freedom along the x axis then it is no longer restricted to moving at only the speed of light. In other words, the particle might be said to be "slowing down". It has already been described how massive particles (particles with mass) move slower than the speed of light, so we interpret this "slowing" of the massless particle as the particle "gaining mass".

Hence, the Higgs field can give mass to otherwise massless bosons.

The hierarchy problem

But the Higgs boson — which was detected for the first time by the LHC in 2012 — introduces an additional fine-tuning problem. The problem is associated with the measured mass of the Higgs boson.

The value of the Higgs mass cannot be calculated — it has to be measured experimentally. The LHC discovered the Higgs has a mass of approximately 125 GeV. Intuitively, though, particle physicists would have expected the Higgs mass to take a "natural" value, which turns out to be vastly heavier. As explained in Chapter Four, a natural mass would be one in which all the "arbitrary dials" were turned to 1.0. In which case, the mass would have to be calculated only from fundamental constants. The three truly fundamental constants are the speed of light, c , the gravitational constant, G , and the Planck constant, h . These three constants can be combined in only one way to produce a quantity which has the units of mass, and this is shown in the following formula:

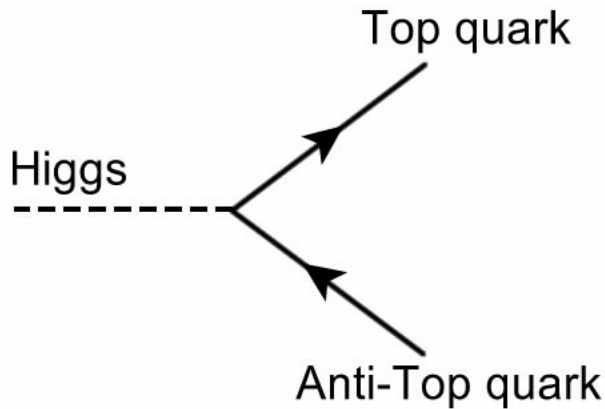
$$m_P = \sqrt{\frac{\hbar c}{G}}$$

The value of this mass, m_P , is called the *Planck mass*.

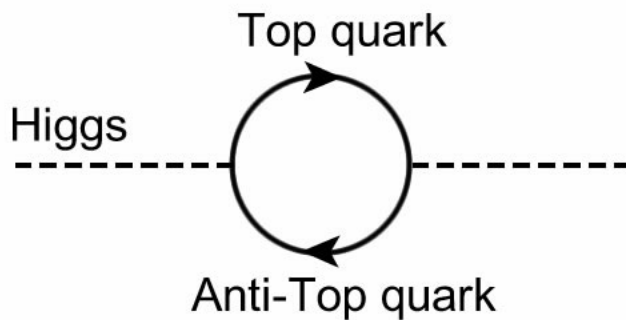
If you substitute the correct values into the formula for the Planck mass you will find you get a surprisingly heavy value: approximately 21 micrograms, the weight of an eyelash. So the measured Higgs mass value is vastly lighter in comparison, which is a surprise and a puzzle.

Another reason why the Higgs mass appears to be surprisingly light arises when we consider the effects of virtual particles temporarily popping into existence (virtual particles were considered earlier in this chapter). As described

in the previous section, the Higgs is responsible for giving mass to particles, so, conversely, the Higgs can interact with any particle that has mass. As an example, the following diagram shows a possible minimal interaction vertex for a Higgs boson (always denoted by a dashed line in Feynman diagrams) interacting with a top quark (an example of a massive particle) and its antimatter equivalent:



At this point, we have to remember that we can glue together these minimal interaction vertices and the resultant Feynman diagram will still be valid. So we can glue together two of these vertices back-to-back to give the following diagram:



The previous diagram shows a Higgs boson which momentarily converts into a top quark/anti-top quark pair, before converting back to a Higgs boson. A top quark has been deliberately chosen for this example as it is the heaviest elementary particle (i.e., the one with the most mass). And, as this Feynman diagram represents a valid interaction, we have to include it in our calculation of the Higgs' path (remember: Feynman diagrams have to include absolutely anything that can possibly happen). The result is that the weight of the top quark adds to the Higgs mass. Plus, we have to include the effects of all massive particles in our calculations (because the Higgs interacts with all massive particles). The end result is that all these quantum contributions once again push the expected weight of the Higgs up towards the vastly larger Planck mass.

So here we have an apparently huge gap between the expected value of the Higgs mass and the measured value: the Higgs is ten million billion times lighter than we would expect, or sixteen orders of magnitude. This huge gap in the mass values represents a *hierarchy*, and the problem of why the Higgs is so light is called the *hierarchy problem*. The hierarchy problem is considered to be one of the greatest unsolved problems in physics.

The hierarchy problem introduces another fine-tuning problem. If the Higgs mass was lighter, then atoms could not form and life could not exist. But if the Higgs was heavier — and particles were therefore as heavy as the Planck mass — then all particles would turn into black holes (too much mass squeezed into a microscopic volume). Hence, the Higgs mass value appears fine-tuned for the existence of life.

There is a popular hypothesis in physics called *supersymmetry* which has been around for forty years which has been touted as a potential solution to the apparent fine-tuning of the Higgs mass. Supersymmetry requires the existence of a whole suite of additional undetected particles called *superpartners*, each superpartner particle being matched to an existing known particle. According to supersymmetry, the superpartner of a boson is a fermion, and

vice versa. The precise symmetry means that the huge quantum contributions from the known virtual particles would be cancelled by the contributions from the superpartner particles. With the huge contributions eliminated, a light Higgs is left. However, no superpartner particles have been discovered at the LHC, and supersymmetry appears to be in trouble. This is a big deal. Many theorists have spent decades of their lives working on supersymmetry. Also, if supersymmetry crashes and burns, then so does string theory which depends on supersymmetry. This has clearly become a high-stakes game. The failure of the LHC to discover new particles leading to the potential demise of supersymmetry — and the dearth of any replacement explanations — has been variously called the "nightmare scenario", a "crisis in physics", or even "the end of science".

Perhaps a new approach is needed ...

7

THE WEAKNESS OF GRAVITY

This is the final chapter of this book.

As regular readers of my books will know, I like to include some of my own original ideas at the end of my books — and this final chapter is no exception. So please bear in mind that parts of this chapter should be considered as being highly-speculative.

Although I have tried to present the concepts as clearly and simply as possible, this is still quite a technical chapter.

In the previous chapter, we considered the mystery of the surprisingly light Higgs mass, a mystery which is called the hierarchy problem. It emerges that there is another hierarchy in Nature, another big gap in the value of the constants. This second hierarchy involves the ratio of the strengths of the fundamental forces. This second hierarchy might appear unrelated to the problem of the Higgs mass, but further analysis shows it might hold the key to solving the hierarchy problem.

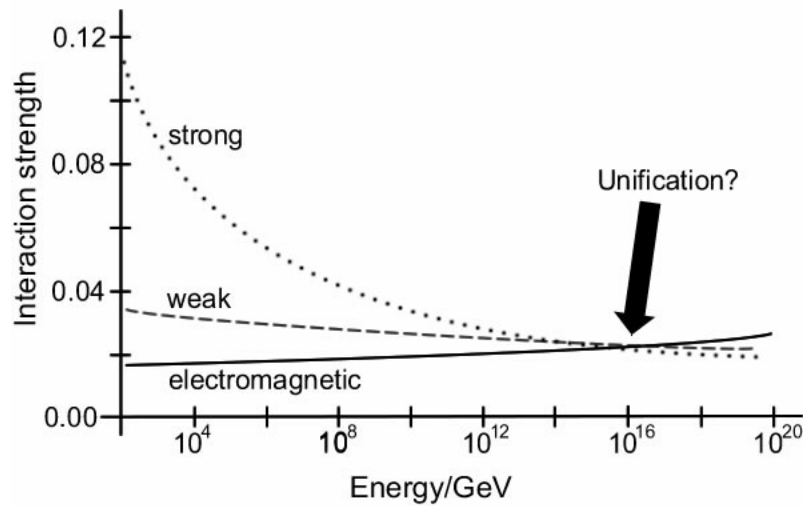
Let us start by reminding ourselves that there are four fundamental forces:

- **Gravity.** Keeps your feet on the ground.
- The **electromagnetic force**, a combination of both the electric force and the magnetic force. In the atom, the electric force attracts negatively-charged electrons to positively-charged protons.
- The **strong force.** In the atomic nucleus, it is the strong force which holds quarks together to form protons and neutrons. It has to be strong to overcome the electrical repulsion between positively-charged protons.
- The **weak force.** In the atomic nucleus, this force can convert a neutron into a proton during radioactive decay.

As explained in my fifth book, in all of these four cases, the actual force is transmitted via gauge bosons, which can be considered as being the "force-carrying" particles. For the electromagnetic force, the gauge boson is the photon. However, as we have seen in the discussion of Feynman diagrams in the previous chapter, the passage of the photon between electrons is constantly disrupted by a swarm of virtual particles. The effect of these virtual particles is to hide the true strength of the electric charge, and to make the force seem weaker over distance than it would otherwise be. This effect is called *screening*. However, if we consider particles interacting at higher energy, these particles will have shorter associated wavelengths and so will be able to "probe" closer to each other. Hence, this will reduce the screening effect and give a truer picture of the strength of the force. And this is what is found through experiment: at higher energies, the electromagnetic force gets stronger.

The opposite is true for the strong force which holds quarks together in the atomic nucleus to form protons and neutrons. Because of the behaviour of the gauge bosons of the strong force (*gluons*), the strong force becomes stronger at large distances. In fact, it is due to the strength of the strong force that no isolated quarks are ever found on their own (it would require so much energy to separate the quarks that new quarks would be produced from that energy).

On that basis, the following graph shows the predicted variation of the strengths of the three forces as the energy of the interactions increases:



As just described, you can see in the diagram that the electromagnetic force becomes stronger at higher energies, whereas the strong force becomes weaker.

It can be seen that the lines describing the strength of the forces are predicted to approximately intersect at a single point at high energy (marked on the diagram by the "Unification" arrow). You will see from the horizontal scale that this represents an energy of approximately 10^{16} GeV, and this is called the *grand unification energy*. This represents a much higher energy than can be achieved using current particle accelerators. This seems to indicate that the fundamental strengths of all three forces are actually the same, and this would become clear at high energies, but that fact is being hidden by the behaviours of the gauge bosons at low energies.

We now know that the electromagnetic and weak forces have the same origin, and only appear to be of different strengths because of the differences in the associated gauge bosons. The gauge bosons of the weak force have mass (due to the Higgs mechanism) which results in the bosons being short-range and they are therefore confined to the atomic nucleus, whereas the gauge boson of the electromagnetic force (the photon) remains massless and is therefore capable of traversing the universe (bringing light from the stars). The true strength of the weak force is not actually weak at all.

It therefore appears probable that all the forces have fundamentally the same strength. So this makes it all the more mysterious to discover that the strength of the force of gravity is many orders of magnitude weaker than the strengths of the other three forces.

At first glance, it might not appear that gravity is a particularly weak force. After all, it is the force which keeps the planets in orbit around the Sun. It is also the force behind terrifyingly-attractive black holes. However, the planets, and the stars, and black holes need to possess immense mass in order for gravity to become dominant.

To understand the weakness of gravity, consider the act of lifting a metal paperclip by using a magnet. The paperclip is being attracted to the centre of the Earth by the force of gravity, and the entire mass of the Earth is pulling on it. However, the electromagnetic force from the small magnet can easily overcome that pull of the entire mass of the Earth.

So just how weak is gravity?

In the previous chapter we considered the electrical repulsion between two electrons in order to derive the fine structure constant which is the coupling constant which describes the strength of the electric force. Now let us derive a coupling constant for the gravitational force which describes the strength of the force of gravity.

Let us calculate the coupling constant for gravity in a similar manner to the way we calculated the coupling constant for the electric force. So, instead of starting with Coulomb's law (for the electric force) we will start with Newton's law of gravity. As we considered electrons in the previous example, let us be consistent and consider electrons again (comparing like-with-like). In which case the gravitational force, F , between the two electrons is given by:

$$F = \frac{Gm_e m_e}{r^2}$$

where G is Newton's gravitational constant, and m_e is the mass of an electron (we can obviously replace the two instances of m_e with m_e^2).

Next, as with our earlier derivation of the fine structure constant, we remove the r^2 term which leaves us — once again — with an expression which has dimensions of energy times distance. So we once again have to divide by $\hbar c$. This gives us our final result, a value for the *gravitational coupling constant* which is a dimensionless number expressed purely in terms of fundamental constants:

$$\alpha_G = \frac{Gm_e^2}{\hbar c}$$

So what is the value of this gravitational coupling constant (which describes the strength of the force of gravity)? Well, if you substitute the correct values into the previous formula you will find that the coupling constant for gravity is approximately 10^{-45} , which is obviously an extremely small number. In her book *Warped Passages*, Lisa Randall refers to this extraordinarily small number when comparing the forces between a pair of electrons: "The gravitational attraction is about a hundred million trillion trillion trillion times weaker than the electrical repulsion between the electron pair."

So here we have another hierarchy, another immensely large number: 10^{45} . Why is there such a huge difference between the strength of the electric force and the strength of gravity? This forms another puzzling hierarchy problem, but it is believed that this particular hierarchy problem is related to the earlier hierarchy problem of the surprisingly-light Higgs mass.

In her book, Lisa Randall considers the hierarchy problem of the Higgs mass and states: "It ultimately boils down to the weakness of gravity compared with all the other known forces." Why is there a connection between the lightness of the Higgs and the weakness of gravity? Well, if you remember back to the discussion of the Higgs mass in the previous chapter, you will remember that the natural value of the Higgs would be expected to be the Planck mass, the formula for which was given earlier as:

$$m_P = \sqrt{\frac{\hbar c}{G}}$$

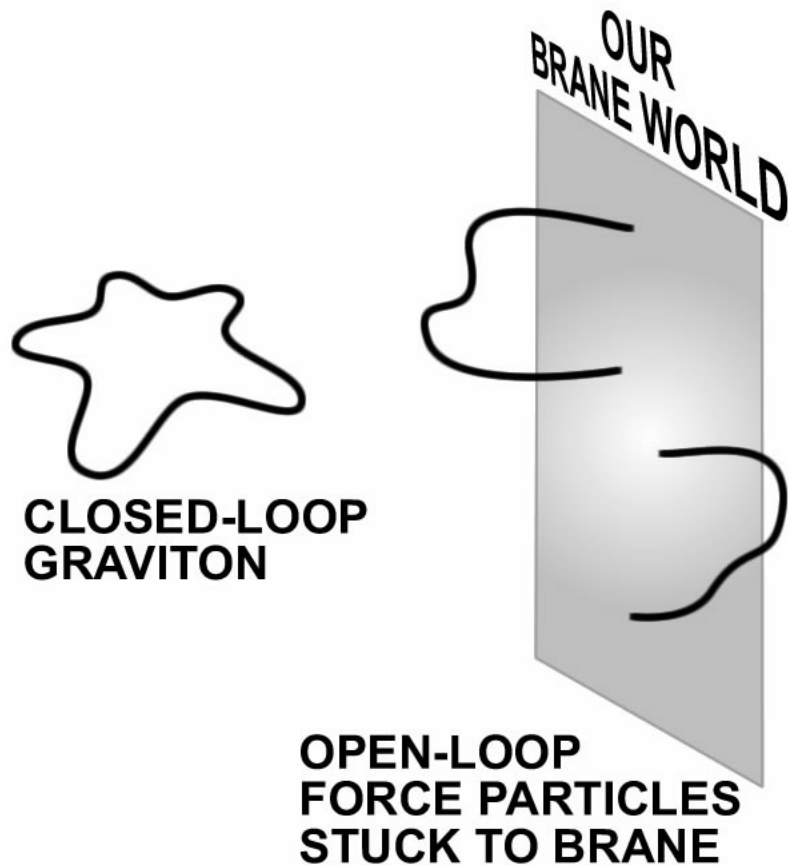
The hierarchy problem is based on the fact that the Higgs mass is immensely smaller than the Planck mass. Or, to put it another way, the hierarchy problem is therefore based on the fact that the Planck mass is so large. And, for reasons we shall consider shortly, a large Planck mass represents weak gravity. Lisa Randall agrees: "A huge Planck scale mass is equivalent to extremely feeble gravity." So that presents us with a possible opportunity: if we want to solve the hierarchy problem of the Higgs mass, we might only need to solve the problem of why gravity is so weak.

The Randall-Sundrum model

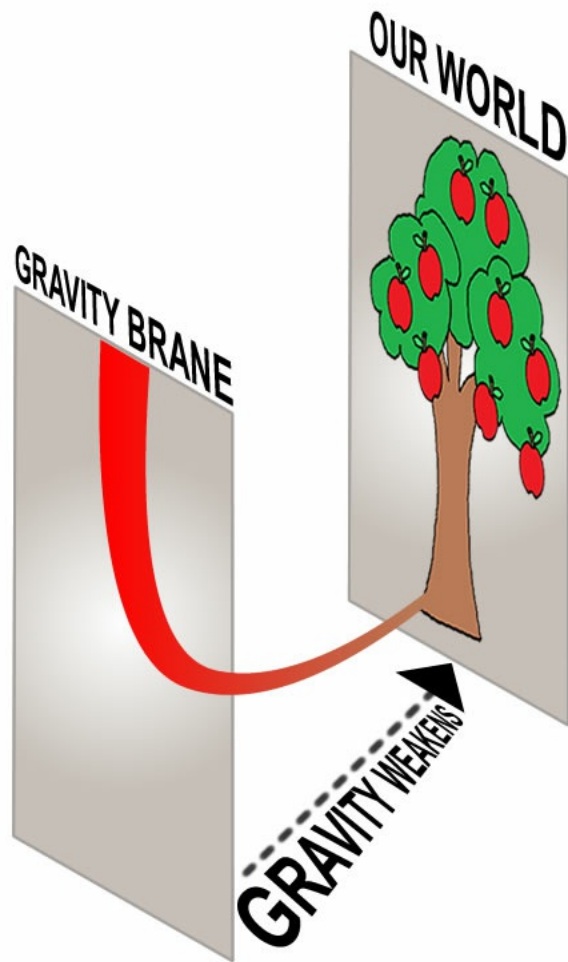
One proposal as to why gravity is weak comes from string theory. String theory requires the existence of many hidden spatial dimensions, and it also predicts the existence of *branes*. Branes are like membranes or sheets in multi-

dimensional space, containing fewer dimensions than the space around them. So a brane is a slice of a higher-dimensional world. The full, multi-dimensional world which surrounds the brane is called the *bulk*.

According to string theory, the particle which carries the force of gravity — the *graviton* — is a closed string loop, whereas the particles which carry the other forces are open strings which have to have their ends terminated on a brane. This restricts the motion of those particles to the brane, whereas the graviton is free to travel through the bulk:



The *Randall-Sundrum model*, proposed by Lisa Randall and Raman Sundrum, is based on the idea that our universe with its three spatial dimensions might be a brane in a higher-dimensional bulk which actually has four spatial dimensions. Unlike the particles associated with the other forces, the graviton is free to travel through the bulk. This, then, presents a proposal for why gravity appears so weak in our universe: we only see a "shadow" of the force of gravity in our three-dimensional universe. The suggestion is that gravity weakens along that fourth spatial dimension as it passes through the bulk to our three-dimensional world:



In her book, which was published in 2005, Lisa Randall listed some of the predictions of the Randall-Sundrum model: "Should this warped geometry scenario prove to be a true description of our world, the experimental consequences at the Large Hadron Collider (LHC) at CERN in Switzerland will be tremendous. Signatures of the warped five-dimensional spacetime could include Kaluza-Klein particles, five-dimensional black holes of anti de Sitter space, and TeV-mass strings."

Any one of these discoveries would have been incredibly exciting. Unfortunately absolutely none of these things were discovered when the LHC started operation in 2010 — although they should have been discovered if the model was correct. Lisa Randall goes on to say: "Results from the LHC are likely to change the way we view the world." Considering the stream of negative results which has emerged from the LHC, I think I can agree with Lisa Randall on that statement — though perhaps not in the way she intended.

Considering the Randall-Sundrum model, imagining an additional invisible dimension of space might represent one route to solving the problem of why the strength of gravity is so weak. But in this series of books I am attempting to build a model of how the universe works in which no unseen extra dimensions are allowed, there are no invisible parallel universes, and you are not allowed to rely on huge suites of undetected supersymmetric particles. In my "reality-based" model, solutions to problems must be found on the basis of what we already know: you are not allowed to invent some parallel universe in which you get to make your own rules.

However, I find those self-imposed constraints concentrate the mind wonderfully. One of the themes of my series of books is that we need to try harder to make sense of what we already know. Sometimes the simplest solution may have been overlooked.

Maybe it is hidden in plain sight?

The true strength of gravity

The weakness of gravity is perceived as being a great mystery, and possibly holds the key to the solution of the hierarchy problem. Let us examine the problem more closely.

Firstly, let us remember that in the previous chapter it was stated that we would naturally expect the mass of the Higgs boson (and therefore the mass of the other particles) to be close to the value of the Planck mass. And the fact that the Higgs is orders of magnitude lighter than this expected value forms the hierarchy problem. But why should we expect the masses of the particles to be naturally close to the Planck mass?

Well, to answer that question, let us remind ourselves of the formula for the Planck mass:

$$m_P = \sqrt{\frac{\hbar c}{G}}$$

and also let us remind ourselves of the formula for the gravitational coupling constant which we derived earlier (remember, the small value of this expression is the reason for weak gravity):

$$\alpha_G = \frac{Gm_e^2}{\hbar c}$$

You will see that the mass of the electron features in this formula for the gravitational coupling constant. But what happens if the electron mass was instead equal to the Planck mass? What would be the strength of gravity in that case?

To answer that question, let us substitute the value of the Planck mass into the previous formula for the gravitational coupling constant. That gives us:

$$\alpha_G = \frac{G \times \left(\frac{\hbar c}{G} \right)}{\hbar c} = \frac{\hbar c}{\hbar c} = 1$$

So, you can see from this formula that the value for the gravitational coupling constant (and, therefore, the strength of gravity) would be equal to 1 for a particle whose mass is equal to the Planck mass.

(Conversely, if the mass of a particle is far less than the Planck mass then it will experience weak gravity — which is the reason why the large Planck mass represents a weak force of gravity in the universe).

At what energy will the strength of gravity become equal to the strengths of the other forces? Well, if you substitute the value of the Planck mass into $E=mc^2$ you will discover it represents an energy of approximately 10^{19} GeV. This is called the *Planck energy*. This is a huge amount of energy for a single particle, approximately equal to the chemical energy stored in a car's petrol tank. You will see that this value is only moderately greater than the value of the grand unification energy (10^{16} GeV) which we considered earlier. This seems to suggest that for particles with extremely high energies — just beyond the grand unification energy — the strengths of all four forces would be approximately equal.

It therefore seems likely that the true strength of gravity is the same as the other three forces, and this would

become clear at high energies. I believe this is fairly generally accepted. This is a valuable insight we can use in our quest to discover why gravity now appears so weak.

Now let us continue by considering a vital fact about the laws of physics.

The laws of physics do not change over time

Emmy Noether was a mathematician who has been described as "the most important woman in the history of mathematics". Emmy Noether worked in academia in the early decades of the 20th century, which was not an easy time to be a female scientist. However, she showed great determination and resilience to make several important contributions to mathematics, and also make an extremely important and influential contribution to theoretical physics.

Noether's great contribution to physics is now called *Noether's theorem*. Put simply, Noether's theorem states that if there is any symmetry in Nature then there will also be a corresponding conserved quantity, i.e., a quantity which does not change over time. Noether's theorem was considered in detail in my fifth book, which explained the tremendous value of the theorem to particle physics.

In that book, an example was presented of the application of Noether's theorem to a skateboarder riding in a halfpipe. It was explained that if there was a symmetry in space, i.e., if the skateboarder was riding down the length of the halfpipe, then the quantity that would be conserved would be the momentum of the skateboarder. In other words, the skateboarder would continue to travel at a constant speed.

So when there is a symmetry in space, momentum is conserved.

Noether's theorem indicates that there is another similar relation between time and energy: if there is a symmetry in time, energy is conserved. But what does symmetry in time actually represent? Well, it means that if we move some physical process — maybe an experiment — along the time dimension then we would find that the underlying situation would be unchanged (that is the definition of a symmetry). As an example, if I perform an experiment today and get a certain result, then if I perform precisely the same experiment again tomorrow then I will get exactly the same result. So what symmetry in time really means is that **the laws of physics do not change over time**.

Noether's theorem tells us that symmetry in time implies conservation of energy. Is there any easy way of understanding why this should be the case? Well, imagine if the strength of gravity (one of the laws of physics) varied with time. In that case, when gravity was weak I could lift a heavy object up some pulley system, connected to an electrical generator. Then when gravity became strong again I could release the weight and get back more energy (in the form of electrical energy) than I put into the system. I could get free energy! This obviously cannot be the case, so the laws of physics not changing with time implies conservation of energy.

I believe that the fact that the laws of physics do not change with time plays a key role to understanding why the strength of gravity is weak. To see why that is the case, let us again consider Newton's law of gravity, which is obviously one of the laws of physics and which should therefore not alter with time:

$$F = \frac{Gm_1m_2}{r^2}$$

The r^2 term represents an *inverse square law* which means the force reduces according to the square of the distance. This is an inevitable consequence of the three dimensions of space (as described in my previous book). It is clear that this aspect of the equation would not vary with time.

However, you will notice that the equation also includes Newton's gravitational constant, G . If the laws of physics do not change with time then that implies that **the value of G does not change with time**. I believe this is an important result in explaining why the strength of gravity now appears so weak, as we shall soon see.

You might not think it is such a big deal to state that the value of G does not change with time. After all, it is supposed to be a fundamental constant! However, that has not stopped the emergence of several theories which suggest a varying value of G . Perhaps the most famous example is that of Paul Dirac, one of the greatest physicists of the 20th century. In one of his wilder flights of fancy, Dirac proposed that the huge ratio of the strength of the electromagnetic force to the strength of gravity was equal to the ratio of the radius of the universe to the radius of a proton. Unfortunately, in an expanding universe, this would mean that both ratios would have to be smaller in the

past than they are is now. How could that possibly be the case if the strengths of the forces does not change? The only way Dirac could think of avoiding this problem was to suggest that the value of G was actually larger in the past (thus reducing the ratio in the past). Could it really be the case that G has varied with time? Dirac stuck doggedly with his theory, but it was shown that if it was the case that G was larger in the past then this would have resulted in increased energy output from the Sun: the oceans would have boiled and life could not have survived.

I firmly believe that we should take it as a rock-solid fact that G has not varied with time. I have always taken it as one of my guiding principles. In fact, I would suggest that if you have a theory which predicts a varying G , you would be wise to throw your theory in the bin.

The early universe

For our next step in trying to construct a potential solution to why gravity is so weak, we will need to travel back in time. A long way back in time.

Physicists now have a very accurate model of the early universe right back to a tiny fraction of a second after the Big Bang. This was a time of extremes, of tremendous temperatures and pressures. The temperature of the universe at this point in time is believed to have been the highest possible temperature which is known as the *Planck temperature*. The Planck temperature is equal to 10^{32} K, or 100 million million million million degrees kelvin. Heat is the result of particles moving randomly at tremendous speed. This means particles had immense kinetic energy.

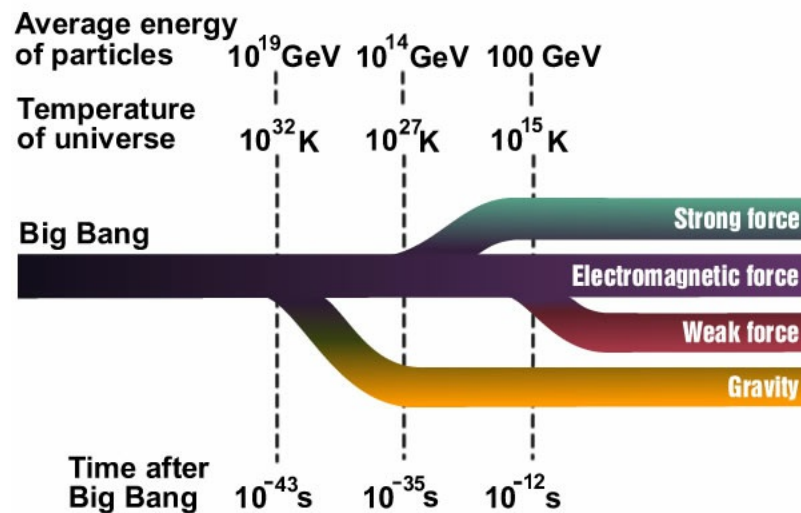
We can understand this situation by considering a large number of particles (for example, a gas) trapped in a box. The box is then heated to a great temperature. Heat is the result of particles moving randomly at tremendous speed, so the kinetic energy of the particles increases. As a result, the total energy of the box increases, and so does its mass. As the Wikipedia page on "Mass in Special Relativity" explains: "If a stationary box contains many particles, it weighs more in its rest frame, the faster the particles are moving. Any energy in the box (including the kinetic energy of the particles) adds to the mass, so that the relative motion of the particles contributes to the mass of the box." [14]

And what is the universe if not a big box full of particles?

As you will see in the following diagram, the Planck temperature of the early universe corresponds to the average energy of particles being 10^{19} GeV, a value which we calculated earlier as being the Planck energy. And, as we calculated earlier, this is the immensely high energy at which the strength of gravity becomes equal to the strengths of the other three forces.

As a result, it is suspected that all the forces were unified into a single force at the time of the Big Bang, and separated into individual distinct forces as the universe cooled.

The following diagram shows this process. Time is on the horizontal scale, with the Big Bang on the left of the diagram:



You will see that the first force to split into a separate distinct force was the force of gravity — which is what interests us. You will see from the diagram that this happened just a fraction of a second after the Big Bang: 10^{-43} seconds, to be precise, an incredibly short period of time which is known as the *Planck time* (the period before this time is known as the *Planck era* or *Planck epoch*). Due to quantum uncertainty, we seem to be fundamentally limited about what we can know about conditions during the Planck era.

As discussed earlier, it is believed that 10^{16} GeV represents the grand unification energy at which the three remaining forces (strong, weak, and electromagnetic) are still unified, but as the universe cooled beyond that point, those three forces separated into distinct forces.

As the universe continued to cool, you can see that at the much lower energy of 100 GeV, the electromagnetic and weak forces split from the previous unified *electroweak* force. This was due to *spontaneous symmetry breaking* by the Higgs field, giving mass to the bosons of the weak force while leaving the photon massless. This energy of 100 GeV is low enough to come within the energy range of our current particle accelerators. And, indeed, the LHC recently detected the Higgs boson (the particle associated with the Higgs field) with a mass of 125 GeV.

Which places us in a position to attempt to answer the main question ...

Why is gravity so weak?

The extreme weakness of gravity is presented as one of the great mysteries of physics. In fact, it has even been called "the greatest unsolved problem in theoretical physics".^[15] Many articles have been written on the subject, and several models have been produced such as the Randall-Sundrum model in order to explain the phenomenon. These models have even incorporated highly-speculative extra dimensions — all with the aim of explaining the weakness of gravity.

However, there does appear to be a very simple solution — an almost trivially simple solution — to this question which only involves conventional orthodox physics. In order to explain the solution, let us return to consider the earliest moments in the life of the universe.

We know that the force of gravity split to become a distinct force in just a fraction of a second after the Big Bang. If there was a force of gravity at that point in time, then there must also have been a law of gravity. And, as we know the laws of physics do not change with time, that law of gravity must have been the same as it is now: Newton's law of gravity must have come into existence 10^{-43} seconds after the Big Bang. So the value of Newton's gravitational constant, G , must have been fixed just 10^{-43} seconds after the Big Bang. It is as if a snapshot was taken of G at that time, and we have been using that value ever since:



For the next step, we need to realise that this means that the value of G would have been fixed **based on the extreme conditions prevailing at that time**. At that early moment in time, the energy of particles was equal to the immense Planck energy (you can see this on the earlier diagram showing the progressive separation of the four forces after the Big Bang: "Average energy of particles: 10^{19} GeV"). The value of G would therefore have been set on the basis that the average energy of particles was far greater than today. And, because of the increased energy of those particles, this would indeed have resulted in gravity having the same strength as the other three forces at that early moment in time (because, as we calculated earlier in this chapter, even today gravity would have the same strength as the other forces if the energy of particles was equal to the Planck energy).

This makes sense in another way as well because it means the natural, expected value for mass at that time could

be calculated in the usual manner from the three most basic fundamental constants, without including any arbitrary constants, which would be equal to the Planck mass:

$$m_P = \sqrt{\frac{\hbar c}{G}}$$

And the Planck mass was, indeed, the average, expected value of the mass of particles at that early time in those extreme conditions, when the laws of physics were set in stone.[\[16\]](#) And it has remained the "natural" value for mass ever since — even though much has changed in the universe since then ...

Over the period of time since the Big Bang, the universe has expanded and cooled to a remarkable degree. From that initial temperature of 100 million million million million degrees, within three minutes it had rapidly cooled to a positively chilly billion degrees. And with that rapid fall in temperature came a corresponding reduction in the kinetic energy of particles. Remember, the kinetic energy of particles dominated in the early universe, but with the average temperature of the universe now at merely a couple of degrees kelvin, the kinetic energy of particles currently forms a negligible part of their total energy.

Which brings us to the next crucial point. Mass and energy can be considered to be the "charge" of gravity: the more mass and energy a particle has, the more it feels the force of gravity. So the cooling of the universe — and the corresponding reduction in energy — has implications for gravitational charge. **But this is not the case for the other forces.** Electric charge, for example, does not vary with temperature. As described at the start of this chapter, there is a minor variation in the strength of the electromagnetic force with energy due to the screening effect, and a graph was presented showing how the strengths of the three forces varies with energy. But this variation would be negligible compared to the variation in the strength of gravity. The cooling of the universe would therefore have left the strengths of the other three forces unchanged — it is the strength of gravity alone which would be affected by many orders of magnitude.

To sum up, the law of gravity uses a gravitational constant, G , the value of which was set when the average gravitational charge was huge. After the cooling of the universe, the average gravitational charge was vastly reduced. With the strengths of the other forces unaltered, gravity now appears relatively weak.

In the discussion on naturalness in Chapter Four, it was explained how theories have a major challenge in explaining the origin of any constant which takes the form of a large dimensionless number. What is the origin of the large number? What mathematics could possibly generate it? Any theory which attempts to explain the weakness of gravity must explain the origin of the large dimensionless number which describes the ratio of the strength of the other forces to the strength of gravity. As I say, it is a major challenge for any theory to identify the origin of this unnaturally-large dimensionless constant.[\[17\]](#) However, in this discussion considering the relative weakness of gravity, a simple explanation of the origin of that particular immense number has emerged: the origin is the ratio between the immense temperature of the universe at the time of the Big Bang, and the cool average temperature of the universe now. In other words, one immense number has been converted into another immense number.

On that basis, a simple calculation can be performed to quantify the effect of the cooling universe on the relative weakness of gravity. Energy is proportional to temperature.[\[18\]](#) So to understand the drop in energy, we only need to consider the drop in temperature. As described earlier, the temperature just after the Big Bang was 10^{32} K (the Planck temperature). With the current temperature of the universe being a mere 2.73 kelvin, that represents a dimensionless ratio of temperatures of approximately 10^{32} . This value of 10^{32} representing the relative weakness of gravity is very much the kind of value we are looking for, coming right in the middle of the following range:

- 10^{45} — the strength of the electromagnetic force relative to the strength of gravity.
- 10^{24} — the strength of the weak force relative to the strength of gravity.

To put it simply, it appears that the reason why gravity is now so weak is that gravity was designed for a much heavier world.

The fine-tuned universe

I hope you have enjoyed this book.

The intention has been to show that grounded, conventional physics provides the best route to solving the apparent fine-tuning problems. Other techniques — such as the strong anthropic principle — might appear to provide shortcuts to quick solutions, but the temptation to go down those routes should be resisted.

In trying to discover solutions to the puzzling fine-tuning problems, it seems as though whenever progress has stalled, the common approach has been to introduce some additional undetected structure as a way of circumventing the problem. Structures which have been invented to solve the fine-tuning problems include:

- **Supersymmetry.** The proposal for a huge suite of undetected supersymmetric particles as a way of explaining the hierarchy problem. None of these particles were detected by the LHC, which is currently our highest-energy particle accelerator. Unfortunately, as these particles have gone undetected as accelerator energies have progressively increased, some physicists have chosen to conveniently increase the predicted masses of these particles so that they lie just beyond current accelerator energies. In other words, the predictions have been modified in order to preserve the theory. That is surely not a good way to do science.
- **Extra dimensions.** The proposal for unseen and undetectable extra spatial dimensions as a means for explaining the weakness of gravity.
- **The inflaton field.** An additional unexplained and undetected field required by the inflation hypothesis, as a means for explaining the fine-tuned flat universe.
- **The multiverse.** An undetected and undetectable group of universes beyond our own universe, used by the strong anthropic principle to potentially "solve" (in the loosest sense of the word) **all** of the puzzling fine-tuning problems.

Can we really continue proposing new structures whenever we appear to hit a dead-end? Is this really the best way to solve the fine-tuning problems? The danger is, of course, that we are trying to solve the fine-tuning problems by inventing structures that simply do not exist.

Surely it would be better if the process of inventing and proposing new undetected structures was treated as a last resort, when all else has failed. Instead, it seems as if this approach is being treated as the preferred first option.

The message of this book has been that we should try harder to make sense of current data using our existing tools and knowledge — rather than inventing additional unseen structures.

The solutions we seek might well be hidden in plain sight.

The principle of naturalness appears to be a useful guide in our efforts to describe fundamental mechanisms. In an entirely natural solution we would only be left with dimensionless constants of the order of magnitude of one. We would then be entitled to consider the value of that constant as being "natural", and not fine-tuned. We may not know the precise origin of the value of the constant, but we can be satisfied we are not far away from knowing the truth. Examples of "natural" constants might include the fine-structure constant, and the number of dimensions of space. I suspect it is likely that simple solutions to these problems will arise at some point. Maybe we don't have all the answers yet, but we can afford to be hopeful in these cases.

In a completely "natural" universe there would be no arbitrariness whatsoever: the state of that universe would be uniquely fixed as a logical necessity. However, there seems to be a fairly widespread belief that the state of our universe could not entirely arise as a logical necessity, in which case — despite our best efforts — we might be forever left with the question of why the universe takes the form it does. In that case, the only answer to why the constants take the values they have would be "that's just the way it is". I certainly do not believe we have reached that point yet, but if we do reach that point then we would be at the limit of possible human knowledge (for example, quantum uncertainty limits our knowledge of conditions during the Planck era).

The discussion of the Fermi paradox in this book seemed to suggest that life is a rare occurrence in the universe, requiring an almost impossibly special combination of conditions — such as those found on Earth. It has been said that the Earth appears to be a "gem". So maybe we should view this as an opportunity. If we eventually come to the limit of possible human knowledge, we should not despair about the "end of science". Instead, we should congratulate ourselves on a job well done, and spend our time enjoying our lives in this amazing universe on this very special planet.



EPILOGUE

Regarding the hypothesis of modified gravity I presented in my earlier books, there has been a recent development which is potentially very interesting. The modified gravity hypothesis did not only predict a naturally-flat universe, but it also predicted a modification to the structure of black holes. The hypothesis eliminated the troublesome singularities which are supposed to lie at the heart of black holes. Instead, the hypothesis predicted that the mass of a black hole would be concentrated at its event horizon.

In August 2016, a team led by Vitor Cardoso of the Superior Technical Institute in Lisbon suggested that the signature of a thickened event horizon could be detected in the recently-discovered gravitational wave signals. The gravitational waves were produced by the merging of two black holes, producing a staggering amount of energy. This prediction was investigated by a team led by Niyayesh Afshordi of the Perimeter Institute and the University of Waterloo.

In December 2016, Afshordi's team released a paper with the evocative title of "Echoes from the Abyss", in which they announced that they had detected echoes of energy released between the inner layer of the event horizon and the outer layer of the event horizon. This would appear to indicate some structure at the event horizon, structure which was not predicted by conventional general relativity. The announcement was also featured in an article in *Nature magazine* which was aimed at the general readership. [\[19\]](#)

Being realistic, the chances that this result will prove to be conclusive evidence of a modification to general relativity is extremely remote. However, what is exciting is that new data is starting to pour in, and will continue to pour in for the next few decades as a series of new ambitious experiments go online. The next few years might prove to be very exciting indeed.

Watch this space!

FURTHER READING

Just Six Numbers by Martin Rees

An analysis of six dimensionless constants which appear to be set to life-friendly values.

The Theory That Would Not Die by Sharon Bertsch McGrayne

The fascinating story of Bayes' theorem. The paperback edition includes technical details and worked examples.

The Copernicus Complex by Caleb Scharf

Are we alone in the universe? This very readable book comes to a stunning conclusion.

The Eerie Silence by Paul Davies

The search for extraterrestrial intelligence.

QED: The Strange Theory of Light and Matter by Richard Feynman

An accessible introduction to quantum electrodynamics.

Feynman by Jim Ottaviani and Leland Myrick

A delightful comic-strip account of the life of Richard Feynman, including good science.

Let's Draw Feynman Diagrams! by Flip Taneda

<http://tinyurl.com/fliptaneda>

An excellent resource for the details of Feynman diagrams and the Higgs boson.

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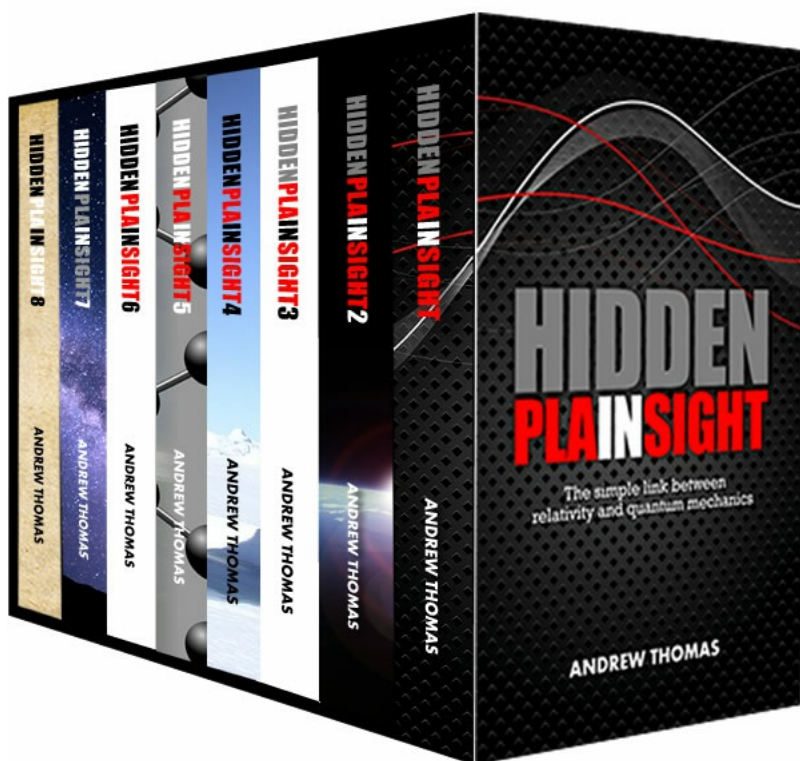
Solar sail artist's impression is by Kevin Gill and is provided by Wikimedia Commons.

Edwin Hubble's graph is courtesy of NASA.

Drawing of Feynman path integral is by Matt McIrvin and is provided by Wikimedia Commons.

NOTES

- [1] Paul Steinhardt, *The Inflation Debate*, <http://tinyurl.com/PaulSteinhardt>
- [2] See the Wikipedia page on "Dimensionless Physical Constant": <http://tinyurl.com/physicalconstant>
- [3] Why is There Life? *Discover Magazine*, <http://tinyurl.com/unlikelyuniverse>
- [4] Peter Pesic, *Times Literary Supplement*
- [5] You can see Bayes' theorem on Sheldon's whiteboard at the start of the episode called *The Cruciferous Vegetable Amplification*.
- [6] A similar beacon signal was intercepted by the crew of the *Nostramo* commercial spacecraft in the movie *Alien*. In that case, the beacon was intended as a warning signal. So maybe we should be careful if we ever receive a genuine beacon signal ...
- [7] *Where should we look for alien life?*, BBC website, <http://tinyurl.com/wherealienlife>
- [8] <http://tinyurl.com/susskindlandscape>
- [9] One possibility might be via an *exponential* mechanism. As an example, place a grain of rice on the first square of a chessboard. On each successive square, double the number of rice grains. You will end up with $2^{64}-1$ (note: all small numbers in that expression) grains of rice on the chessboard, which is equal to the immensely large number 1.8×10^{19} .
- [10] *Quantum Mechanics for Engineers* by Leon van Dommelen, <http://tinyurl.com/qmforengineers>
- [11] http://en.wikipedia.org/wiki/Quantum_field_theory
- [12] In order to create a particle of mass m , sufficient energy must be put into the field according to the formula $E=mc^2$.
- [13] For *composite* particles such as protons, i.e., particles which are composed of elementary particles grouped together, most of the mass arises from the binding energy which holds the elementary particles together — **not** the Higgs field (the binding energy is equivalent to mass via $E=mc^2$).
- [14] <http://tinyurl.com/massinrelativity>
- [15] Ethan Siegel, *The Greatest Unsolved Problem in Theoretical Physics*, <http://tinyurl.com/greatestunsolved>
- [16] With the Planck mass being calculated from the Planck energy. This refers to the *relativistic mass* of particles, as opposed to their *rest mass*. If the particle was placed on weighing scales, it would weigh more due to the increase in its relativistic mass. Relativistic mass includes the contributions from both mass **and** energy, which makes it more important as far as gravity — and weighing scales — is concerned (mass and energy are the "charge" of gravity).
- [17] The Randall-Sundrum model for weak gravity gets its immense number from the *exponential* weakening of gravity as it moves from the gravity brane to our three-dimensional world. As Lisa Randall says: "An exponential automatically turns a modest number into an extremely huge number."
- [18] Energy is equal to kT , where k is Boltzmann's constant, and T is the temperature. You can also see that energy is proportional to temperature from the energy and temperature values on the earlier diagram showing the progressive separation of the four forces after the Big Bang.
- [19] *LIGO black hole echoes hint at general relativity breakdown*, <http://tinyurl.com/blackholeechoes>



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CONTENTS

PROLOGUE: THE Nth COUNTRY EXPERIMENT

1) OUR FRIEND THE ATOM

The Gilbert Atomic Energy Lab
Operation Plowshare
Project Orion

2) FAINT FAIRY LIGHTS

Alpha and beta
The alchemists
Nuclear reactions
The power of the atom
Beta radiation
The weak interaction

3) SPLITTING THE ATOM

Artificial radioactivity
The discovery of fission
The nuclear mousetrap

4) THE CHAIN REACTION

The New World
The letter from Einstein
Oppenheimer
Los Alamos
The *Los Alamos Primer*

5) THE CRITICAL MASS

The ratio of volume to surface area
Spherical coordinates
The build-up of neutrons
The derivative
To cut a long story short ...

6) OAK RIDGE

The secret city

[The largest building in the world](#)
[The Calutron Girls](#)
[Mail-order uranium](#)

7) PLUTONIUM

[The nuclear reactor](#)
[The world's first nuclear reactor](#)
[The Demon Core](#)

8) DETONATION

[The sex of the bomb](#)
[Implosion](#)
[Trinity](#)

APPENDIX: CALCULATING THE CRITICAL MASS

[Creating the equation](#)
[The genius of Mr. Wolfram](#)
[Solving the equation](#)
[Calculating the critical mass](#)

PROLOGUE: THE Nth COUNTRY EXPERIMENT

The year is 1964.

Dave Dobson was a physics student, excited to have just received his PhD. Dobson was a bright guy, and a science enthusiast. He had a good general knowledge about several fields of physics, but his knowledge was nothing spectacular.

To all intents and purposes, Dobson was Mr. Average.

This made it all the more surprising when Dobson received a telephone call from the renowned nuclear physicist Edward Teller. Teller invited Dobson to come to Washington D.C. for an interview for a job in one of the country's leading nuclear research facilities. Dobson was amazed and, frankly, wondered if they had got his name mixed up with someone else. He later described everything he knew about nuclear chain reactions at that time: "I had seen an exhibit with a model of a chain reaction made up of mousetraps and ping pong balls."

Dobson met Teller and they spent an evening together. Teller quizzed Dobson to discover everything he knew about nuclear weapons, and Dobson honestly replied that he knew nothing more than any other amateur science enthusiast. To be frank, Dobson admitted he knew absolutely nothing at all about nuclear weapons.

"Great", replied Teller. "You will be perfect for the job".

At that time — the early 1960s — the Pentagon was extremely concerned about the possible proliferation of nuclear weapons to other countries. Only the United States, the Soviet Union, Britain, and France possessed nuclear weapons. Britain had been the third country, France had been the fourth. Which country would be the fifth country to possess nuclear weapons? Or the sixth country? Where would it all end? Which country would be the "Nth country"?

In order to shed some light on that question, the Pentagon had started a top secret project called the "Nth Country Experiment". Dave Dobson would be one of two physics students who had been selected to work on the project.

The worry was that so much information about how to make an atomic bomb had been published in the popular press. While no classified secrets had been leaked publically, there was plenty of more general information freely available to an amateur enthusiast. Given the availability of that general information, would it be possible for a rogue state, employing nothing more than a few physicists of very average ability, to create a nuclear weapon?

Basically, the goal of the Nth Country Experiment was to determine how difficult (or easy) it was for a bunch of amateurs to make an atomic bomb.

This, then, was to be Dave Dobson's first job straight out of university. Dobson was given a desk in a corner of a laboratory in the Livermore Radiation Laboratory in California. He was introduced to another amateur physics enthusiast, Bob Selden, a 28-year-old soldier who would be working with him. Neither man had any nuclear expertise whatsoever.

Their job was to imagine they were working for a rogue state (named the "Nth Country"). They were handed a document explaining their task. Here is the first paragraph of the document: "The purpose of the so-called Nth Country Experiment is to find out if a credible nuclear explosive can be designed, with a modest effort, by a few well-trained people without contact with classified information. The goal of the participants should be to design an explosive with a militarily significant yield. A working context for the experiment might be that the participants have been asked to design a nuclear explosive which, if built in small numbers, would give a small nation a significant effect on their foreign relations."

The first thing which needed to be done was to obtain security clearance for Dobson (Selden had already been cleared because of his military background). Clearance was necessary because it was against the law to design nuclear weapons without security clearance.

Dobson and Selden would have access to none of the secret research material at the laboratory, but they would have access to the general library and its publically-available material. They were told that the imaginary "Nth Country" they were working for would have "more resources than Ghana, but less than an industrialized nation." They should assume they had access to good machinists able to shape uranium and plutonium, and also access to some engineers experienced with conventional explosives. Apart from that, they were given no more instructions on

how they should proceed. They were on their own.

In the library, Selden found a book about the Manhattan Project, the U.S. project which developed the atomic bomb. According to Dobson: "It gave us a road map. But we knew there would be important ideas they'd deliberately left out because they were secret. This was one of the things that produced a little bit of paranoia in us. Were we being led down the garden path?"

If Dobson and Selden wanted to perform an experiment, perhaps with high explosives, they had to describe their desired experiment in great detail. A team of experts then calculated the result of the experiment and passed the result back to Dobson and Selden.

Ironically, one of the most useful sources of information came from President Eisenhower's "Atoms for Peace" programme, the motivation for which was to encourage the use of non-military nuclear power around the world. Atoms for Peace was just one example of the enthusiasm at the time for nuclear energy, the result of which was to distribute a vast amount of technical information into the public domain.

After two-and-a-half years, in 1966, Dobson and Selden had finally finished their design. According to Selden: "We produced a short document that described precisely, in engineering terms, what we proposed to build and what materials were involved. The whole works, in great detail, so that this thing could have been made by Joe's Machine Shop downtown."

However, after they had presented their document, everything went very quiet, and Dobson and Selden were not informed of the outcome. They presumed that they had failed in their task. So, one day in Livermore when they met a senior researcher, Jim Frank, they asked him why things had gone so quiet. Did he have any knowledge of the outcome of their experiment? Yes, said Frank, he knew what had happened. The reason why everyone had gone quiet was because they had realised that if a bomb had been constructed precisely according to their detailed instructions, it would have exploded with the same order of magnitude as Hiroshima.

1

OUR FRIEND THE ATOM

In 1870, the French science fiction writer Jules Verne wrote the classic adventure novel *Twenty Thousand Leagues Under the Sea*. It is the story of Captain Nemo who terrorised the world's shipping using his mysterious submarine called the *Nautilus*.

As usual, Jules Verne showed his amazing talent as a futurist, predicting technological advances many years before that technology came to exist. In this case, the submarines of the 19th century were very primitive vessels, so Jules Verne's description of a craft which could stay submerged for several days proved to be prophetic. That was because, in 1954, the real-life *Nautilus* was launched. And it could, indeed, travel underwater for weeks or months at a time.

The *USS Nautilus* — named after the craft in Jules Verne's book — was the world's first nuclear-powered submarine. In a nuclear-powered submarine, heat generated by a small nuclear reactor turns water into steam which, in turn, powers the propeller of the submarine. Unlike a diesel engine, a nuclear reactor requires no air to operate. As a result, nuclear-powered submarines are capable of staying at sea for many months without needing to refuel, and can travel huge distances under water.^[1] To prove the point, in 1958 the real-life *Nautilus* took four days to complete the first submerged voyage under the North Pole.

The following photograph shows the *USS Nautilus* arriving in New York City in 1958:



America in the 1950s was an optimistic time, and nuclear power was viewed very differently from how it is viewed today. The almost unlimited energy produced by the atom gave the promise of cheap, compact power sources which could be used for almost any application. The success of the *USS Nautilus* inspired ideas for other nuclear-powered forms of transport. One of the most outrageous suggestions included the world's first nuclear-powered car, the Ford Nucleon which was proposed by the Ford Motor Company in 1958. In the rear of the car was to be a small nuclear reactor which would allow the car to travel 5,000 miles without refuelling (unfortunately the car never got off the drawing board: such a small nuclear reactor did not exist, and the required shielding to protect the passengers would have made the car too heavy).

It was widely-believed that the electricity produced by nuclear power would be so cheap that it would make more sense to provide it for a flat fee — or even give it away for free — rather than installing expensive meters. This optimism was summed-up in a 1954 speech by Lewis Strauss who was the chairman of the United States Atomic Energy Commission: "Our children will enjoy in their homes electrical energy too cheap to meter. It is not too much

to expect that our children will know of great periodic regional famines in the world only as matters of history, will travel effortlessly over the seas and under them and through the air with a minimum of danger and at great speeds, and will experience a lifespan far longer than ours, as disease yields and man comes to understand what causes him to age."

It is believed that Strauss was referring to power produced by nuclear fusion, which would provide almost unlimited power from readily-available hydrogen. Indeed, if nuclear fusion research proves successful then Strauss's prediction of too-cheap-to-meter energy might yet come true.

In 1954, feeding off the excitement caused by the launch of the Nautilus, Walt Disney released the movie *Twenty Thousand Leagues Under the Sea* starring Kirk Douglas and James Mason as Captain Nemo. To support the release of the movie, an episode of the Disney television series *Disneyland* was devoted to examining the wonders of nuclear power. Continuing the optimistic tone of the age, the episode was called *Our Friend The Atom*.

The *Our Friend The Atom* episode is an excellent introduction to nuclear physics, and it is available on YouTube:

<http://tinyurl.com/movieatom>

The programme starts with Walt Disney standing beside a scale model of the USS Nautilus (including a clip from the Disney movie *Twenty Thousand Leagues Under the Sea* featuring the fictional Nautilus). We are then shown around Disney's "Atomic Energy Lab" which features some very nice wood-panelling and some "scientists" in white coats looking down optical microscopes (presumably at "atoms"?). It is rather bizarre to hear Walt Disney say: "As you can see, we found ourselves deep in the field of nuclear physics."

We are then introduced to Heinz Haber, a physicist who worked for the Luftwaffe in World War Two. After the war, he was taken to America together with Wernher von Braun to keep his expertise out of the hands of the Soviet Union. Haber went on to provide valuable contributions to the NASA space programme.

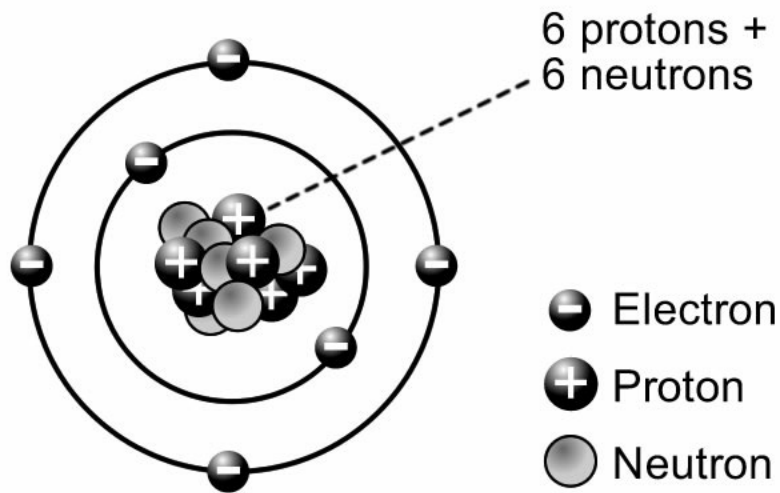
Haber then introduces some Disney animated sequences which are used to illustrate various issues associated with nuclear energy. For example, in a tale from *The Arabian Nights*, nuclear energy is compared to a genie in a lamp which has the power to do good or evil, but can never be trapped back inside the bottle from which it came.

Heinz Haber then proceeds to tell the story of the discovery of the atom, starting in ancient Greece with Democritus who suggested that matter was formed of indivisible small hard balls. Democritus could never provide any evidence to support his atomic theory. However, the story then moves to consider the work of the 19th century English chemist John Dalton who proposed the atomic theory of chemistry. Dalton realised that the combination of chemical elements (such as hydrogen and oxygen) to form chemical compounds could be explained if the elements were formed of atoms. This was the first truly scientific theory of the atom. According to Dalton, when atoms of different elements joined together, compounds were formed, e.g., two hydrogen atoms can combine with one oxygen atom to form water.

Haber then considers advances in atomic theory through the 19th and early 20th centuries. Slowly, Haber builds-up the model of the atom.

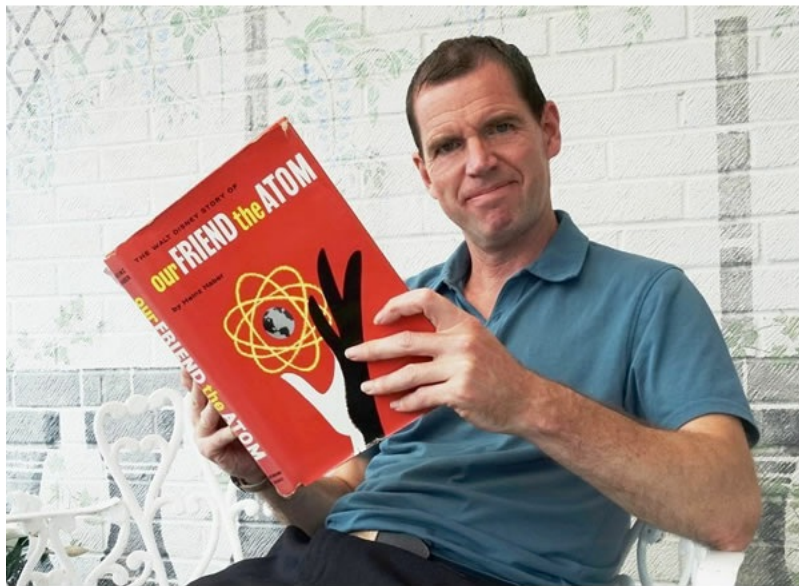
Atoms are composed of a tightly-packed nucleus surrounded by orbiting electrons. The nucleus is made out of positively-charged *protons* and electrically-neutral *neutrons*. Because protons have positive electric charge, their tendency is to repel each other. The neutrons, therefore, have to act like glue to hold the protons together and to stop the nucleus from flying apart. The negatively-charged electrons are held in their orbits by the electrical attraction to the positively-charged protons (opposite charges attract).

The following diagram shows a carbon atom. It is composed of six electrons orbiting a nucleus which is composed of six protons and six neutrons:

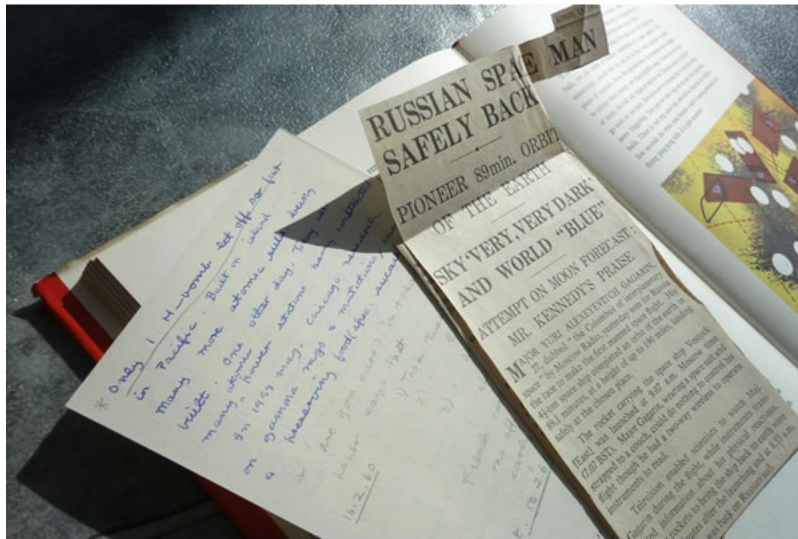


In this book we are only going to be interested in the nucleus of the atom. The study of the nucleus of the atom is called *nuclear physics*. In his book *The Making of the Atomic Bomb*, Richard Rhodes reveals the key reason why it is the nucleus of the atom which provides the energy for nuclear explosives: "Nuclear physics, the study of the nucleus of the atom, is where most of its mass — and therefore its energy — is concentrated."

A Disney book was published in association with the television programme, also called *Our Friend The Atom*. The book was written by Heinz Haber who hosted the television programme. Here is a photo of me with a copy of the book in good condition which I bought off eBay:



When my copy of the book arrived I was delighted to find the pages were pristine white, completely unfaded, and I got the impression the book had not been opened for over fifty years. This impression was strengthened when I opened the book and found a cutting from the *Daily Telegraph* newspaper dated April 13th 1961 announcing that the Soviet astronaut Yuri Gagarin had returned safely from the first manned space flight, having completed an orbit of the Earth. I was even more delighted to find hand-written notes (on perfect white paper) detailing contemporary hydrogen bomb tests and other atomic research. The following photograph shows the notes I found in my book:



The book had clearly belonged to a science enthusiast. It is an example of the interest and excitement of the general public about atomic energy in the 1950s and early 1960s. I was delighted to find these hidden secrets — I guess sometimes you just get lucky.

Our Friend The Atom was obviously aimed at a young audience, but it was a superb project. It is a shame to think that such a high-level educational programme about nuclear energy would never be aimed at young children today. It is also a shame that we have lost our optimism and enthusiasm about the potential contained within the atom. In this book, I hope to restore some of that optimism.

The Gilbert Atomic Energy Lab

Our Friend The Atom was not the only example of 1950s nuclear education which was aimed at children. Take a look at the following toy. The boy on the lid of the box looks thrilled. No wonder! He has just been given the Gilbert Atomic Energy Lab for his birthday and he is busy doing experiments with radioactive material:



According to its Wikipedia page, the Gilbert Atomic Energy Lab has been called "The world's most dangerous toy", which is extremely unfair and — frankly — completely inaccurate. I would prefer to call it "The world's coolest toy ever".

Alfred Gilbert, the toy maker who released the Atomic Energy Lab, believed that his toys held the key to building a "strong American character", and his toys always included some educational quality. But the Atomic Energy Lab contained genuine radioactive ore samples. So was the Atomic Energy Lab a safe toy?

Well, in assessing whether it was safe, it is important to realise that we are all constantly being irradiated by a low-level background radiation. This radiation may come from the rocks and soil which surround us, or even from the plants which we eat — particularly bananas, which are surprisingly radioactive. This has resulted in the creation of a measure of radiation called the *banana equivalent dose* (or BED). One BED is approximately equal to 1% of a day's worth of background radiation (which would therefore be equal to 100 BEDs). The level of this background radiation is low, but over a year it all adds up. It is true that the radioactive ore samples in the Atomic Energy Lab were considerably more active than the constant background radiation, but you would not be exposed to those samples for long. In evaluating the safety of the Atomic Energy Lab it is important to realise that "safe" is a relative concept.

It is perhaps a shame that nowadays the concept of giving children an atomic energy lab seems bizarre. It exemplifies the public misconceptions about the relative risks of radioactivity. We have lost sight of the positive contributions of radioactivity to our world, from power generation to cancer radiotherapy. I am sure Alfred Gilbert's laboratory was a wonderfully educational toy.

Later in this book we will be considering my own experiments with radioactive substances when I have fun by creating my own version of the "Gilbert Atomic Energy Lab" using a Geiger counter and some highly-radioactive uranium ore. I can assure you that I do live to tell the tale!

Operation Plowshare

In the 1950s, there was also a much more positive attitude towards nuclear explosives. Yes, it was the case that the atomic bomb had been recently used in warfare, but the general belief was that its use had prevented the loss of the lives of hundreds of thousands of American servicemen during an invasion of the Japanese mainland. It was also believed that the awesome destructiveness of the bomb would lead to the end of mass warfare as countries realised the futility of "Mutually Assured Destruction", or MAD.

As part of that more positive approach to nuclear explosives, the U.S. government started Operation Plowshare to investigate the use of nuclear explosives for peaceful construction purposes. The name "Plowshare" came from the Biblical quote "They shall beat their swords into plowshares", indicating a desire to convert weapons into tools. Proposed uses of nuclear explosives included the excavation of large amounts of earth and rock, creating artificial harbours, widening the Panama canal, cutting paths through mountains for highways, and creating underground caverns for mining and storage.

The largest nuclear test of Operation Plowshare was the Sedan test which took place on 6th July 1962. The aim of the test was to examine the feasibility of using nuclear explosives to excavate large amounts of earth and rock. The nuclear explosive was buried 194 metres underground, and the explosion displaced twelve million tons of rock. The resultant crater is called the Sedan Crater and it is the largest man-made crater in the United States. Over 10,000 visitors a year now visit the site on free monthly tours.

The Sedan test took place at the Nevada Test Site, which is a 1375-square-mile area of empty desert which is located only sixty miles away from Las Vegas. The first atomic test at the site took place in 1951, and over the next four decades it hosted a further 928 tests giving the area the nickname of "the most bombed place on Earth". Even today, if you search for "Nevada National Security Site" on Google Maps you will find the pock-marked area of desert, with each crater representing a nuclear explosion. It is even possible to see the enormous Sedan Crater at the north of the site.

In 1951, Las Vegas was a struggling small town with a population of fewer than 25,000 which was looking to boost its profile. When atomic bomb testing started at the nearby test site, the Las Vegas Chamber of Commerce promoted the blasts as a tourist attraction, handing out leaflets giving the dates of the detonations. Hotels built north-facing penthouses with the best views of the atomic mushroom clouds.

The following photograph was taken in Las Vegas and shows the mushroom cloud of a nuclear explosion at the Nevada Test Site rising high above the casinos in the foreground:



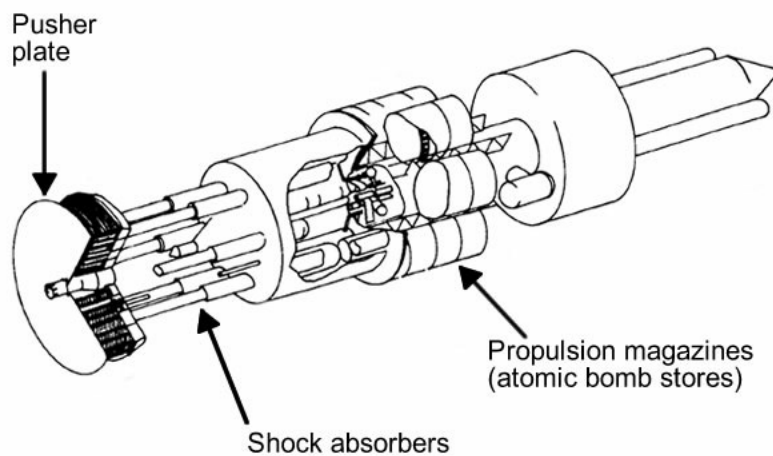
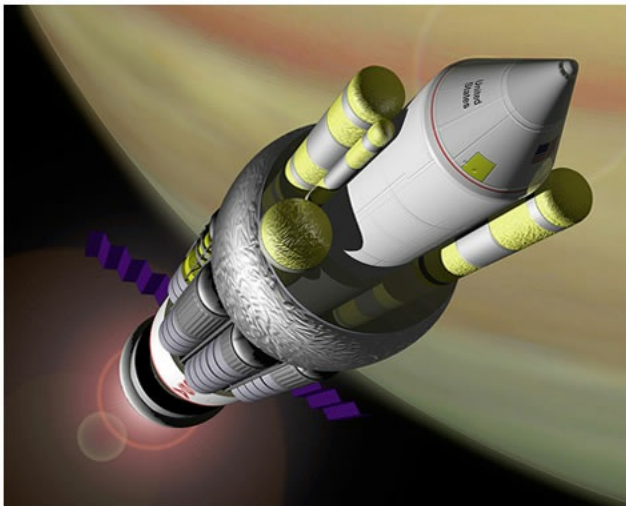
Project Orion

One of the most remarkable proposed uses for nuclear explosives in this period was Project Orion. The aim of Project Orion was to design a spacecraft which was to be propelled by a sequence of thousands of nuclear bombs

exploded in succession at the rear of the craft. The craft was to be protected by a 1,000-ton steel plate (called a *pusher plate*) and shock absorbers to protect the crew from the crushing acceleration (though that would not be a problem if the craft was unmanned). Radioactive nuclear fallout would not be a problem if the propulsion system was restricted to being only used in space. So, although the Project Orion proposal might sound absurd, experiments at the time showed that it would actually be a viable means of space travel.

In the BBC documentary *To Mars by A-Bomb: The Secret History of Project Orion*, the physicist and author Arthur C. Clarke emphasized that the idea behind Project Orion was not crazy: "After all, every time you get into a motor car you are being driven around by means of a series of rapid explosions." [2]

The following image shows a NASA artist's impression of the Orion spacecraft with Saturn drawn in the background. The image is taken about four milliseconds after the explosion of a nuclear propellant charge, showing the blast hitting the pusher plate at the rear of the craft. The line drawing underneath is another NASA diagram showing the key components of the Orion craft, including the pusher plate and the multiple shock absorbers:



If the spaceship was of standard size (e.g., just a few tons in weight) then the force of the exploding bombs would pulverise the craft. The solution was to make the spacecraft big: a few thousand tons in weight. According to Newton's second law of motion, the resultant acceleration would be greatly reduced due to the immense mass. Not only would this save the structure of the craft, it would also make the acceleration endurable for the on-board travellers. The plan was therefore to make an enormous craft, the size and weight of an ocean liner. To this day, the Orion technology remains our only method for moving extremely large payloads around the Solar System because of the huge energy advantage of nuclear explosives over chemical propellants. It has been said that: "To this day, Orion is still the only feasible means of interstellar travel, both robotic and manned, that could actually be built with current technology and knowledge." [3]

As a result of the necessity for large mass, the spacecraft would be built using a radically new philosophy. The spacecraft would be constructed out of steel, resembling a building more than a spacecraft. In fact, it would be more like a hotel — or an ark. It would have the potential to carry a large population out of the Solar System to colonise nearby planetary systems. According to Freeman Dyson, one of the physicists who worked on Project Orion: "Establishing human colonies was certainly part of our plan".

But surely there could never be a pressing need for such an ark. Why would humanity ever need to leave the Earth? Why would humanity need to colonise distant planets? Well, there is potentially one very good reason: a large asteroid or comet might appear on a collision course with the Earth threatening the mass-extinction of all life on the planet. In that situation, Orion might provide our only chance of survival.

If an asteroid on a collision course is detected a long way from Earth, there would be time to use "kinetic impact" — ramming a spacecraft into the asteroid — in order to produce a slight deflection to the course of the asteroid. Because of the great distance left on its course, that small deflection might be enough to cause the asteroid to miss the Earth. Time is of the essence when it comes to asteroid deflection.

Unfortunately, we would probably not have a long-enough warning period to launch such a spacecraft. In 2014, a comet was detected on a collision course with Mars — just 22 months before it crashed into the planet. According to Dr. Joseph Nuth, a NASA researcher, that would not have been nearly enough time to launch a rocket had the comet been on a collision course with the Earth. It takes five years to design and launch a spacecraft.

Orion might be the best technology to intercept and deflect an Earth-bound asteroid. John Dale Solem, a physicist at Los Alamos National Laboratory, said that "Orion provides such an advantage in speed over chemical propellants that it seems that interception could take place in a much shorter timescale, and consequently the deflection could take place further away so that it would be easier to make such an object miss the Earth."

Once intercepted, nuclear explosives could also be deployed either close to the asteroid to deflect it, or they could be used on the surface or beneath the surface of the asteroid in order to destroy it. The public perception of nuclear explosives might be very negative, but one day we might need to rely on them to save our planet.

I hope this introductory chapter has convinced you that nuclear explosives are not necessarily evil and maybe one day — in a world without war — they may prove to be of tremendous benefit to humanity. After all, dynamite has been a great boon to the construction and demolition industries, and we do not consider there to be anything fundamentally evil about dynamite.

A nuclear explosion is just an astonishing natural phenomenon. How we harness the power of that natural phenomenon represents a challenge — and an opportunity — for humanity.

Let us now start the long story of the development of the atomic bomb ...

2

FAINT FAIRY LIGHTS

Marie Curie looked at the test tube in delight. The year was 1902. Marie was thirty one years old, and working in the laboratory of her husband Pierre at the School of Physics and Chemistry in Paris. The test tube contained radium, a new element which Marie and Pierre had just discovered. To her delight, she noticed the test tube was glowing with a beautiful green colour, an effect she innocently called "faint fairy lights". Even when Marie closed her eyes she could still see the magic colours as the rays penetrated her eyelids as though they were not there.

In the evenings, she would often sit with Pierre in the laboratory they shared and gaze in wonder at the eerie blue-green glow of their new discovery which illuminated the entire room. Marie gave a name to these emitted rays: *radioactivity*. In this chapter we will be considering radioactivity in detail.

Six years earlier, the French physicist Henri Becquerel had first discovered the radioactive properties of uranium. Becquerel was investigating the effect of sunlight on photographic plates when he was frustrated by a cloudy day in Paris. Unable to perform his experiment due to the lack of sunlight, Becquerel put away his photographic plate into a drawer — which also happened to contain a nugget of uranium.

The next day, when Becquerel took the plates out of the drawer, he was surprised to find that the uranium had left clear imprints on the plates as though they had been exposed to a bright light. This was the first detection of radioactivity, and Becquerel's cloudy day in Paris stands as a clear example of the role of good luck in scientific discovery.

The discovery of radioactivity is presented in animated form at the 19:53 minute mark of Disney's *Our Friend The Atom*. This link takes you there directly:

<http://tinyurl.com/radioactivediscovery>

Becquerel did not take his work any further, so it was left to Marie and Pierre Curie to pursue this mystery.

Marie discovered that the rays were purely a product of uranium on its own — not due to any chemical reaction with any other element. Therefore, Marie had the insight that the rays were a fundamental property of uranium atoms. It was also clear that there was considerable energy being produced purely from the atom. This was the first observation of the potential of atomic power. Marie Curie's "faint fairy lights" were going to light up the world.

But if uranium was radioactive, might not other elements be radioactive as well? This was the question which was to lead to the discovery of radium. Marie tested all eighty known elements for radioactivity, and many other substances as well. Eventually, Marie found one particular mineral called pitchblende — a by-product of mining — which appeared to be far more radioactive than uranium. If radioactivity really was generated from the atoms of a single element then there had to be some new and mysterious element in the pitchblende compound. But it would be no easy task to refine the mystery element. The Curies obtained seven tons of pitchblende from the mines of Bohemia, a pile of black rubble which filled their laboratory. The rubble had to be laboriously crushed by hand in a pestle and mortar. But after four years of hard labour, the Curies managed to extract one tenth of a gram of a new element — radium — from the pile of rubble.

The discovery of radium proved to be an international sensation. It appeared to be a new, constantly-glowing miraculous source of energy — ideal for the luminous paint of watch dials. Radium was also viewed as a potential cure for numerous diseases, including throat medicines and cough cures, and you could even buy radium toothpaste, condoms, and suppositories.

Marie and Pierre were interested in the medical applications of their new discovery, and were even willing to sacrifice their own health in their research. At one time, Pierre strapped a test tube filled with radium to his arm for ten hours, creating a lesion on his arm. Bizarrely, Pierre was thrilled — and for good reason. If radiation could damage healthy tissue, then it should also be able to destroy diseased tissue. This gave the Curies the idea to use radioactivity to treat cancer — the first use of radiotherapy. Radiotherapy represents one of the ways in which radiation has provided benefits to humanity.

The declining health of Pierre was noted when Edward Rutherford came to visit the Curies in Paris in the summer of 1903. To celebrate the award of Marie's doctorate, a party was held in their garden. Pierre brought out a glowing tube of radium which impressed Rutherford greatly, describing it as "a splendid finale to an unforgettable day".

However, the light was bright enough to reveal Pierre's hands to Rutherford, who noted that they were inflamed and painful due to exposure to radioactivity.

In April 1906, Pierre was crossing the busy intersection of Rue Dauphine near the Seine when he fell under a horse-drawn carriage. He narrowly missed being trampled by the horses as the driver attempted to stop the carriage, but the carriage was carrying six tons of military equipment and kept slowly rolling. The back wheels of the carriage crushed Pierre's head, killing him instantly.

Marie was devastated by the loss of her husband and colleague. The Sorbonne (the University of Paris) awarded Pierre's professorship to Marie, making Marie the university's first female professor in its 650-year history.

By 1911, Marie was feeling more content about her personal situation, and there were three reasons for her improved state of mind. The first reason for Marie's happiness was that she had just received a telegram confirming that she had won her second Nobel Prize. That award of the 1911 Nobel Prize in chemistry, together with her 1903 award in physics for the discovery of radioactivity, made her the first person to win two Nobel prizes.

Secondly, Marie was invited to be a participant at the first International Solvay Conference in Brussels, which was a meeting of the greatest minds in physics. Attendees included Albert Einstein, Max Planck, and Ernest Rutherford. The following photograph shows the attendees, with Marie Curie the second seated person from the right:



The third reason for Marie's happiness was the presence of her lover, Paul Langevin, who was standing next to Einstein at the extreme right of the Solvay photograph. Unfortunately, Langevin also happened to be a married man. When Langevin's wife saw the photograph of Marie and Paul together at the Solvay Conference she told the press of the affair and it quickly became a national scandal with lurid stories in the newspapers. At one point, an angry mob formed outside Marie's house and threw stones through her window. Einstein wrote a letter of support to Marie regarding her treatment by the press: "If the rabble continues to be occupied with you, simply stop reading that drivel. Leave it to the vipers it was fabricated for."

Paul Langevin, defending his honour, challenged the journalist of the newspaper to a duel. The two duellists met at eleven o' clock in the morning. Each took their pistol, and paced-out twenty five yards. But when they turned to face each other, the journalist fired into the ground. Explaining his action later, he said: "Paul Langevin has a reputation as a scientist. However grave may be the errors made by Langevin in his domestic life, I did not wish to deprive French science of a precious brain." On seeing his adversary's action, Langevin also fired into the ground, saying: "I am not an assassin".

Langevin returned to his wife, and the outrage over the affair was brief. But the incident gives us an insight into the non-conformist life of Marie Curie, and reminds us of the challenging culture in which she had to work.

Marie Curie died at the age of 66 from exposure to radiation. The bodies of Marie and Pierre Curie were interred in the Panthéon in Paris. To this day, Marie's original documents remain so highly radioactive that they are kept in lead-lined boxes and can only be read whilst wearing protecting clothing.

Alpha and beta

As has just been described, Marie Curie explained that radioactivity had to be a property of the atoms of certain elements. But what was the cause of radioactivity? What was so special about those elements? And what was the radiation made of? It was the great experimental physicist Ernest Rutherford who supplied the answers to these questions.

In 1899, Rutherford took a sample of uranium and wrapped it in layers of thin aluminium foils. As more foil was added, the effect was to reduce the amount of emitted radiation which could penetrate the total amount of foil. The experiment revealed that there were two types of radiation being emitted from the uranium sample with greatly different abilities to penetrate the foil. Rutherford called these two types of radiation *alpha* and *beta* (named after the first two letters of the Greek alphabet).^[4] Alpha rays could be quite easily stopped by the foil, whereas the beta rays were more penetrating. Also, it was observed that the two types of rays were deflected by a magnetic field, suggesting that the alpha rays were composed of positively-charged particles, while the beta rays were composed of negatively-charged particles. Also, the alpha rays were deflected by a smaller amount than the beta rays, suggesting that the alpha particles had much greater mass than the beta particles.

What particles do we know which have negative charge and low mass and so have the same properties as the beta particles? Yes, electrons have negative charge and low mass. Indeed, further experiments revealed that the beta particles were, in fact, just electrons being emitted from the atoms at extremely high speed (high energy).

But what were the alpha particles made of? In 1909, Ernest Rutherford found the answer.

Rutherford was famous for creating ingenious experiments using the very limited apparatus available at that time. As an example, to examine alpha particles Rutherford placed a sample of radioactive radon gas in a thin-walled glass tube and then surrounded that tube with a second glass tube which had a thicker wall. The alpha particles emitted by the radon were able to penetrate the first glass wall but could not escape the second wall. As a result, the alpha particles became trapped in the space between the two glass walls. After a week, the substance between the two walls was analysed and found to be helium, which meant that alpha particles are composed of the nuclei of helium atoms.

The nucleus of a helium atom is composed of two protons and two neutrons. Rutherford's discovery, therefore, explained why alpha particles had positive electric charge (supplied by the two protons in the helium nucleus), and also had greater mass than the beta particles (which were just electrons).

The alchemists

The type of element (hydrogen, helium, uranium, etc.) is defined by the number of protons it has in its atomic nucleus. If alpha particles (which each contain two protons) were being emitted from atoms, then that implied that the element was changing into a different element, the atoms of which had two fewer protons. To change an element into a different element (for example, changing lead into gold) had long been the dream of alchemists. However, until the start of the 20th century it was considered impossible for any chemical element to change into a different chemical element — a process known as *transmutation*.

However, all that changed when Rutherford — together with Frederick Soddy — discovered that a sample of the radioactive element thorium appeared to be converting into radium. When Soddy realised what was happening, he shouted out "Rutherford! This is transmutation!", to which Rutherford replied "For Christ's sake, Soddy, don't call it transmutation. They'll have our heads off as alchemists."

If an element is capable of spontaneously changing into a different element, it would be very desirable to find a way of quantifying that change. For example, if I have a sample of uranium, I would like to know how long it would take for that sample to change into a different element. In order to be able to quantify the speed of the transmutation, it would appear we would need to know the precise details underlying radioactive decay (in physics, whenever an unstable particle transforms into a different particle it is called "decay"). However, the physics which underlies radioactive decay is quantum physics, and — if you have read my fourth book — you will know that all quantum processes are fundamentally random. In other words, you can never analyse those processes to a deeper level to discover how they work — you just have to accept that they are completely random. So that leaves us with a problem: if completely random quantum physics underlies radioactive decay, then how can we ever hope to develop a precise formula which describes the transmutation?

Well, even though we can never accurately predict when the decay of a single atom will occur, if we have billions of decay events then we can determine the average likelihood of a decay occurring and we can use that to make reliable predictions (the same method a casino uses to be certain of making money from probabilistic events).

A single atom of uranium, for example, might decay in the next second, or it might take billions of years before it decays — we have no way of knowing, it is fundamentally random. However, if we are considering a sample of billions of atoms then we can use an averaging statistical measure to describe the rate of decay. The statistical measure which is generally used is called the *half-life* of an element. The half-life is defined as the length of time it would take for half of the atoms in a sample to decay.

As an example, the half-life of uranium is 4.5 billion years. That means if I have a sample of uranium and wait for 4.5 billion years, then half of my sample will have turned into a different element, leaving me with a sample containing only half the original amount of uranium. If I then wait another further 4.5 billion years, half of that remaining amount of uranium will turn into a different element, leaving me with only a quarter of the original amount of uranium.

Nuclear reactions

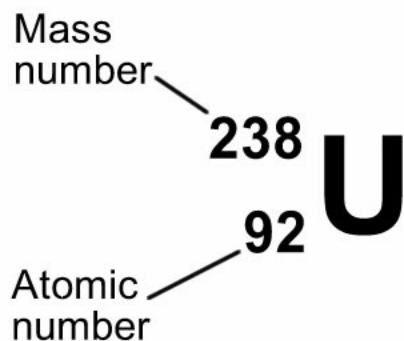
This discussion of radioactive decay has provided us with a clearer understanding of the cause of radioactivity. Radioactivity occurs in heavy elements whose nuclei are fundamentally unstable. Those elements are heavy precisely because their atoms have nuclei made of a high number of protons and neutrons. As Heinz Haber says in *Our Friend The Atom*: "Here Nature has crowded so many protons and neutrons into the nucleus that it becomes unstable". Parts of those heavy nuclei get radiated-away as those elements decay into elements which have more stable nuclei. It is the emitted particles which form alpha and beta radiation.

Let us now consider the effect of the two types of radiation. We will need to define two important numbers which describe an atomic nucleus.

The *atomic number* of a chemical element is the number of protons in the nucleus of each atom of that element. The atomic number is crucial because an element is uniquely defined by the number of protons in the nuclei of its atoms. For example, all hydrogen atoms contain one proton, and all oxygen atoms contain eight protons. Hence, the atomic number defines which element an atom represents.

The other important number which describes the composition of an atomic nucleus is the *mass number*. The mass number is the **total sum** of the number of protons and neutrons in the nucleus.

The conventional notation is to describe a sample of an element by writing its chemical symbol preceded by its atomic number (as a subscript) and its mass number (as a superscript). This convention is shown in the following example for uranium (the chemical symbol for uranium is "U"):



The previous example shows natural uranium, in which the nucleus has 92 protons and 146 neutrons, giving a total mass number of 238 (as shown in the previous image). Crucially, though, it is possible for an atom of a particular element to have the same number of protons **but a different number of neutrons**, in which case the substance is called an *isotope*. As isotopes of elements have different numbers of neutrons they therefore have different values for their mass number. The natural form of uranium shown in the previous diagram is uranium-238 where the "238" represents the mass number. Later in this book we will be examining the vital importance of the isotope uranium-235 for nuclear reactions.

Let us now consider what happens during the radioactive decay of an element. Remember, in alpha radioactive decay the nucleus emits a helium nucleus which is composed of two protons and two neutrons. So the emission of an alpha particle would decrease the atomic number by two (as the nucleus has lost two protons) and decrease the mass number by four (as the nucleus has lost a total of two protons and two neutrons). For the example of uranium-238,

this would transmute the uranium atom into an atom of thorium:



You can see from the previous diagram that thorium has an atomic number of 90 and a mass number of 234. You can also see the emitted helium nucleus forming the alpha particle.

Any process such as this in which atomic nuclei are modified is called a *nuclear reaction* (as opposed to a chemical reaction). When we describe a nuclear reaction using this notation, we must check two rules which are always true in any nuclear reaction:

1. The total number of protons and neutrons **before** the reaction is always equal to the total number of protons and neutrons **after** the reaction. In other words, the total mass number is always unchanged.
2. Electric charge is always conserved through a nuclear reaction.

Let us now examine how those two rules apply in the case of the alpha decay of uranium we have just considered.

Considering the first rule, and referring back to the previous diagram of alpha decay, you will note that the total number of protons and neutrons before the reaction (238, the mass number of uranium) is equal to the total number of protons and neutrons after the reaction (234 for the thorium nucleus, plus the mass number of four for the helium nucleus gives a total of 238). So the first rule is obeyed.

Now let us consider the second rule about conservation of electric charge. Every proton has a single unit of positive electric charge, so the total electric charge of the uranium nucleus before the reaction is 92 (the atomic number of uranium). After the reaction, the thorium nucleus has 90 units of positive electric charge (its atomic number), and the emitted alpha particle has two units of positive electric charge (the atomic number of helium). So electric charge is conserved through the reaction ($92 = 90 + 2$), and the second rule is therefore also obeyed.

The power of the atom

Alpha particles have enormous energy as they are ejected at about 5% of the speed of light. Plus, these particles are being constantly emitted as the individual atoms of a piece of radioactive material decays. Each click of a Geiger counter reveals the detection of one of these charged particles. You can see the use of a Geiger counter in the following direct link to *Our Friend The Atom*, immediately followed by the use of a cloud chamber to reveal the "constant shower" of radioactive particles emitted by a sample of radium:

<http://tinyurl.com/radioactiveparticles>

Now imagine the enormous quantity of energy which would be released if all those clicks of the Geiger counter happened at the same time. Or, equivalently, imagine if all those radioactive particles were emitted by the radium at the same time. Well, that is basically what happens in a nuclear explosion, with all the energy released in a few microseconds. According to Ernest Rutherford, a single gram of radium emits enough energy in its lifetime to raise a 500 ton weight a mile high.

Soddy commented on this energy release in a 1903 paper: "This reaction sets free more energy for a given weight than any other chemical change known. The energy of radioactive change must therefore be at least twenty-thousand times, and maybe a million times, as great as the energy of any molecular change."

This gives us our first insight into why nuclear reactions (and explosions) are so powerful. For example, the detonation of dynamite releases about ten electron-volts of energy per molecule, whereas a nuclear reaction can release millions of electron-volts of energy per nucleus. Multiply that value by the trillions of atoms in a sample of nuclear explosive and you can start to understand the source of its extraordinary power. As Bruce Cameron Reed says in his book *The History and Science of the Manhattan Project*: "This begins to give you a hint as to the

compelling power of nuclear weapons. An 'ordinary' bomb that contains 1,000 pounds of chemical explosive could be replaced with a nuclear bomb that utilizes only 1/100 of a pound of a nuclear explosive. Thousands of tons of conventional explosive can be replaced with a few tens of kilograms of nuclear explosive."

In a lecture in 1904, Soddy suggested presciently: "It is possible that all heavy matter possesses — latent and bound up with the structure of the atom — a similar quantity of energy to that possessed by radium. If it could be tapped and controlled what an agent it would be in shaping the world's destiny! The man who put his hand on the lever by which a parsimonious Nature regulates so jealously the output of this store of energy would possess a weapon by which he could destroy the Earth if he chose."

Beta radiation

We have just examined alpha radiation so we will now examine beta radiation.

As explained earlier, Rutherford had discovered that beta radiation from an atom was composed of an emitted electron. This happens when a neutron in the nucleus converts into a proton — by a process which we will examine later in this chapter.

Now let us consider the effect of beta radiation on atomic number and mass number. The conversion of the neutron into a proton increases the atomic number by one (one more proton in the nucleus) while leaving the mass number unchanged (total number of protons and neutrons is unchanged). Hence, the following diagram shows how an atom of carbon-14 is transmuted into an atom of nitrogen-14 after beta radioactive decay (atomic number increases by one, mass number stays the same):



You will see that an electron and a particle called an *antineutrino* are also emitted. We shall consider the antineutrino later in this chapter, but let us now consider why this conversion of a neutron in a proton necessarily results in an electron (the beta radiation) being emitted. Well, to see why, remember our two golden rules of nuclear reactions. The second golden rule says that electric charge must always be conserved through a nuclear reaction. With this in mind, remember a proton has positive electric charge, whereas a neutron has zero electric charge (an antineutrino also has zero electric charge). So when a neutron converts into a proton during beta decay we have a situation in which the amount of positive charge is increasing by one unit — which clearly breaks the law of conservation of charge. In order for balance to be restored, a negatively-charged electron must also be produced in addition to the proton. That electron represents the emitted beta radiation. Hence, the beta radiation emerges as a necessary result of the law of conservation of electric charge.

In 1946, a Bedouin shepherd named Muhammed edh-Dhib was herding his sheep through the barren rocky wilderness on the west side of the Dead Sea. High in the sheer cliffs above, he saw a small cave and decided to climb up to investigate. Deep in the cave he found a number of small pottery jars, and in those jars he found seven ancient parchment scrolls on which there was Hebrew writing.

Muhammed edh-Dhib had just discovered the Dead Sea Scrolls.

After selling the scrolls to an antiquities dealer, they caught the attention of an archaeologist who believed they dated back to Biblical times. But, unfortunately, there was no way of accurately dating the scrolls. It was left to science to provide the answer using a new technology which had just been developed.

It has just been described how the radioactive isotope carbon-14 will decay to nitrogen-14 via beta radiation. There is always a small amount of carbon-14 in the atmosphere, and this combines with oxygen to make carbon dioxide. Carbon dioxide is absorbed by plants during photosynthesis, and those plants are eaten by animals and humans, or that plant material is used by humans for creating parchment manuscripts. In other words, a significant

amount of carbon-14 ends up in all organic material.

When a plant dies, it stops absorbing new carbon-14 from the atmosphere. However, the carbon-14 it absorbed during its life continues to decay. The half-life of carbon-14 is known to be 5,730 years. Therefore, a sample which was 5,730 years old would only have half the amount of carbon-14 compared to a living organism. After 11,460 years it would only have 25% of the amount of carbon-14 compared to a living organism. On that basis, in the late 1940s the science of *radiocarbon dating* was developed which was based on analysing the proportion of carbon-14 in dead organic material.

The radiocarbon dating system was calibrated by measuring the amount of carbon-14 in dead bristlecone pines which are found along the west coast of North America. Bristlecone pines were known to be the oldest living life-forms on Earth. The age of bristlecone pines could be measured accurately by counting the rings of bark which make up the tree trunk. Using this method, the oldest bristlecone pine was found to be 5,000 years old.

By measuring the amount of carbon-14 in an ancient bristlecone pine, a graph showing variation of carbon-14 with age was produced. The task now was to apply this new technique to dating the Dead Sea Scrolls. A sample of the linen wrapping of the scrolls was tested using radiocarbon dating in 1955 and was found to be 1,917 years old, with a plus or minus error of 200 years. The announcement of this first major success of radiocarbon dating had a major impact on archaeology, and radiocarbon dating laboratories have been created around the world.

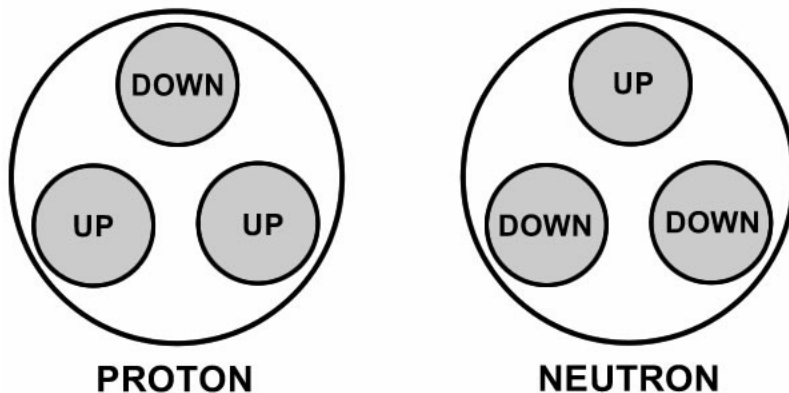
Radiocarbon dating represents another way in which radioactivity has provided benefits to humanity. Remember that the basis of all radiocarbon dating is beta radioactive decay.

The weak interaction

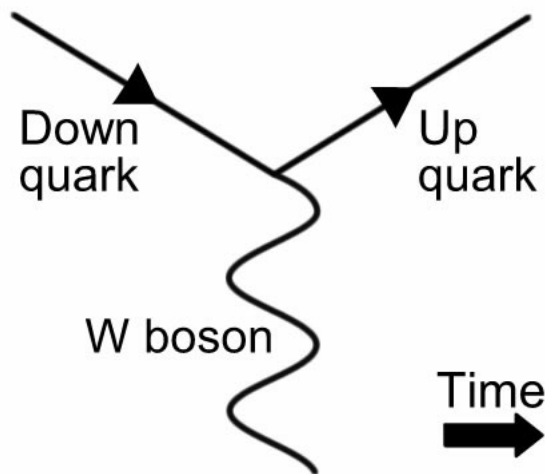
Let us now consider beta radioactive decay in more depth. This section is quite technical and is not essential knowledge for atomic bomb construction, so you can skip to the next chapter if you wish. However, if you want to understand the origin of the antineutrino particle which is emitted during beta decay, here is the explanation.

It is now known that the protons and neutrons which make up the nucleus of an atom are not truly elementary particles. Instead, protons and neutrons are each composed of three particles called *quarks*, and it is these quarks which are considered to be truly elementary. Beta radiation is produced from the interactions between those quarks.

Protons and neutrons are composed of two different types of quarks called *up* quarks and *down* quarks. A proton is composed of two up quarks and one down quark. A neutron is composed of one up quark and two down quarks:



There is a symmetry between up and down quarks, which means it is possible for a down quark to turn into an up quark, and vice versa. This conversion is achieved via the *weak interaction* in which the quark interacts with a *boson* (a force-carrying particle). The following diagram is a simple *Feynman diagram* which shows how a down quark can change to an up quark when it interacts with a W boson, one of the bosons associated with the weak interaction. You can see that the W boson also modifies the path of the original particle — as if acted on by a force — so it is said that the W boson is the particle which carries the *weak force*:

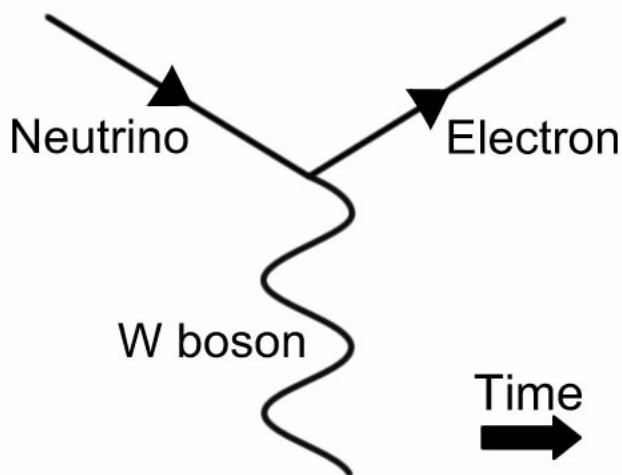


As stated earlier, a neutron is composed of two down quarks and one up quark. So this conversion of a down quark into an up quark via the weak interaction would have the effect of converting a neutron into a proton, which is what we know happens during beta radioactive decay. So we can now see why the weak interaction is so important for the emission of beta radiation.

For the next step in our analysis of beta radiation, we need to introduce a strange and elusive new particle: the *neutrino*. A neutrino is the only electrically-neutral matter particle, and it is virtually massless (i.e., it is extremely light) so therefore travels at speeds close to the speed of light. Because the neutrino is so light and has a ghostly nature, it passes through materials as though they were not there — including the materials which are used to make particle detectors. Unfortunately, a particle which flies straight through a particle detector without interacting with that detector is a particle which is not going to be detected easily. When Wolfgang Pauli predicted the existence of the neutrino in 1930 he said: "I have done a terrible thing. I have postulated a particle that cannot be detected!"

Don't get a neutrino and a neutron mixed up — their names might sound similar but they are completely different particles. As explained earlier, a neutron is composed of three quarks so it is not a genuinely elementary particle, whereas the neutrino is believed to be truly elementary (i.e., not composed of any other particles).

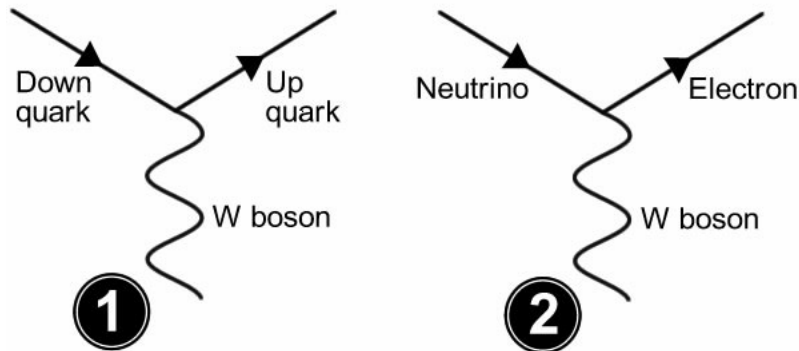
We have just seen that there is a symmetry between a down quark and an up quark, which is moderated by the weak interaction. There is a similar symmetry between a neutrino and an electron. The following diagram shows how a neutrino can change to an electron when it interacts with a W boson:



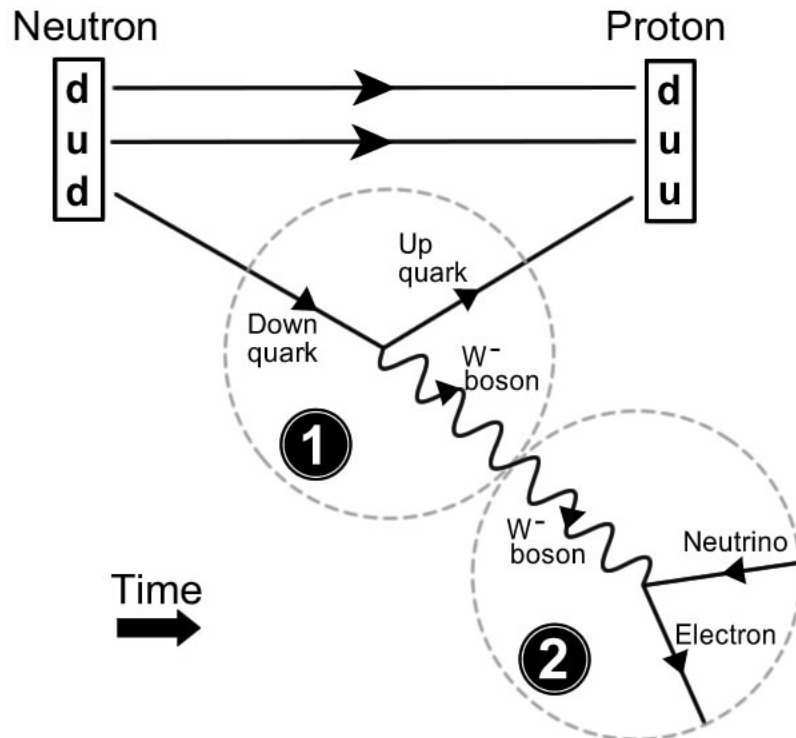
We have now generated two simple Feynman diagrams showing how the weak interaction can act to change down quarks into up quarks (and vice versa), and neutrinos into electrons (and vice versa). These simple Feynman diagrams which include just one vertex (junction) are called a *minimal interaction vertex*. These simple diagrams

can be used to completely characterise the behaviour of a force.

Let us draw our two minimal interaction vertices again, and, so we can refer to them, let us number them as diagram 1 and diagram 2:



These are the two diagrams which interest us as these are the diagrams which are relevant to beta radioactive decay. Let us now use these two Feynman diagrams to construct the complete Feynman diagram of radioactive beta decay. This can be achieved because Feynman diagrams have a very useful feature: they can be rotated and the interaction they describe will still remain valid. On that basis, the following diagram includes both diagram 1 and diagram 2 which have been joined together. Both diagrams have been surrounded by grey dashed circles to make their position clearer. You will see that diagram 1 has been rotated slightly anti-clockwise, while diagram 2 has been rotated clockwise by a larger amount:



In this way, you can see how the complete diagram for beta radioactive decay can be constructed via these minimal interaction vertices — just like Lego!

As you can see from the previous diagram, the end result is that a neutron changes into a proton, and in the process it emits an electron and a neutrino (these two particles shown at the bottom right of the diagram). The

emitted electron represents the beta radiation which is detected (remember, beta radiation is just a stream of electrons). The neutrino, meanwhile, does not interact with anything — it just shoots away at close to the speed of light straight through the walls of the laboratory as if they were not there and it is halfway to the moon in a matter of seconds.

Importantly, note that the arrow on the emitted neutrino seems to indicate that it is travelling backward in the time direction (you will see the forward time direction indicated by the arrow on the bottom left of the diagram). In a Feynman diagram, any particle which is travelling backward in time is equivalent to an *antiparticle* which is travelling forward in time. In other words, it is a particle of *antimatter* (see my fifth book for details). Hence, the emitted neutrino is not actually a neutrino at all: it is the antimatter equivalent of a neutrino which is called an *antineutrino*. This explains the origin of the antineutrino which is emitted during beta decay.

3

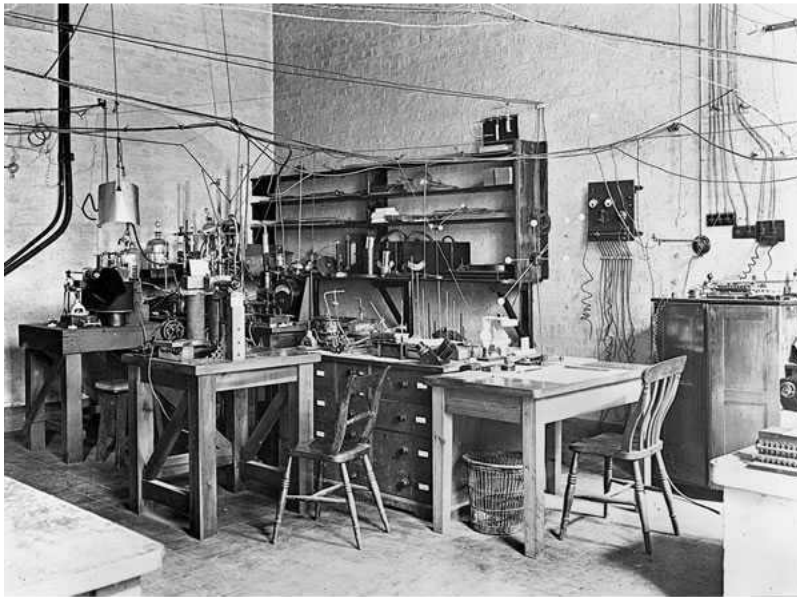
SPLITTING THE ATOM

As we have just seen, radioactive particles have high energy and are emitted from the nucleus at great speed. The question then arises: what would happen if one of these particles was directed to collide with a second nucleus? What would be the outcome?

That was the question first considered by Ernest Rutherford in 1909. Rutherford knew that the alpha particle had more mass than the beta particle, so an alpha particle colliding with a second atomic nucleus could potentially reveal the structure of that nucleus. With this in mind, Rutherford directed a stream of alpha particles at thin gold foil and placed a Geiger counter on the other side of the foil to detect the alpha particles as they passed through the foil. The intention was to consider the scattering of the alpha particles due to the nuclei in the gold foil.

To Rutherford's great surprise, some of the alpha particles bounced back from the foil. Rutherford realised this had to mean that there was a minute, comparatively-heavy, positively-charged nucleus at the heart of the atom. This was to be Rutherford's greatest discovery.

The following image shows Rutherford's laboratory at Cambridge, which was fairly typical of nuclear laboratories at that time. It looks very different from today's LHC, but no particle physics laboratory has made more historic discoveries than Rutherford's lab:



So the value of alpha particles as a nuclear probe was clear — but there was a problem. As described earlier, an alpha particle is a helium nucleus with two protons and therefore has positive electric charge. But a nucleus also has positive electric charge. So if an alpha particle is directed towards a second nucleus, the alpha particle will be repelled by the electric charge of that nucleus (two charges of the same sign will repel). This makes it very difficult to use a charged particle as a nuclear probe. The problem becomes more acute when an attempt is made to probe the nuclei of heavier elements as heavier elements have more protons in their nuclei and therefore have greater positive electric charge. As Richard Rhodes says in his book *The Making of the Atomic Bomb*: "Farther along the periodic table a barricade loomed. The naturally radioactive sources Rutherford used emitted relatively slow-moving alpha particles that lacked the power to penetrate past the increasingly formidable electrical barriers of heavier nuclei. For a time, the newborn science of nuclear physics stalled."

However, everything changed in 1932.

James Chadwick was a researcher at Rutherford's Cavendish Laboratory in Cambridge University. In 1932, in a letter to the British journal *Nature*, Chadwick announced the discovery of the neutron. As was described in Chapter One of this book, the atomic nucleus is composed of protons and neutrons. The neutron has approximately the same mass as the proton but it has no electric charge. It was realised very quickly that this meant that the neutron had the potential to be perfect for probing a nucleus as — unlike the positively-charged proton — it would not be repelled by the positive electric charge of the nucleus.

The neutron was to revolutionise the examination of the nucleus. The Nobel prize-winning nuclear physicist Hans Bethe once said that he considered everything before 1932 to be "the prehistory of nuclear physics, and from 1932 onward (after the discovery of the neutron) modern nuclear physics was born."

As Bruce Cameron Reed says in his book *The History and Science of the Manhattan Project*: "Neutrons would prove to be the gateway to reactors and bombs."

Artificial radioactivity

If nuclear physics had been stalled for over ten years since 1919, with the discovery of the neutron in 1932 it suddenly sprang into life. Progress would now be incredibly rapid as we shall see, with the discovery of nuclear fission in 1938, the construction of the first nuclear reactor in 1942, and the first man-made nuclear explosion in 1945 — events which all depended on the discovery of the neutron. After the discovery of the neutron, the race was on.

The first experimentalist to use neutrons to bombard atomic nuclei was Enrico Fermi. Fermi was a talented physicist based at the University of Rome who had been appointed to a full professorship at the age of 26. Fermi gained a reputation for having uncanny intuition about physics. It was even suggested that "Fermi had an inside track to God". His near infallibility at predicting the results of experiments meant his colleagues gave him the nickname "the Pope".

Fermi started his work on neutron bombardment in 1934, with a particular interest in bombarding the heavy metals which had many protons and neutrons in their nuclei. By bombarding various target elements, Fermi found he could make elements radioactive which would never normally be radioactive.^[5] As an example, by bombarding gold with neutrons he found that a neutron was sometimes absorbed by the gold nucleus, creating a heavier nucleus with one more neutron than the natural form. However, the resultant isotope with its extra neutron was highly-unstable, and — as explained earlier — an unstable atom is radioactive. So the resultant isotope atoms were highly radioactive with a very short half-life of sometimes only a few minutes. As a result, Fermi would have to run down the corridor with his unstable radioactive isotopes to test them with a Geiger counter in a second room before the radioactivity faded away (due to the extremely short half-life).

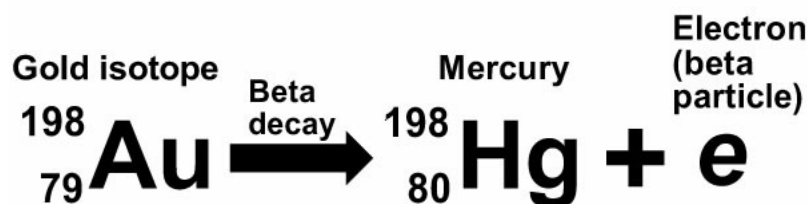
Let us consider the neutron bombardment of gold in more detail. The first stage is for the neutron to be absorbed by a gold nucleus, adding one to the mass number, and thereby creating an isotope of gold:



(You might want to check that our two rules of nuclear reactions apply here: the neutron is electrically-neutral so electric charge is conserved before and after, and the total number of neutrons and protons before the reaction is equal to the total number of neutrons and protons after the reaction: $1+197=198$).

But the additional neutron makes the nucleus unstable, so let us now concentrate on the gold isotope and consider the second stage of the process.

The nucleus of the unstable gold isotope decays via the beta radiation we considered in the previous chapter. That means a neutron in the nucleus transforms into a proton, with the emission of an electron (beta radiation):



So, as explained in the previous chapter, you can see that the result of the beta decay is to increase the atomic number of the gold nucleus by one, transmuting it into mercury ("Hg" is the chemical symbol for mercury). In the previous diagram you can see that the atomic number has increased from 79 (gold) to 80 (mercury).

Crucially, this shows that neutron bombardment can be used to increase the atomic number of the bombarded element, adding a proton to the nucleus and thereby transmuting it into a heavier element. We shall see later that this is the process by which heavy elements for nuclear weapons can be made. Indeed, as we shall see in Chapter Seven, the first atomic bomb used plutonium produced in an atomic reactor by this method of neutron bombardment.

If he could transmute gold into a heavier element via neutron bombardment, Fermi reasoned that he could also transmute uranium into a heavier element. However, that represented a much bigger deal: uranium is the heaviest natural element. If he was going to create a heavier element (a so-called *transuranic* element) then Fermi would be creating a substance which had never before existed on Earth.

But that appeared to be precisely what happened when Fermi bombarded uranium with neutrons. Beta emissions from the bombarded uranium appeared to suggest the usual increase in the atomic number by one. In June 1934, Fermi announced in *Nature* that his results "suggested the possibility that the atomic number of the element may be greater than 92 (the atomic number of uranium)." This announcement generated a great deal of excitement in Italy at the time, with some Italian journalists suggesting that this new element should be called "Mussolinium". However, this was to be one of the rare occasions when Fermi's intuition failed him.

In detecting a possible new heavy element, Fermi had been careful to eliminate the possibility that the radiation might be coming from some heavy element which was slightly lighter than uranium. However, he had never considered the apparently crazy possibility that it was coming from an element which was only half the weight of uranium, as if the uranium nucleus had been split in two. After all, such an effect had never been seen before.

But that was his big mistake ...

The discovery of fission

In 1912, the German Kaiser decided he wanted to support German science — and create a symbol of increasing German strength — by building a new scientific institute. The result was the Kaiser Wilhelm Institute in a suburb of Berlin. The architect of the institute decided to incorporate a spiked German army helmet on top of a round corner tower. The intention was undoubtedly to flatter the Kaiser but, as you can see at the top right of the following photograph, the end result was rather comical:



Among the first physicists to be based at the new institute were Otto Hahn and Lise Meitner. Hahn had established his reputation by previously working with Rutherford, and Meitner had published papers on alpha and beta radiation, gaining a reputation as an accomplished experimentalist. Einstein was later to call her the "German Marie Curie" (even though she was, in fact, Austrian).

By the 1930s, Hahn and Meitner had acquired enough experience to be acknowledged experts in the field of radioactivity (Richard Rhodes called Hahn "the ablest radiochemist in the world"). In 1935, they became intrigued by Fermi's results of bombarding uranium with neutrons and the claim that transuranic elements were being created. Hahn and Meitner decided to investigate Fermi's claim, and to help them in their task they enlisted the chemist Fritz Strassmann.

However, the investigations of Hahn and Meitner were to be derailed by the darkening atmosphere in Europe. In March 1938, Nazi Germany invaded Austria (the invasion was called the "Anschluss"). With Austria now part of the German Reich, Lise Meitner became a German citizen. This was a worrying development because Meitner was Jewish, so Germany's many anti-Semitic laws suddenly applied to her. Firstly, as part of the persecution of Jewish academics, Meitner's research funding was withdrawn. Meitner decided she had no choice but to flee Germany quickly. Niels Bohr arranged for her to find a research position at a physics institute in Sweden.

Hahn and Strassmann continued their research into the neutron bombardment of uranium, and kept Meitner informed of their progress. Hahn and Strassmann were discovering some very puzzling results. They appeared to be detecting barium as one of the side-products of the bombardment. This seemed to make no sense whatsoever as barium has an atomic number of 56 (56 protons in its nucleus), whereas uranium has an atomic number of 92. As was described earlier, alpha and beta decay might modify an atomic number by one or two places, but there was no known explanation for a modification of 36 places (92 minus 56).

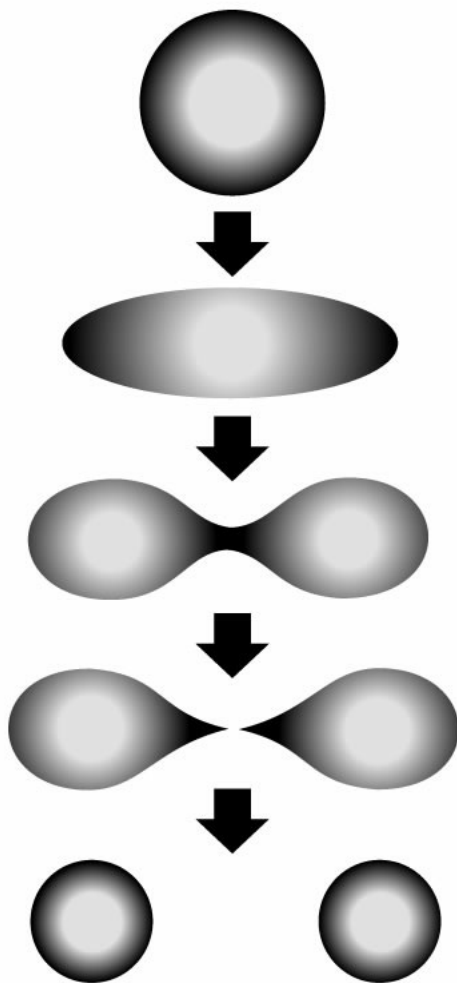
However, further extensive checking proved that this seemingly inconceivable result was genuine: barium was being generated. Hahn and Strassmann were excited, but they were also completely stunned. How could a nucleus of approximately half the size of the uranium nucleus be produced? It was as though the uranium nucleus was being split in two!

Hahn contacted Meitner by mail, desperate to obtain a solution to the puzzle: "Perhaps you can suggest some fantastic explanation", he wrote. "We understand that it really **can't** break up into barium." At that moment, Meitner was being visited by her nephew, Otto Frisch, who was also a nuclear physicist who was working in Copenhagen with Niels Bohr. They went for a walk into the nearby Swedish forest to clear their heads and to try to imagine a possible solution.

At one point, they both sat down on a log to discuss the problem. Meitner realised that a possible solution might come from the "liquid drop" model of the atomic nucleus which had been suggested by Niels Bohr. According to Bohr, the protons in the nucleus were loosely held together by a form of surface tension in much the same way as a small drop of liquid. The result was that the nucleus was not a hard ball at all, but instead resembled a "wobbly

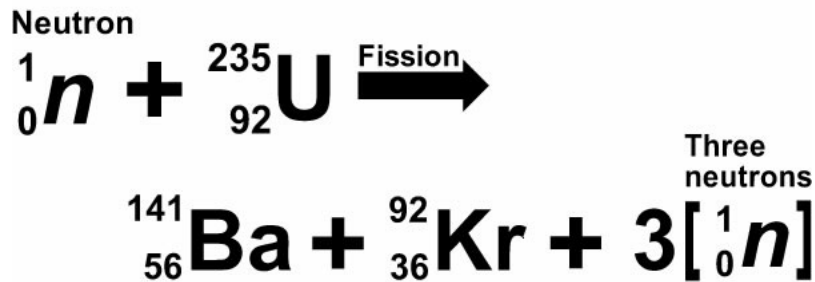
drop" of liquid. In that case, the addition of just a single neutron to the nucleus might well be enough to make the whole wobbly nucleus unstable, and it might well split in two.

Meitner found a pencil and a scrap of paper in her purse and drew some rough shapes to explain her idea. You can see a version of Meitner's shapes in the following diagram. After the addition of the extra neutron, the unstable nucleus wobbles and becomes elongated. A narrow "waist" appears, giving the nucleus the shape of a dumbbell. Each end of the dumbbell would repel the other end due to the intense electrical repulsion between the protons. This would result in the two halves flying apart and forming two smaller nuclei:



Otto Frisch coined the term *nuclear fission* to describe this splitting of a nucleus into two roughly equal parts. Let us consider this proposed fission reaction in more detail.

The proposal was that a nucleus of uranium-235 was absorbing a neutron, and that resulted in the nucleus splitting into a nucleus of barium and a nucleus of krypton, as described by the following reaction:



However, there was one other important factor to be taken into account. A nucleus of uranium-235 is so large that it needs 143 neutrons to act as "glue" to hold the nucleus together ($235-92=143$). This is more neutrons than is required in total by a nucleus of barium plus a nucleus of krypton. Hence, there would be an excess of neutrons after the reaction. You can see that the previous reaction also shows three neutrons being expelled. We will soon see that these three extra neutrons held the key to the all-important fission chain reaction.

You might like to check that the previous reaction with its three extra neutrons satisfies our golden rules for electric charge being conserved ($92=56+36$) and the total number of neutrons and protons being conserved ($235+1=141+92+3$).

Meitner and Frisch then turned their attention to calculating the amount of energy which would be released by this fission reaction, and the result left them totally astonished ...

The nuclear mousetrap

Immediately after a nucleus fissions, two smaller nuclei are created, and those are positioned a microscopic distance apart. As both of those nuclei are heavily positively-charged, there is a huge electrical repulsion between them — they would actually fly apart at 3% of the speed of light. Meitner and Frisch calculated that this represented an energy of about 200 million electron-volts, which is enormous when you consider that — as stated in the previous chapter — the detonation of dynamite releases only about ten electron-volts per molecule. This meant that a nuclear explosion based on fission would be twenty million times more powerful than a conventional explosion using the same amount of material. One kilogram of uranium would have the same explosive power as twenty million kilograms (equivalently, twenty thousand tons) of conventional explosive.

As another way of looking at it, Otto Frisch calculated that the energy from each split uranium nucleus would be enough to make a grain of sand visibly jump. That might not sound very impressive, until you realise that in each gram of uranium there are 2.5×10^{21} atoms, which looks even more amazing when it is written as 2,500,000,000,000,000,000,000 atoms. It has been estimated that there are "only" 10^{18} grains of sand on all the beaches on Earth, which means a single gram of uranium possesses enough energy to make all the grains of sand on all the beaches on Earth jump — quite high. It is clear how an atomic fission bomb can release enough energy to cause catastrophic damage.

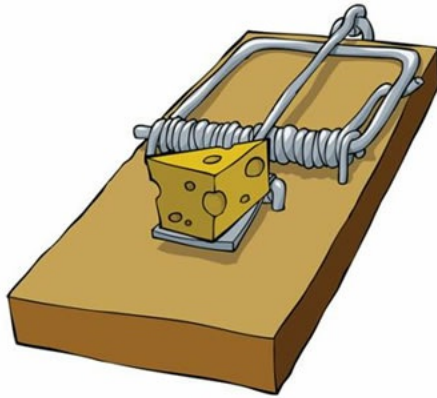
Lise Meitner wondered about the source of this tremendous energy, and then she remembered a lecture she had attended in 1909 given by Albert Einstein. In the lecture, Einstein had derived his famous formula $E=mc^2$ which described the equivalence between mass and energy, and explained how a small amount of mass could release a huge amount of energy. Meitner realised that if a uranium nucleus split into two smaller nuclei of barium and krypton then the total mass of the barium and krypton nuclei would be very slightly less than the mass of the original uranium nucleus. Some mass was being lost during fission. Meitner calculated that the amount of mass being lost was approximately equal to a fifth of the mass of a proton, and if that amount of mass was substituted into the $E=mc^2$ formula it could be calculated that the equivalent amount of energy was 200 million electron-volts, which was precisely the amount of energy being released by fission.

So it was clear that this was the source of the energy being released by fission: some of the mass of the uranium nucleus was being converted into energy. Let us consider this storage and release of energy in more detail.

Protons have positive electric charge, so they would naturally tend to repel each other via the electric force (like charges repel, opposite charges attract). It is therefore difficult to hold protons together in an atomic nucleus, and this must be achieved by a force which is stronger than the repelling electric force. That force is the *strong nuclear force*, the force which holds protons together in the nucleus. The strong nuclear force has a very short range

compared to the electric force. Imagine the electric force acting like a spring trying to push protons apart. Then, in order to form a nucleus, protons must be pushed together against that electrical repulsion until the protons are very close together and then the short-range strong force can lock them into place like a latch.

The mechanism resembles a mousetrap. The electric force acts like the spring on the mousetrap. You have to put energy into the mousetrap in order to bend the spring and prime the trap, and then the strong force acts to lock the trap in place:



In the Disney television programme *Our Friend The Atom*, Heinz Haber compares the energy trapped in the nucleus to a mousetrap which has been set. Here is a direct link to the relevant point in the programme:

<http://tinyurl.com/fissionmousetrap>

How does the strong force work? How can it hold the protons together? Well, when protons and neutrons are pushed very close together, the strong force locks them into place by releasing an amount of energy via gamma radiation. This released energy is called the *binding energy*. If you then wanted to pull the neutrons and protons apart again to return the system to its initial state — fighting against the attractive strong force — you would have to do work to put energy into the system which is equal to that lost binding energy. This is due to the law of conservation of energy: if energy was lost, you will have to replace that energy to return the system to its original state. So it can be seen how the binding energy acts to lock protons and neutrons together via the strong force.

This release of binding energy during the formation of nuclei — by compressing protons and neutrons together — is called *nuclear fusion*. This process occurs in the centre of stars, forming light elements such as helium from hydrogen, with the release of huge amounts of energy.

But for heavy elements being fused together, with many protons in their nuclei, the electrical repulsion becomes an ever-larger factor. In other words, the "spring" on the mousetrap becomes much stronger, and the mousetrap becomes harder to set (it becomes harder to push the nuclei together due to the electrical repulsion). In that case, the energy required to push the protons together is larger than the binding energy that would be released when the strong force locks the protons together. Therefore, the generation of energy via nuclear fusion is then no longer possible. Any element heavier than iron cannot be used for energy production via nuclear fusion inside a star.

But when a star explodes in a massive supernova explosion, the pressures and temperatures are so great that even heavy elements, heavier than iron, can be fused together, pushing against the tremendous strength of the electrical "spring". This is how uranium, the heaviest naturally-occurring element is formed: all the uranium now found on Earth was created in one or more supernova explosions over six billion years ago.^[6] Luckily, the 4.5 billion year half-life of uranium explains why not all of the uranium on Earth has vanished due to radioactive decay over that period.

The energy then lies trapped in the uranium nucleus for billions of years, like a primed mousetrap. And when the nucleus fissions, the trap explodes into action. As we have seen, the two halves of the fissioned nucleus fly apart with tremendous energy because of the intense electrical repulsion between them. The energy stored in the mousetrap is finally released. As Robert Serber says in his book *The Los Alamos Primer*, the two nuclei "would fly apart with an amount of energy equal to the work that went into pushing them together."

So when we are watching a nuclear explosion, we are watching the energy which has been trapped in atoms by supernova explosions billions of years ago, energy which has waited half the age of the universe before being set

free. Maybe that thought should fill us with increased awe when we watch the extraordinary phenomenon that is a nuclear explosion.

4

THE CHAIN REACTION

At this point in our story, we must introduce one of the most fascinating characters in the story of the atomic bomb. This is a man who played a seemingly peripheral role during the development of nuclear physics in the early decades of the 20th century, but he had a vision of the true potential of nuclear power and, perhaps more importantly, he was the first man to see the possibility of a nuclear chain reaction. As we shall soon see, he then went on to play a central role in the decision to develop nuclear weapons by enlisting the help of none other than Albert Einstein.

That man was Leo Szilard.

Leo Szilard (the "s" is silent) was born in Budapest in Hungary in 1898. After deciding he could not achieve his ambitions in Hungarian universities, he moved to Germany. He started a course on engineering, but switched to study physics at the University of Berlin because he heard that several Nobel laureates including Albert Einstein and Max Planck taught at the university. At this point we start to see Szilard as a man who was perhaps unsure of the direction he wanted to take in life, a man who for most of his life lived in rented rooms, living out of suitcases — which was perhaps not a bad idea given the political situation in Germany at the time (Szilard was a Jew): "All I had to do was turn the key of the suitcase and leave when things got too bad."

Although Szilard was studying physics, he was more of an inventor and entrepreneur than an academic. In fact, he might even be described as something of a "hustler", always with an eye for a money-making scheme. Rather bizarrely, he approached Albert Einstein with an idea for a new type of refrigerator which had no moving parts. Even more bizarrely, Einstein agreed to work with Szilard to develop the fridge, with Einstein using his earlier patent office experience to formulate a patent application.

Yes, the Einstein fridge really was a thing.

As we shall see later, Szilard's strong working relationship with Einstein was to play an important role in the development of the atomic bomb.

Perhaps Szilard's greatest talent was an almost uncanny ability to visualize the future and sense trends — perhaps a necessary talent for any successful entrepreneur. In the late 1920s he became aware of the promising advances in nuclear physics and was particularly interested to hear of Chadwick's discovery of the neutron in 1932. Szilard immediately realised the potential of the neutron as a way to probe the nucleus without being repelled. Might the neutron also provide a way to unlock atomic power?

In 1933, Adolf Hitler was appointed Chancellor of Germany, prompting Szilard to move to London in anticipation of the Nazi persecution of the Jews. It was in London that Szilard read a remarkable book by another visionary figure: the English science fiction writer H.G. Wells.

H.G. Wells had become aware of the discoveries of Rutherford and Soddy (which were described in Chapter Two) which suggested that there was a huge reserve of energy contained in the nucleus of an atom. Let us remind ourselves of Soddy's alarming prediction in 1904: "It is possible that all heavy matter possesses — latent and bound up with the structure of the atom — a similar quantity of energy to that possessed by radium. If it could be tapped and controlled what an agent it would be in shaping the world's destiny! The man who put his hand on the lever by which a parsimonious Nature regulates so jealously the output of this store of energy would possess a weapon by which he could destroy the Earth if he chose."

Such a dramatic statement must have resonated with H.G. Wells who, in 1913, wrote a remarkably prophetic book called *The World Set Free*. In that book, Wells imagines a world in which nuclear power has been harnessed by mankind, but it has also been used to create atomic bombs. Szilard described the plot of *The World Set Free* in his own words: "Wells describes the liberation of atomic energy on a large scale for industrial purposes, the development of atomic bombs, and a world war which was apparently fought by an alliance of England, France, and perhaps including America, against Germany and Austria, the powers located in the central part of Europe. He places this war in the year 1956, and in this war the major cities of the world are all destroyed by atomic bombs."

At the time, Szilard was living at the Imperial Hotel in Russell Square in London, not far from the British Museum, living off his savings of £1,500 (£100,000 in today's money). On the morning of September 12th 1933, Szilard was lounging in the hotel lobby when he read a report in *The Times* newspaper of one of Rutherford's recent speeches at the nearby meeting of the British Association for the Advancement of Science. Rutherford had explained

how alpha particles could be accelerated to such energies that they might be able to release energies from atomic nuclei. But Rutherford said he believed this would require more energy input than could be gained. Rutherford said that "anyone who looked for a source of power in the transformation of the atoms was talking moonshine (meaning foolish talk, or nonsense)."

According to Richard Rhodes: "All of which made Szilard restive. The leading scientists in Great Britain were meeting and he wasn't there. He was safe, he had money in the bank, but he was only another anonymous Jewish refugee down and out in London, lingering over morning coffee in a hotel lobby, unemployed and unknown."

Szilard was annoyed by Rutherford's negativity. He threw down his newspaper and stormed out of the hotel onto the street. Walking down the road, Szilard then had a flash of inspiration which he described in his own words: "Pronouncements of experts to the effect that something cannot be done have always irritated me. That day as I was walking down Southampton Row and was stopped for a traffic light, I was pondering whether Lord Rutherford might not prove to be wrong. As the light changed to green and I crossed the street, it suddenly occurred to me that if we could find an element which is split by neutrons and which could emit two neutrons when it absorbed one neutron, such an element, if assembled in sufficiently large mass, could sustain a nuclear chain reaction, liberate energy on an industrial scale, and construct atomic bombs."

According to Richard Rhodes: "Szilard was not the first to realize that the neutron might slip past the positive electrical barrier of the nucleus; that realization had come to other physicists as well. But he was the first to imagine a mechanism whereby more energy might be released in the neutron's bombardment of the nucleus than the neutron itself supplied." In particular, this was the first time that anyone had conceived of the principle of using neutrons to generate a chain reaction.

So what did Szilard mean by a "nuclear chain reaction"? Well, as he suggested, if a nucleus can be split (fissioned) by a neutron, then that split nucleus can produce additional neutrons (as described in the previous chapter). Those neutrons can then proceed to fission other nuclei. If a split nucleus emits two neutrons, then that will result in two further nuclei being fissioned. If those two nuclei emit two neutrons each, then that means there will be four neutrons in total produced, and those neutrons can proceed to split a further four nuclei. By this constant doubling of numbers, the total number of fissioned nuclei will rise extremely rapidly to a huge number.

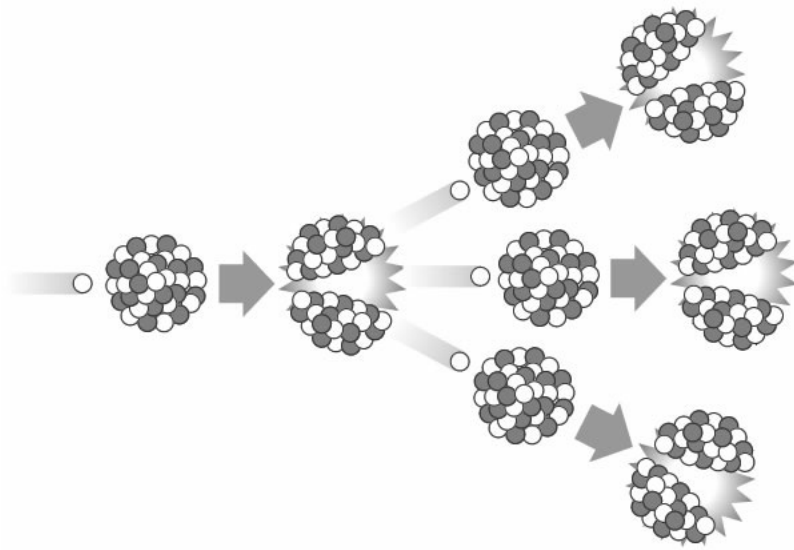
Remember the analogy from the previous chapter of the energy trapped in an atomic nucleus being like a mousetrap. In the Disney television programme *Our Friend The Atom*, Heinz Haber performs an excellent visual demonstration in which many mousetraps (representing nuclei) are used to generate a "chain reaction" of mousetraps and ping-pong balls. Here is a direct link to the relevant point in the programme:

<http://tinyurl.com/mousetrapreaction>

The programme segment also considers the discovery of fission by Hahn and Strassmann. The mousetrap chain reaction idea was also used in a clever (and destructive) Pepsi advert:

<http://tinyurl.com/mousetrapchainreaction>

The following diagram shows the start of a chain reaction in which each split nucleus releases three neutrons:



Bearing in mind that a neutron from a fissioned nucleus moves at about 5% of the speed of light, this chain reaction is clearly going to release its energy extremely quickly. With a great deal of energy released with each fissioned nucleus, Szilard realised that the total amount of energy released by an uncontrolled chain reaction could be used to create an atomic bomb.

But Szilard had his idea in 1933, and in the previous chapter we saw that nuclear fission was not discovered by Hahn and Strassmann until 1938. So, for the time being, Szilard's idea about a nuclear chain reaction would have to remain just an idea.

The New World

As another example of Leo Szilard's uncanny foresight, he saw the oncoming Second World War with great clarity. In 1936 he announced his intention to "stay in England until one year before the war, and then move to New York City". It was a very strange thing to say as no one in 1936 could be sure if there would be a war, or when it would start. But Szilard's prediction was perfectly accurate: he moved to America in 1938, precisely one year before the war began.

Szilard was joining a group of brilliant physicist refugees from Nazi Germany who were either Jewish or had Jewish family connections. The group included Enrico Fermi, Eugene Wigner, Hans Bethe, Edward Teller, John von Neumann, and Emilio Segrè. According to Emilio Segrè: "America looked like the land of the future, separated by an ocean from the misfortunes, follies, and crimes of Europe." All of those aforementioned refugee physicists were destined to work on the American project to develop the atomic bomb, designed to be deployed against their former persecutors in Germany.

In 1939, Leo Szilard travelled from New York to Princeton to visit his friend Eugene Wigner who informed Szilard of the recent sensational news of the discovery of fission by Hahn and Strassmann. According to Szilard: "Wigner told me of Hahn's discovery. Hahn found that uranium breaks into two parts when it absorbs a neutron. When I heard this I immediately saw that these fragments, being heavier than corresponds to their charge, must emit neutrons, and if enough neutrons are emitted then it should be, of course, possible to sustain a chain reaction. All the things which H.G. Wells predicted suddenly appeared suddenly real to me."

Szilard's phrase describing the two resulting fissioned nuclei as being "heavier than corresponds to their charge" is interesting. This principle was described in the discussion of fission in the previous chapter. A nucleus of uranium is so large that it needs many neutrons to act as "glue" to hold the nucleus together. But this is more neutrons than is required in total by the two resulting fissioned nuclei, hence the phrase describing the uranium nucleus as being "heavier than corresponding to its charge". There would be more neutrons than required. This fact led to Szilard's suspicion that neutrons would be released by fission.

As Szilard realised earlier, in order for there to be a chain reaction, a uranium nucleus had to emit two neutrons when it was absorbed and split by one neutron. Whether or not this was the case was something Szilard had to

determine.

Szilard was still living an unsettled life in America, but he arranged to use a laboratory in Columbia University in New York City for three months. In his experiment, he bombarded uranium with neutrons in order to fission the uranium nuclei. Any neutrons being released as a result of fission would be detected and displayed on an oscilloscope. According to Szilard: "If flashes of light appeared on the screen, that would mean that neutrons were emitted in the fission process of uranium and this in turn would mean that the large-scale liberation of atomic energy was just around the corner. We turned the switch and saw the flashes. We watched them for a little while and then we switched everything off and went home."

Analysing the results, Szilard found that there were approximately two neutrons released per fissioned nucleus, which would be enough to sustain a chain reaction. According to Szilard: "That night there was little doubt in my mind that the world was headed for grief."

The letter from Einstein

Leo Szilard was now confident that a chain reaction would soon be achieved, and there was now a race with Nazi Germany to create the first atomic bomb. However, initial contacts with the military were not promising. The only interest came from a naval physicist who worked on submarine propulsion and was attracted to the idea of a power source which did not require oxygen (remember the discussion of the USS Nautilus in Chapter One).

Szilard became frustrated at the lack of progress. According to Richard Rhodes, at this point: "despite his Olympian ego not even Leo Szilard felt capable of saving the world entirely alone." Szilard contacted his fellow refugee physicists Edward Teller and Eugene Wigner and asked for their help. Wigner, in particular, felt it was essential to inform the U.S. government, maybe even going straight to the president if necessary. Szilard wondered if he could get his old refrigerator engineer friend, Albert Einstein, to come on board. Einstein was no longer producing useful work, but he was still the most famous physicist in the world and his word would carry weight in Washington D.C.

Despite being unable to swim, Einstein was a keen sailor, and Szilard learned that Einstein was away sailing in Peconic Bay on Long Island (Einstein had a reputation as a lousy sailor, getting stuck on a sand bar once, and on another occasion almost drowning when his boat capsized). Einstein was staying at a summer house by the sea on Nassau Point.

Maybe physicists are generally not good at directions and vehicles, because Szilard could not drive and had to rely on his friend Eugene Wigner to drive to Long Island. They set out on their journey on Sunday, July 16th, 1939. Inevitably, they got lost and spent hours circling the narrow country lanes, trying in vain to locate Einstein's house.

On the verge of giving up, Szilard saw a seven-year-old boy standing on the curb, so Szilard asked him: "Do you know where Professor Einstein lives?" Luckily, the boy knew the way and was able to direct them to Einstein's house at the end of Old Cove Road. It is interesting to imagine how the world might have turned out differently if Szilard and Wigner had never met that seven-year-old boy, and therefore never managed to find Einstein.

Once Szilard explained the principle of the nuclear chain reaction to Einstein, Einstein exclaimed "I never thought of that!" Einstein agreed to dictate a letter which was to be delivered to Franklin Roosevelt, the president of the United States. Here is an edited portion of the letter which was sent:

*Albert Einstein
Old Grove Rd.
Nassau Point
Peconic, Long Island
August 2nd, 1939*

*F.D. Roosevelt,
President of the United States,
White House
Washington, D.C.*

Sir:

Some recent work leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. I believe therefore that it is my duty to bring to your attention the following facts and recommendations:

It may be possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

This new phenomena would also lead to the construction of bombs, and it is conceivable — though much less certain — that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory.

In view of this situation you may think it desirable to have some permanent contact maintained between the administration and the group of physicists working on chain reactions in America.

*Yours very truly,
Albert Einstein.*

When Roosevelt was handed the letter and read it, he agreed that this required investigation, but there was still no great urgency and only limited resources were assigned to the investigation.

However, everything changed on the morning of December 7th, 1941. On that morning, Japan attacked the U.S. Pacific Fleet at Pearl Harbor, triggering the entry of America into the war. From that point, the race to build the first atomic bomb had begun. Codenamed the *Manhattan Project*, it was to be the largest single industrial and scientific project in the history of the world.

In his book *Trinity*, Jonathan Fetter-Vorm describes the challenge of the Manhattan Project: "For all the money and infrastructure invested, the challenge of the Manhattan Project was still rather mystical. Somehow, a very small chunk of glowing metal was going to be transformed into the largest explosion that humans had ever made."

Oppenheimer

Robert Oppenheimer had been a precocious child. He was born in 1904 to an ambitious family. When his grandfather saw his five-year-old grandson playing with bricks, he gave him an encyclopaedia of architecture. Oppenheimer developed an interest in science at an early age — mainly chemistry and mineralogy — and at the age of twelve he gave a lecture to the members of the New York Mineralogical Club. He had a wide range of other interests, including writing poems at the age of ten. At school, Oppenheimer did not hide the fact that he felt superior to the other children, telling them: "Ask me a question in Latin and I will answer you in Greek". He was described by a childhood friend as "very frail, very shy, very brilliant of course, and very superior."

Rather a sickly child, at the age of eighteen he was sent to spend the summer at a ranch in New Mexico to toughen him up before university. The ranch was in the mountains northeast of Santa Fe, and Oppenheimer thrived in the wilderness environment, chopping wood and learning to ride horses. The area was to make a lasting impression on Oppenheimer who was to say later that his two great loves were "physics and desert country".

At Harvard to study chemistry, Oppenheimer proved adept in a wide range of additional subjects including French literature and philosophy. He also wrote short stories and poetry, often giving an impression of being overly-sensitive and pretentious — and something of a drama queen. In a letter to a friend, he described his recent activities as: "Read Greek, committed faux pas, and wished I was dead. Voila".

In university, Oppenheimer extended his esoteric interests to include Hindu philosophy, while transferring his main field of study from chemistry to physics. However, Oppenheimer struggled with the laboratory work, "unable even to solder two copper wires together", and, as a result, he concentrated on theoretical physics. Oppenheimer went on to make significant contributions in the field of quantum mechanics.

Here is a photograph of Robert Oppenheimer:



In 1942, in a surprising move, Oppenheimer was selected to be the scientific director of the Manhattan Project. Oppenheimer was a surprising choice in many ways. Firstly, he was a theoretical physicist, rather than an experimental physicist. Oppenheimer may have been able to speak six languages, but surely someone in charge of running the largest-ever research and development project should have been able to solder two copper wires together.

Secondly, while Oppenheimer had no Nobel Prize he would be in charge of several physicists who did have Nobel Prizes. It was not so much a question of whether Oppenheimer was their intellectual equal — he was undoubtedly brilliant — it was more a question of whether the other physicists would be happy working under him.

Thirdly, Oppenheimer was well-known for having left-leaning political sympathies. Though he was not a communist, many of his friends were. Would he be a security risk? That was to be a question which dogged Oppenheimer throughout his career.

But what was impressive about Oppenheimer — and the reason he was selected to be project director — was his ambition and determination to make the project a success. Oppenheimer saw this as his opportunity to prove to others what he knew all along: that he was the best.

Los Alamos

One of the first decisions to be made was where to locate the development laboratory for the Manhattan Project. As Bruce Cameron Reed says in his book *The History and Science of the Manhattan Project*, the selected location had to satisfy the following criteria: "A laboratory site would have to be isolated, relatively inaccessible, have a climate that would permit year-round construction and operations, be large enough to accommodate a testing area, and be sufficiently inland to be secure from enemy attack."

Oppenheimer recommended the "desert country" of New Mexico where he spent summers riding horses as a youth. Specifically, he knew there was a ranch school in Los Alamos which would be ideal. The army engineers were concerned about the narrow access road from Santa Fe and the poor water supply, but otherwise agreed with Oppenheimer that it would be ideal.

The geography of Los Alamos is striking and unusual. It is situated on the slopes of the 13-mile-wide extinct volcanic crater called the Valles Caldera (or Jemez Caldera). Over a million years, rainfall down the slopes has carved a series of steep canyons, leaving a flat-topped hill on either side of each canyon. A small flat-topped hill like this is called a *mesa* ("mesa" is Spanish for "table"), and Los Alamos was spread out over four mesas. The following photograph shows the present-day town of Los Alamos spread over the four mesas, with the canyons visible. The location of the original Los Alamos laboratory is indicated by an arrow:



Because of its location on top of the mesa, the Los Alamos laboratory was given the nickname "The Hill".

For the remainder of 1942, and into the first few months of 1943, Oppenheimer had the job of touring the physics departments of American universities to persuade the best available physicists to join the Manhattan Project. His task was not made easier by the need to maintain strict secrecy. Although he could not describe the work in detail, he could state that this was important work which would probably end the war to end all wars. Almost every physicist he approached decided to join the project.

Security within Los Alamos was strict. In order to reduce the possibility of security leaks, the entire Los Alamos site was fenced-off. As a result, the facility operated like a small town, with a school, a general store, a family doctor, a library, and even a movie theatre. With a whole town having to be built from scratch, conditions were primitive. There were no paved roads, and fresh food and water was scarce. Los Alamos resembled a frontier town of the old American West. A wife of one of the physicists described her role as being "akin to the pioneer women accompanying their husbands across uncharted plains westward."

Initially, the military insisted on strict security in the scientific section of Los Alamos, with a need-to-know restriction on the transfer of information between sections. However, Oppenheimer argued that scientific progress could only be made if there was freedom of speech and free exchange of ideas. Eventually, the military agreed to complete scientific openness within the camp, but it came at a cost: the technical area of Los Alamos had to be entirely surrounded by high barbed-wire fence. For the refugee physicists from Europe, this generated the uneasy feeling that they were in a concentration camp.

The following photograph shows the entrance to the technical area of Los Alamos in 1944. The visual similarity to a concentration camp is clear:



The Los Alamos Primer

Because of the strict security, new scientific personnel arriving at Los Alamos were completely unaware of the work they would be doing or the goal of the Manhattan Project. In order to bring them up to speed quickly, it was decided to hold a series of introductory lectures. The task of giving the lectures fell to Robert Serber who was a former postdoctoral student of Oppenheimer. Serber's lectures were recorded in a 24-page document which was called the *Los Alamos Primer*.

The document represents everything that was known in 1943 about how to make an atomic bomb. In which case, it is surprising that this top secret document was declassified in 1965. Once declassified, the document was released into the public domain.

Here is a link to the original 1943 Los Alamos Primer document:

<http://tinyurl.com/losalamosprimer>

It is basically a recipe for making an atomic bomb.

The document was available on the Los Alamos website until 2001. However, everything changed after the September 11th attacks of that year. Because of the possibility of terrorists obtaining information about atomic bomb manufacture, the document was removed from the website on that day. But, as is the nature of the internet, once the document was released the genie could never be put back in the bottle.

Using the Los Alamos Primer as our starting point, let us now consider the physics of how to make an atomic bomb, starting with the most important calculation ...

5

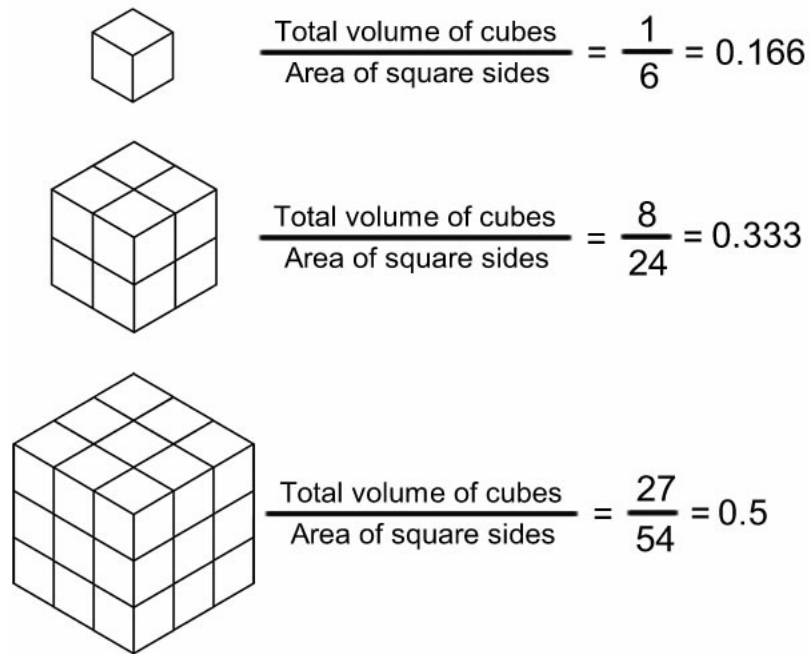
THE CRITICAL MASS

In this chapter we will discover the crucial importance of the volume of the fissionable material which is used to make an atomic bomb. We shall see that there exists a certain size of material at which point the chain reaction will be unstoppable and an explosion becomes a certainty. This amount of material is called the *critical mass*.

The accurate calculation of the value of the critical mass is the most important calculation in the construction of a nuclear bomb. Indeed, when you consider the impact of nuclear weapons, this is surely one of the most important calculations in the history of science. Therefore, this chapter considers the calculation of the critical mass. The calculation is inevitably highly mathematical, so most of the mathematical details have been included in the Appendix at the end of this book. I do not believe the detailed calculation of critical mass presented in this book can be found anywhere on the internet.

The ratio of volume to surface area

The existence of a critical mass relies on the fact that the ratio of an object's volume to its surface area is greater for larger objects than for smaller objects. In order to understand this principle, consider the following diagram showing three cubes of different sizes:



The first cube at the top of the diagram is the smallest. We can say that its volume is equal to one unit of volume (one small cube). If you count the sides of that small cube, you will find that it has six sides. So the total surface area of the cube is six units of area. This means that the all-important ratio of volume to surface area is then 0.166, as shown on the diagram.

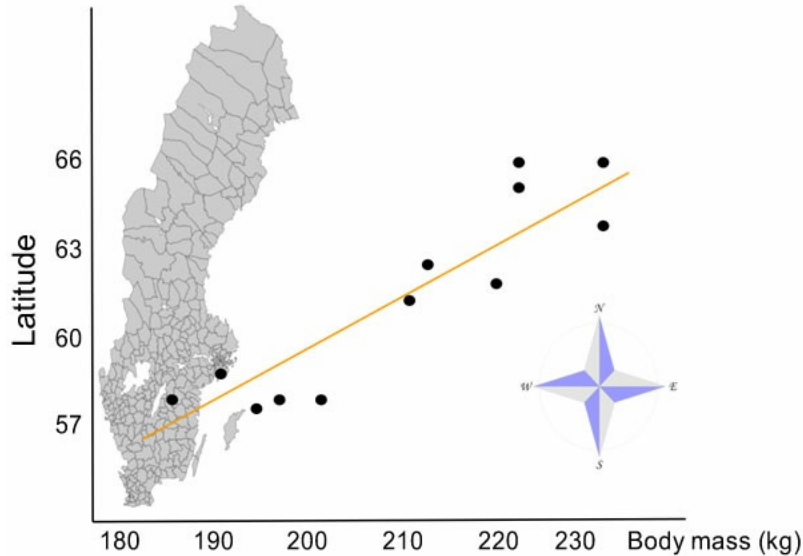
The second cube in the diagram has a total volume of eight small cubes (you can count them), and a total surface area of 24 units. Hence, the ratio of volume to surface area has increased to 0.333, as shown on the diagram.

The final cube, shown at the bottom of the diagram, is the largest. You can count that it has a total volume of 27 cubes, and a total surface area of 54 units. Hence, the ratio of volume to surface area has increased to 0.5, as shown

on the diagram.

So larger objects have a greater ratio of volume to surface area. Interestingly, this explains why — in general — larger animals are found in cold climates, e.g., polar bears, and smaller animals are found in hot climates, e.g., rodents (I guess we are supposed to ignore the elephant in the room). A small animal has a larger surface area (proportionately) and so can cool down better in a hot climate. Whereas a larger animal has a proportionately smaller surface area so loses less heat through its skin. This principle is called *Bergmann's rule*.

The following diagram illustrates Bergmann's rule by showing how larger moose are found in more northerly parts of Sweden:



Why does this principle allow us to build a bomb based on nuclear fission? To put it simply, if we have a sufficiently large amount of fissionable material then the build-up of neutrons inside the volume of the material will be larger than the loss of neutrons through the surface area of the material. When that happens, the resultant chain reaction will increase exponentially and the result will be an explosion.

If we have a small amount of fissionable material then the surface area of that material will be proportionately quite large compared to its volume. As a result, the amount of neutrons being lost through the surface will be greater than the amount of neutrons being generated inside the material and the chain reaction will be unable to continue.

As the amount of mass is progressively increased, the surface area becomes proportionately smaller compared to the volume of the material, and so the loss of neutrons also becomes proportionately smaller. As the amount of mass continues to increase it is clear that a certain balance point will be reached at which point the loss of neutrons through the surface will be precisely equal to the build-up of neutrons inside the material. This amount of mass is called the critical mass. A sample of material this size — or larger — is going to explode.

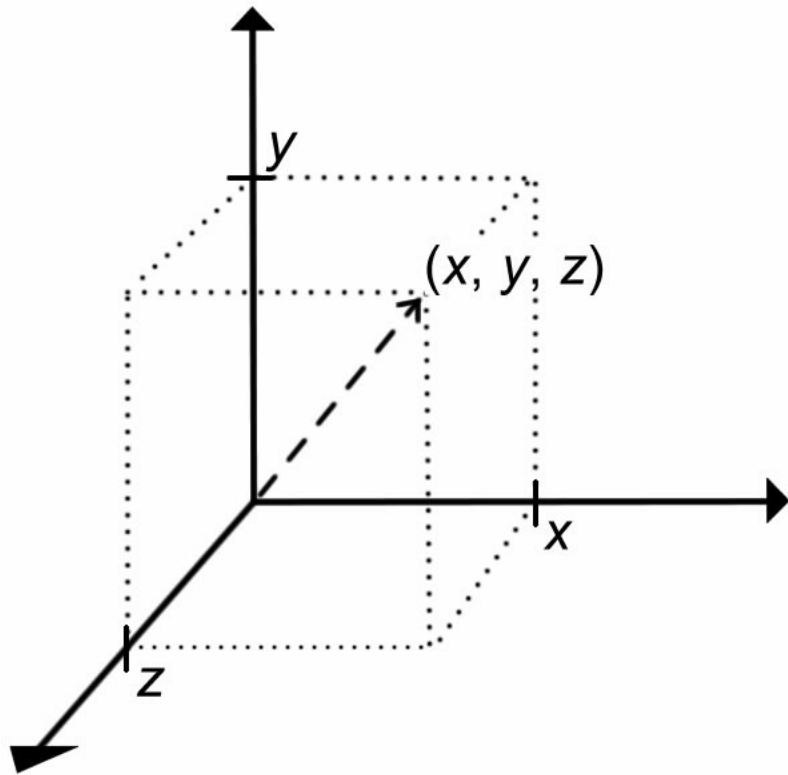
This is an important point which we will be using later in our calculation: if we have a volume of fissionable material, then **critical mass occurs when the build-up of neutrons inside the material is equal to the loss of neutrons out of the material.**

Put simply, the critical mass is the smallest amount of fissionable material which will cause a nuclear explosion. Therefore, determining the correct value of the critical mass is the most important task in designing a nuclear bomb.

Spherical coordinates

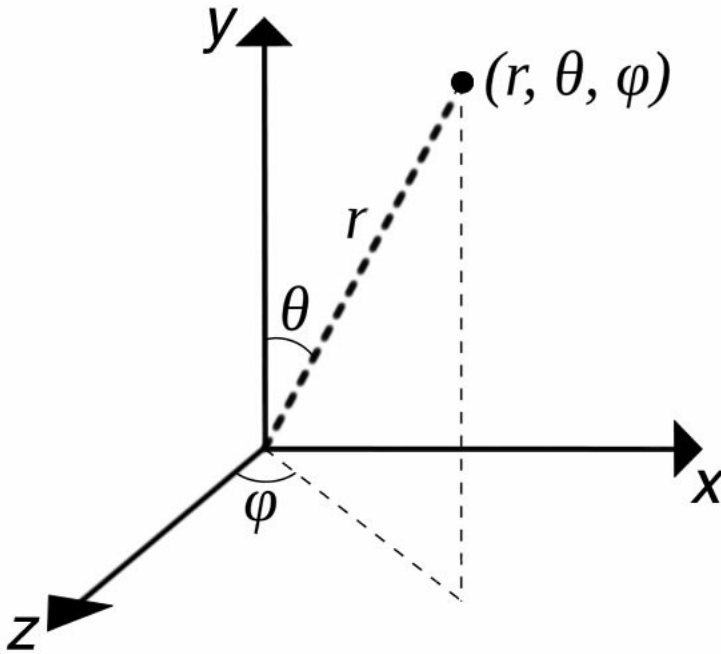
In our analysis of critical mass, we will need to use the most efficient and natural method of describing the distribution of neutrons within the material.

Normally, when we want to describe the shape of an object in three-dimensional space we would use Cartesian coordinates (as shown in the following diagram). We could then define any point in space by its (x, y, z) coordinates, where x , y , and z are the distances along the three axes:



However, for describing the distribution of neutrons within a sample of fissionable material, we can use a better method of defining a point in space. This is because nuclear bombs almost always use a solid sphere of fissionable material as a critical mass (a solid sphere represents the most efficient use of the material). The most efficient means of defining a point in a solid sphere is to use *spherical coordinates*.

Spherical coordinates define a point in space using the distance from the centre of the space, and two angles of rotation, as shown in the following diagram:



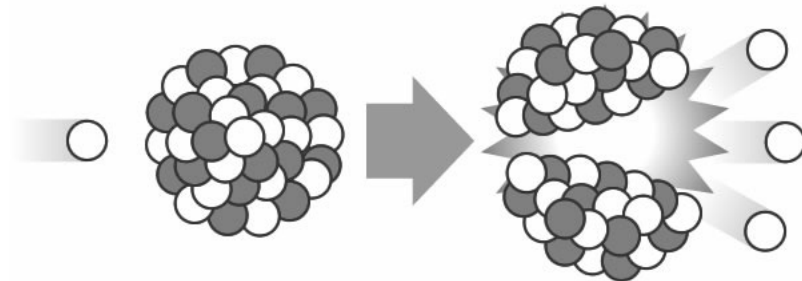
This method for defining a point in space is so efficient because our sphere of fissionable material has rotational symmetry: it does not matter how we rotate that sphere in space, it would still look the same. Because of that rotational symmetry, all we need to consider is the distribution of neutrons along the radial thick dashed line coming out of the centre of the material, as shown in the previous diagram. We do not need to be concerned about the two rotational angles because it does not matter how we rotate the line the distribution of neutrons along it will still be the same.

So, in this calculation of critical mass, we will only be interested in the distribution of neutrons in the one dimension along the line of length r coming from the centre of the material.

The build-up of neutrons

In this section we will consider the build-up of neutrons within a volume of the fissionable material. In the next section we will consider the loss of neutrons through the surface of the volume.

You will remember from the previous chapter that when a nucleus undergoes fission, several neutrons can be released. These neutrons would then continue the chain reaction by splitting more nuclei. In the diagram below, you will see an example in which three neutrons (on the right of the diagram) are released by the fission of a single nucleus:



If we are to generate an ever-increasing chain reaction then the question of how many neutrons are released in a single fission is crucial. Clearly, if the chain reaction is to build in intensity then we will need a situation in which

the total number of neutrons in the volume increases.

Considering the example of the previous diagram, what is the net increase in the number of neutrons due to the fission of a single nucleus? We can see that one neutron comes in from the left and is absorbed by the nucleus. The nucleus then fissions and three neutrons are released. The net increase in neutrons is therefore going to be three neutrons minus one neutron (the neutron which was initially absorbed), giving a net increase of two neutrons.

On that basis, we can now calculate the build-up of neutrons within the volume of fissionable material. Let us define the average number of neutrons produced per fission as ν (the Greek letter "nu"). In the previous example, ν would be equal to three. Then the net increase in the number of neutrons because of the fission of one nucleus will be given by $\nu - 1$, the "-1" term coming from the absorption of the initial incoming neutron. That means that as long as more than one neutron is produced by the fission of a nucleus, then the total number of neutrons will increase over time (ignoring the loss of neutrons through the surface of the volume).

If there is currently a total of N neutrons in a volume of material, and we assume that each of those neutrons goes on to fission a nucleus, then the new total number of neutrons in the volume after the round of fissions will be the net increase in neutrons due to a single fission, multiplied by the number of fissions:

$$(\nu - 1) \times N$$

If the average time between fissions is given by τ (the Greek letter "tau") then the rate of increase in the number of neutrons will be given by:

$$\frac{(\nu - 1)}{\tau} N$$

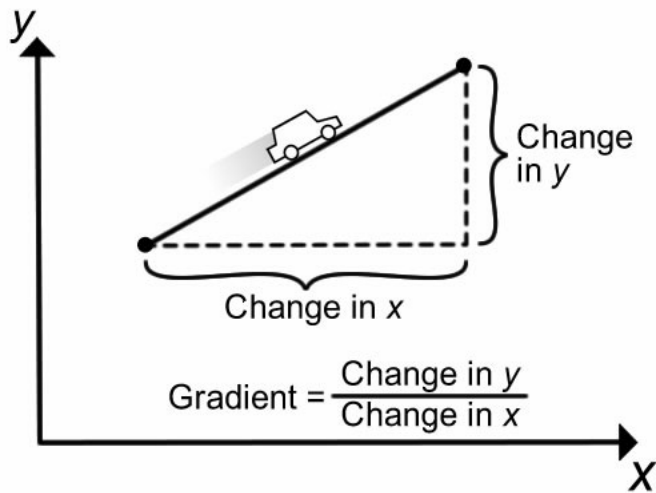
This formula then tells us the rate of increase of neutrons within a volume of the material — ignoring the loss of neutrons through the surface of that volume. This is the first result we need on our quest to calculate the critical mass.

The derivative

Now let us start to consider the flow of neutrons out through the surface.

The flow of neutrons out through the surface represents a *current* flow of neutrons — just like an electric current is a flow of electrons. And just as the magnitude of an electric current depends on the potential difference (voltage) over a distance, so the current flow of neutrons depends on the difference in the number of neutrons over some distance. In other words, the neutron current depends on the *gradient* of the number of neutrons.

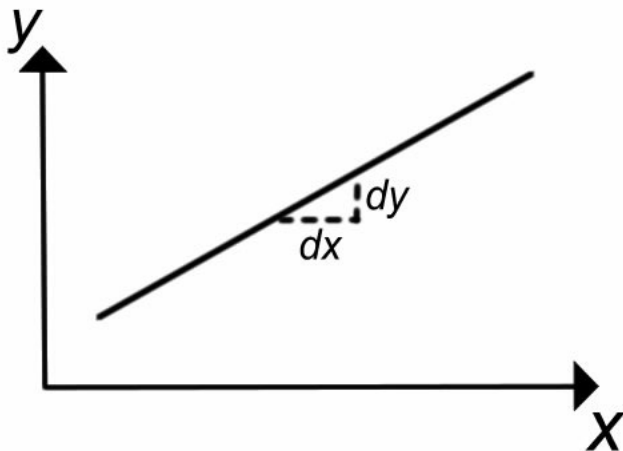
We are well aware of the idea of a gradient as representing the steepness of a hill. In that case, if we are driving up a hill, the gradient is defined as the change in our vertical height divided by the distance we drive in the horizontal direction. This is shown in the following diagram:



But the principle of a gradient can be applied to the change of any variable — not just height. We have seen that a gradient is defined as being "the amount of change of a variable divided by the amount of change of another variable". If we have two variables, x and y , then the change of y with respect to x (i.e., the gradient) is known as the *derivative* and is written as:

$$\frac{dy}{dx}$$

You can see how this relates to the gradient at a point:



Mathematically, this derivative notation can be used to describe the flow of neutrons out of the material. The value of the critical mass can then be calculated by setting the flow of neutrons out of the material equal to the build-up of neutrons within the material. The lengthy and detailed calculation is contained in the Appendix at the end of this book.

If you want to know the mathematical details of how the world's greatest physicists constructed the world's first atomic bomb, I can highly recommend that you read the Appendix.

To cut a long story short ...

To cut a long story short, the detailed calculation of the value of the critical mass which is described in the Appendix reveals that the critical radius of uranium-235 is 9.1 centimetres. To give an impression of this size of a critical mass, I made my own "critical mass" of the correct dimensions (from a rubber ball and a can of silver spray paint) which you can see me holding in the following photograph:



If this was real, this sphere of metal would explode with a force of several thousand tons of TNT, taking most of my hometown with it.

If you were to hold an actual solid sphere of uranium of this size, the overriding impression would be due to its extraordinary weight. Uranium has the atomic number of 92, which means it has 92 protons in its nucleus — the most of any naturally-occurring element. As most of the mass of an atom is found in its nucleus, this explains why uranium is so heavy. The "critical mass" of uranium I am holding in my hand in the previous photograph would weigh 52 kilograms, or over eight stone. In other words, it would weigh more than many people weigh!

We simply never encounter extraordinary substances such as uranium in our everyday lives. How can this metal weigh so much? How can a small ball of this metal explode with such force? Sometimes these metals glow because of their radioactivity, or they are permanently warm. The properties of these substances seem uncanny and alien. Which raises the question ... how do we obtain these unearthly metals?

6

OAK RIDGE

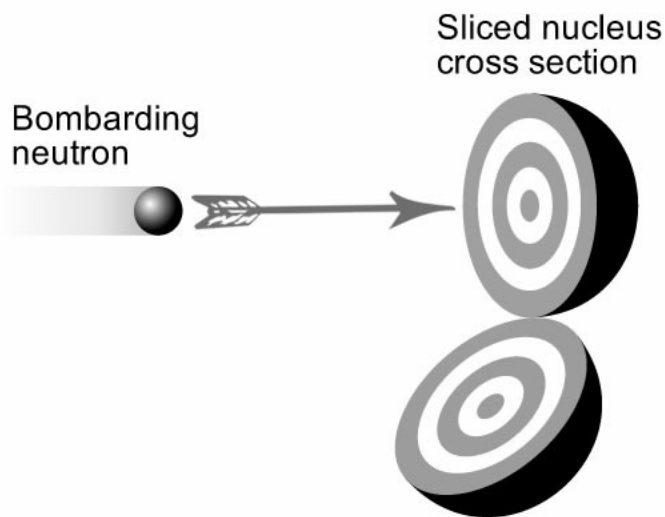
As explained in Chapter One, it is possible for the nucleus of a particular element to have a different number of neutrons, in which case the substance is called an *isotope*. As isotopes of elements have different numbers of neutrons they therefore have different values for mass number, the mass number being the total number of protons and neutrons in the nucleus. As an example, the isotope of uranium called uranium-238 has a mass number of 238 (which is composed of the sum of 92 protons and 146 neutrons).

Natural uranium, extracted from uranium ore, is composed of two isotopes: uranium-238 and uranium-235 (from now on, uranium-235 will be referred to as "U-235" and uranium-238 will be referred to as "U-238", where "U" is the chemical symbol for uranium). U-238 is by far the most common isotope representing over 99% of natural uranium. However, for purposes of constructing nuclear explosives, it is U-235 which is more interesting.

In this chapter, we will be considering how to obtain U-235 by separating it from U-238 in a process known as *enrichment*.

Remember it was described in Chapter One that neutrons have to act like glue to hold protons together to stop the nucleus from flying apart due to electrical repulsion between the protons. As we have just calculated, U-238 has 146 neutrons, whereas you can similarly calculate that U-235 has the fewer number of 143 neutrons. As the job of neutrons is to act like glue to hold the nucleus together, those three fewer neutrons mean that a nucleus of U-235 is not so strongly "glued together". As a result, U-235 is much more unstable than U-238, and is therefore much more fissionable.

In order to quantify the difference in fission behaviour between U-235 and U-238 we need to introduce the concept of a nuclear *cross section*. Using the usual sense of the term, a cross section is a slice through an object. If we consider a spherical atomic nucleus (or any spherical particle) then a slice through the middle of that particle is going to be a circle. We can then interpret that circle as a target, as shown in the following diagram. The behaviour of the nucleus when it is hit by a bombarding neutron will then depend on whether that neutron hits the target or not:



The area of the target is called the nuclear cross section. The different ways in which a nucleus might behave when it is hit by a neutron can be described by defining different cross sections (different sizes of target) for each different type of behaviour. If a cross section is smaller, then that means that the target is smaller, and the behaviour is less likely (the neutron is less likely to hit the target). Conversely, if a cross section is larger, then that means that the corresponding behaviour will be more likely.

As an example, when an atomic nucleus is hit by a neutron, one of three things might happen. Firstly, the neutron might bounce off the nucleus in a process known as *scattering*. The probability of this occurring would be defined

by the *scattering cross section* of the nucleus. Secondly, the neutron might be absorbed (captured) by the nucleus. The probability of this occurring would be defined by the *capture cross section* of the nucleus. Thirdly, the neutron might cause the nucleus to split. The probability of this occurring would be defined by the *fission cross section* of the nucleus.

The difference in behaviour when a nucleus of U-235 and a nucleus of U-238 is hit by a neutron can be described in terms of their cross sections. As was explained earlier, a nucleus of U-235 is more fissionable. It can therefore be said that it has a larger **fission** cross section. However, remember that U-235 represents less than one percent of natural uranium, the rest being U-238. This represents a problem if we are trying to achieve a chain reaction in natural uranium because U-238 has a very large **capture** cross section. If we consider a neutron emerging from a fissioned nucleus, we need that neutron to travel unhindered until it reaches a secondary nucleus which it can fission. If, instead, it hits a nucleus of U-238 then the large capture cross section of that nucleus means that the neutron will be captured by that U-238 nucleus without fissioning that nucleus. The chain reaction will then grind to a halt.

Because of this "poisoning" effect of U-238, the only way to achieve an explosive chain reaction is to laboriously separate the U-235 from the much larger proportion of U-238, and then to use only that extracted U-235 in the atomic bomb core.

As stated earlier, less than 1% of natural uranium is U-235, whereas weapons-grade uranium needs to be enriched to 90% U-235. It is therefore clear that a tremendous amount of uranium ore would need to be enriched to make a bomb. The necessary process would resemble an industrial-scale operation more than a laboratory experiment. In 1939, Niels Bohr insisted "it can never be done unless you turn the United States into one huge factory."

Well, effectively, that is just what happened ...

The secret city

The scale of the Manhattan Project was staggering. Apart from the development facility at Los Alamos, the project involved more than thirty sites across the United States, Britain, and Canada. These sites included two vast factories in the United States for the production of fissionable material for the bomb cores.

The main industrial facility was the 60,000-acre isotope separation plant (for separating U-235 from U-238) which was located in rural Tennessee. At the time, the area was virtually uninhabited, so the factories and the entire town to house the employees had to be built from scratch. The town was given the rural-sounding name of Oak Ridge in order to make it sound like a small, uninteresting village which would not attract outside interest. In 1945, after being in existence for just two years, Oak Ridge employed 80,000 people and had become the fifth-largest town in the state of Tennessee — and it consumed more electricity than New York City.

At its peak, the Manhattan Project employed 130,000 people and was larger than the entire American automobile industry. It was simply the greatest scientific and engineering gamble in the history of the world. Niels Bohr's prediction that the United States would have to be turned into "one huge factory" was becoming true.

Oak Ridge had to provide all the facilities of a normal town. It had over seven thousand houses, two high schools, nine shopping areas, churches, movie theatres, and a hospital. However, the need for security meant that the entire town had to be surrounded by a barbed-wire fence, and Oak Ridge did not appear on any maps until 1949. To its inhabitants it was called the "Secret City".

To all intents and purposes, Oak Ridge appeared like a normal town, though none of its inhabitants had any idea of why they were doing the jobs they were doing. The difficulty of working in such secrecy was described by one of the managers at Oak Ridge: "Well it wasn't that the job was tough — it was confusing. You see, no one knew what was being made in Oak Ridge, not even me, and a lot of the people thought they were wasting their time here. It was up to me to explain to the dissatisfied workers that they were doing a very important job. When they asked me what, I'd have to tell them it was a secret. But I almost went crazy myself trying to figure out what was going on."

All the workers were sworn to secrecy, and were told never to speak a word to outsiders about their work at Oak Ridge. They were even told what to say if anyone outside asked about their work. If they were asked what they were making in Oak Ridge, they were told to say: "Oh, about 76 cents an hour." And if they were asked how many people were working in Oak Ridge, they were told to say: "Oh, about half of them."

Here are some photographs of everyday life in the secret city of Oak Ridge during the war:



The largest building in the world

The isotope separation factories at Oak Ridge were faced with a daunting challenge. In his graphic novel version of the Manhattan Project called *Trinity*, Jonathan Fetter-Vorm describes the challenge by using an analogy: "To make a bomb, you need to enrich the uranium, skimming off the less reactive isotope and concentrating the amount of U-235. To get some idea of how hard this is, imagine mixing together two different colours of clay, then trying to separate the colours from each other."

The problem is made more difficult because the relatively simple and cheap process of chemical separation cannot be used. Chemical separation relies on differences in the chemical properties of the two substances being separated: the substances would behave differently in a chemical reaction. Those chemical properties are determined by the distribution of electrons in the shells of the atom, and the numbers of those electrons are, in turn, determined by the number of protons in the atomic nucleus. But two different isotopes of an element have the same number of protons (the same atomic number), so they would have the same distribution of electrons. Therefore, their chemical properties would be the same and chemical separation could not be used.

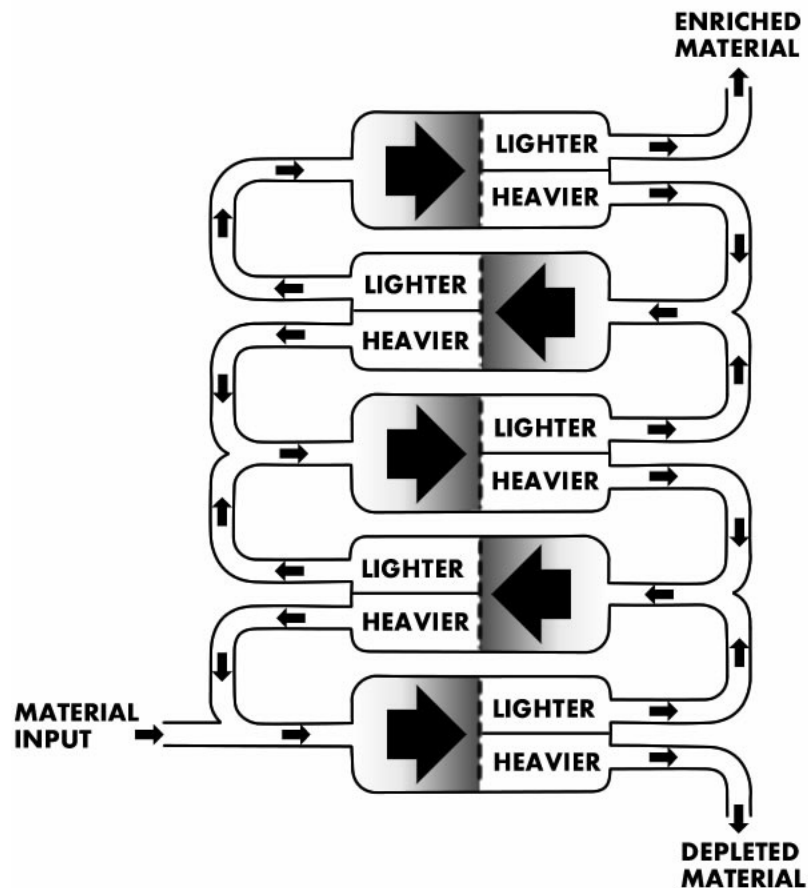
The only possible alternative is to rely on the difference in the physical properties of the two isotopes, which means the extremely slight difference in the mass of the atoms due to the additional neutrons. On that basis, it is possible to separate the isotopes by using *diffusion*. Diffusion is considered in the Appendix as a means for calculating the critical mass (by considering the diffusion of neutrons through an atomic bomb core), but it is stated in the Appendix that diffusion describes the spread of any group of particles through a substance (for example, the spread of dust particles in air, or the spread of a chemical through a liquid). In Oak Ridge, diffusion was used to

separate isotopes by considering the diffusion of uranium atoms through a membrane peppered with microscopic holes.

Firstly, in order to allow diffusion of the uranium, the uranium was turned into a gas: uranium hexafluoride. The gas was then pumped through the membrane. Only gas molecules containing the lighter U-235 isotope would diffuse through the holes in the membrane, so those molecules could be separated from the heavier U-238.

But the very small difference in the atomic mass of the two isotopes meant that it was impossible to achieve perfect separation with a single filter. In fact, the amount of percentage enrichment achieved with each filter was very small. As a result, a high level of enrichment was only possible by using a large number of stages cascaded together, with the output of one stage passing to the input of the next stage. Each stage only provided a very small amount of percentage enrichment, but with enough stages the material became progressively more enriched as it passed through all the stages.

The design of the isotope enrichment process using gaseous diffusion which was used at Oak Ridge was ingenious and is shown in the following diagram:

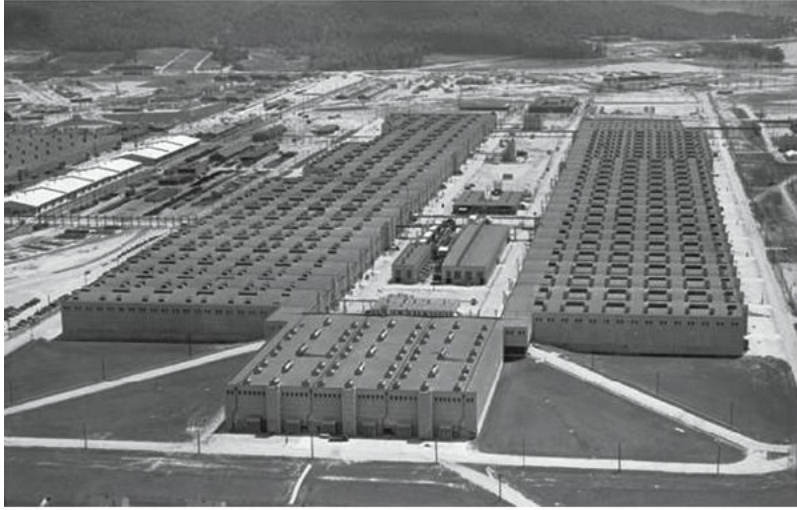


You can see that in each stage the material is pumped against the filter membrane which separates the material into lighter and heavier isotopes. By following the small arrows, you can follow the progressive enrichment of the material on the diagram as it passes through the stages, emerging at the top as highly-enriched material.

You will see that even if some of the material fails to pass through the filter, that material is not wasted. Instead, as you can see on the diagram, the rejected material just drops down to the stage below and is processed again. This is because the filtering process could never be perfect with such a small difference in mass between the isotopes, so the rejected material might still include some atoms of the lighter isotope which should not be wasted.

Because of the very small percentage amount of enrichment achieved by each stage, the extraordinary total of 2,892 stages were required. And these were not small stages: each diffusion tank held 1,000 gallons. As a result, the building which contained the sequence of stages was truly monumental. When it was completed, the Gaseous Diffusion Plant at Oak Ridge was a four-storey U-shaped building which was half a mile long and a quarter of a

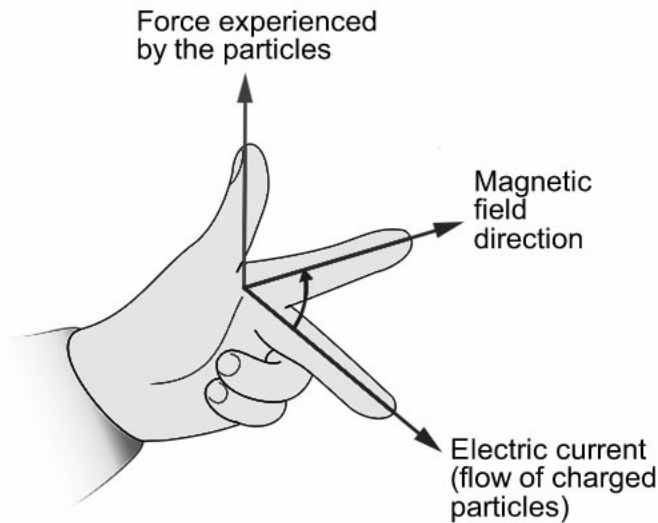
mile wide. It surpassed the Pentagon to become the largest building in the world — even though the world did not know it existed:



The Calutron Girls

The other major factory at Oak Ridge employed a completely different method of isotope separation based on the electromagnetic force. The technique, known as electromagnetic separation, considered the deflection of electrically-charged uranium atoms as they passed through a magnetic field.

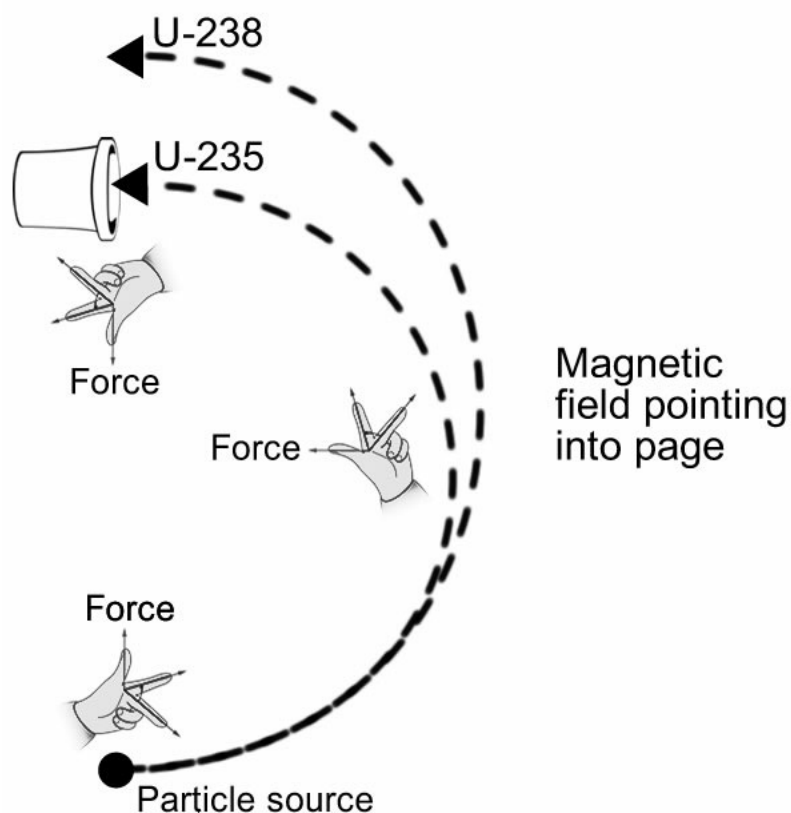
The deflection of the particles is described by *Fleming's left-hand rule for motors*, which you might have been taught in your physics class in school. The rule is described by the following diagram:



The previous diagram shows that if your middle finger points in the direction in which the charged particles are moving (in the case of a motor, this would be electrons moving down a wire), and if your index finger is pointing in the direction of the magnetic field, then the charged particles will experience a force in the direction of your thumb. This principle was used by the electromagnetic separation process in Oak Ridge to curve the path of beam of uranium atoms as they moved through a magnetic field.

In the following diagram, you will see the charged particles emitted from the source at the bottom of the diagram. At that point, with the direction of the magnetic field into the page, your index finger should point into the page.

Your middle finger should always point in the direction in which the particles are travelling (which would be toward the right at the start). In which case, your thumb represents the direction of the force experienced by the particles, which — as you can see on the diagram — will always point toward the centre of curvature:



In fact, at every point of their path, the particles will always experience a force toward the centre of curvature, which will result in the beam of particles taking a curved path.

Because the U-235 atoms have slightly lower mass, they will be slightly more affected by the force. In other words, their path will curve more. If a receptacle is correctly placed (a bucket is shown on the diagram) then this will be able to collect only the U-235 atoms and reject the U-238 atoms.

This electromagnetic isotope separation device was called a *calutron*. The name derives from a combination of the words "Cal" and "tron". The "tron" comes from the word *cyclotron* which was an electromagnetic particle accelerator developed by Ernest Lawrence. The "Cal" comes from "California" as Lawrence invented the cyclotron at the University of California.

It can be seen that this calutron method of isotope separation involves building-up the enriched uranium atom-by-atom. It is clear that this would be a very low-yield and time-consuming process: each calutron could produce only 100 milligrams of U-235 per day. In order to increase the yield up to 100 grams of U-235 per day, nine buildings were built at Oak Ridge to house 1,152 calutrons — another monumental operation.

Operating a calutron was a labour-intensive process requiring constant human intervention. In practice, the operators were young women from the local Tennessee community — many straight out of high school or fresh off the farm — who were given the name the "Calutron Girls". Let us now consider the story of the Calutron Girls as described in Denise Kiernan's bestselling book about the female workers of Oak Ridge called *The Girls of Atomic City*.

Many of the young female workers at Oak Ridge had to work in a state of constant anxiety as their brothers and husbands were fighting a brutal war on foreign shores. Despite their anxiety, the women worked tirelessly, motivated by being told that their mysterious work on these futuristic machines would make the war shorter and bring their loved-ones home sooner.

This was the case for Dorothy Jones (affectionately known as "Dot") who was a young girl from Hornbeak, Tennessee. All three of Dot's brothers were fighting in the war, including Shorty who was 23 years old and a deck

gunner for the Navy on the battleship USS Arizona. Unfortunately, the Arizona was one of the ships in dock in Pearl Harbor when the Japanese bombed it in December 1942. Dot's family had received the news just before Christmas that Shorty was missing, presumed dead. Dot was determined to do something for the war effort in Shorty's memory, so she had signed up to be one of the Calutron Girls at Oak Ridge.

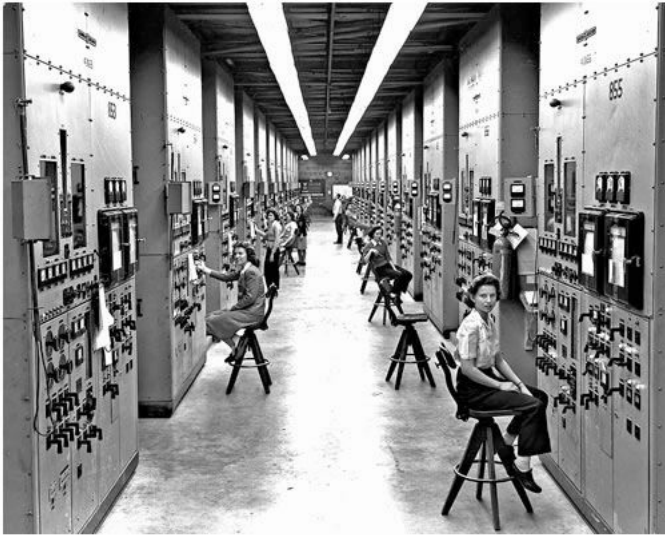
When Dot entered the building which housed the calutrons, she found it to be a very daunting experience. The building was enormous, with a high ceiling, bright lights, and constant loud electrical sparking sounds from the high-voltage calutrons. Also, bear in mind that in 1944 these were the most futuristic and advanced industrial machines anywhere in the world.

Dot took her place on the wooden stool in front of her calutron control panel, and started her day's work.

The main job assigned to the Calutron Girls was ensuring that the magnetic field strength was set precisely so that the beam of U-235 atoms would be correctly directed into the final receptacle. This was a labour-intensive process as it requiring continuous twisting of handles to adjust the strength of the magnetic field and thereby keep the beam correctly aligned. Here is a photograph of one of the Calutron Girls turning the handles while keeping her eyes firmly fixed on the dial reading:



The following picture shows the Calutron Girls, each woman seated in front of her individual calutron:



Of course, due to the tight security, none of the girls knew the true nature of the task they were performing. The woman seated at the front right of the previous photograph was Gladys Owens who only realised the job she had done during the war when she saw herself in the previous photograph when she toured a museum of Oak Ridge fifty years later.

The girls were warned never to venture behind their control panels because that was where the giant magnet used to generate the powerful calutron magnetic field was positioned. The girls knew that if you carelessly wandered into the magnetic field it would pull the metal hairclips right out of your hair. Or, if you had a belt buckle, it could even pin you against the wall. Legend had it that a maintenance man who had nails in his shoes had been rooted to the spot.

It is clear that the tireless and focussed Calutron Girls performed an essential role in the war effort. However, not everyone was so impressed by the girls. After Ernest Lawrence — the inventor of the calutron — had visited the plant he ran into the office of the chief engineer and blustered: "How dare you pick these silly hillbilly girls to run my machines!" Lawrence insisted that only his male PhD physicists had the ability to run a calutron correctly. Lawrence was certain that the performance of these young girls — straight out of school or off the farm — would be inferior to that of his highly-educated men. However, the chief engineer defended his girls loyally, and told Lawrence how productive the girls had been. He persuaded Lawrence that there should be a production race: Lawrence's highly-qualified physicists versus the Calutron Girls. Whoever produced the most U-235 would be the winner and would get to keep their job. Lawrence reluctantly agreed to the race, totally confident that his men would win.

Of course, in predictable Hollywood movie style, when the race started the Calutron Girls blew the physicists out of the ballpark by collecting a far larger amount of U-235 (apparently the rather geeky physicists were constantly being distracted by getting their slide rules out and analysing any minor variation in the dials). The Calutron Girls were victorious — and they finally won their much-deserved respect. Of course, they were allowed to continue doing their fine job.

The story of the Calutron Girls is one of many remarkable stories of the efforts of the workers at Oak Ridge.

Amazingly, at the end of every week, all the enriched uranium produced by Oak Ridge was taken to Los Alamos **in a briefcase** by a plain-clothed military security officer **on a public train**, with the briefcase handcuffed to his wrist. All actual bomb design and manufacture took place in Los Alamos. It was there that the received uranium was machined to form the bomb cores.

After the dropping of the atomic bomb on Hiroshima in 1945, the nature of the work at Oak Ridge was no longer a secret. The Under Secretary of War, Robert Patterson, sent a letter to all the workers of Oak Ridge: "Today the

whole world knows the secret which you have helped us keep for many months. I am pleased to be able to add that the warlords of Japan now know its effects better, even than we ourselves. The atomic bomb which you have helped to develop with high devotion to patriotic duty is the most devastating military weapon that any country has ever been able to turn against its enemy. No one of you has worked on the entire project or knows the whole story. Each of you has done his own job and kept his own secret, and so today I speak for a grateful nation when I say congratulations, and thank you all. We are proud of every one of you."

Mail-order uranium

In this chapter we have examined how the enriched uranium for a nuclear explosive can be produced. It is clear that this is not a simple process. And for that we should be grateful: it is only the difficulty in obtaining suitable nuclear fuel which prevents terrorists and rogue states from making their own nuclear weapons.

However, I thought it would be interesting to discover how difficult it actually is to obtain uranium. Especially when you consider the subtitle of this book is "How to make an atomic bomb". So I did an online search and found it is surprisingly easy to obtain uranium ore.

There are many online companies who will provide you with uranium ore — especially in the U.S. The company **unitednuclear.com** provides a wide range of radioactive material and scientific equipment. Material and equipment is also available on Amazon and eBay. I bought an excellent sample of radioactive uranium ore from eBay.

I also obtained a Geiger counter in order to examine the uranium ore. You can buy many expensive modern small plastic Geiger counters, but I went to eBay and bought an ex-military Geiger counter for a very reasonable price (£50). The Geiger counter was built for the Polish Army in 1970. I get the impression the market is flooded with ex-military equipment, very reliably-built, the Geiger counter will probably last for another hundred years.

The Geiger counter is called a DP-66. There are plenty of these available on eBay. I also bought an external microphone for my DP-66 (to make the clicks audible) from the company **anythingradioactive.com**. They also sell a range of Geiger counters.

A similar American Geiger counter was built around the same time as the DP-66 and it is called the CDV-700. The CDV-700 Geiger counters are also available on eBay and Amazon.

I made a five-minute video of my examination of the uranium ore using my Geiger counter. You can watch the video at the following link:

<http://tinyurl.com/radioactivevideo>

Here are some stills from the video:



PLUTONIUM

In the previous chapter, it was explained that approximately 99% of natural uranium is the isotope U-238 with less than 1% being the desirable fissionable U-235. It was described how that large proportion of U-238 acts to "poison" any chain reaction by capturing stray neutrons. Hence, natural uranium cannot be used in nuclear explosives.

It was then described how the aim of enrichment is to increase the amount of U-235 up to 90%, at which point the enriched uranium is capable of sustaining a chain reaction and is considered to be "weapons-grade" uranium.

On that basis, it might be imagined that U-238 is nothing more than a nuisance, only having the effect of poisoning any chain reaction. However, this would not be a correct assessment of the value of U-238. In fact, U-238 has been used to create more modern nuclear weapons than has U-235.

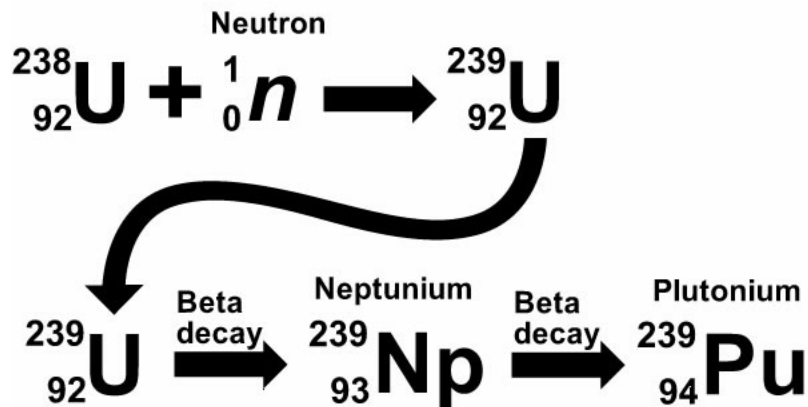
So how can this be the case? How can U-238 be used to create nuclear weapons? Well, it is because the U-238 is not directly used as an explosive. Instead, it is used to create another element which is highly-fissionable: *plutonium*. It is that plutonium which can be used as a nuclear explosive. As Richard Rhodes says in *The Making of the Atomic Bomb*, using apparently-useless U-238 to create plutonium "would thereby indirectly put U-238 to work".

To understand how U-238 can be used to create plutonium, remember the discussion of beta decay in Chapter Two. It was explained how beta decay occurs when there are "too many" neutrons in a nucleus, with the result that a neutron converts into a proton — with the emission of an electron, which is the beta particle. The conversion of the neutron into a proton increases the atomic number by one (one more proton in the nucleus) while leaving the mass number unchanged (total number of protons and neutrons is unchanged).

So, in a nutshell, the effect of beta decay is to increase the atomic number by one, thereby creating an element one position further up in the periodic table.

Next, remember in the previous chapter it was explained that U-238 acts to poison a chain reaction because it has a very large capture cross section, which means it is very likely to capture and absorb any neutron which hits its nucleus. If U-238 captures a neutron, it turns into U-239 (one extra neutron increases the mass number by one). The resultant U-239 nucleus would then have an excess neutron, and beta decay would therefore be likely. As just described, the effect of that beta decay would be to move the U-239 one place further up the periodic table, converting it to an element called *neptunium*.

The first line of the following diagram shows a nucleus of U-238 capturing a neutron to become U-239. Follow the curved arrow to see that U-239 then beta decays to neptunium (shown to have an atomic number of 93, which you will see is one more than the atomic number of uranium, which is 92):

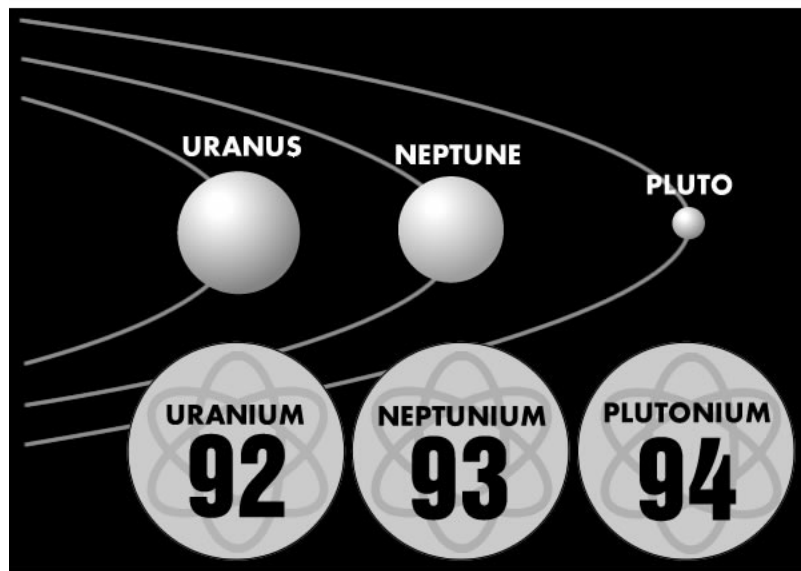


Neptunium is unstable with a half-life of only two days so, as you can see on the diagram, the neptunium quickly beta decays to produce a new element — plutonium — which has an atomic number of 94.

It is interesting to consider the origin of the names "neptunium" and "plutonium". Uranium was originally named after the planet Uranus (which is itself named after the Greek god), which is the seventh planet from the Sun in the

Solar System. When the element neptunium was discovered it was decided to continue this naming convention, so neptunium was named after the planet Neptune which is the eighth planet of the Solar System, one place beyond Uranus (Neptune was also named after the Roman god). When plutonium was discovered, the naming convention was continued so it was named after Pluto which, at the time, was considered to be the ninth planet of the Solar System just beyond Neptune (rather ominously, Pluto was also the name of the Greek god of death).

The following diagram shows the three outermost planets of the Solar System, together with the three elements named after them. The consecutive atomic numbers of those elements (92, 93, 94) are also shown:



Uranium and plutonium are the only elements which can be used as nuclear explosives. So why is it the case that uranium and plutonium are nuclear explosives, but neptunium is not? After all, as can be seen, neptunium lies between uranium and plutonium in the periodic table. To understand why only uranium and plutonium are nuclear explosives, we need to consider the concept of *parity* in the atomic nucleus.

In mathematics, parity indicates whether a number is even or odd. If we consider the number of protons and neutrons in an atomic nucleus, it is known that the parity of those numbers plays a large role in describing the fission behaviour of that nucleus.

Firstly, if we consider uranium-235, it has an atomic number of 92. That means it has 92 protons, which is an **even** number. It therefore must have 143 neutrons ($235-92$) which is an **odd** number. So the parity of U-235 is **even/odd**.

If we then consider neptunium in a similar manner, we find it has 93 protons and 146 neutrons, so the parity of neptunium is **odd/even**, which is clearly different to the parity of fissionable U-235.

However, if we apply the same reasoning to plutonium, we find it has 94 protons and 145 neutrons, which is **even/odd** parity, **which is the same as fissionable U-235**. So this is the reason why plutonium fissions in a similar manner to U-235, and why plutonium can also be used as a nuclear explosive.

The nuclear reactor

If it takes the capture of a single neutron by a single nucleus of U-238 to produce plutonium then it is clear that to produce a significant amount of plutonium would require trillions of neutrons. In practice, the only way to generate those neutrons would be by starting a self-sustaining chain reaction in uranium, with each fissioned uranium nucleus producing more than one neutron.

But it has already been explained how U-238 acts to poison any chain reaction because of its tendency to capture any free neutrons. So how can U-238 be involved in any chain reaction in uranium?

The answer is that we have to slow the neutrons down.

It might seem counter-intuitive that slowing-down neutrons can encourage a chain reaction based on the fissioning of nuclei — it might be suspected that faster neutrons would be more effective at splitting nuclei.

However, a slower neutron can be much more effective. This discovery was made by Enrico Fermi, and Fermi's discovery was described by Richard Rhodes: "Everyone had assumed that faster neutrons were better for nuclear bombardment because faster protons and alpha particles always had been better. But the analogy ignored the neutron's distinctive neutrality. A charged particle needed energy to push through the nucleus's electrical barrier. A neutron did not. Slowing down a neutron gave it more time in the vicinity of the nucleus, and that gave it more time to be captured." [\[7\]](#)

This effect was particularly notable in the isotope U-235 rather than U-238. For U-235, the fission cross section for slow neutrons is absolutely huge. In other words, if you have a sample of U-235 and you bombard it with slow neutrons, the nuclei will almost certainly fission, rather than the nuclei capturing those neutrons. In fact, it is that huge fission cross section of U-235 for slow neutrons which allows a chain reaction to be generated in natural uranium (i.e., uranium which has not been enriched). This is despite U-235 making up less than 1% of natural uranium. The remarkable fission cross section of U-235 allows a chain reaction in natural uranium **as long as the neutrons are slowed down**. And this is what happens in a *nuclear reactor*: a chain reaction is generated in natural uranium by slowing down the neutrons.

In order to slow the neutrons down in a nuclear reactor, the uranium has to be surrounded by a material called a *moderator*. The neutrons collide with nuclei in the moderator and lose energy: they slow down. An example of a moderator which is used in nuclear reactors is graphite, which is a form of carbon. A fast neutron which has been emitted from a fissioned nucleus needs to travel through 20 centimetres of graphite, colliding with graphite nuclei on its way, before its speed is sufficiently reduced. So it is clear that a nuclear reactor has to be quite a large structure. In the reactor core, spheres or rods of natural uranium are interspersed with the moderator material, which acts to slow down the neutrons.

So a nuclear reactor is based on a nuclear chain reaction in much the same way as we have seen a nuclear bomb is also based on a nuclear chain reaction. But, because slow neutrons are involved rather than fast neutrons, the energy released by a nuclear reactor is slow and controllable rather than fast and uncontrolled (as in a nuclear bomb). This is also the reason why slow neutrons (and natural uranium) cannot be used to manufacture a nuclear bomb: a nuclear bomb requires fast neutrons and enriched uranium.

And if a nuclear reactor is based on a self-sustaining nuclear reaction, then it has to have a critical mass of material — again, just like in a nuclear bomb. But the inclusion of large amounts of moderator material, and the complex arrangement of fuel rods, made it difficult to calculate the value of that critical mass — unlike the relatively simple critical mass calculation for a nuclear bomb core which was presented in Chapter Five of this book. Hence, the value of the critical mass for a nuclear reactor had to be found from experiment. Richard Rhodes considers the problem: "A slow-neutron chain reaction in natural uranium, like its fast-neutron counterpart U-235, requires a critical mass: a volume of uranium and moderator sufficient to sustain neutron multiplication despite the inevitable loss of neutrons from its outer surface. No one knew the specifications of that critical volume, but it was obviously vast — on the order of some hundreds of tons."

It was clear that in order to calculate the value of the critical mass, and to prove that a nuclear chain reaction was possible, a test reactor would have to be built.

The world's first nuclear reactor

We are so used to the idea of nuclear reactors producing electrical power that it may come as a surprise that the very first nuclear reactor was designed without the slightest interest in its potential to produce power. It has just been explained that a chain reaction in natural uranium in a nuclear reactor is the perfect environment to produce plutonium for nuclear bombs, and it was for this purpose that the first nuclear reactor was built.

To tell the story of the world's first nuclear reactor, we must once again catch up with the itinerant Leo Szilard. When we last left Leo Szilard in 1939 he was just a guest researcher in Columbia University in New York City for three months. Amazingly, in November 1940, Szilard had managed to find himself a proper job at last, and had been added to the Columbia payroll. Szilard was worked hard with Enrico Fermi throughout 1941, trying to create an experimental nuclear reactor. They had been trying to generate a slow-neutron chain reaction in natural uranium, using graphite as a moderator. So far, they had not been successful.

With the attack on Pearl Harbor in December 1941, and the launch of the Manhattan Project, a decision was taken in January 1942 to centralise all reactor research at the University of Chicago. Hence, Leo Szilard was on the move once again.

It was clear that the reactor would be extremely large and would require a lot of space. The University of Chicago was very supportive of the war effort, and agreed that the physicists could use any of the extensive sports facilities.

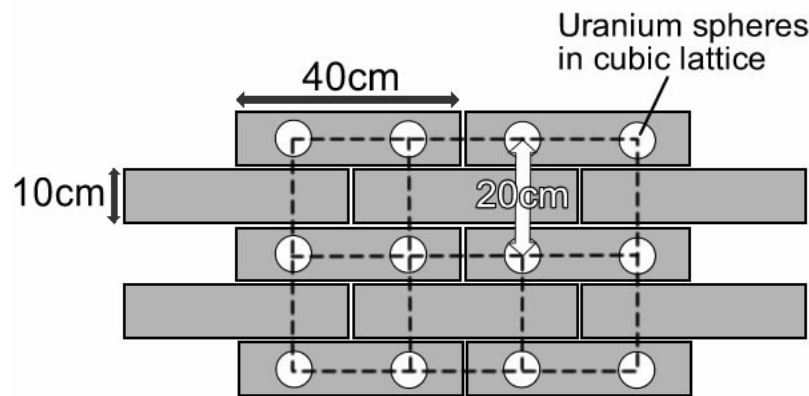
There were a number of rackets courts under the West Stand of the university's football stadium at Stagg Field. A decision was made to locate the reactor in a doubles squash court.

In his successive reactor experiments, Fermi had to determine how close he was to achieving a sustained chain reaction. In order to measure his progress toward that goal, Fermi calculated a value for the average number of neutrons produced per fission in the reactor. As explained in Chapter Five of this book (the calculation of critical mass), as long as more than one neutron is produced by the fission of a nucleus, then the total number of neutrons will increase over time and a self-sustaining chain reaction will result. The goal for Fermi, therefore, was to ensure that the average number of neutrons produced per fission was more than 1.0. However, in his first attempt at creating a reactor, Fermi calculated that neutron production number to be a disappointing 0.87.

By May 1942, Fermi had improved the purity of the uranium and graphite in his experimental reactor and had managed to improve the neutron production value to 0.995. While this was still short of the value of 1.0 required for a chain reaction, it was believed that further improvements to the purity of the materials would now push the value beyond 1.0. Therefore, at that point, work began on the full-scale reactor.

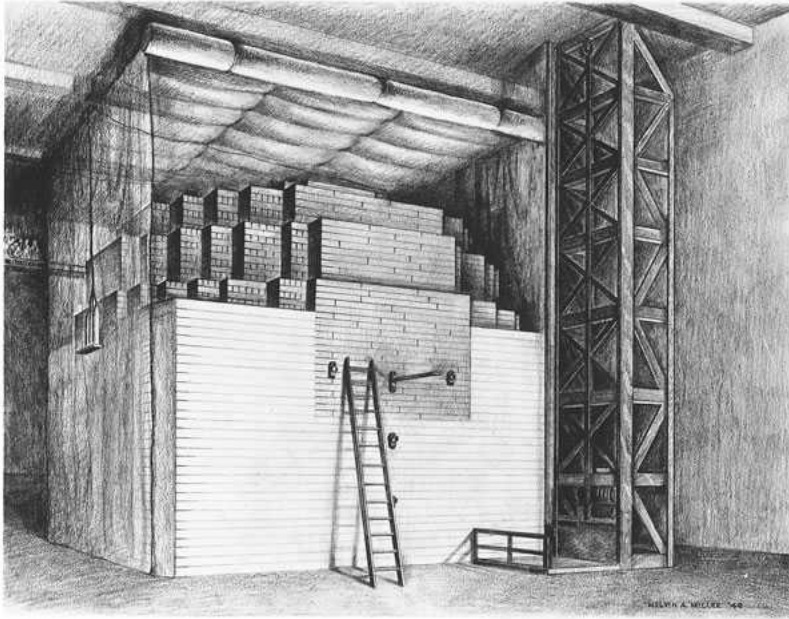
A total of 45,000 black graphite blocks were required. They were all machined to a standard size approximately the size of a shoebox. The reactor was built in layers on the floor of the squash court. The first layer was purely made of graphite blocks, containing no uranium. The second layer was made of blocks which had two seven-centimetre diameter uranium spheres embedded. The layers alternated in this fashion as the reactor was built up.

The resultant arrangement of the graphite blocks is shown in the following diagram. You can see that some of the blocks have two spheres of uranium embedded in them, whereas some of the blocks have no uranium spheres. The end result is that the uranium spheres form a perfect cubic lattice, with each sphere surrounded by the necessary 20 centimetres of graphite moderator:



Ten control rods made of cadmium were used to keep the reaction under control. The rods were thirteen foot long and were inserted into the reactor. Cadmium has a huge capture cross section for neutrons, so the control rods could be used to dampen the chain reaction if necessary and keep it within safe bounds.

For security reasons, no photographs were taken of the Chicago reactor, but we do have an artist's rendering. At the top of the ladder, you can see one of the control rods poking out of the blocks of graphite:



After 57 layers had been completed, Fermi's measurements of neutron intensity indicated that the reactor would now go critical if all of the control rods were removed. By this point, the reactor was 20 feet high and 25 foot wide. The reactor was completed on December 1st 1942, but it was decided that the experiment would take place the following day.

The temperature the following morning was below zero. A crowd of about forty people gathered on the balcony of the squash court to witness the historic event. As each of the control rods were removed slowly, the neutron intensity increased but then levelled off — the reactor was still subcritical. The last remaining control rod was then withdrawn slowly, with Fermi predicting "Now it will become self-sustaining. The trace on the recorder will climb and continue to climb; it will not level off." Fermi's colleague, Herbert Anderson, describes what happened next: "At first you could hear the sound of the neutron counter, clickety-clack, clickety-clack. Then the clicks came more rapidly, and after a while they began to merge into a roar. Suddenly Fermi raised his hand and said that the pile had gone critical. No one present had any doubt about it."

Now the chain reaction had started, the neutron intensity would keep rising instead of levelling-off. If the control rods had not been reinserted then after an hour-and-a-half the rate of increase would have resulted in a power output of a million kilowatts. But before it would have reached that stage, it would have killed everyone in the room and melted through the concrete in the floor and the underlying rock. Theoretically, there is nothing that can stop a reactor in meltdown before it melts its way to the Earth's core.

The Chicago event was historic. It was the first artificial nuclear chain reaction, the birth of nuclear power, and the first time appreciable energy had been released from the atom. Crucially, it also opened the way to the production of plutonium as a nuclear explosive.

As described earlier in Chapter Four, just eight years earlier, Leo Szilard had crossed the road in Southampton Row in London and had first had the idea of how a nuclear chain reaction might be achieved. Standing on the balcony of a squash court in Chicago, he had now seen his idea become a reality.

The Demon Core

Plutonium is an incredibly dangerous substance. Plutonium is extremely toxic if it is ingested or inhaled, and the radiation from plutonium can also be deadly. The American environmental activist Ralph Nader once claimed that a pound of plutonium could kill eight billion people.

A single plutonium core (sphere of plutonium) was responsible for two separate horrific fatal incidents at Los Alamos. The sphere of plutonium had been created to be used in a series of "criticality experiments" designed to accurately determine the necessary critical mass of plutonium for the bomb. The sphere was only 3.5 inches in

diameter — about the size of an orange. It was designed to be 5% smaller than the critical mass, and therefore safe for experimentation. However, that was a small safety margin, and if any neutrons which were emitted by the core were reflected back into the core then that could cause the core to become critical.

On August 21st 1945, the physicist Harry Daghljan was working alone, performing a criticality experiment using the core. When Daghljan accidentally dropped a tungsten carbide block near the core, the neutrons which were reflected by the block turned the core critical. There was a sudden blue flash — and even the air seemed to glow blue (this is because of the fluorescence of air molecules when they are hit by charged radioactivity). Daghljan quickly threw the brick away, but it was too late: he died 25 days later from radiation poisoning.

Precisely nine months later, Louis Slotin was working with the same core, performing a different criticality experiment. However, Slotin's dangerous technique was unapproved. Slotin had surrounded the core with two hemispheres of neutron-reflecting beryllium. Slotin was keeping the hemispheres apart by using the blade of a screwdriver as a lever. Slotin was full of bravado, and had performed the experiment a dozen times before to various teams of observers, proud of his ability to wield his screwdriver. When Enrico Fermi saw Slotin's experiment he told Slotin that he would be "dead within the year".

The following photograph shows a re-creation of Slotin's experiment showing the hemispheres being kept apart by a screwdriver blade (the spherical core is hidden inside the hemispheres, approximately the same size as the two spheres you can see on the right):



On the day of the accident, Slotin's screwdriver slipped and the two hemispheres came together for a fraction of a second. There was the usual flash of blue light showing that the core had gone critical. The criticality lasted for only half a second before the core expanded due to the heat produced, and was then no longer critical. But the damage was done.

Slotin died nine days later.

As a result of these two fatal incidents by the same core, the core was given the ominous name the "Demon Core". The second of the Demon Core incidents was dramatised in the 1989 movie *Fat Man and Little Boy*. The character of Louis Slotin in the movie was played by John Cusack. The Demon Core sequence is accurate and extremely chilling. The sequence is available on YouTube at the following link:

<http://tinyurl.com/thedemoncore>

Right at the start of the sequence if you look carefully you can see the two hemispheres being kept apart by

nothing more than the blade of Slotin's screwdriver, and you can even see the small spherical plutonium core inside the hemispheres. You can later see Slotin twisting the wooden handle of his screwdriver to move the upper hemisphere up and down. Then, as Slotin's screwdriver slips, you can see the deadly flash of blue light.

After these two fatal incidents, all hands-on criticality experiments at Los Alamos stopped. From then on, remote-controlled machines were used to perform the experiments, with all personnel safely watching TV cameras a quarter of a mile away.

8

DETONATION

In this final chapter we will move on to consider the final step of the process: actual bomb design, and how to detonate a nuclear bomb.

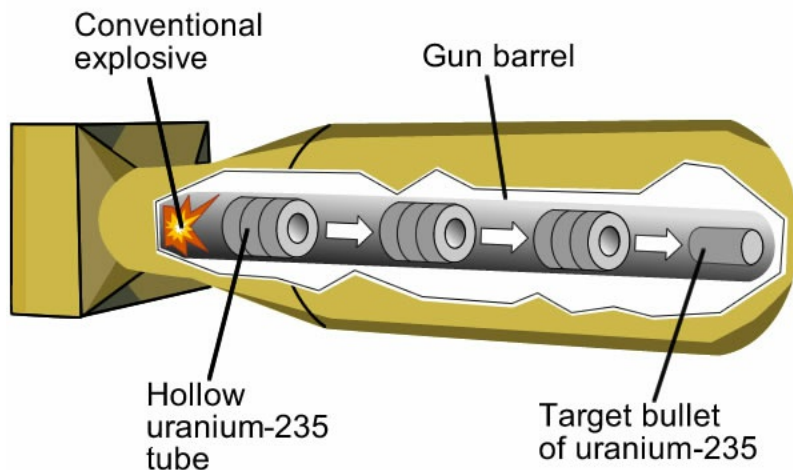
The sex of the bomb

The message from the discussion so far seems to be that the theory behind building a nuclear bomb is fairly straightforward: you just have to assemble a critical mass of fissionable material in order to generate an explosive chain reaction. However, there is another major technical challenge involved in the detonation of a nuclear bomb: there is a need to assemble the critical mass in a very short period of time.

The critical mass must be assembled from smaller sub-critical pieces. A problem arises in that before the critical mass is fully assembled, there is inevitably a short period of time when the total assembled mass is smaller than the critical mass. During this very short window of time, it is possible for a small chain reaction to start in the material. This small chain reaction might be initiated by an external source, for example, a neutron from a cosmic ray. Only a very small amount of the material will be fissioned and the bomb will detonate with a vastly smaller explosive power. This small explosion will blow the rest of the bomb apart before the majority of the material is fissioned. This represents a failure of the nuclear explosive. This problem is called *predetonation*, and the resultant relatively small explosion is called a *fizzle*.

In order to avoid predetonation, it is essential that the entire critical mass is assembled in an extremely short period of time. In practice, this needs to be less than one millisecond.

The simplest way in which a critical mass can be rapidly assembled is to split the critical mass into two sub-critical pieces, and then fire those two pieces together at great speed by using a conventional explosive. An example is presented in the following diagram which shows an assembly mechanism which has been successfully used in a nuclear bomb. The diagram shows a hollow tube of U-235 being fired down a gun barrel towards a bullet of U-235. When the two pieces of U-235 are joined together, the resultant mass will be equal to (or greater than) the critical mass and the bomb will explode:



It might appear rather perverse to fire the hollow tube of uranium onto the bullet, rather than performing the reverse operation by firing a "male" bullet into the hollow tube. In fact for fifty years after the first atomic bomb was constructed it was always believed that the bullet was fired into the tube, and this was always how it was presented in every history book. However, we now know the correct design of the bomb thanks to the investigative work of a

truck driver from Wisconsin named John Coster-Mullen.

Coster-Mullen, together with his son Jason, has built a perfect replica of the Hiroshima atomic bomb. The construction details were laboriously obtained from a huge variety of different sources including interviews with machinists who worked on the bomb, and by forensic examination of photographs of the bomb.

In 1994, as part of his detective work to uncover the secrets of the bomb, Coster-Mullen had a telephone interview with one of the bomb's original engineers named Harlow Russ. Russ was being careful not to divulge classified information, but in the middle of the interview he happened to mention: "You know the projectile was hollow, didn't you?" In other words, Harlow Russ had revealed that a hollow tube was fired onto the bullet — not vice versa as had been assumed. Coster-Mullen had discovered that the "sex" of the bomb was female — not male.

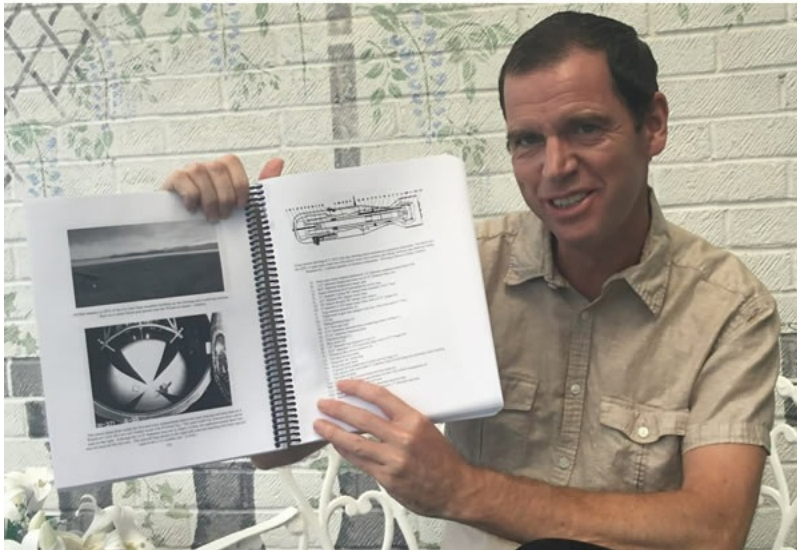
According to the journalist Howard Morland: "Every encyclopaedia in the world, from the Britannica to the World Book, described how the Hiroshima bomb was made, and included a diagram. News articles and school teachers referenced these diagrams. But here's the thing: every single one got it wrong. John Coster-Mullen and his self-published memoir got it right."

The story of John Coster-Mullen — and a discussion about the sex of the bomb — is available at the following link:

<http://tinyurl.com/costermullen>

Coster-Mullen has also published a book called *Atom Bombs* which contains design details of the first atomic bombs. The details are so accurate that this is truly "the book that the Feds tried to ban". In 2005, Coster-Mullen was handed an internal Los Alamos email that described discussions taking place at the highest levels of the Los Alamos National Laboratory to identify a way to quash his book. The book is also permanently banned from sale at the National Museum of Nuclear Science and History in Albuquerque on orders from Sandia National Laboratory. According to Harold Agnew, the former Scientific Director of Los Alamos: "There are drawings in there that are absolutely correct. He's got everything exactly: dimensions, materials, and things that have been really classified. His cross-section drawings are the most incendiary portions of his book."

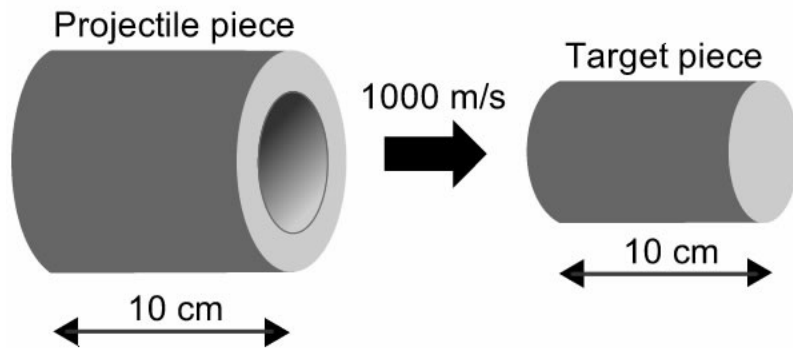
Here is a photograph of me looking suitably awestruck at the cross-sectional diagrams in my copy of John Coster-Mullen's book *Atom Bombs*:



Implosion

Let us now calculate how long it takes to assemble the critical mass using this method. The following calculation is from Bruce Cameron Reed's book *The History and Science of the Manhattan Project*.

The gun muzzle velocity will be approximately 1,000 metres/second, and the lengths of both the projectile tube and the target cylinder will be approximately 10 cm. These measurements are shown on the following diagram:



At that speed of travel, it will take the projectile piece about 100 microseconds to completely surround the target piece. So, using the "gun assembly" mechanism, it is possible to assemble a critical mass in approximately 100 microseconds. Hence, this method can be used to create a critical mass of uranium (it was stated earlier that assembly time for a critical mass of uranium needs to be less than one millisecond).

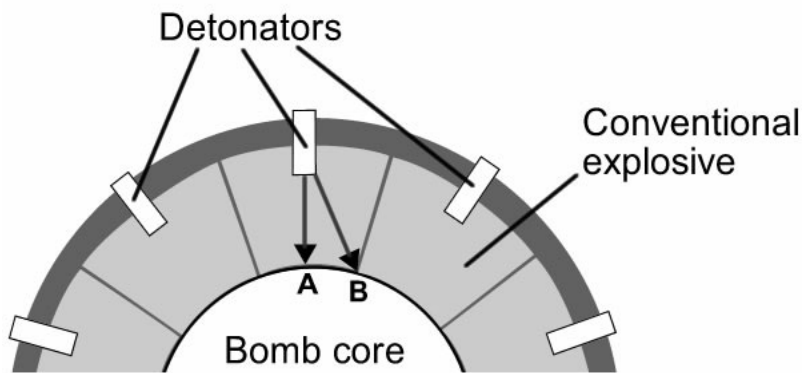
However, it was discovered that the problem of predetonation was more serious for a plutonium bomb. The problem arises because plutonium was found to have a far higher rate of spontaneous fission than uranium. Spontaneous fission can occur when a nucleus splits randomly of its own accord, without being hit by a neutron. Because of random neutrons being produced by spontaneous fission, it was likely that the chain reaction would start before the projectile piece had completely surrounded the target piece, which would result in a much smaller "fizzle" explosion. This meant that the previously-described gun assembly mechanism taking approximately 100 microseconds would be too slow to detonate a plutonium bomb. As an alternative, a more sophisticated "implosion" method was developed at Los Alamos.

In order to understand how the implosion method works, let us remember the principle which underlies the calculation of the critical mass. As described in Chapter Five, a critical mass of material is created when the amount of neutrons escaping through the surface area of the material is less than the amount of neutrons being generated within the material. So the obvious way to create a critical mass is to add more material. But it is clear that an alternate method would be **to reduce the surface area of the material**, and thereby reduce the number of neutrons escaping. This can be achieved by compressing the material, and increasing its density in the process.

The implosion method works by surrounding the bomb core with conventional high-explosive. The resultant explosion can have a huge compressive effect, pushing inward at a speed of several kilometres a second and achieving pressures comparable to those at the Earth's core. It takes only about a microsecond to compress the core to criticality, which is clearly far faster than the 100 microseconds it takes for the gun assembly method. So the implosion method avoids the predetonation problem of plutonium.

However, it is extremely difficult to compress a heavy metal object in a symmetrical manner using implosion. When the method was first proposed, there were many in Los Alamos who thought it was not possible. The problem was compared to the problem of crushing a full beer can without spilling any beer. A brilliant young physicist called Richard Feynman who was working at Los Alamos considered the implosion method and simply said "It stinks".

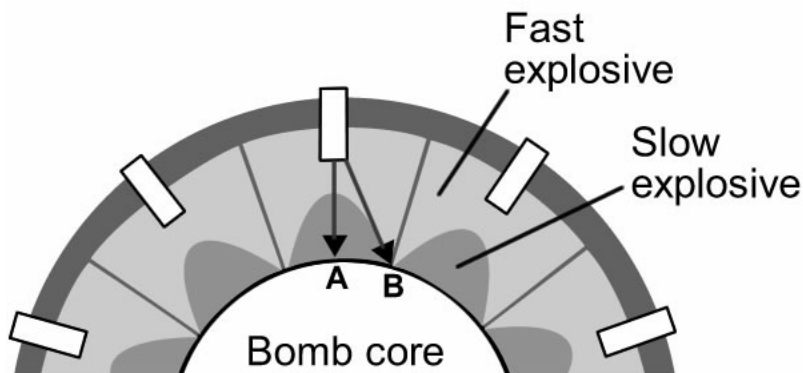
The main problem arises because simply smearing a uniform spherical coating of high-explosive around the bomb core will not produce a smoothly symmetrical compression of the core. To understand why that is the case, consider the following diagram:



The diagram shows a uniform coating of conventional explosive (shaded in light grey) spread evenly around a bomb core. You can see that a series of rectangular detonators are inserted into the explosive at a regular spacing.

In the diagram, let us just consider the top detonator. Because of the curvature of the bomb core, you can see on the diagram that the distance from that detonator to a point A on the surface of the bomb core is slightly shorter than the distance from the detonator to a point B on the surface of the bomb core. What this means is that the wave of detonation of exploding material spreading from the detonator will reach point A slightly earlier than it will reach point B. As a result, the compression will be applied earlier to point A and the result would be to deform the bomb core — like crushing and deforming a beer can in your hand — rather than applying a smooth compression at all points at the same time.

Clearly, the key to achieving a smooth compression is to ensure that the detonation wave hits all points on the surface of the bomb core at the same time. This can be achieved by using a combination of fast-burning explosive and slow-burning explosive, as shown on the following diagram:



The previous diagram shows two different types of conventional explosive being used, which burn at different speeds. The fast-burning explosive is shown in the lighter grey than the slow-burning explosive.

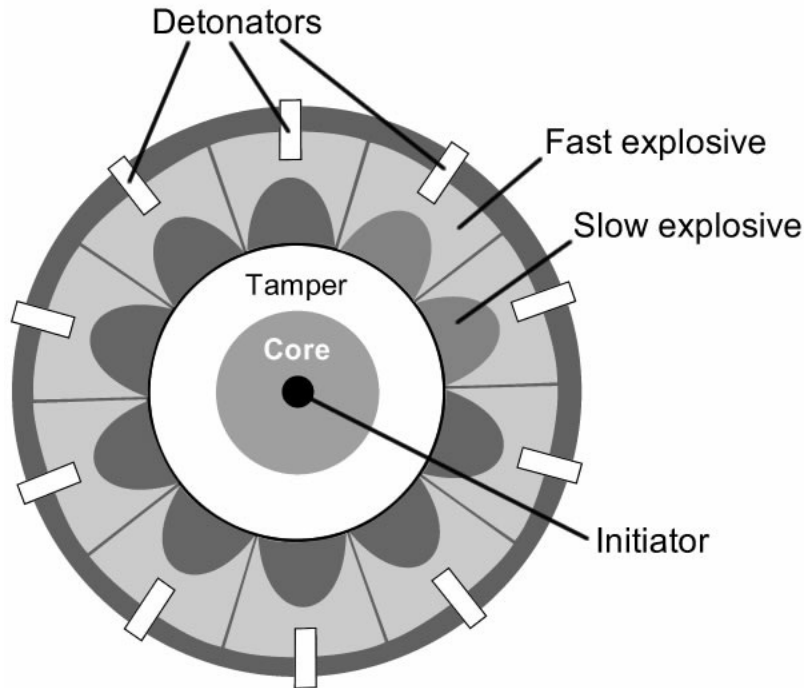
Because of this arrangement of fast-burning and slow-burning explosives, you will see that even though the distance from the top detonator to point A is shorter, the detonation wave will have to pass through more of the slower explosive. Whereas the distance from the top detonator to point B is longer, but the detonation wave will only pass through the fast explosive to get to point B. As a result, the detonation wave reaches both points A and B at the same time, applying equal compression to all points at the same time. The result is a smooth compression of the bomb core.

These arrangements of explosive charges have the effect of "bending" the emerging shockwave from the detonator so that the shockwave meets the entire surface of the core at the same time. In other words, the shockwave is bent in order to fit the shape it is intended to squeeze. These arrangements of explosives are sometimes called explosive lenses because of the similarity to the way an optical lens bends a light wave, based on the similar principle that light travels at different speeds through different media.

Interestingly, in modern implosion bombs the surrounding explosives are often modified by random amounts so that the timing for individual detonators has to be correspondingly modified. The timing device is then stored away

from the bomb. In this way, even if a bomb is stolen by a terrorist group they will not be able to explode it without the corresponding custom timing device. This technology — called a Permissive Action Link (PAL) — was developed by the U.S. in the 1960s and freely-given to the Soviet Union to make the world a safer place.

So that basically describes the structure of a plutonium bomb based on implosion. However, there are two structures that have not been described yet, and these are shown on the following diagram:



Around the plutonium core can be seen the *tamper*, which is a jacket of heavy metal. This acts to increase the yield (the explosive power) of the explosion, and it does this in two ways. Firstly, the sheer weight of the tamper restricts the expansion of the core due to the extreme heat generated in the core, thus giving the core more time to fission completely. It is important that the core does not expand too rapidly as once its surface area grows too large it no longer represents a critical mass and the chain reaction stops. The tamper also acts to reflect neutrons back into the core and stop them escaping through the surface of the core.

At the centre of the core you will see a small black sphere, about the size of a golf ball. This is called the *initiator*, and it is a neutron source which is designed to produce the very first neutron of the chain reaction.

The initiator is usually made of a small piece of the radioactive element polonium surrounded by some beryllium, which is a very light metal. This arrangement is known to provide a good source of neutrons. Energetic alpha particles from the polonium can knock neutrons out of the beryllium nuclei. When the core is crushed, the beryllium mixes with the polonium sending out a shower of millions of neutrons — enough to kick-start the chain reaction.

So that completes the design of the plutonium implosion bomb. In the following final section of this book, we will now see how a bomb such as this was used in the very first man-made nuclear explosion.

Trinity

In the middle of the barren New Mexico desert, 160 miles south of Los Alamos, there stands a black stone obelisk, about 12 foot high. The obelisk is made of local lava-rock. There is a plaque on the obelisk on which just a few words are written: "Trinity Site Where the World's First Nuclear Device Was Exploded on July 16, 1945."



The obelisk marks the hypocentre of the explosion.

There are several reasons why the site was chosen. The site had to be flat to allow for accurate measurements of the explosion, the site had to have little wind to prevent the spread of radioactive fallout, and it was preferred to have a site reasonably close to Los Alamos.

The following map shows the location of the Trinity test site. You can see it lies about 160 miles south of Los Alamos, and about sixty miles away from the town of Alamogordo:



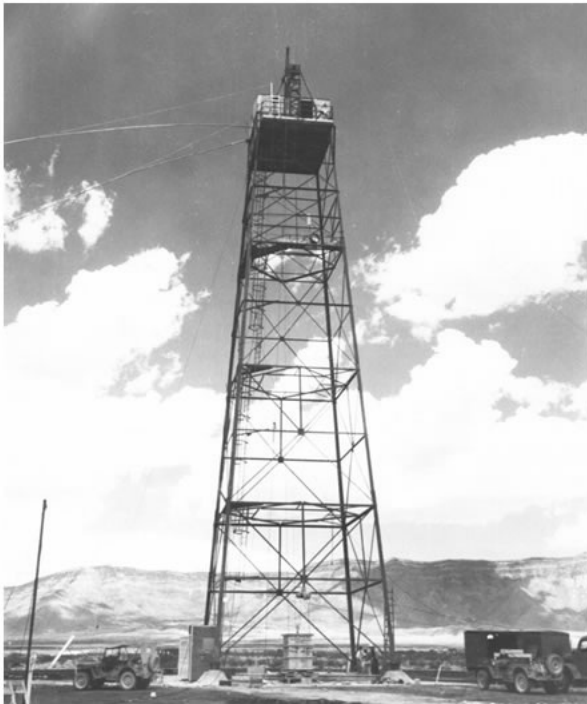
The decision was taken that a test of the plutonium bomb was essential, because of the uncertainties about the implosion mechanism. The plutonium had cost about 250 million dollars to produce, and if the test failed then the plutonium could be recovered and re-used.

The plutonium core and the surrounding shell of high explosive were manufactured at Los Alamos and transferred separately to the Trinity test site. The plutonium core left Los Alamos first on the afternoon of Thursday July 12th (the test was planned for the early morning of the following Monday). The orange-sized piece of metal was given the VIP treatment, driven to Trinity on the back seat of an army sedan with a convoy of armed guards riding in front and behind. The high explosive was driven overnight to avoid traffic and potential accidents, taking eight hours to travel at thirty miles an hour to Trinity.

At Trinity, a temporary base camp was constructed nine miles away from where the bomb was to be detonated. The following photograph shows the Trinity base camp:



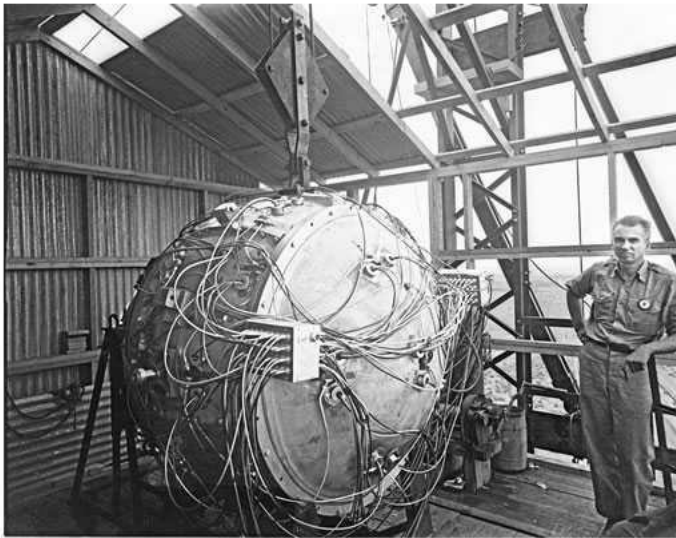
The bomb was to be detonated at the top of a steel tower, one hundred feet tall. There was an oak platform at the top of the tower which could support those working on the bomb, and there was a hole in the platform through which the bomb could be raised. The platform was surrounded on three sides by corrugated iron, making a shack. Here is a photograph of the Trinity tower:



At 1pm on the Friday afternoon, the high explosive shell arrived at the tower. The plutonium core arrived later in the afternoon. Final assembly of the bomb took place in a canvas tent at the base of the tower. The bomb assembly group was headed by Norris Bradbury. It was Bradbury who finished the bomb assembly in the late evening under floodlights.

The following morning, the Saturday, the canvas was removed and the bomb was hoisted to the top of the tower

by an electric winch. When the bomb was at the top of the tower, the detonators were inserted into the bomb. Here is a photograph of Norris Bradbury standing by the fully-assembled bomb at the top of the tower:



The power cables you can see attached to the bomb are attached to the detonators which were spaced around the high-explosive shell. The power cables were so thick because a new type of detonator was developed specifically for the plutonium bomb. If you remember back to the discussion about implosion earlier in this chapter you will remember the importance of the shockwave hitting all points of the spherical core at the same time in order to achieve smooth compression of the core. However, all that work on explosive lenses would have been pointless if all the detonators did not all detonate at precisely the same time.

In order to achieve that microsecond accuracy of detonation, a new type of detonator was developed called an exploding bridge wire detonator. The detonator was made of a thin wire through which a pulse of extremely high current was passed. The current needed to be in the region of 100 kiloamps, which explains the large power cables attached to the bomb. The wire instantly becomes hot and literally explodes — starting the detonation. Crucially, all the detonators will detonate within a microsecond when the pulse of high current is applied.

The detonators were inserted on the Saturday, so Sunday became a day of waiting before the planned detonation of the bomb early on Monday morning. An intense thunderstorm hit the site at 2 a.m. on Monday morning. According to Isidor Rabi: "It was raining cats and dogs, lightning and thunder. We were really scared that this object there in the tower might be set off accidentally. So you can imagine the strain on Oppenheimer." The detonation was delayed until just before dawn. A telephone call was made to the governor of New Mexico warning him that he might have to declare martial law if the explosion caused a panic.

At 5:30 a.m., the weather had cleared. The detonation sequence was controlled from inside an earth-covered concrete control centre six miles from the bomb tower. Oppenheimer would watch the explosion from that shelter.

Busloads of visitors from Los Alamos were ready to view the explosion from the summit of Compañia Hill, twenty miles from the bomb. The crowd included many of the physicists who had worked on the bomb. It was dark and cold, and the tension was almost unbearable. They had been advised to lie face down on the ground, with their feet pointing toward the explosion. They had also been given welding glasses to protect their eyes. However, Richard Feynman refused the glasses, later claiming to have been the only person to have viewed the explosion with no eye protection. According to one observer: "It was an eerie site to see a number of our highest-ranking scientists seriously rubbing sunburn lotion on their faces and hands in the pitch-blackness of the night, twenty miles from the expected flash."

In the control centre just six miles from the bomb, the atmosphere was so tense that Oppenheimer could hardly breathe. He held onto a post to steady himself and stared directly ahead as the last seconds ticked away.

5 ... 4 ... 3 ... 2 ... 1 ... 0 ...



First came the instant blast of light. Pitch black night suddenly turned to the most intense daylight, three times brighter than the brightest Sun. Those lying on the ground at Compania Hill, twenty miles from the explosion, saw distant hills suddenly brightly illuminated as if by a rising Sun.

Isidor Rabi at Base Camp, nine miles from the explosion, described the light: "We were lying there, very tense, in the early dawn. Those ten seconds were the longest ten seconds that I ever experienced. Suddenly, there was an enormous flash of light, the brightest light I have ever seen or that I think anyone has ever seen. It seemed to last forever. You would wish it would stop; altogether it lasted about two seconds. Finally it was over, and we looked toward the place where the bomb had been; there was an enormous ball of fire which grew and grew and rolled as it grew; it went up into the air, in yellow flashes and into scarlet and green. It looked menacing. It seemed to come toward one. A new thing had just been born; a new control; a new understanding of man, which man had acquired over nature."

Philip Morrison described the other overwhelming sensation of the radiant heat: "The thing that got me was not the flash but the blinding heat of a bright day on your face in the cold desert morning. It was like opening a hot oven with the Sun coming out like a sunrise."

Norris Bradbury explained the difficulty in making sense of something which no one had ever seen before: "Most experiences in life can be comprehended by prior experiences, but the atom bomb did not fit into any preconceptions possessed by anybody."

The bomb had exploded with force of twenty thousand tons of TNT. The temperature at the centre of the explosion was four times greater than the temperature at the centre of the Sun. The resultant pressure was more than a hundred billion times the pressure at the surface of the Earth, and was the greatest pressure ever to exist on the Earth. In Arizona, 150 miles away, it was reported that a woman was puzzled why she saw "the Sun come up and go

down again".

The greatest physics experiment of all time had been a success.

Robert Oppenheimer, the director of the Manhattan Project, was in the control centre just six miles from the bomb. His brother Frank, also a physicist, was by his side. After the incredibly tense last few minutes, Oppenheimer could breathe freely at last.

They both walked outside and climbed on top of the earth-covered bunker. Frank turned to face his brother — who within the next few days would become the most famous man in the world — and said "It worked".

Oppenheimer looked at the immense mushroom cloud now climbing high over the desert.

"Yes", said Oppenheimer, "It worked".

FURTHER READING

The History and Science of the Manhattan Project by Bruce Cameron Reed

A highly-detailed and technical description of the science of the atomic bomb.

The Making of the Atomic Bomb by Richard Rhodes

The definitive account of nuclear physics leading up to the development and use of the first atomic bomb.

Trinity by Jonathan Fetter-Vorn

A graphic novel of the development of the atomic bomb, with plenty of good science. Extremely well done.

APPENDIX:

CALCULATING THE CRITICAL MASS

This Appendix is highly-mathematical, so only read it if you are confident about your mathematical abilities.

This Appendix contains the detailed calculation of the value of the critical mass, and continues from the discussion in Chapter Five. We will start by calculating the flow of neutrons out of the material. This initial section is going to introduce some mathematical terminology which is likely to be new to you. Please do not worry about it or get bogged-down by the details. All we will need is the result at the end of this section which is a well-established result in mathematics.

The spread of particles through a substance (for example, the spread of dust particles in air, or the spread of a chemical through a liquid) is called *diffusion*. The theory behind diffusion has been well-studied, and there is a branch of physics specifically called *diffusion theory*. We can apply precisely the same theory to consider the flow of neutrons out of a volume (after all, neutrons are just another type of small particle — like dust particles).

To cut a long story short, in this section we will be seeing that diffusion theory tells us that the flow of neutrons out of the material is described mathematically by the *Laplacian* operator. All we will be needing from this section is to find the formula for the Laplacian operator.

OK, so let's go ...

As described in Chapter Five, the value of the neutron current is proportional to the gradient of the number of neutrons. So, using the derivative notation, we can express the value of the neutron current, j , as:

$$j = -D \frac{dN}{dr}$$

where N is the number of neutrons in a volume of the fissionable material, and r represents the distance from the centre of the material. Assuming the fissionable material to be in the shape of a solid sphere, then r represents the distance from the centre of the sphere towards the edge of the sphere.

You will see that there is another constant in the expression: D is a constant called the *diffusion coefficient* which is a fixed property of the fissionable material. We will be calculating the value of D later in this chapter.

The minus sign in the formula arises because the current is from the larger neutron concentration to the smaller neutron concentration, whereas a positive gradient would normally be from low to high (as in climbing a hill, which would represent a positive gradient).

But if the value of the neutron current remains the same over a distance then the number of neutrons entering a volume of the material (the current in) will be the same as the number of neutrons leaving the volume of the material (the current out). In other words, the number of neutrons in that volume will be unaltered. But what we are really interested in is the **change** in the number of neutrons in that volume. That will then give us the rate at which the neutrons are spreading into space, escaping out of the volume. Mathematically, this is called the *divergence*.

So if we want to calculate the divergence (the change in the number of neutrons in a volume) then we have to consider the **change** in the value of the neutron current. In other words, we have to consider the derivative of the neutron current. But we calculated earlier that the value of the neutron current, j , is given by:

$$j = -D \frac{dN}{dr}$$

which is, clearly, a derivative itself. So to find the change in the number of neutrons we need to take the derivative of a derivative. Therefore, the change in the number of neutrons in a volume is calculated by the derivative of j :

$$-D \frac{d}{dr} \left(\frac{dN}{dr} \right)$$

What we have done here is show that the change of the number of neutrons in a volume is given by the divergence of the gradient. In mathematics, it is well-known that the divergence of the gradient is called the *Laplacian*. As I said earlier, this is all we need to know from this section. The mathematical form of the Laplacian is well-known and you can even find it on the Wikipedia page for the Laplacian.

The Laplacian for spherical coordinates (which is what we want) is given halfway down the Wikipedia page:

<http://tinyurl.com/laplacianspherical>

It does indeed have the two derivatives (a derivative of a derivative), which is what we just calculated. You will see that the precise form is:

$$-D \frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{dN}{dr} \right)$$

Creating the equation

So now we have a formula describing the flow of neutrons out of a volume. We are making good progress.

As stated at the start of Chapter Five, the critical mass occurs when the loss of neutrons through the surface of a volume is equal to the build-up of neutrons inside that volume. In Chapter Five we calculated that the rate of increase in the number of neutrons in a volume of the material is given by:

$$\frac{(\nu - 1) N}{\tau}$$

Putting this value equal to the previous equation for the loss of neutrons through the surface of that volume gives:

$$-D \frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{dN}{dr} \right) = \frac{(\nu - 1)}{\tau} N$$

Dividing both sides by D and N , and changing the sign of both sides, gives:

$$\frac{1}{N} \left[\frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{dN}{dr} \right) \right] = -\frac{(\nu - 1)}{D\tau}$$

This equation describes the distribution of neutrons in a critical mass. So now all we need to do is solve the equation and find the shape of the distribution. However, I must admit, the equation does look very complicated! But do not worry — we will find the equation has a surprisingly simple solution.

And in order to solve the equation, we are going to use a quite amazing tool ...

The genius of Mr. Wolfram

We now have an equation we need to solve to find the value of N , which will tell us the distribution of the number of neutrons within the fissionable material. You will see that the equation includes the value of N , and also the derivative of N . Equations which include combinations of variables and their derivatives like this are called *differential equations*.

Differential equations can capture the dynamics of a complex system in which elements are moving at different rates to one another. As a result, differential equations are very useful tools for describing physical phenomena such as heat flow or the motion of waves, and are used throughout physics and engineering. But differential equations can also be used to describe any complex system with "moving parts" such as biology and economics.

The **solution** of differential equations then takes a central role in many science problems. The problem can be complex because differential equations can come in a huge variety of different forms. For many simple forms, the method of solution is well known and described in mathematical textbooks. But when more complicated situations are described (for example, modelling the movement of airflow in weather forecasting), the differential equations might have no simple solution and it is then necessary to use a powerful computer to perform repeated calculations, slowly converging to a solution.

Our attempt to calculate the critical mass of an atomic bomb has resulted in the creation of a differential equation, and we now have to solve that equation. However, the task of solving differential solutions just got a whole lot easier thanks to the artificial intelligence website Wolfram Alpha.

The driving force behind Wolfram Alpha is the controversial mathematical genius Stephen Wolfram. Wolfram was a child prodigy who published physics papers at the age of 15. In 1988 he left academia to develop the software package called Mathematica. Mathematica can be used to solve complex problems, and to visualise solutions. The program was an instant success and made Wolfram his fortune.

In 2002, Wolfram released a controversial book called *A New Kind of Science* in which he claimed that great complexity arises from simple rules called *cellular automata*. Wolfram claimed to be able to use these simple programs to model almost any complex system. Unfortunately, the book was widely-criticised for its arrogant tone and unscientific approach, and there was the suggestion that the project represented a huge ego-trip for Wolfram. It would appear that even geniuses have their failings.

In 2008, Wolfram released the Wolfram Alpha search engine (or "computational knowledge engine" as they call it). The search engine technology behind Wolfram Alpha claims to be unique in that it can answer questions which are posed in everyday language. I thought I would test this claim of Wolfram Alpha, so I went to its webpage:

<http://www.wolframalpha.com>

In the Wolfram Alpha search box I entered the question "Who was the oldest Beatle?" Sure enough, in just a few seconds it came back with the correct answer "John Lennon". In contrast, entering the same query into Google just returns the usual long list of search results. It is clear that Wolfram Alpha is attempting to do something very different: it is trying to **understand** your question, and **calculate** an answer (this is opposed to the usual search engine method of just matching character strings). This is true artificial intelligence: a brain on the web.

What makes Wolfram Alpha particularly interesting for our particular problem is that some of the mathematical processing ability of Mathematica has been incorporated into Wolfram Alpha. This makes Wolfram Alpha incredibly useful for solving any mathematical problems you might encounter. For example, I was surfing the net recently when I saw a mathematical puzzle asking me to find the value of x in the following equation:

$$\sqrt{x+15} + \sqrt{x} = 15$$

Can you solve the puzzle and calculate the value of x ?

Well, it looked a bit of a brain-ache to me, so I went straight to the Wolfram Alpha website:

<http://www.wolframalpha.com>

and in the search box at the top of the page, I typed the puzzle in English just as it is written:

square root of (x+15) plus square root of x equals 15

So the search box looked like:



Try it yourself. Then click the icon at the extreme right of the search box to start Wolfram Alpha computing the solution. After a few seconds computation, it returns the correct answer, giving you the value of x (you may have to scroll down the page to see the solution). I won't tell you what the answer is — try it yourself!

So Wolfram Alpha can understand most mathematics problems (or any question) which you type in natural English. That makes it very handy for solving a wide range of puzzles. In fact, in typically modest Wolfram style, it claims to have the ambitious long-term goal of "computing whatever can be computed about anything".

Of particular interest, Wolfram Alpha is able to recognise a differential equation and find its solution — and that's good news for us because we are going to use Wolfram Alpha to solve our differential equation ...

Solving the equation

If you remember, this is our differential equation:

$$\frac{1}{N} \left[\frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{dN}{dr} \right) \right] = - \frac{(v-1)}{D\tau}$$

Yes, it looks very complicated, but as I said earlier we will find it has a very simple solution.

I am going to make a temporary modification to this equation purely for reasons of brevity and convenience, and also to make it easier to enter into Wolfram Alpha. You will see that the right-hand side of the equation is formed from a combination of various constants, which are based on the properties of the fissionable material. The end-result will just be another different constant. So, purely so that I don't have to write out the same long expression each time, let us replace the right-hand side of the equation with the constant value, k . In other words:

$$k = \frac{(\nu - 1)}{D\tau}$$

In which case, our differential equation then becomes:

$$\frac{1}{N} \left[\frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{dN}{dr} \right) \right] = -k$$

When we finish our calculation, we will replace k with the original combination of constants.

In order to solve this equation, we have to discover the form of the distribution of neutrons which is described in the equation by N , with the value of N varying as we move from the centre of the material to the edge of the material. We are going to use Wolfram Alpha to solve this equation in rather a backward fashion. We are going to suggest a likely candidate solution for N , and then use Wolfram Alpha to check if that potential solution satisfies the differential equation. If that is shown to be the case, then we have a verified solution for our equation and we would have achieved success. However, if the solution is only slightly incorrect then we will need to slightly modify our candidate solution and run it through Wolfram Alpha again.

So what type of candidate solution might we try to describe the distribution of neutrons? Well, we would imagine that the number of neutrons in the material would be highest in the centre of the material as that is the region which is furthest from the edge. Conversely, we would imagine that the number of neutrons would be lowest at the edge of the material as that is where the losses occur. And in between those two extremes we would imagine the number of neutrons would decrease smoothly along a curve.

This suggests a smooth curve like a sine wave, and there is a simple potential candidate solution which fits the bill:

$$N(r) = \frac{\sin(r)}{r}$$

Let us now use Wolfram Alpha as a visualization tool to help us see what this candidate solution looks like. Will it resemble the expected distribution of neutrons in a critical mass? To find out, go to the Wolfram Alpha website:

<http://www.wolframalpha.com>

In the search box at the top of the page, enter the following string into the search box (take care to note the first "minus pi" term):

plot (sin(r)/r) from r=-pi to r=pi

Your Wolfram Alpha search box should then look like this:

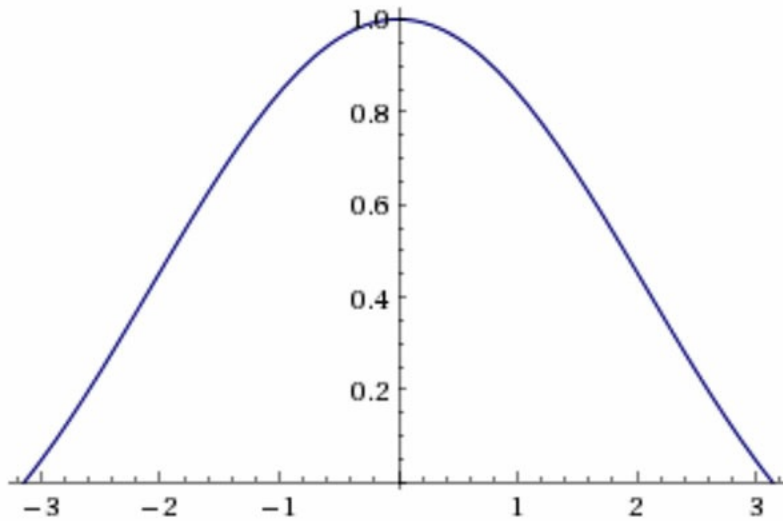
Enter what you want to calculate or know about:

plot (sin(r)/r) from r=-pi to r=pi



Web Apps Examples Random

Click the icon at the extreme right of the search box to start Wolfram Alpha computing the solution. After a few seconds computation, you will be rewarded with the following graph:



You can see the distribution of neutrons is at its highest in the middle of the graph, which represents the centre of the fissionable material ($r=0$). There is then a smooth decline in the number of neutrons toward the edge of the material as losses are higher nearer the edge. The number of neutrons is zero at the edge as any neutrons produced by fission are free to fly straight out of the material, so there is never any opportunity there for the number of neutrons to build up.

So the general shape of this graph looks much as we would expect. This gives us confidence in our candidate solution.

If you are stuck and having problems getting Wolfram Alpha to work correctly, I have already entered the correct data and generated the correct graph. So, only if you are stuck, the following link should always work, taking you directly to the correct page showing the graph:

<http://tinyurl.com/neutrongraph>

For our next step, we will use a different feature of Wolfram Alpha: its capability to solve differential equations. To recap, our candidate solution is:

$$N(r) = \frac{\sin(r)}{r}$$

Can this really be the solution we are seeking? We might have our doubts as it does seem to be rather simple. We need to check to see if this potential solution satisfies our differential equation. To do that, we need to replace both occurrences of N in our differential equation with $\sin(r)/r$. That gives:

$$\frac{1}{\frac{\sin(r)}{r}} \left[\frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{d \frac{\sin(r)}{r}}{dr} \right) \right] = -k$$

We will check if this is the correct solution by using Wolfram Alpha to calculate the value of the left-hand side of the equation, and checking that the result is equal to minus k (the right-hand side of the equation).

So return to the Wolfram Alpha webpage and carefully enter the following expression as a single continuous line into the search box:

1/(sin(r)/r) * 1/(r squared) * derivative of ((r squared) * derivative of (sin(r)/r))

This expression represents the left-hand side of the previous differential equation. Compare the expression with the left-hand side of the differential equation and see if you can spot that the various elements in the two forms correspond to each other.

Your Wolfram Alpha search box should now look like this:



Click the icon at the extreme right of the search box to start Wolfram Alpha computing the solution. After a few seconds computation, it should come back with its answer:

Input interpretation:

$$\frac{1}{\frac{\sin(r)}{r}} \times \frac{1}{r^2} \times \frac{\partial}{\partial r} \left(r^2 \times \frac{\partial \sin(r)}{\partial r} \frac{1}{r} \right) \leftarrow \text{Correct equation}$$

[Open code](#)

Result:

-1 \leftarrow **Close to the correct result**

Download page POWERED BY THE WOLFRAM LANGUAGE

If everything has gone correctly then at the top of the answer you should see that Wolfram Alpha has correctly interpreted the input string into the correct form of the differential equation. And underneath that you will see that Wolfram Alpha has calculated the value of the expression and found that it is equal to minus one.

If you are stuck and having problems getting Wolfram Alpha to work correctly, I have already entered the correct data and the computation worked correctly for me. So, only if you are stuck, the following link should always work, taking you directly to my results page:

<http://tinyurl.com/candidatesolution>

The result of minus one is an encouraging result, though it is not quite correct. We were hoping that the result would be equal to the right-hand side of our differential equation, which is minus k . But minus one is very similar to minus k , so all we have to do is tweak our candidate solution slightly.

Clearly, in order to get a result of minus k , our candidate solution will have to include the value of k somewhere in it. So let us modify our candidate solution slightly by including the value of k in some way. With that in mind, let us try this new candidate solution for the distribution of neutrons:

$$N(r) = \frac{\sin(r\sqrt{k})}{r}$$

You will see that the square root of k has been added to the candidate solution. Let us now check if that satisfies our differential equation (which has now become even more complicated!):

$$\frac{1}{\frac{\sin(r\sqrt{k})}{r}} \left[\frac{1}{r^2} \frac{d}{dr} \left(r^2 \frac{d}{dr} \frac{\sin(r\sqrt{k})}{r} \right) \right] = -k$$

Let us enter the left-hand side of this equation into Wolfram Alpha and see if it gives us the answer we want. So return to the Wolfram Alpha webpage and carefully enter the following expression as a single continuous line into the search box:

1/(sin(r * square root of k)/r) * 1/(r squared) * derivative of ((r squared) * derivative of (sin(r * square root of k)/r))

Once again, click the icon at the extreme right of the search box to start Wolfram Alpha computing the solution. After a few seconds computation, it should come back with its answer:

The screenshot shows the Wolfram Alpha interface. Under "Input interpretation:", the input is displayed as $\frac{1}{\frac{\sin(r\sqrt{k})}{r}} \times \frac{1}{r^2} \times \frac{\partial}{\partial r} \left(r^2 \times \frac{\partial}{\partial r} \frac{\sin(r\sqrt{k})}{r} \right)$. A large black arrow points from this expression to the text "Correct equation". Below this, under "Result:", the answer is shown as $-k$. A large black arrow points from $-k$ to the text "Correct result!!". At the bottom, there is a "Download page" link and the text "POWERED BY THE WOLFRAM LANGUAGE".

Hooray! Wolfram Alpha has calculated that the result is equal to minus k , which is the correct result we were looking for (minus k was the value on the right-hand side of our differential equation). So our complicated differential equation turned out to have a really simple answer: the accurate formula for the distribution of neutrons in our critical mass is given by:

$$\frac{\sin(r\sqrt{k})}{r}$$

If you are stuck and having problems getting Wolfram Alpha to work correctly, I have already entered the correct data and the computation worked correctly for me. So, only if you are stuck, the following link should always work, taking you directly to my correct results page:

<http://tinyurl.com/resultspage>

If you followed all the steps and everything worked correctly, then congratulations! Now, for the last step, let's put some actual numbers into this result and calculate the value for the critical mass in terms of kilograms.

Calculating the critical mass

We have now done the hard part of this calculation. The rest is now relatively simple.

To recap, we have shown that the distribution of neutrons in our critical mass is described by:

$$\frac{\sin(r\sqrt{k})}{r}$$

To obtain the value of r when we have a critical mass of the material, we will use our knowledge of the properties of the edge of the critical mass. In solving a differential equation, this is called a *boundary condition*.

We know that the net amount of neutrons produced at the edge will be the smallest value as that is where neutron losses out of the material are largest. From our high-school knowledge of trigonometry we know that the sine function reaches a minimum at π radians (or, equivalently, 180 degrees). Indeed, if you look at our earlier graph showing neutron distribution, you will see that it reaches zero when the horizontal scale is at π radians. So, in the previous formula, with r set equal to the critical radius, R_c , that means the contents of the bracketed term must be equal to π .

So, just considering the contents of the bracketed term:

$$R_c \sqrt{k} = \pi$$

Let us now replace k in this equation with the combination of constants which k represents (remember, we did the reverse substitution earlier). The equation now becomes:

$$R_c \sqrt{\frac{\nu - 1}{D\tau}} = \pi$$

Squaring both sides of the equation gets rid of the square root:

$$R_C^2 \left(\frac{\nu - 1}{D\tau} \right) = \pi^2$$

Rearranging the elements of this equation gives:

$$R_C^2 = \frac{\pi^2 D\tau}{\nu - 1}$$

Which is the formula for the critical radius which you will find in Section 10 of the *Los Alamos Primer* which deals with the calculation of the critical mass.

Let us take the square root of both sides to get our final result for the critical radius:

$$R_C = \sqrt{\frac{\pi^2 D\tau}{\nu - 1}}$$

And that's it! That is the final equation for the critical radius of the critical mass! If you managed to follow all the steps — and completed the Wolfram Alpha exercises on your computer — then you can genuinely tell your friends that you used a computational knowledge engine to solve a differential equation to calculate the distribution of neutrons in a nuclear bomb core. If they are not impressed by that — then get new friends.

Let us now put numbers into this formula to get a value for the critical mass:

- If you remember it was explained in Chapter Five that ν is the average number of neutrons produced from the fission of one nucleus, which for uranium-235 is equal to 2.52.
- Also explained in Chapter Five, τ is the average time between fissions. This is a very short period of time, only a few nanoseconds. As a result, a nuclear explosion releases all its energy in just a microscopic fraction of a second. To be precise, τ is equal to only 8.1×10^{-9} seconds.
- D , which was introduced earlier is the diffusion coefficient. D is calculated from the average distance between collisions (the *mean free path*) which is 0.029 metres, multiplied by the velocity of the neutrons which is 1.7×10^7 metres/second, divided by the number of dimensions of space which is 3. That means D is equal to 1.6×10^5 metres²/second.

If you substitute these three values into the previous formula for the critical radius you will get the result that the critical radius of uranium-235 is 9.1 centimetres.

PICTURE CREDITS

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Diagram of moose size in Sweden is by Nmccarthy16 and is provided by Wikimedia Commons.

NOTES

[1] Note that the "Twenty thousand leagues" of Jules Verne's book refers to a huge distance travelled — not depth under water, as twenty thousand leagues is twice the circumference of the Earth.

[2] *To Mars by A-Bomb: The Secret History of Project Orion*, <http://tinyurl.com/projectorionmovie>

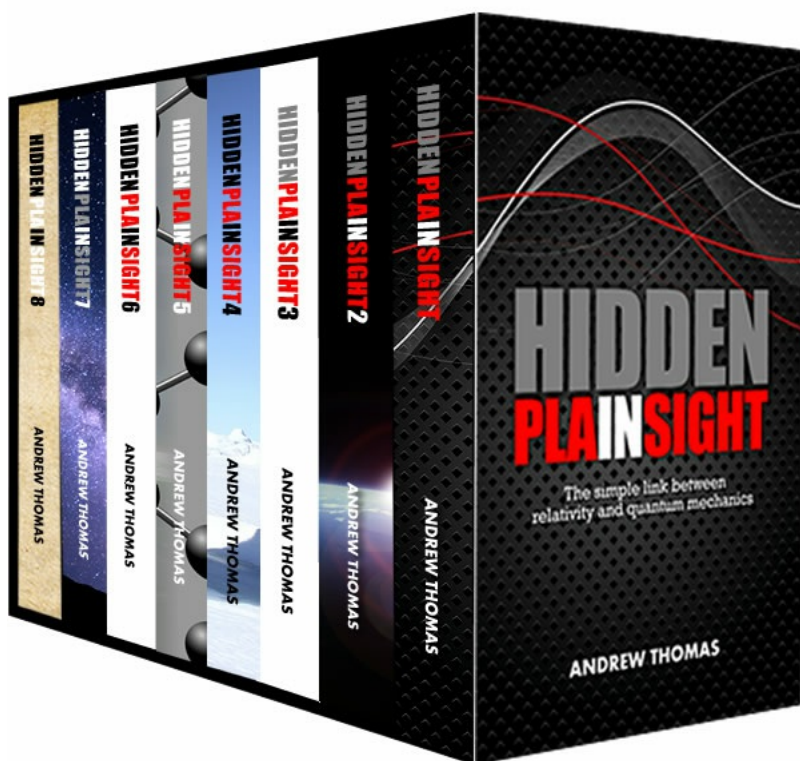
[3] Paul Gilster, *Project Orion: A Nuclear Bomb and Rocket — All in One*, <http://tinyurl.com/centauridreams>

[4] A third type of radiation called *gamma* radiation was discovered later. Gamma radiation is a form of high-energy electromagnetic radiation (such as light or X-rays). We will not be considering gamma rays further in this book.

[5] This echoed a discovery in 1932 by Marie Curie's daughter Irène and her husband Frédéric Joliot who had considered alpha particle bombardment of light elements.

[6] *The Cosmic Origins of Uranium*, World Nuclear Association, <http://tinyurl.com/uraniumorigins>

[7] This effect can also be understood in a different way. Because we are dealing with particles, quantum mechanical effects dominate. Every particle has an associated radius called the *de Broglie wavelength* which can be understood as being the cross section of a point particle. A slow-moving neutron will have low energy and will see a larger de Broglie wavelength of the nucleus, which means a larger fission cross section.

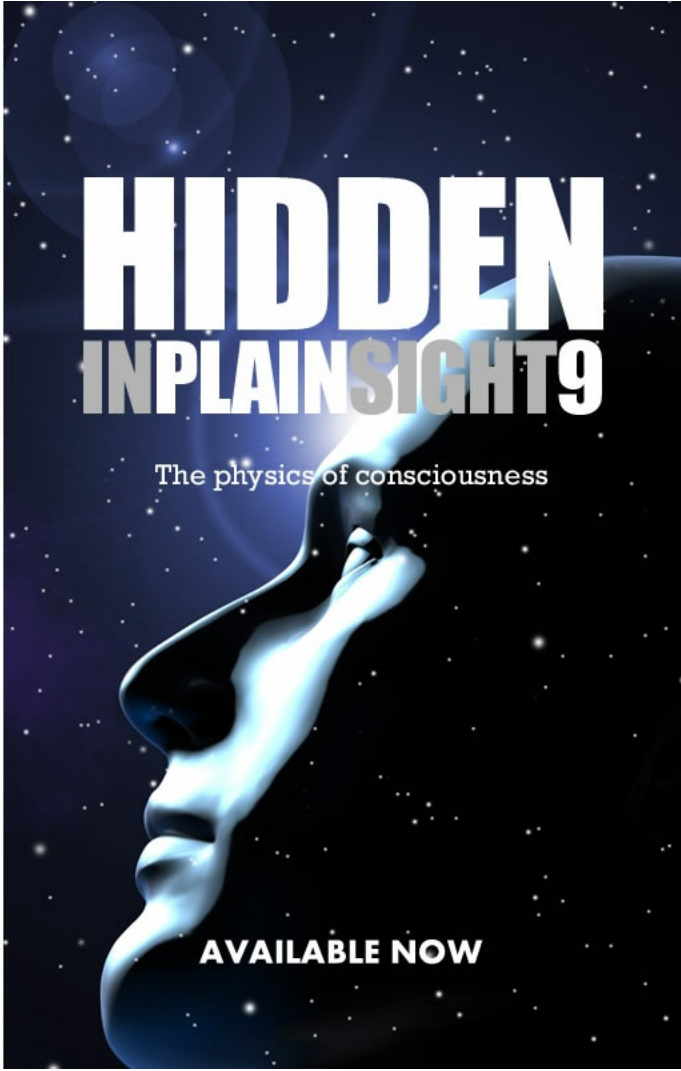


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The physics of consciousness

ANDREW THOMAS

HIDDEN IN PLAIN SIGHT 9

The Physics Of Consciousness

Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

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The Physics Of Consciousness

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CONTENTS

1) THE PHYSICS OF CONSCIOUSNESS

[The mind-body problem](#)
[Substrate-independence](#)
[Consciousness and the Standard Model](#)
[Information](#)
[Maxwell's Demon](#)
[The material of our thoughts](#)

2) A QUICK TOUR OF THE BRAIN

[Lobes of the brain](#)
[The neural correlates of consciousness](#)
[Neurons](#)
[Inside the neuron](#)

3) ARTIFICIAL NEURONS AND ELECTRONIC BRAINS

[Integrated circuits](#)
[Digital information](#)

4) COMPLEXITY

[Chaos](#)
[Emergence](#)
[Reductionism vs. emergence](#)
[A measure of emergence: \$\Phi\$](#)
[The low-hanging fruit](#)

5) CAN A COMPUTER THINK?

[The liar's paradox](#)
[The halting problem](#)
[The new mind of Roger Penrose](#)
[Quantum theories of consciousness](#)

6) THE RISE OF AI

[The Turing Test](#)
[The Winograd effect](#)
[My PhD thesis](#)
[Deep learning](#)
[Deep learning and the cortex](#)
[Beyond human](#)

7) THE CHINESE ROOM

[Understanding "understanding"](#)

[The man with two heads](#)

[The internal model](#)

[Self-awareness](#)

8) THE "HARD PROBLEM"

[Leibniz's Mill](#)

[The DRAM analogy](#)

["It from bit"](#)

[Beyond the physical](#)

"No problem can be solved from the same level of consciousness that created it."

- ALBERT EINSTEIN

1

THE PHYSICS OF CONSCIOUSNESS

Here are six questions. I would like you to answer either "yes" or "no" to each question:

- Is a human being conscious? (Presumably you would answer "yes" to this question).
- Is a chimpanzee conscious?
- Is a dog conscious?
- Is an ant conscious?
- Is a computer conscious?
- Is the internet conscious?

Maybe you answered "yes" to all six of those questions, but I imagine most people would have started saying "yes" then at some point they would have felt that a threshold had been crossed and they would have started to say "no", the object was not conscious.

I am not presenting these questions as a test to see if you give "right" or "wrong" answers. I certainly do not know the correct answers myself, and I do not even know if there is such a thing as a right or wrong answer to a few of these questions. I am merely presenting these questions to emphasize how difficult it is to define consciousness, and how difficult it is to detect the presence of consciousness.

Even though it is very difficult to define a feeling, we might ask "what is consciousness?" It might be said it is an awareness, a perception of one's self and the world around you. It is an awareness that you exist as an independent thinking entity.

I hope you get the message that it is very difficult to describe consciousness in anything but very vague terms. However, that is not to say the task of recognising consciousness is impossible. In the late 1960s, the psychologist Gordon Gallup was shaving himself in the mirror when he got the idea for a consciousness test which is now called the *mirror test*. The aim of the test is to determine if an animal has visual self-recognition, which is believed to be a measure of self-awareness. In the test, a mark is discreetly written on the forehead of an animal (for example, a chimpanzee) so that the animal is not normally capable of seeing the mark. The animal is then given access to a mirror and the reaction of the animal is observed. If the animal uses the mirror to recognise and investigate the mark, then that would appear to show that the animal perceives the reflected image as itself. This seems to suggest that there is some inner awareness of self — something which is often considered to be a key element of consciousness.

The following image shows an actual example of the mirror test being performed on a baboon:



However, so far only humans, chimpanzees, dolphins, and a single very clever elephant have passed the mirror test. Are we really suggesting that only those animals are conscious? Are we suggesting that dogs, cats, bears, and all those other animals are not conscious? Is the mirror test a reliable test of consciousness? In other words, is self-awareness a necessary factor of consciousness? We shall be considering these questions later in this book.

Perhaps it is easiest to admit that consciousness is best described in fuzzy terms as just a feeling, without strict definition: if you are currently wondering what consciousness is, then you must be conscious. It is the feeling you are having right now.

It is this vague and subjective definition of consciousness that has made it an unattractive and unpopular subject for physicists. And the few physicists who have dared to treat the subject seriously have generally, unfortunately, not found their work particularly well-received by the physics community. The real problem with the field is that it is not possible to test — or, more accurately, falsify — hypotheses about consciousness. Everyone seems to have their own personal hypothesis, their own personal theory. However, unlike physics, it is not possible to test those theories (how can you perform experiments on "feelings"?) to discover which hypotheses are incorrect. So, unlike physics, it is not possible to winnow-out the weak theories: there is no natural selection, no "survival-of-the-fittest" process for those theories. As a result, not only does the field not advance, but it gains a reputation for being unscientific — and best avoided by physicists. The field has therefore mainly been studied by neuroscientists and philosophers, with several valuable new insights coming from the neuroscientists. We shall also be seeing later that the neuroscientists are developing tests for consciousness, so consciousness research should no longer be considered "untestable".

This book, however, will take a slightly different approach. In this book, we will be tackling the problem from the viewpoint of physics, mathematics, computer science and artificial intelligence — and even some electronics.

But, before we start our quest to uncover the mystery of consciousness, there are a couple of principles (or problems) of which you should be aware ...

The mind-body problem

In the 17th century, René Descartes presented a rather direct explanation for consciousness. Descartes declared that the mind was made of fundamentally different "stuff" to the rest of the body. The mind was non-physical, and was distinctly separable from the rest of the body. This philosophy is called *dualism*.[\[1\]](#) Descartes even suggested a

region in the brain where the mind might be found: the pineal gland, which is a small gland in the centre of the brain.

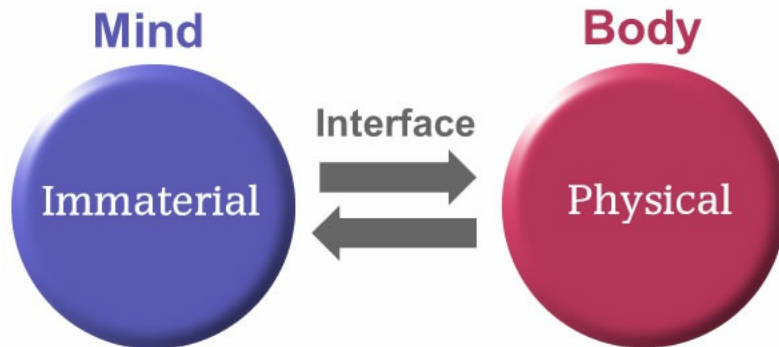
The motivation for Descartes philosophy was that the contents of our minds seem fundamentally different from the physical world we see around us. We might see a rock, and we know it is not conscious. We might see a more complex object, like a clock or a car, but we still know that those objects are not conscious. Somehow, the contents of our minds seem different. We do not seem tied to the physical world, the world of matter. Instead, our minds seem somehow immaterial, insulated from the material world, somehow floating in a higher realm of thought.

And in that higher realm, our insulated minds cannot be damaged by the physical world. As our bodies grow old and maybe painful, our minds can stay young, apparently impervious to the ravages of time. I have often heard an old person say that they feel the same in their mind as they did when they were young — I feel the same way myself (though I do not yet consider myself old). It is as if the physical world cannot affect our mind.

But if that is really true — if the mind is immaterial and the physical world cannot affect the mind — then that raises a problem. The problem comes when we consider the other direction. Because if our minds really live in a higher-realm, unaffected by the physical world, then how on Earth can our minds ever affect the physical world? How can the immaterial consciousness in our heads move our arms and legs, for example?

This apparent paradox is called the *mind-body problem*. It is similar to the question of how ghosts in movies can walk through walls, but conveniently do not fall through the floor.

So, according to the mind-body problem, the challenge lies in the interface:



Substrate-independence

The second principle I would like to describe to you is based on the idea that there is nothing particularly special about biological cells: consciousness could still arise in some different underlying hardware. This idea seems eminently sensible: if you read my seventh book you will know that physics tells us that all electrons are exactly the same, and all protons are exactly the same. There is surely nothing special about the particles that form the atoms of biological cells.

This principle also seems to tie-in with our own experience. Our brains might be made of material with the consistency of rice pudding, but in our minds we do not feel as though we are made of "brain stuff" — we do not feel as though we are made of rice pudding. In fact, we feel completely independent of our brain hardware. We would surely feel the same even if our consciousness was transported to completely different hardware.

This principle — that consciousness is independent of the underlying hardware — is called *substrate-independence*. The principle of substrate-independence is described by the neuroscientist David Eagleman in his book *The Brain*: "If that turns out to be true, then in theory you could run the brain on any substrate. As long as the computations chug along in the right way, then all your thoughts, emotions, and complexities should arise as a product of the complex communications within the new material. In theory, you might swap cells for circuitry, or oxygen for electricity: the medium doesn't matter, provided that all the pieces and parts are connecting and interacting in the right way. In this way, we may be able to 'run' a fully functioning simulation of you without a biological brain."

A very similar standpoint is expressed by the neuroscientist Christof Koch in his book *Consciousness*: "Functionalism applied to consciousness means that any system whose internal structure is functionally equivalent to that of the human brain possesses the same mind. If every axon, synapse, and nerve cell in my brain were

replaced with wires, transistors, and electronic circuitry performing **exactly** the same function, my mind would remain the same. It is not the nature of the stuff that the brain is made out of that matters for mind, it is rather the organization of that stuff — the way the parts of the system are hooked-up, their causal interactions. A fancier way of stating this is 'Consciousness is substrate-independent'."

Taken to its logical conclusion, substrate-independence appears to suggest that there is nothing preventing a sufficiently-complex computer from becoming conscious. But is that really the case? We will be considering the question of whether computers can be conscious in Chapter Five.

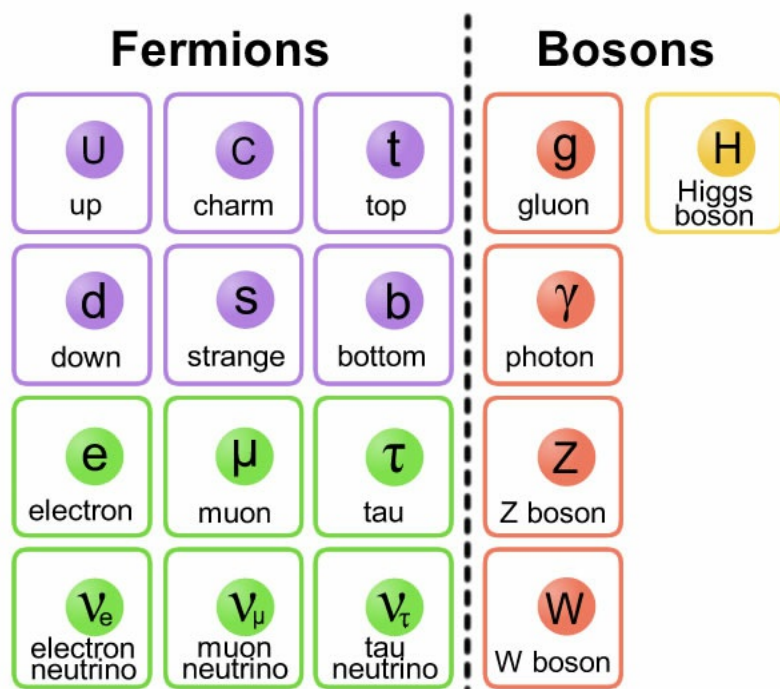
The principle of substrate-independence seems to have gained widespread acceptance by consciousness researchers, and it would appear that any explanation of consciousness would likely need to possess the property of substrate-independence. That will be a guiding principle of this book.

So the mind-body problem and substrate-independence provide us with some guidance on our quest to explain consciousness. But where should we look for our solution? Surely, as physicists and scientists, there is only one place we should be looking ...

Consciousness and the Standard Model

The discovery of the Higgs boson in 2012 completed the orthodox model of particle physics. That model is called the *Standard Model of particle physics*. The Standard Model contains a complete listing of the known elementary particles, together with a complete understanding of their interactions. Experiments have tested the predictions of the Standard Model with great accuracy, and there is no doubt that it is an accurate model of the subatomic world.

Here are the particles in the Standard Model:



Because the Standard Model explains the universe with such accuracy, and as it has been tested so thoroughly, it makes it very difficult to propose any convincing new extension to the model — there really are very few gaps to be exploited. The most famous of these "Beyond the Standard Model" (BSM) theories is *supersymmetry*, which proposed an additional suite of particles to be added to the Standard Model, but experiments at the LHC have found no such particles.

The overwhelming success and acceptance of the Standard Model seems to raise challenges for the previously-described philosophy of dualism, in which consciousness is suggested to be held in some vague "immaterial" substance in the brain. As scientists, vaguely stating that an additional substance exists which is not described by the

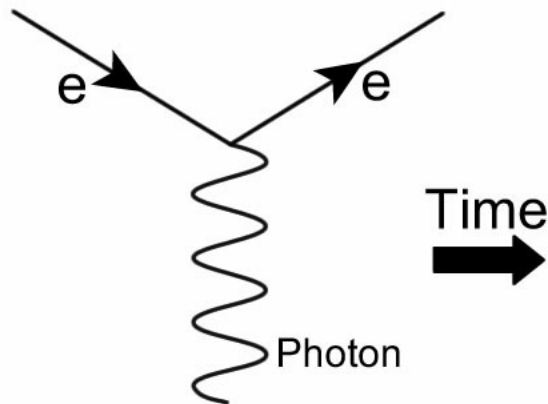
Standard Model is not sufficient: we have searched for additional particles using high-energy accelerators and we have found nothing more.

So our challenge appears to be to try to find where this peculiar "immaterial" mind substance can be found within the Standard Model.

As described earlier, the mind-body problem raises the question of how something immaterial could ever interact with the world of matter. How can consciousness ever hope to move arms and legs? What would the interface look like between matter and non-matter? Well, perhaps surprisingly, the Standard Model has the answer as to whether or not something immaterial can affect something material. The solution is that it is absolutely no problem: yes, something immaterial can definitely affect something material.

To understand why this is the case, we need to realise that all of the particles in the Standard Model can be divided into one of two classes. Referring back to the previous diagram, you will see that the first class of particles is the *fermions*, which are the matter particles such as the electron and the proton which can combine to make atoms. Atoms are made of *matter* — the "stuff" which makes the objects around us, the objects we can touch and feel. The second class of particles is the *bosons*, which might be considered the immaterial particles ("immaterial" means "not made of matter"). As an example, a beam of light is composed of photons which are bosons — and you cannot touch or feel an immaterial beam of light.

However, it is known that a photon (an immaterial particle) can deflect an electron (a matter particle) in an effect called *Compton scattering*. The following diagram shows a photon deflecting the path of an electron (this is showing a vertex from a Feynman diagram):



So here in one diagram we have an answer to one question which is often raised about the mind-body problem: "Could it ever be possible for something immaterial to affect something material?" The answer — according to the Standard Model — is yes it can, and this is how. The question raised earlier was how could there possibly be an interface between the material and the immaterial. Well, the previous vertex describes just such an interface.

The general point I am trying to make is that it **is** possible to cross seemingly unbridgeable gaps between the material and the immaterial, and we will be returning to this theme towards the end of this book.

However, elementary particles are not considered to have any internal structure and are surely not capable of sustaining consciousness as individual units. Also, attempting to tie consciousness to any particular form of hardware (e.g., a particular type of particle) appears to be at odds with our intended aim of finding a substrate-independent solution which would be independent of any particular underlying hardware.

So it would appear we have drawn a blank in our attempt to incorporate consciousness into the Standard Model. But we should not give up yet.

Because there is something else ...

There is a different substance, a different candidate to be considered the "stuff" from which our consciousness is made.

This substance is completely tied to the physical world, it is therefore represented in the Standard Model, but it also appears to inhabit a realm above the physical world. What is more, it possesses the desired substrate-independence because it can traverse the world of **both fermions and bosons** — the material and the immaterial — giving an impression of how it might represent a potential solution to the mind-body problem.

This substance never decays, never grows old. In that respect, it is impervious to the damage inflicted by the physical world. But it is also rigorously defined both in physics and mathematics, and it now even has its own law of

conservation — which is considered to be on the same level as the law of conservation of mass or energy.

But this substance seems grander than the purely physical: it can represent music and poetry, art and ideas. However, it can also start wars — and bring peace. We find this substance so fascinating that we can stare at it for hours every evening as it holds us spellbound.

In fact, this substance dominates our lives to such a extent that it has given its name to this entire current era of humanity.

So let me introduce you to this remarkable substance ...

Information

463 West Street today is a rather inconspicuous twelve-story apartment block overlooking the Hudson River in Lower Manhattan. Everyday, people walk past staring into their smartphones, unaware that the technologies which makes their smartphones "smart" were developed in the building.

Until the 1960s, 463 West Street was the home of the Bell Telephone Laboratories, the largest industrial research centre in the United States. The technologies invented or developed there included talking movies, colour television, radar, and live video broadcasts. But the most monumental year of the Bell Telephone Laboratories came just after the war.

In 1948, there were two major developments in the Bell Telephone Laboratories which might initially appear unconnected, but acting together they were to create the modern world. The first announcement was of the invention of a tiny electronic device, described in the press release that "it may have far-reaching significance in electronics and electrical communication". That was definitely an understatement. The tiny device rather unimpressively resembled an insect with a small body and spindly legs. It was called the *transistor*.

Each of those people walking past the inconspicuous apartment block in Lower Manhattan holding an iPhone in their hand is actually holding two billion of those strange little transistor devices (in the Apple A11 microprocessor). The transistor was to revolutionise the world. We shall be considering the transistor in Chapter Three.

The second major discovery to emerge from the Bell Telephone Laboratories in 1948 was a scientific paper published in *The Bell System Technical Journal*. The paper had the title "A Mathematical Theory of Communication" and it was written by a thirty-two-year-old researcher named Claude Shannon. Shannon was thin, gaunt, with an intense gaze. They were the eyes of a man who could see the future:



If the transistor was to create the hardware for the iPhone, the idea in Shannon's paper was to supply the signal — and the content. The word "transistor" was a new term introduced by the Bell Telephone Laboratories in 1948. Shannon's paper introduced yet another new word: the *bit*.

At the time, the Bell Telephone Laboratories' revenue came from telephone sales, and their telephone network. The question was raised internally, "What do we sell? What do we carry?" The Post Office carried letters and parcels. What did Bell Telephones carry? Electricity along its wires? Surely not — it was not a power company. Shannon realised that what was being carried was conversations, but he needed some way to quantify the amount. Hence, Shannon devised the "bit" as a fundamental unit, just like the metre, or the litre, or the kilogram. But what did the "bit" measure?

Shannon said it himself. The bit was: "A unit for measuring **information**."

Up to that point, the word "information" had only been used very informally, with ambiguous meaning. Shannon redefined the term by giving it a very specific technical meaning: information was something you could measure in terms of the number of bits it took to describe a message. In his book titled *The Information*, James Gleick describes the impact of this redefinition of "information": "And then, when it was made simple, distilled, counted in bits, information was found to be everywhere. It led to compact discs and fax machines, computers and cyberspace, Moore's law and all the world's Silicon Alleys."

The word "bit" is a contraction of "binary digit". A binary digit can have one of only two values: either 0 or 1. Bits can be strung together to make a larger binary number, which could potentially represent any form of information: a movie, words in a book, music. The more bits there are in a string, the more information is contained in that string:

101100110011000101101110101101011011101

When information is transmitted or stored, it is common to use an alphabet of symbols. The most widely-used alphabet is the Latin alphabet, with its modern day English, French, and Germanic variants. But the same principles apply to any alphabet of symbols.

Characters in the alphabet can be converted into bits in order to be transmitted or stored electronically. Let us now consider an example. Let us imagine we have a complete text document — written in English — which we want to

transmit to a second computer in order for that second computer to display the document on its screen in its entirety. How many characters would we need in our alphabet?

We would obviously need the 26 letters of the English alphabet ("A", "B", "C", etc.) and the 26 lower-case equivalent letters ("a", "b", "c", etc.) requiring 52 characters in our alphabet. But there would also be other characters required for punctuation, such as the full stop (period), comma, and hyphen, and — of course — the "space" character between words. Other characters which might appear in a text document include the dollar sign, the ampersand, and bracket characters. So it appears our alphabet would require in the region of about a hundred characters, or maybe slightly more.

To cut a long story short, such an alphabet for representing text in computers has been constructed and it is called the ASCII code (American Standard Code for Information Interchange). There are 128 characters in the ASCII alphabet. Those characters are given numeric codes from (0 to 127) in order to be transmitted and recognised by the receiving computer.

In order to be transmitted as a stream of information, each character is converted into a seven-bit code. Why seven bits? That is because in the binary numbering system it is possible to represent a number from 0 to 127 using seven bits.^[2] Here are a few of the ASCII characters together with their associated decimal codes and seven-bit binary codes:

ASCII Character	Decimal	Seven-bit binary
SPACE	32	0100000
\$	36	0100100
&	38	0100110
A	65	1000001
B	66	1000010
a	97	1100001
b	98	1100010

So the total number of characters in an alphabet is given by 2^N , where N is the number of bits allocated to each character. In the previous ASCII example, the total number of characters would be 2^7 , which is equal to 128.

But now let us consider the reverse question: if a single character from an alphabet is received, or a string of such characters, then how much information has been transmitted? The answer actually depends on the size of the alphabet. If a single character is transmitted from a very small alphabet (for example, a 0 being transmitted when the only possibilities are either 0 or 1) then the amount of information which is transmitted is less than if the character had come from a very large alphabet. This is because, in the latter case, you would be specifying a single symbol from a greater range of possibilities: more precise and more specific information is being transmitted. Shannon stated that the amount of information, H , transmitted by a series of n characters is given by:

$$H = n \log_2 W$$

where W is the size of the alphabet.

Hence, for the previous ASCII example, the amount of information contained in a single ASCII character (setting $n=1$ for a single character) would be $\log_2(128)$, which is equal to 7. The previous formula therefore tells us that the information transmitted by a single ASCII character is equal to seven bits of information.

By developing this equation to describe the amount of information content, Shannon revealed how information could be defined and measured. Shannon's breakthrough is described by James Stone in his book *Information Theory*: "Before Shannon's paper, information had been viewed as a kind of poorly defined miasmic fluid. But after Shannon's paper, it became apparent that information is a well-defined and, above all, **measurable** quantity."

And, if information could now be measured, that made it sound like a very real thing indeed. Information could now be processed as if it was a physical substance. It could be "compressed" like a gas (for example, to reduce the size of a movie file on a hard disk), or "filtered" like a liquid (for example, to extract interesting search results).

After Shannon, "information" resembled a physical substance.

After Shannon, "information" was a **thing**.

But what is the connection between entropy and information? Let us find out ...

Maxwell's Demon

In our attempts to analyse consciousness, what we would really like to discover would be some way of representing conscious thought in a form which we could analyse scientifically. However, it would appear to be a hopelessly ambitious goal to be able to represent consciousness in that manner: how could you express a "feeling" in an equation? But while it seems an almost impossible task to quantify consciousness, it appears it is possible to quantify "thinking".

In this section, we are going to generate a scientific definition of "thinking". In doing so, we will gain an insight into precisely what activity the brain actually **does**.

The way we are going to define thinking is by considering a famous thought experiment which involves the following cute little gremlin:



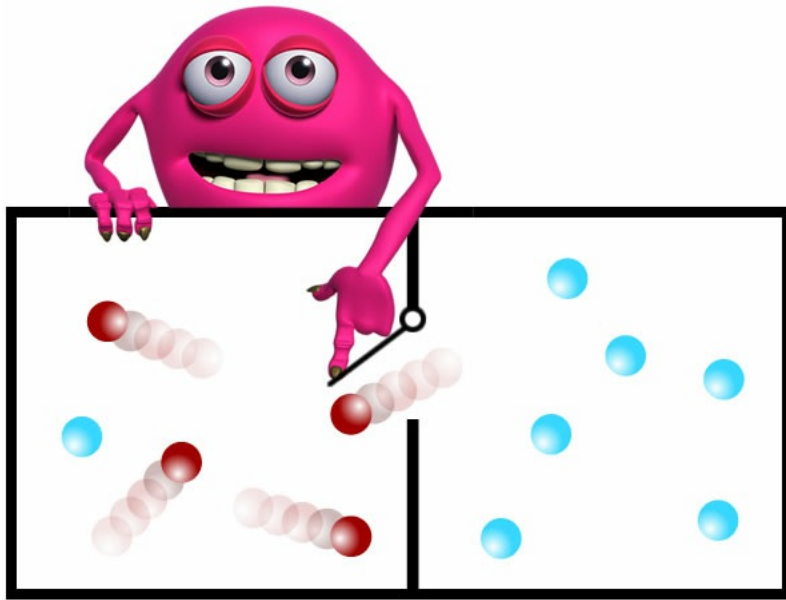
In our thought experiment, the gremlin is going to be doing a lot of thinking. However, rather bizarrely, the gremlin is going to do **no actual physical work**. It might appear to be impossible for the gremlin to have any measurable effect on the physical world if he performs no actual physical work, but we shall see that the thought experiment describes a particular situation in which that is possible.

To analyse the thinking of the gremlin, we are not going to consider the details of the workings of the gremlin's mind. Instead, we are going to treat the gremlin's head as a "black box", and merely consider the external effects of the gremlin's thought processes. With no physical work being performed, we can be sure that all observed effects must be purely due to the intellectual efforts inside the gremlin's head. We are then going to define "thinking" as the process which must have occurred in the gremlin's head in order to produce the observed effects.

So let us consider the thought experiment.

In 1867, the great Scottish physicist James Clerk Maxwell wrote a letter entitled "On the Decrease of Entropy by Intelligent Beings". In the letter, Maxwell proposed a famous thought experiment called *Maxwell's Demon*.

The thought experiment is shown in the following diagram. You can see it involves our gremlin (the eponymous "demon" in Maxwell's experiment). But this is not a nasty demon — he is more like a cute gremlin (from the film of the same name) who cannot stop fiddling with things:



The diagram shows Maxwell's demon lurking over a chamber which is divided into two compartments. There is gas in both compartments, and initially the temperature of the gas is the same in both compartments. There is an airtight trapdoor in the wall separating the two compartments, and the demon is in charge of opening and closing the trapdoor.

The demon is selected because the demon is supposed to have beyond-human superpowers which allow him to see individual molecules in motion, and incredibly fast reflexes which allow him to open the trapdoor to let individual molecules pass through into the opposite compartment.

The molecules of the gas are all moving randomly, though some of the molecules are moving faster than other molecules. Remember that the demon has super-powers, and is capable of seeing individual molecules. As you can see in the previous diagram, when the demon sees a fast-moving molecule approaching the trap door from the right-hand compartment, the demon activates the trap door so as to let that faster-moving molecule pass to the left-hand side. Similarly, the demon lets slower-moving molecules pass from the left-hand compartment to the right-hand compartment.

As a result, the left-hand side contains more faster-moving molecules and will become warmer, while the right-hand side will become cooler. This result appears to be in conflict with the second law of thermodynamics which states that heat will always tend to move from a warmer region to a cooler region, thus eventually equalising the temperatures. Because of the intelligent action of the demon, you could even take advantage of this eventual separation of temperature by running a heat engine as the heat passes from the warmer compartment to the cooler compartment.

But there lies an apparent mystery. It appears we have discovered a source of perpetual power, a steam engine which could run forever. As James Gleick describes: "A demon who could catch the fast molecules and let the slow molecules pass would have a source of useful energy, continually refreshed."

The mystery becomes even deeper if we consider the trapdoor to be completely frictionless. In physics, "work" is defined as the distance an object is moved against a force. If the trapdoor is frictionless, then it will exert no force against the hand of the demon, and therefore the demon will have to perform no actual physical work in order to open and close the door. James Clerk Maxwell wondered how energy had been produced "**and yet no work has been done**", only the intelligence of a very observant and neat-fingered being has been employed."

As Maxwell states, no physical work has been done. The only effort has been the intellectual effort — the "intelligence", as Maxwell says — of the demon. Has the clever demon really reversed the laws of physics purely by thinking?

Well, to a certain extent, yes he has. It is certainly true that the gas in the left compartment will become warmer, and the gas in the right compartment will become cooler, in apparent violation of the second law of thermodynamics. To be more precise, the second law of thermodynamics states that the amount of *entropy* in a

system will always increase, where we might interpret entropy as being the amount of disorder in a system. By ordering the gas according to temperature — warmer molecules in the left-hand side, cooler molecules in the right-hand side — the demon appears to have reduced the entropy of the system.

However, the second law of thermodynamics is not violated. This is because if we consider the system as a whole — including the demon — we find that the total entropy of the system has increased, in line with the second law of thermodynamics. The demon has to perform some work in his brain — even just by looking at the molecules and calculating their velocity. When the calculations are performed, it is realised that the increase in entropy inside the brain of the demon is sufficient to outweigh the reduction in entropy due to his actions. This result was described the American physicist Carl Eckart: "**Thinking generates entropy**".

So this provides us with a way to quantify "thinking". All we have to do is measure the change in temperature of the gas, and — with no physical work having been performed — we then know that that change must have been entirely caused by the demon's intellectual effort. Therefore, that value provides us with an objective method of the amount of "thinking".

So that is quite a result. We may not be able to measure consciousness using this method, but it does appear theoretically possible to measure "thinking". It's a good start!

Now let us remember what was said at the start of this section. It was stated that we were going to define "thinking" as the process inside the demon's head. So what does the demon do? The demon has to obtain information about the velocities of the particles (either visually or by some similar method), he then has to calculate the speed of the particle and decide whether it is slow or fast, and then finally come to a decision as to whether or not to open the trapdoor. All of this represents the capturing of information, and the processing of that information. So we can define thinking as *information processing*, and we can consider the brain to be an **information processing unit**.

The material of our thoughts

So might information be the "stuff" of our thoughts?

Information certainly seems to fit the bill. For a start, information possesses the substrate-independence which we would expect from consciousness. As long as the particular model of information processing is preserved, it would appear possible that the same consciousness could be created in a range of different hardware. Substrate-independence also means that information is not tied to any particular type of particle in the Standard Model. Information can be stored as fermions (as electrons stored in electronic memory, for example), or transmitted as photons (as electromagnetic radio signals, for example). Hence, information spans both the material and the immaterial.

Information is also resolutely physical. Information always requires a physical substrate. Information is rigidly defined both in physics and in mathematics. But, in many ways, information appears to lie in a realm above the physical, being completely substrate-independent.

This possibility is described by the *Information Philosopher*: "The 'stuff' of mind is pure information. Information is neither matter nor energy, though it needs matter for its embodiment and energy for its communication." [3]

The way I am presenting the concept of information, as existing in a substrate-independent "higher realm" from the material world might make it appear as though it is a mystical substance, similar to the "immaterial" substance of consciousness proposed by Descartes. And, indeed, in its behaviour we see that information does possess many of the qualities exhibited by Descartes' mystical substance. But the point I want to make is that information is also rigorously defined scientifically: we can talk about it, we can analyse it, it unquestionably **exists**.

Information appears to be a perfect fit for the material of our thoughts, the substance out of which our consciousness is made. We will be returning to consider information later in this book when we will see how a network based on information can create our thoughts, our self-awareness, and our consciousness.

2

A QUICK TOUR OF THE BRAIN

The importance of the human brain was realised over two thousand years ago when the Greek physician Hippocrates (of the Hippocratic Oath fame) said: "From the brain, and from the brain only, arise our pleasures, joy, laughter and jests, as well as our sorrows, pains, griefs, and tears."

That seems like a fairly accurate description. The brain is our central information processing unit which appears to be the centre of our thoughts, the seat of our consciousness. However, the brain also has to perform other functions of which our conscious mind is never aware. Regular signals from the brain keep our heart beating, and keep our lungs breathing. The brain is also responsible for controlling the release of hormones into the bloodstream. If we had to consciously remember to "breathe, breathe, breathe, ..." then our conscious minds would be too occupied to ever think of anything more productive. Hence, these *autonomic* output signals are produced by unconscious regions of our brain.

Similarly, the mass of sensory information entering the brain from the nerves would overwhelm our conscious mind if we had to deal with each signal individually. This would include monitoring body temperature, and monitoring carbon dioxide levels in the blood (which can then be used for regulating heart rate and breathing). Therefore, the unconscious brain has the job of filtering the huge number of sensory signals coming into the brain, and only passing the really important signals to the conscious part of the brain.

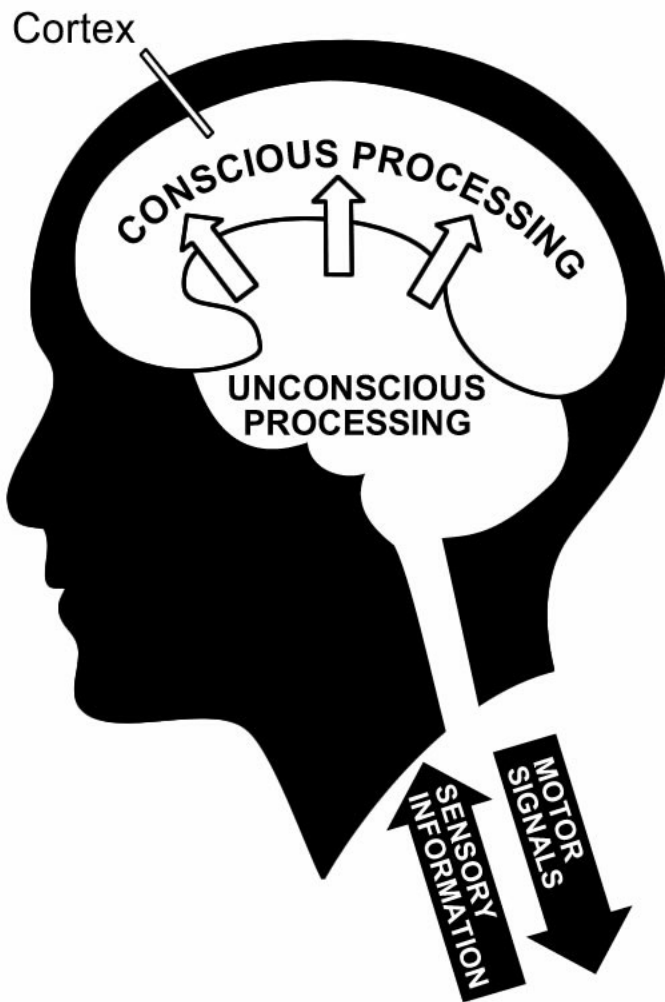
The power of the unconscious mind is illustrated in the medical phenomenon which has come to be known as *blindsight*. Blindsight occurs in people with healthy eyes who are blind because they have experienced damage in the region of the brain which is responsible for conscious processing of visual information. Even though the subjects are unable to see, the experiment involves showing them various pictures and asking to guess what the subject of the picture is. It would appear to be a pointless exercise, but the experiment shows that the subjects guess more accurately than would be expected from chance alone. This reveals the extent of the involvement of the unconscious visual system.

The unconscious signals coming out of the brain ("breathe, breathe, ...") pass out through the spinal cord, and, similarly, the unconscious signals coming in to the brain come in through the spinal cord. For that reason, the brain appears to be organised with its unconscious processing region positioned at the top of the spinal cord (and is therefore able to intercept signals), while the higher-level conscious region of the brain is positioned on top of that unconscious region. The conscious region of the brain is then able to receive the filtered information from the unconscious part of the brain.

Another benefit of this arrangement is that the unconscious brain can respond to critical reflex reactions — for example, quickly pulling your hand out of a fire — without ever having to pass those messages up to the higher-reasoning levels.

In his book, *The New Science of Consciousness*, Paul Nunez considers the situation in which a small child runs out in front of the car you are driving. Your unconscious mind would slam on the brakes of the car as a reflex action, and this can be performed in 150 milliseconds — which is much too fast for the conscious mind to reason about the situation (imagine the mental dialogue: "Should I start to brake?" — far too much time wasted). In fact, conscious awareness of the child does not emerge until a full half-a-second (500 milliseconds). Your conscious mind is not aware of any delay — it is as if your consciousness is always lagging half-a-second behind the reality of the situation.

The following diagram shows the brain roughly separated into two regions: the unconscious processing region positioned at the top of the spinal cord, and the conscious region positioned on top of the unconscious region:



As can be seen on the diagram, the all-important region of the brain believed to be responsible for high-level thought processes is called the *cerebral cortex* (or simply the *cortex*). The cortex is a thin layer — only a few millimetres in depth — which is spread around the outside of the top region of the brain. It is the cortex that is the centre of our memory, awareness, thought, language, and consciousness.

To be more precise, the cortex is divided into two areas. Approximately 90% of the cortex is the *neocortex*, which is the region responsible for higher-level brain functions and is the region which interests us. The remaining 10% of the cortex is called the *allocortex* which is simpler and older in evolutionary terms ("neo" means "new"). In this book we will only be considering the neocortex. The terms "neocortex" and "cortex" are often used interchangeably. In this book, I will just be referring to the "cortex".

Because conscious processing appears to be confined to the cortex, we will only be considering the cortex in this book. In his book *On Intelligence*, Jeff Hawkins follows a similar strategy. In the following passage, Hawkins defends his preoccupation with the cortex, and is fairly dismissive of those who disagree: "I know I'm going to meet some resistance on this point, so let me take a minute to defend my approach before we get too far in. Every part of the brain has its own community of scientists who study it, and the suggestion that we can get to the bottom of intelligence by understanding just the neocortex is sure to raise a few howls of objection from communities of offended researchers. They will say things like: 'You cannot possibly understand the neocortex without understanding brain region **blah**, because the two are highly interconnected like so, and you need brain region **blah** to do such and such.'"

However, Hawkins stresses that it is the cortex which is the area which interests us from the point of view of consciousness: "We are going to focus most of our attention on the cortex. Almost everything we think of as intelligence — perception, language, imagination, mathematics, art, music, and planning — occurs here. Your

cortex is reading this book."

The cortex is composed of dense brain material: the *grey matter*. This material is made of brain cells called *neurons*. The neurons are so tightly-packed within the cortex that the thin cortex layer actually represents 40% of the total brain mass.

How can such a thin layer be responsible for all our high-level brain functions? Well, the cortex achieves this by expanding as far as possible in width and breadth, in other words, by increasing its surface area. So the cortex is a thin layer, but it spreads across the outer layer of the top of the brain.

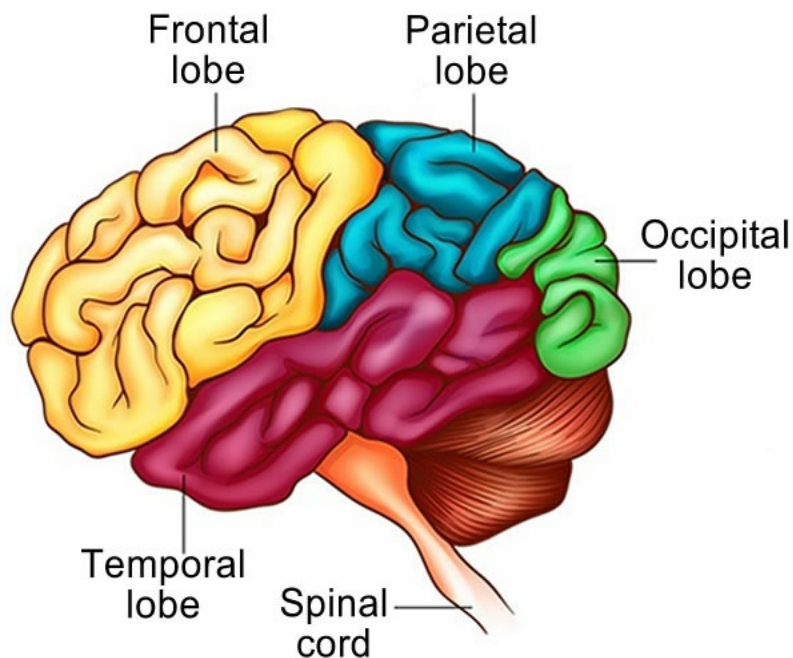
We now see why the structure of the brain makes so much sense. The cortex needs to maximise its surface area, so it is positioned on the outer surface of the brain (the outer surface of a sphere has the greatest surface area). Conveniently, that means the cortex can cover the unconscious part of the brain, which, in turn, acts to filter the signals coming in from the centrally-positioned spinal cord.

So, as has been described, the cortex seeks to maximise its surface area. But the amount by which the cortex can expand is limited because it is surrounded by an hard, bony skull. The only way the cortex can grow in size is by pushing against the skull and wrinkling — thus giving the brain its characteristic wrinkled appearance. If you look at a human brain you only see about a third of the surface of the cortex because the majority is hidden in the wrinkles. If you could remove the cortex and spread it flat, it would be about the size of a small tablecloth, revealing how the wrinkling acts to increase the processing capacity of the brain. Many animals have perfectly smooth brains as their cortex does not grow enough to push against their skulls.

It seems that — when it comes to the brain — wrinkles really are a sign of wisdom.

Lobes of the brain

It is believed that different regions of the cortex are responsible for different brain functions. The division is not precise — there is some overlap — but the cortex is often divided into four *lobes*, each lobe having a distinct functional responsibility.



As an example of the function of the lobes, it is believed that the *frontal lobe* is where most of our imaginary thinking and problem-solving takes place, as well as language processing. It has been said that this is "the seat of our intelligence and the location of our personalities".^[4] The frontal lobe is where we find most of the wrinkles in the cortex — the brain really does pack the processing power where it is needed the most. As another example, the *occipital lobe* at the back of the brain is responsible for processing visual information — very much as if we have a cinema screen at the back of our head onto which the images are projected.

How have neuroscientists discovered which part of the brain is responsible for which type of behaviour? Well, originally it was discovered that people with brain injuries in different parts of the brain displayed behaviour which was characteristic of the site of the injury. The first example of this came from the work of the nineteenth century French physician Paul Broca. One of Broca's patients was nicknamed "Tan", because that was the only word he could say. In every other way, however, the patient appeared to be perfectly intellectually sound. When the patient eventually died in 1861, Broca conducted an autopsy and discovered that there was a lesion in his frontal lobe, and concluded that this area was responsible for language processing.

Nowadays, neuroscientists have more sophisticated methods of watching the brain in action. One method is Positron Emission Tomography (PET) scanning, in which the patient is injected with a mild radioactive material which is dissolved in glucose. The radioactive source decays via beta decay, emitting positrons (positrons are antimatter, and the principle behind PET scanning was considered in detail in my fifth book about particle physics). When the emitted positrons reach any normal tissue in the brain, they are annihilated (via matter/antimatter annihilation). This annihilation produces energy in the form of gamma rays. The gamma rays can be detected by the surrounding scanner, and the source of the radiation can be pinpointed.

While being scanned, the patient is requested to perform various tasks. To perform these varied tasks, different areas of the brain require more energy, and so use more of the injected glucose. Different regions of the brain then "light up" in the PET scan, thereby revealing which areas of the brain are responsible for the particular activity.

The neural correlates of consciousness

One of the biggest challenges in analysing consciousness is being able to detect the existence of consciousness in the first place. We might judge a person is conscious by whether or not they could respond to questions, or squeeze a hand when requested. However, this approach is not sufficient: some patients who are damaged in the lower brain but have no damage in the upper brain can be totally paralysed in a state known as "locked-in" syndrome. Even though they are conscious and aware of their surroundings, they are unable to physically respond.

So if consciousness cannot be detected via purely external responses, maybe it can be detected if we analyse the brain directly. With this end in mind, in the 1990s the American neuroscientist Christof Koch began working with Francis Crick — the molecular biologist who was the co-discoverer of the structure of the DNA molecule. Koch and Crick tried to identify the sectors of the brain which represented the active regions responsible for different conscious activities. Koch and Crick called these the *neural correlates of consciousness* (NCC), a term which seems to have become widely adopted.

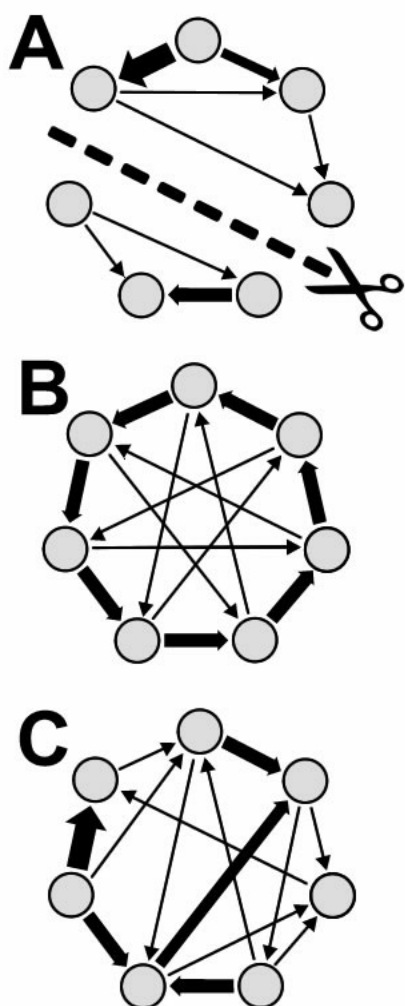
According to Koch in his book *Consciousness*: "Imagine that you are looking at a red cube, mysteriously left in the desert sand, with a butterfly fluttering above it. Your mind apprehends the cube in a flash. It performs this feat because the brain activates specialized cortical neurons that represent color and combines them with neurons that encode the percept of depth, as well as neurons that encode the orientation of the various lines that make up the cube. The minimal set of such neurons that cause the conscious percept is the neural correlate of consciousness for perceiving this alien object."

Koch is currently the Chief Scientific Officer at the Allen Institute for Brain Science in Seattle (funded by Microsoft co-founder Paul Allen). He is currently collaborating with Giulio Tononi of the University of Wisconsin in order to identify some of the neural correlates of consciousness. Their approach has involved EEG recording of the brain to determine which areas are active in conscious patients, and thereafter use that information to determine the presence of consciousness in other patients.

The situation is complicated by the fact that some areas of the brain are always active — in both conscious patients and unconscious patients. In order to take account of this fact, the brains of subjects who are in deep, dreamless sleep (i.e., in an unconscious state) were first analysed and then those areas (which would presumably be active all the time) were subtracted from images of brains in a conscious state. Logically, the resultant areas of the brain should be those responsible for consciousness.

Tononi and Koch are developing a theory known as *integrated information theory* (or IIT). The principle behind the theory is that the pattern of information in a conscious mind would show certain characteristics, and those characteristic patterns could be used to detect the presence of consciousness. Two key features of the pattern would be *integration* and *differentiation*. My understanding of IIT is that "integration" means that distant parts of the brain must be connected, and be able to talk to each other — otherwise the brain would contain many separate consciousnesses. So we might consider "integration" as referring to the large-scale patterns of activity in the brain. In contrast, "differentiation" refers to the small-scale patterns of activity. For example, we might be thinking of a visual scene containing many objects: cars, trees, houses, etc. So there is clearly a lot of detail, there. What is more,

the representation of each of these small-scale objects must be clearly different from each other (otherwise we would be thinking of many objects which were all the same). This requirement that the small-scale objects must be different is called *differentiation*. The following schematic diagrams show three possible arrangements of connectivity:



The top diagram (diagram A) shows a network with a lot of differentiation (with considerable variation in the types of connection) but a lack of integration (with two major regions of the network not being connected — you can see the network is cut by a pair of scissors). The middle diagram (diagram B) shows a great deal of integration (with all distant parts of the network being connected) but the perfect symmetry means there is a lack of differentiation. Finally, the bottom diagram (diagram C) shows a healthy balance between integration and differentiation. According to integrated information theory, in a healthy conscious mind, we would expect to find a balance of integration and differentiation in the EEG pattern, so this pattern could represent a conscious brain.

Giulio Tononi has developed a measure of integrated information which he has named Φ (the Greek letter "phi"). We shall be considering Φ in the next chapter on emergence.

In the November 2017 cover story of *Scientific American*, Christof Koch described the promise of IIT: "The development of several technologies in recent years has raised real prospects for detectors that meet the criteria for consciousness meters — devices useful in medical or research settings to determine whether a person is experiencing anything at all. This ability to detect consciousness could also help physicians and family members make decisions about how to care for tens of thousands of uncommunicative patients."

In his book *Consciousness*, Koch also explains how this research will make consciousness research testable at last: "The bottom line is that these physiologic experiments are steadily narrowing the gap between the mind and the brain. Hypotheses can be put forth, tested and rejected or modified. And that is a great boon after millennia of sterile

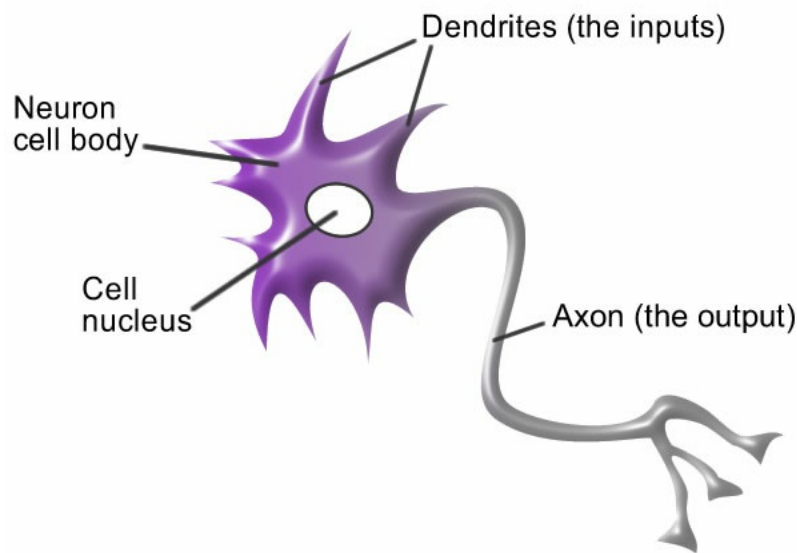
debate."

Neurons

The human brain contains approximately 100 billion brain cells which are called *neurons* — which means that there are 14 times more neurons in your head than there are people on this planet. Neurons are the only cells which are able to transmit electrical signals. Neurons transmit those electrical signals to other neurons, forming a network (a network which eventually forms a brain).

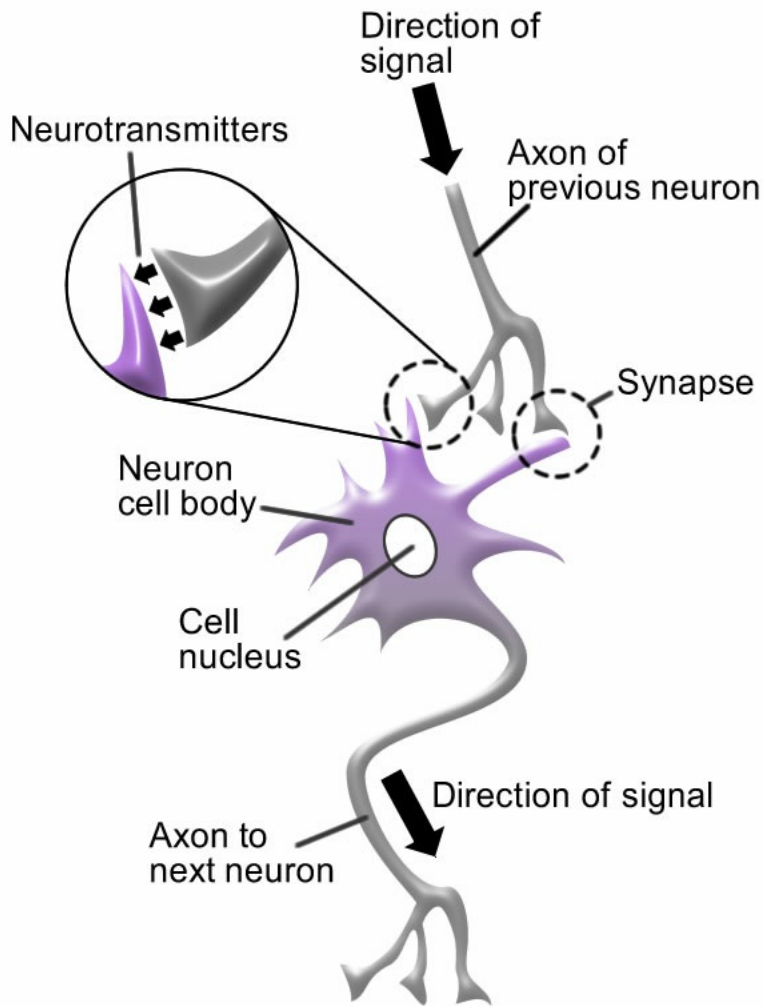
At the heart of a neuron is a cell nucleus, just like any other cell. But the cell body is surrounded by small branch-like extensions which are called *dendrites*. These receive electrical signals from other cells. Therefore, these might be considered the "inputs" to the neuron. There is also one very long extension which comes out of the cell body which is called an *axon*. The axon can be extensively-branched. The axon proceeds to connect to other neurons, and it is a one-way connection. So the axon might be considered the "output" of the neuron.

The following diagram shows a neuron, showing the dendrites which surround the cell body, and the single axon output:



A crucial feature is the connection between two neurons, when the axon from a previous neuron connects with the dendrites of the next neuron. There is no direct physical contact between the two cells. Instead, there is a very small gap between the end of the previous neuron's axon and the next neuron's dendrites, and that gap is called a *synapse*. The synapse gap is just one forty-thousandth of a millimetre in width.

The following diagram shows two neurons which are connected together via synapses (shown in dashed circles):



The synapse gap is filled with chemicals called *neurotransmitters*. Neurotransmitters play a vital role because they allow signals to bridge the gap of the synapse, thus allowing signals to be transmitted between neurons. It has been shown that these neurotransmitters play a vital role in our moods and our thinking processes. For example, it is known that variations in the amount of certain neurotransmitters (such as dopamine and serotonin) can cause mental health issues such as anxiety and depression.

Mind-altering drugs also target the neurotransmitters in the synapses. Stimulants, which include caffeine, nicotine, amphetamine, and cocaine, work by increasing the levels of the neurotransmitters dopamine and noradrenaline. Conversely, sedatives such as alcohol and Valium operate by reducing neurotransmitter activity in the synapse.

It might, therefore, be said that the construction of brain neurons with the synapses outside of the cell is an ingenious design feature. This makes the all-important synapses easily-accessible to the global release of chemicals into the general intercellular fluid of the brain. By releasing large amounts of neurotransmitters into the brain, it is possible for the body to trigger virtually instantaneous changes in mood and performance. For example, the release of noradrenaline increases the body's "fight-or-flight" response. And the release of natural opiates can lessen pain, which could be a life-saving strategy if the subject has to quickly run (on a broken leg) to escape a dangerous situation.

Inside the neuron

We have a remarkably full and accurate understanding of the internal structure of a neuron. What follows next is a description of the mechanism by which a neuron "fires" and transmits the output signal down its axon.

We know that messages are sent as electrical signals. It might be imagined that these messages would be formed of electrons passing down a conductive substance (like electricity passes down a wire). However, this is not the case. We will now see that a completely different — and apparently unnecessarily uncomplicated — method is used for sending signals down a neuron's axon to the next neuron. Indeed, in his book *The Emperor's New Mind*, the physicist Roger Penrose expresses his surprise that such a complicated method is used instead of the apparently obvious method of simply sending electrons down a "wire": "What form do the signals take as they propagate along nerve fibres and across the synaptic clefts? What causes the next neuron to emit a signal? To an outsider like myself, the procedures that Nature has actually adopted seem extraordinary — and utterly fascinating! One might have thought that the signals would just be like electric currents travelling along wires, but it is much more complicated than that."

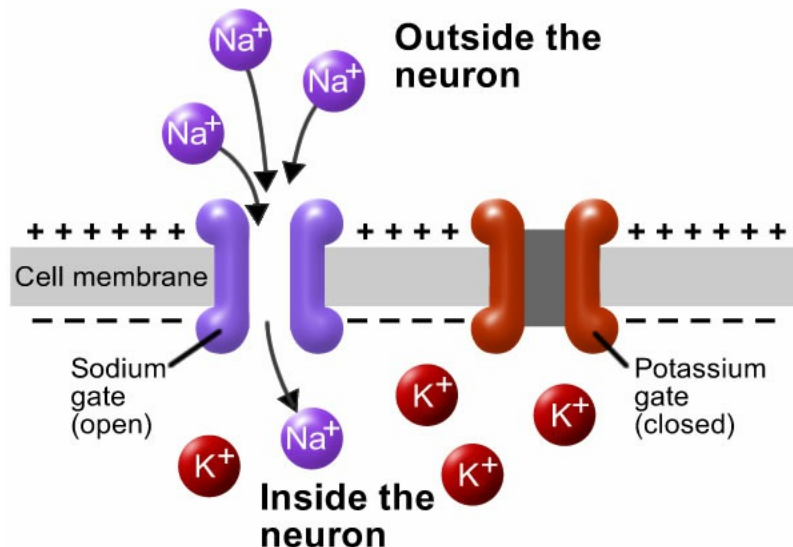
Instead, the signals are passed in the form of *ions*. An ion is an atom which has either positive electric charge (because it has lost an electron) or negative electric charge (because it has gained an electron). Signals are passed by the physical movement of these ionised atoms.

Common examples of ions found in neurons are sodium ions and potassium ions. Sodium has the chemical symbol Na, while potassium has the chemical symbol K. Sodium and potassium are both metals, which means they have a single electron in their outer shells (it is that electron which allows electric current to pass through a metal). By losing that outer electron, a sodium atom can form a positive ion (Na^+), and a potassium atom can form a different positive ion (K^+). Other ions can be formed which have negative charge.

The body of each neuron is surrounded by a cell wall called a *membrane*. The membrane is punctured by many microscopic gates called *ion channels* which only allow certain ions to pass through them. These gates are opened or closed depending on the electric voltage (or *potential*) across them.

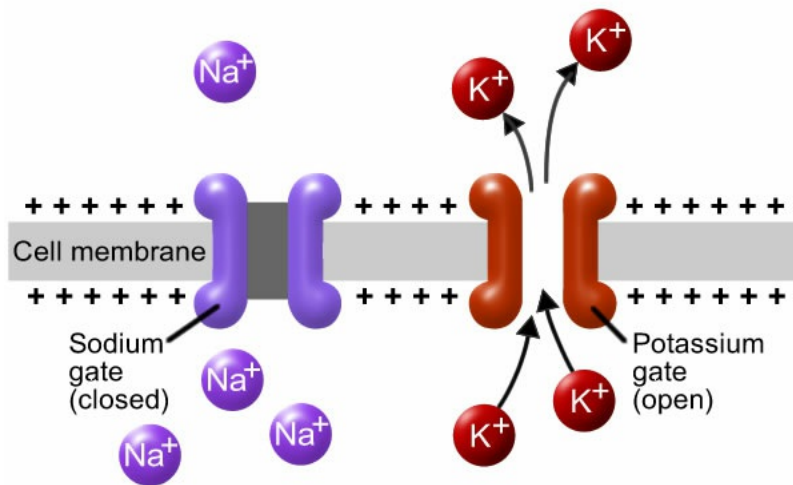
Because there are generally more negative ions inside the neuron than outside the neuron, there is a voltage difference of approximately -70 millivolts across the membrane, with the interior of the neuron being slightly electrically negative compared to the exterior environment of the neuron. This voltage is called the *resting potential*. This electric potential is enough to hold closed all of the ion channel gates.

However, when the neuron receives a large number of input signals on its dendrites, this can increase the amount of positive charge inside the body of the neuron. If this increase in positive charge increases beyond a certain threshold value, then it can overcome the voltage difference which was causing the sodium ion gate to remain closed (remember: it was the -70 millivolt voltage difference which was holding the gate closed). So when the threshold voltage is passed, the gate opens and the exterior sodium ions flood through the membrane into the neuron interior, attracted by the negative charge inside the neuron, as shown in the following diagram:



The influx of sodium atoms makes the interior of the neuron even more positively charged. This forms a positive feedback effect, and more sodium gates open. The effect is explosive, the opening of gates forming a ripple effect which passes down the neuron's axon at a speed of up to 100 metres per second. This fast moving spike of voltage represents the "firing" of the neuron and is called the *action potential*.

As the voltage continues to climb, a point is reached at which the sodium gate closes, and the potassium gates open. There is then an outflow of the positively-charged potassium ions, repelled by the positive charge inside the neuron, as shown in the following diagram:



The effect of this outflow of positive charge is to restore the potential of the membrane back to its resting potential, ready for the next firing of the neuron.

This mechanism is not just used by brain neurons — it is also used by nerves to tell muscles when to fire. Whenever I come home after running, I always have an *electrolyte* drink. Electrolytes are ions including sodium, potassium, and magnesium. After exercise, you can lose salt through perspiration. Salt (sodium chloride) includes the electrolytes sodium and chloride. It is therefore important to top-up your body's store of electrolytes to avoid muscle cramp, in which the ability to send correct firing signals to the muscles is lost.

So why is such a complicated chemical process used to send messages down an axon, instead of simply sending an electrical signal down a "wire"? In the next chapter we will see a reason why this is possibly the case, and it is all to do with the -70 millivolts threshold voltage difference across the membrane. We will be seeing how this threshold voltage can result in "nonlinear" behaviour which would surely be necessary in any thinking machine.

In the last two sections, the two main methods by which neurons process information have been described. As Christof Koch said: "Two operations underlie information processing by neurons: the chemical transmission of information from one neuron to another at the synapses, and the generation of action potentials."

It is clear that the method by which signals are passed down the axon of a neuron is surprisingly complicated, with the arrangement of "gates" and "pumps" resembling nanotechnology. But it is also clear that we have a very complete and detailed understanding of these processes. We really do understand the workings of a single neuron remarkably well.

But that is not the challenge for us.

It is undoubtedly the case that consciousness is not held in any individual neuron. Individual neurons frequently die without obviously affecting our thought processes: we do not suddenly perceive any "dead pixels" in our mental images. Instead, consciousness arises from the interaction of billions of neurons: there may be 100 billion neurons in your brain, but each neuron is connected to as many as 10,000 other neurons. If you do the arithmetic you find that gives the extraordinary total of 1,000 trillion synaptic connections in the brain.

To suggest that we can understand consciousness by considering a single neuron — in however much detail — is to take a "reductionist" approach. Instead, there is a general consensus that consciousness arises as an "emergent" effect from the huge connectivity in the brain. Our challenge is to understand how consciousness emerges from this network.

In Chapter Four, we will be examining the severe challenges which emergent behaviours pose for our current way of doing science.

3

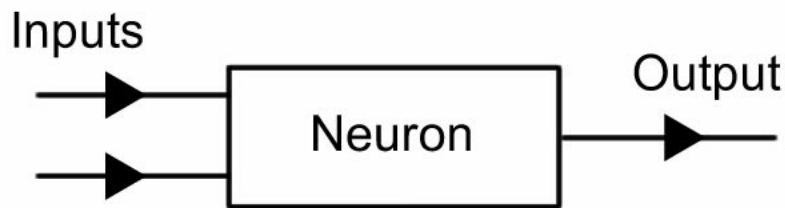
ARTIFICIAL NEURONS AND ELECTRONIC BRAINS

In this chapter, we will discover that neurons possess a very particular mathematical property which allows them to perform calculations, and to allow thinking to occur. It is undoubtedly a property which the components of all conscious systems must possess. We will also be seeing that it is a property which is possessed by electronic transistors, a property which allows those transistors to make computers — which are, after all, "thinking machines".

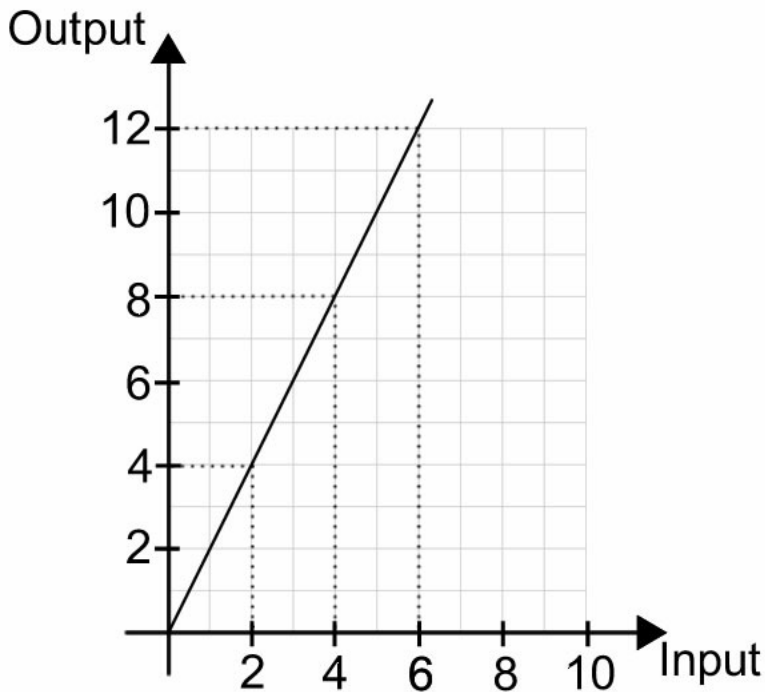
The property is called *nonlinearity*.

To understand nonlinearity, and why it is so important, let us first consider the related concept of *linearity*.

As stated in the previous section, a neuron can be considered as having a series of inputs (its dendrites) and a single output (its axon). To simplify this picture, let us draw a neuron as a simple block diagram:



We might then ask how the output value varies as the input values are varied. We would probably imagine that as the input values increase, then the output value would increase proportionately. We might imagine the neuron simply summing all the input values and passing that total value to the output, or maybe multiplying that output by a constant number. In either of those cases, the output will be directly proportional to the input. As an example, the following graph shows this behaviour when the output value is equal to twice the total input value:



You can see in that case that the relationship between the neuron's input and output is given by the steep diagonal line. A few values for input and output have been plotted on the graph. For example, when the input is equal to two, you will see that the output is four (2×2). And when the input is six you can see that the output is twelve (2×6).

Because the relationship between the neuron's input and output forms a perfectly straight line, we say that represents a *linear* relationship ("linear" meaning "like a line"). We might then call it a linear neuron.

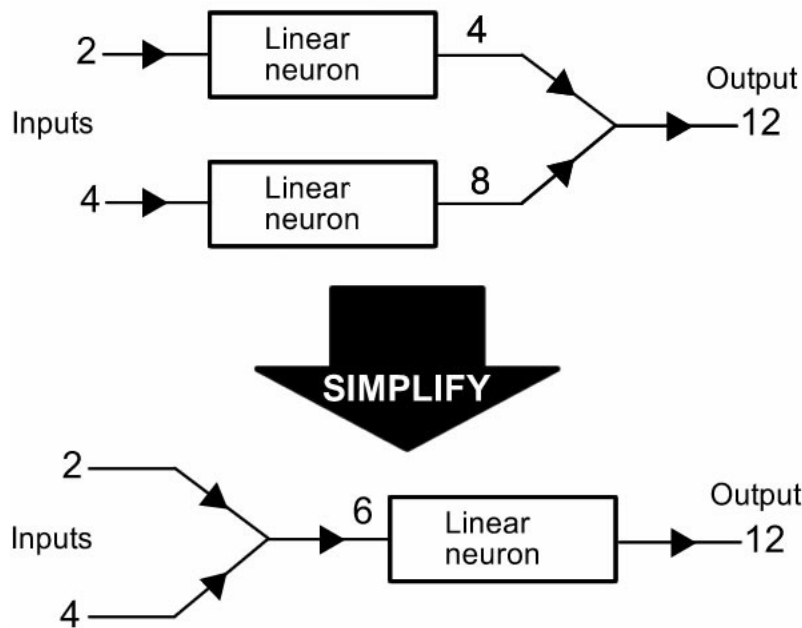
In physics, many systems can be modelled as linear systems. For example, if you double the weight attached to a linear spring, then the spring would extend to twice its original length. Linear systems are easy to analyse mathematically, so physicists find it very convenient to work with linear systems. The reason that linear systems are easy to work with is because of the *superposition principle*. A description of this principle is presented on the Wikipedia page for the superposition principle: "If input A produces response X and input B produces response Y then input (A+B) produces response (X+Y)." [5]

We can see that this principle is true on the previous graph. We can see that an input of 2 produces an output of 4, and an input of 4 produces an output of 8, so — according to the superposition principle — an input of $2+4$ (which is 6) should produce an output of $4+8$ (which is 12). And we can see that this is the case from the graph because an input of 6 does indeed produce an output of 12. So the superposition principle is indeed true for linear systems.

The key point I am going to be making about linearity is that the superposition principle reveals that a brain could never be made out of these linear neurons. We will now see why that is the case.

The superposition principle reveals that it is possible to greatly simplify any system which is made out of linear components. For example, it shows that if we had a system made out of two of these linear neurons, we could simplify it to a system of just one linear neuron.

The following diagram shows how this simplification can be achieved. It shows two linear neurons, which both act to double the value of the input in a linear manner (as described earlier). You can see that, when inputs of 2 and 4 are applied to the two neurons, the combined output is equal to 12.



However, the superposition principle states that we could achieve the same result by using just one of those linear neurons, and summing the input — as you can see in the lower section of the previous diagram. You can see that with precisely the same inputs, the single neuron gives the same output as the output of the two neurons.

So there is no need to have two linear neurons — just one linear neuron would achieve exactly the same result. In fact, the superposition principle reveals that no matter how many linear neurons we have, in whatever configuration, the result can always be simplified down to a single neuron. [6]

To see this principle in action, let us consider a linear component from the field of electronics (we will be seeing that there are remarkable parallels between electronic components and neurons — in the same way that there are remarkable similarities between a computer and a brain). The electronic component we will be considering is a *resistor*. The resistor is a simple component whose behaviour might be thought of as "resisting" (i.e., reducing) the electrical current flowing through a wire. Here is a photograph of a typical resistor, with the resistance value (measured in ohms) being denoted by the coloured bands painted around it:

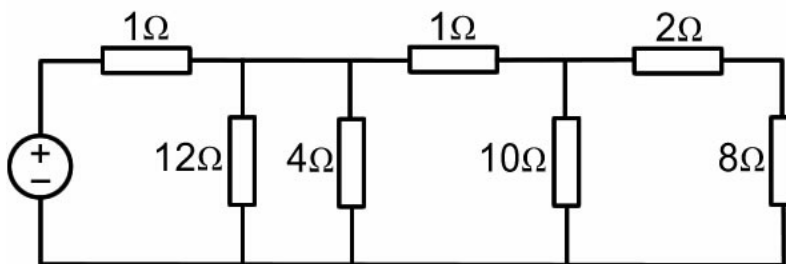


The symbol for a resistor in a schematic circuit diagram is a small rectangle, as shown in the following diagram:

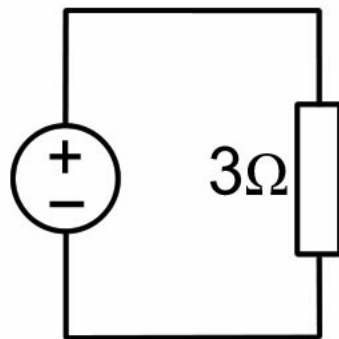


The current through a resistor is proportional to the voltage applied across the ends of the resistor. The relationship is directly linear, which means if you drew a graph relating current to voltage, then it would be a perfectly straight line. This linear behaviour of the resistor is important because it means that the previously-described superposition principle applies if we have a network built of many resistors. That principle can be used to greatly simplify the network.

As an example, consider the following circuit diagram which contains seven resistors (and a battery on the left). The resistors have different values written next to them, measured in ohms. You will see that the symbol for the ohm is the Greek letter omega, Ω :



The superposition principle suggests that we could simplify this network down to a single component — a single resistor. And that is precisely what we find. There are simple arithmetic formulas which are well-known to any electrical engineer which can reveal that the previous network of seven resistors is equal to a single resistance value of precisely 3 ohms: [7]



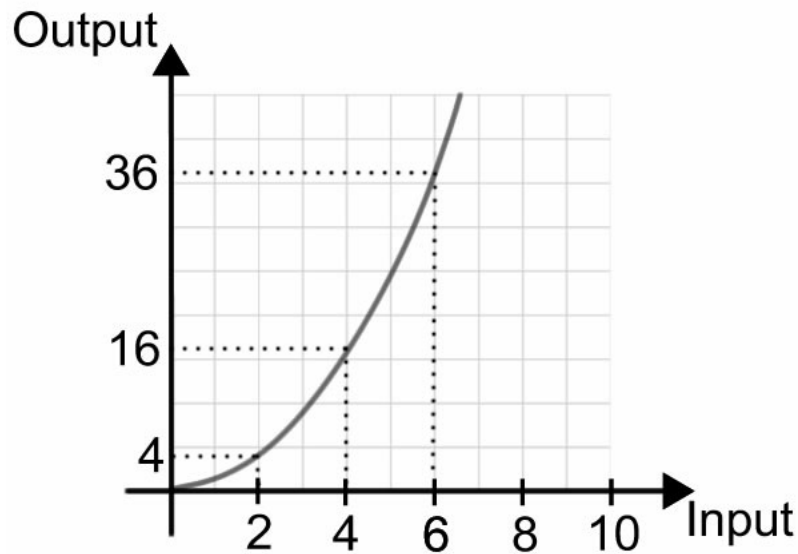
So a network consisting purely of a number of resistors can always be simplified to a single resistor — as revealed by the superposition principle.

If you were actually designing an electronic circuit, you could never create an interesting complex system with just one resistor: a single resistor can do nothing useful. Therefore, logically, you could never create a complex system with any greater number of resistors — as the situation would be equivalent to the single resistor case.

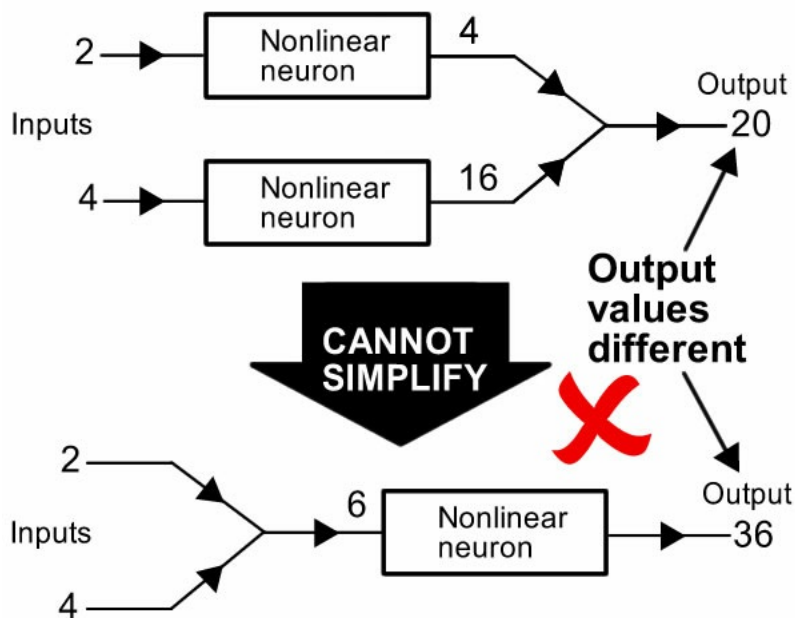
And the same principle applies to linear neurons: you could never create a complex system with any number of linear neurons. Crucially, you could not build a brain with a single linear neuron, so, logically, **you could not build a brain with 100 billion linear neurons** (as the 100-billion-neuron brain could always be simplified to a single-neuron brain). For this reason, linear neurons could not be used to build a brain.

So, if linear components on their own cannot be used to create complex systems, let us now move on to consider *nonlinear* components. As an example, the following graph shows the relationship between input and output when the output is the square of the input. You will see that the relationship between input and output is no longer

described by a straight line — instead, it is a curved line. Hence, it is a nonlinear relationship:



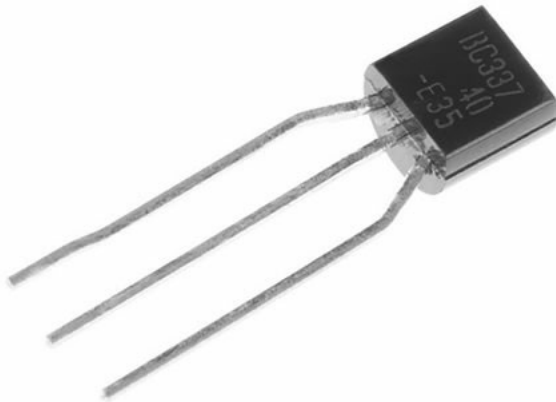
Let us see if the superposition principle still applies in this nonlinear case. Considering the previous graph, an input of 2 produces an output of 4, and an input of 4 produces an output of 16. If the superposition principle applies then an input of $2+4$ (which is 6) should produce an output of $4+16$ (which is 20). But, from the graph, we can see that is not the case: an input of 6 produces an output of 36 — not 20. So, crucially, **the superposition principle does not apply to nonlinear components.**



And, as you can see from the previous diagram, if the superposition principle does not apply then a network built from nonlinear components cannot be simplified (i.e., unlike linear components). It might sound like a bad thing to be unable to simplify a network, but if we want to create a large and complex network, it is very good news indeed. A network which cannot be simplified down to a single component is a network which can do very interesting things indeed.

Let us now consider an electronic component which is much more interesting than a resistor — precisely because it is nonlinear. This is a photograph of a *transistor* (its actual size would be only about two centimetres long in

total):

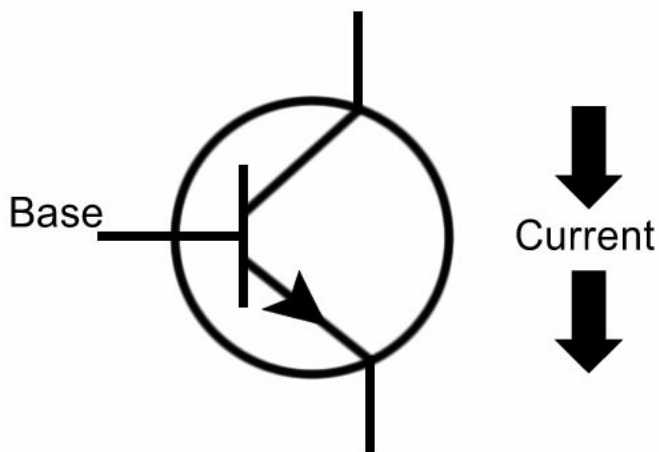


It was described in Chapter One how the transistor was invented in the Bell Telephone Laboratories in 1948. It was invented by John Bardeen, Walter Brattain, and William Shockley, the three receiving the 1956 Nobel Prize in Physics for their invention. It could be argued that the transistor was the most important invention of the 20th century.

If we examine the appearance of the transistor in the previous photograph we see a small body and long, thin, flexible legs. Apart from the obvious difference in size, this is reminiscent of a brain cell — a neuron — described in the previous chapter. A neuron has a small cell body, a series of inputs (dendrites) and a long axon output. The similarity is not coincidental as the two different devices have to perform similar functions: receiving inputs from other similar units, and passing outputs to other similar units, forming a network of a vast number of components. In this chapter we will be seeing that the similarities between a transistor and a neuron are much more than just skin deep.

The material inside a transistor is called a *semiconductor*, and is often silicon or germanium. A semiconductor can operate as either an electrical conductor or an electrical insulator. In a transistor, the behaviour of the semiconductor depends on the voltage applied to one particular leg of the transistor, called the *base*. If a sufficiently high voltage is applied to the base, a current can pass between the other two legs. However, if no voltage is applied to the base, the transistor acts like an insulator and no current can pass between the other two legs.

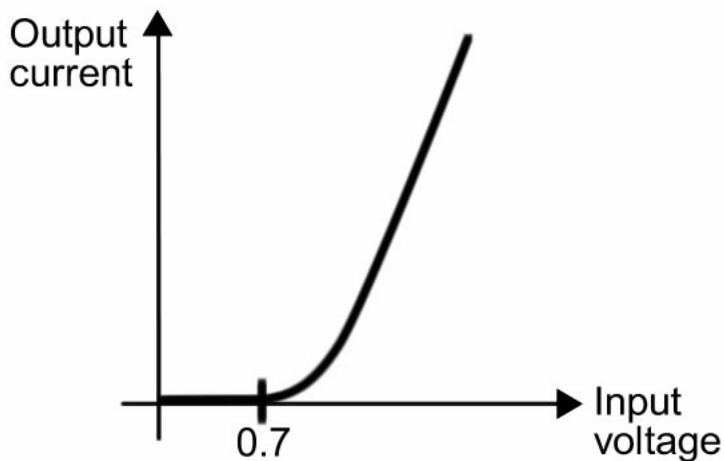
The following diagram shows the schematic symbol for a transistor as used in circuit diagrams. The three legs are shown. The base leg is indicated, and the current flowing between the other two legs is also shown:



We will be seeing this diagram again later in this book.

Crucially, though, the behaviour of the transistor is nonlinear. Until the base voltage reaches 0.7 volts, no current can pass through the transistor. But once the 0.7 volt is reached, the transistor "turns on" and current can pass.

This nonlinear behaviour is shown by the thick black line in the following diagram:



So the 0.7 volts acts as a threshold voltage. If you scan your memory, you might remember where we encountered a "threshold voltage" earlier in this book. We encountered a threshold voltage in the discussion of neurons at the end of the previous chapter. There it was explained how, when the neuron receives a large number of input signals on its dendrites, this can increase the amount of positive charge inside the body of the neuron. If that increase in positive charge increases beyond a certain threshold voltage, then the neuron will "fire", sending an action potential shooting down the neuron's axon to the next neuron. For the neuron, this thresholding effect is called the "all-or-none" law. [8]

In his book *The Emperor's New Mind*, the physicist Roger Penrose considers how this "all-or-none" law makes neurons behave as though they were elements of a digital computer: "An important feature of nerve transmission is that the signals are entirely 'all-or-nothing' phenomena. The strength of the signal does not vary: it is either there or it is not. This gives the action of the nervous system a digital computer-like aspect."

So both transistors and neurons fire when the combined inputs exceed a certain threshold voltage — and this is no coincidence. The threshold voltage is essential. In both cases, the threshold voltage introduces the required nonlinear behaviour — and it is that nonlinear behaviour which allows us to build complex systems (computers or brains) from transistors and neurons.

And now we see that possible reason why signals are sent down the axons of neurons using the rather surprising chemical method — instead of simply sending an electrical current down a "wire". The chemical method creates the crucial threshold voltage inside the neuron, and it is the existence of that threshold voltage which introduces the essential nonlinear behaviour. In fact, the peculiar chemical method inside the neuron might be considered as turning the neuron into a form of nonlinear "semiconductor", so to speak.

Paul Davies emphasises this nonlinear behaviour of neurons in his book *The Cosmic Blueprint*: "The electrical output signal of a given neuron will depend in a **nonlinear** way on the combined input it receives from its connected partners." (That book includes a good section on nonlinearity).

There is one simple message I want you to take from this discussion: in its design and nonlinear functionality, **a transistor can be considered to be an artificial neuron.**

Integrated circuits

The similarity between transistors and neurons continues when we consider how most transistors are used nowadays. The vast majority of transistors are micro-miniaturised onto a semiconductor substrate to form an *integrated circuit* ("silicon chip"). The latest fabrication techniques allow extraordinary densities of up to 25 million transistors on a square millimetre of silicon. This actually results in an individual transistor size which is rather smaller than a neuron, but it is clear that the principle of packing microscopic transistors onto an integrated circuit resembles the packing of microscopic neurons in a brain.

Here is an image of the Apple A11 microprocessor. If you have the latest iPhone then you are already in possession of one of these. This is an image of the entire external package — the actual "chip" and its 4.3 billion transistors is contained within it:

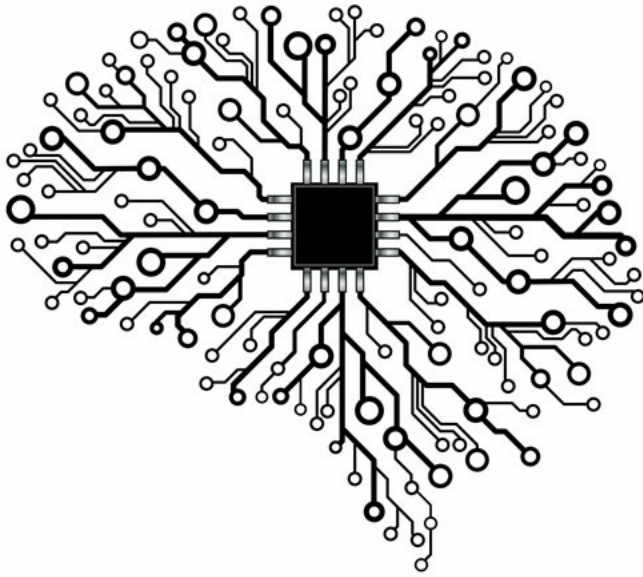


With 4.3 billion transistors in an integrated circuit, it is clear we are approaching the number of 100 billion neurons in the brain. So why do integrated circuits possess nowhere near the functionality and flexibility of the brain? The answer must surely lie in the extreme connectivity of the neurons in the brain: each neuron can be connected to as many as 10,000 other neurons. In order to achieve that level of connectivity, it would appear we will eventually have to move away from fabricating integrated circuits on a flat two-dimensional plane, and instead create three-dimensional cubes of circuitry — again, moving in a direction which resembles the structure of an actual brain.

Three-dimensional chips are now starting to appear. Samsung have recently released computer memory chips featuring 38 layers of transistors, and the rumour is that this is seen as the future of the industry. One website presents this development as a simple solution to the problem of how to achieve more of the crucial interconnects in integrated circuits, and compares the move to three-dimensions on a chip with the drive to build high-rise towers in cities: "The obvious choice for where to put these interconnects was the same solution in any sprawling metropolis; if you can't grow **out**, grow **up**. Three dimensional chips will be released. It is only a matter of time. There is simply no other way to increase the density of interconnects, the number of devices on a chip, or speed than by moving into a third dimension of silicon." [9]

The development of integrated circuits which resemble the structure of the brain is called *neuromorphic computing*. It is currently an area of rapid growth. As an example, IBM released its True North integrated circuit in 2014 which contains over a million artificial "neurons" on a chip. Each neuron has 256 programmable "synapses" giving a total of just over 268 million synapses. The artificial neurons communicate using transient electrical spikes — just like real neurons. This chip has been described by IBM as "literally a synaptic supercomputer in your palm". [10]

It is clear that each successive innovation in the integrated circuit industry is moving us closer to creating true three-dimensional artificial-neuronal electronic brains. [11]

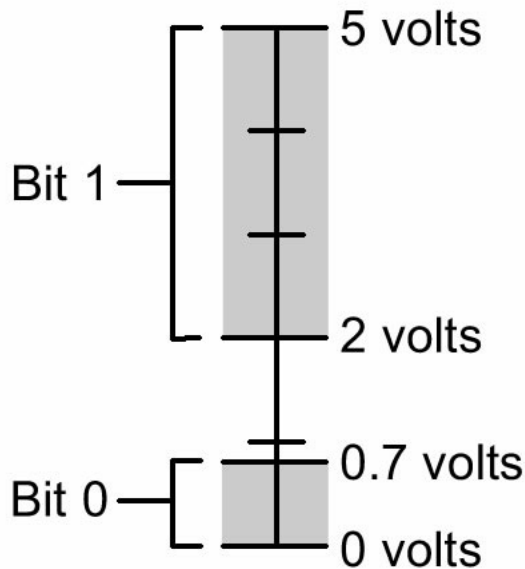


Digital information

The information inside most integrated circuits is purely digital. That means all information is represented in strings of binary "bits", each bit being either 0 or 1. The principle of Claude Shannon's "bits" as a means of representing information was described in Chapter One of this book.

Electrical input signals — coming into the metal legs of the integrated circuit — must also clearly represent either a 0 or 1 bit. If the specification sheet for an integrated circuit is examined, the corresponding voltage levels representing 0 or 1 are defined. The following diagram represents the actual acceptable input voltage levels for a family of common integrated circuits:

Acceptable TTL gate input signal levels



You can see from the previous diagram that the acceptable input voltage level for a bit 0 is from zero volts up to 0.7 volts. Why 0.7 volts? You will remember that 0.7 volts is the threshold voltage for a transistor. Any voltage lower than that level will not be sufficient to turn that transistor "on".

The threshold voltage on a transistor therefore performs a valuable function. Imagine an input signal coming into an integrated circuit with a value of zero volts (bit 0). If there is a temporary noise spike on that signal of anything less than 0.7 volts, that noise will not be sufficient to turn the first transistor "on" — the signal will still be interpreted as bit 0. So the threshold voltage acts to "clean up" the input signal and insulate the integrated circuit from external noise.

We now see how the threshold voltage in both neurons and transistors can act to convert a continuous, noisy, analogue signal into clean digital information. In *The Emperor's New Mind*, Roger Penrose describes how a similar thresholding mechanism is used by the cells in the retina of our eyes in order to reduce speckled noise in the images we see. Penrose explains that a single photon hitting the retina will not be sufficient to fire a signal: "In this case there is an additional mechanism present which suppresses weak signals, so that they do not confuse the perceived picture with too much visual 'noise'. A combined signal of about seven photons is needed in order that a dark-adapted human subject can actually become aware of their arrival. The type of cells that have been examined all require a threshold to be reached, and a very large number of quanta are needed in order that the cell will fire."

Once converted into a digital format, the input data can be stored in our brains as digital information. Digital information does not decay over time: a digital photograph stored as a file on a computer does not fade like a physical photograph. Digital information can be transmitted without loss and degradation. In contrast, analogue data will inevitably degrade each time it is copied (try making successive photocopies of photocopies). Digital information seems insulated from physical damage. In similar fashion, our mental images are uncorrupted by any interference "snow" which used to afflict old analogue televisions. When we imagine old memories, there are no random white spots appearing in those images. Instead, our mental images seem noise-free like a modern digital television.

In Chapter One it was explained how a consciousness based on information would feel insulated from the physical world. Even though your brain is composed of a material with the consistency of rice pudding, you would not feel as though you were made of rice pudding — your consciousness would feel substrate-independent, independent from the physical world, and insulated from physical damage and the ravages of time. We now see how the threshold voltage — in both neurons and transistors — further acts to insulate our consciousness from the noise of the physical world. The thresholding mechanism prevents the accumulation of electrical noise, both in

microprocessors and in our brains. It is as if our thoughts exist in a realm above the physical world, and insulated from physical damage.

4

COMPLEXITY

In the last chapter it was explained how a large number of nonlinear components can combine to produce systems which cannot be simplified to a simple component. This means that the behaviour of the multiple-component system could never be predicted from just studying the single component. In practice, it means that the behaviour of the multi-component system can be wildly different — completely unrecognisable, in fact — from the behaviour of the single component.

Multi-component nonlinear systems which behave in these surprising ways are said to exhibit *emergent* behaviour. Human intelligence and consciousness is typical of this emergent behaviour, emerging from the interactions of billions of neurons. You would never imagine that behaviour so extraordinary as intelligence and consciousness could arise if you just considered a single neuron in isolation.

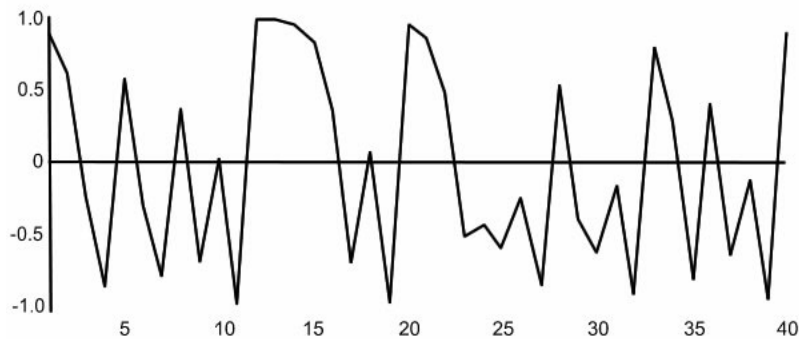
The science which considers these nonlinear systems — and their emergent behaviour — is called *complexity*. We shall consider complexity in this chapter.

Chaos

Complexity — and its implications for science — was largely ignored by researchers until the second half of the twentieth century. The catalyst for complexity research was the invention of the digital computer. Suddenly, it became possible to simulate complex systems in the laboratory.

The first example of this surprising emergent behaviour in computer simulations came with the discovery of *chaos*. In the 1960s, the meteorologist Edward Lorenz working at MIT performed a very simplified simulation of weather systems on a computer and found that his simulation behaved in a surprisingly unpredictable manner. The long-term behaviour of the simulated weather displayed extreme sensitivity to initial conditions — any slight difference would eventually produce a wildly different outcome. Hence the well-known phrase about the chaotic behaviour called the *butterfly effect*: "A butterfly flapping its wings in China could cause a hurricane next month in New York". The implications for weather forecasting were clear, as stated on the UK Met Office website: "When looking at forecasts beyond five days into the future the chaotic nature of the atmosphere starts to come into play". It can never be possible to make an accurate weather forecast more than a week or two in advance — no matter how accurate are your measurements or how powerful your computer.

Chaos was considered in detail in my fourth book. In that book, I presented an example of chaotic behaviour emerging from the remarkably simple nonlinear mathematical expression $2x^2-1$ (it was explained in the previous chapter how the x^2 term results in nonlinear behaviour). Using that mathematical expression, it was shown how the following apparently random graph can be produced:



It is clear from the graph that dramatically random behaviour can be produced from very simple arrangements of a few nonlinear components. In fact, this is how pseudo-random numbers are produced in hand-held electronic calculators: a very small subsystem composed of transistors in the calculator's main integrated circuit can produce

the random stream of numbers on demand.

With it being so easy to produce such dramatically random behaviour from a few nonlinear components, it is easy to imagine how a small module of chaotic circuitry in our unconscious brain could be responsible for our random creativity and flashes of inspiration apparently appearing "out of nowhere". There is surely no need to imagine that any more exotic processes — such as random quantum processes — would need to be involved to generate our creativity and inventiveness.

In the December 1986 issue of *Scientific American*, a major article on chaos described this possibility: "Innate creativity may have an underlying chaotic process that selectively amplifies small fluctuations and molds them into macroscopic coherent mental states that are experienced as thoughts. In some cases the thoughts may be decisions, or what are perceived to be the exercise of will. In this light, chaos provides a mechanism that allows for free will within a world governed by deterministic laws."

Emergence

Chaos is one example of the surprising and remarkable behaviour which can emerge in complex systems which contain a huge number of elements. This sudden jump to a new mode of behaviour is called *emergence*, and the resulting behaviour would then be called "emergent" behaviour.

In this book, we are particularly interested in emergence as it is clear that consciousness is a form of emergent behaviour which results from the interaction of billions of neurons. John Barrow describes this surprising nonlinear jump in behaviour in his book "Impossibility": "Complex structures seem to display thresholds of complexity which, when crossed, give rise to sudden jumps in the complexity. Take groups of people. One person can do many things; add another person and a further relationship becomes possible; but gradually add a few more people and the number of complex interrelationships grows enormously. Economic systems, traffic systems, computer networks: all exhibit sudden jumps in their properties as the number of links between their constituent parts grows. Consciousness is the most spectacular property to emerge in this way when a very high level of complexity is reached in a connected logical network, like the brain."

A dramatic example of emergent behaviour is the termite mound, emerging from the behaviour of millions of termites. A termite mound is a vertical city, resembling a human skyscraper, and containing very similar heat regulation and air conditioning systems. The tallest structure constructed by humans is the Burj Khalifa Tower in Dubai, which stands 828 metres tall. With a man measuring — on average — 1.73 metres tall, that means the Burj Khalifa is 479 times taller than its human builder. In comparison, the tallest termite mound so far discovered is 12.8 metres high. With a single mound-building termite measuring just 0.6 cm in length, that means a termite mound is 213 times larger than its builder. [\[12\]](#)

It is clear that termites have the edge when it comes to skyscraper construction. Here is a photograph of a man standing between two enormous termite mounds in the Northern Territory of Australia:



However, each individual termite has no knowledge of how to build the mound, and there is no single "foreman" in overall charge of the project. Each individual termite pursues a very simple operation, guided only by its local environment and its genetically-encoded rules. If you were to study the behaviour of just a single termite you would see no indication that they were capable of such extraordinary feats. The mound only "emerges" when millions of termites interact.

This sudden and unexpected emergence of an impressive capability has seen the property of emergence being described as "The whole is greater than the sum of its parts". As an example, it would certainly appear that the property of consciousness is far more impressive than any property possessed by a single neuron.

Though not everyone is so impressed ...

Reductionism vs. emergence

Many scientists would feel uneasy — or even reject outright — this notion of emergence, the notion that the behaviour of a system cannot be reduced to considering the behaviour of one of its component parts. That is because the philosophy seems to strike against the way we have done science for 400 years.

The modern scientific method is a relatively new phenomenon, the start of which can be traced back to Galileo in the 17th century. René Descartes described his own scientific method in 1638: "To divide all the difficulties under examination into as many parts as possible, and as many as were required to solve them in the best way, and to conduct my thoughts in a given order, beginning with the simplest and most easily understood objects, and gradually ascending, as it were step by step, to the knowledge of the most complex."

The suggestion of Descartes is that the best way for science to progress is to break Nature into its smallest pieces, and analyse how those pieces behave. This has certainly proven to be a successful strategy for science, and has underpinned our technological advances.

This philosophy that a full understanding of behaviour can be achieved by considering the smallest elements of a system is called *reductionism*.

However, the scientist who believes in the importance of emergent behaviour would say the philosophy of reductionism is like saying: "I understand how a brain works because I understand how a neuron works", or "I understand how a computer works because I understand how a transistor works".

The difference of opinion between the reductionists and those who believe in the importance of emergence is often portrayed as an ideological conflict. So which is right: reductionism or emergence?

Well, as is usually the case when you have two sides with strong arguments, both sides are right — and both sides are wrong. It all depends on the behaviour of the components which make-up the system of interest. Specifically, it depends on whether the components which make-up the system are linear — or nonlinear.

The solution was actually presented in the previous chapter when we considered nonlinearity. In that chapter, it

was explained how systems which were formed from linear elements could successfully be reduced to a single component while still maintaining the behaviour of the system. Remember the resistor network being reduced to a single resistor? That was a typical example of reductionism: the single resistor had exactly the same behaviour as the combined network of seven resistors. Reductionism is a convincing argument — with just one problem: **it is only true for linear components**. As soon as you shift to consider nonlinear components (such as neurons and transistors), the argument breaks down. As described in the previous chapter, a system which is composed of nonlinear elements cannot be successfully simplified: the behaviour of the composite system is not completely contained in the behaviour of a single component. This principle is described in the December 1986 issue of *Scientific American*: "The interaction of components on one scale can lead to complex global behavior on a larger scale that in general **cannot be deduced from knowledge of the individual components**."

By simplifying the system, you lose some aspect of the overall behaviour. In that case, your only option is to consider the large-scale emergent behaviour. On the plus side, that emergent behaviour due to nonlinearity can be very interesting indeed (consciousness, for example).

Particle physicists tend to be reductionists: they operate at the lowest-level, and they assume that systems will scale linearly. For many systems and materials, that will be the case: a sample of a few atoms of iron behaves in just the same way as a planet-sized block of iron, for example. If you know the behaviour of atoms, it is a simple process to scale that behaviour up to systems consisting of billions of atoms — as long as those atoms remain in a regular arrangement so that their behaviour scales linearly: a crystal, for example. It is believed that there is a 1,500 mile-long crystal of iron at the centre of the Earth, and geologists know how it behaves because they know how single atoms of iron behave: the behaviour scales linearly.

However, sometimes large numbers of atoms can combine to produce surprising behaviour which is highly nonlinear. The study of these materials is called *condensed matter physics*. Condensed matter physics is the most popular area of physics research (according to a recent poll, one third of all American physicists consider themselves to be condensed matter physicists). That means one third of American physicists are studying emergent behaviour. However, the field gets very little publicity compared to other areas of physics research. This general lack of awareness of the subject was made clear when the 2016 Nobel Prize in physics was awarded to condensed matter research. The announcement of the award sent science journalists scurrying to the internet to find out more about emergent behaviour. [13]

Another example of emergent behaviour when large numbers of particles interact is *superconductivity*. The phenomenon of superconductivity occurs when electrons act together and can freely move through a conductor as though there is no resistance. According to an article by the National Science Foundation: "Take a metal such as lead or tin and cool it below a certain critical temperature: many of the individual electrons in that metal will suddenly start to march in step, so to speak — a collective motion that allows them to flow as if the metal offered no electrical resistance whatsoever. **Again, electrons in the aggregate exhibit behaviors that are nowhere to be found in one electron alone.**" [14]

In the case of nonlinear components there is no way of predicting the onset of emergent behaviour unless you actually connect a huge number of the components together, or maybe run an equivalent huge computer simulation featuring possibly billions of simulated components. There are no short-cuts. As stated earlier, you cannot simplify large complex systems which result from the interaction of nonlinear components — the whole thing becomes a mathematical nightmare.

This is the reason why — as stated earlier — scientists only became able to tackle the problems of complexity when digital computers were invented. Maybe at this point you are starting to realise why complexity presents such a problem for conventional science.

I have seen this mathematical "nightmare" mentioned in the scientific literature. Melanie Mitchell is a professor of computer science who has worked at the Santa Fe Institute which is the world's leading centre for complexity research. In 2009, Mitchell wrote a book entitled *Complexity: A Guided Tour* which is an introduction and overview of complexity. Chapter Two of that book provides a clear explanation of nonlinearity. The mathematical "nightmare" that nonlinearity poses for reductionism is described by Mitchell: "Linearity is a reductionist's dream, and nonlinearity can sometimes be a reductionist's **nightmare**."

It was mentioned earlier that emergence is often described as: "The whole is **greater** than the sum of its parts". In her book, Melanie Mitchell presented a similar succinct phrase to describe reductionism in which the behaviour of components scales in a linear and predictable manner: according to Melanie Mitchell, reductionism can be described as "The whole is **equal** to the sum of its parts".

A measure of emergence: Φ

In the previous chapter, it was explained how Christof Koch and Giulio Tononi have developed a theory of consciousness which is called integrated information theory, or IIT. This is regarded as being the current leading theory of consciousness. If you remember, IIT involves considering the connectivity of the network of information in the brain.

Giulio Tononi has described a numeric value which can be calculated from that connectivity of information. According to Tononi, this numeric value — which is called Φ (the Greek letter "phi") — then represents the consciousness of the network. According to Tononi, this calculation could be applied to anything: from an iPhone to the Milky Way, and the calculated value of Φ would reveal whether or not the object was conscious.

After reading more about Tononi's work, it seems rather clear to my mind that Φ is a measure of the emergent behaviour of a system: the more emergent the behaviour, the more likely the system is to be conscious. Indeed, in his book entitled *Phi*, Tononi describes Φ as the extent to which "the whole is more than the sum of its parts" — the definition of emergence.

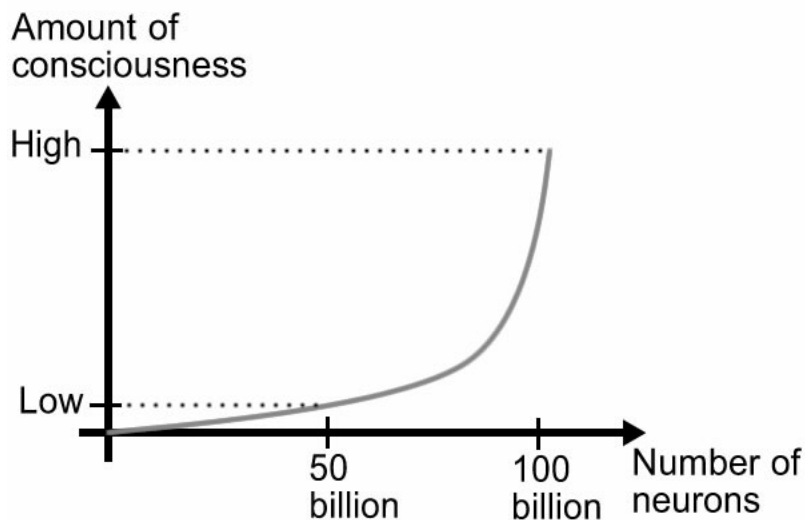
The following discussion describes my attempt to visualize this measure of emergence: Φ .

IIT possesses a cool and imaginative feature which is called the "cruellest cut". Tononi considers the situation in which a network of information might be sliced into two smaller networks. What would be lost by doing that? Again, the question boils down to the distinction between reductionism and emergence: a system formed of linear components would lose nothing by being sliced in half, whereas a system formed of nonlinear components — exhibiting strongly emergent behaviour — might find its performance severely reduced by being sliced in half.

The "cruellest cut" is specified as being the single slice of a network which has the most destructive effect, reducing the emergent behaviour by the greatest amount. To illustrate the principle of the cruellest cut, Tononi considers examples involving slicing a conscious brain in two, or cutting the head off a person's body — both of which, I would suggest, place this aspect of the theory firmly in the "untestable" category!

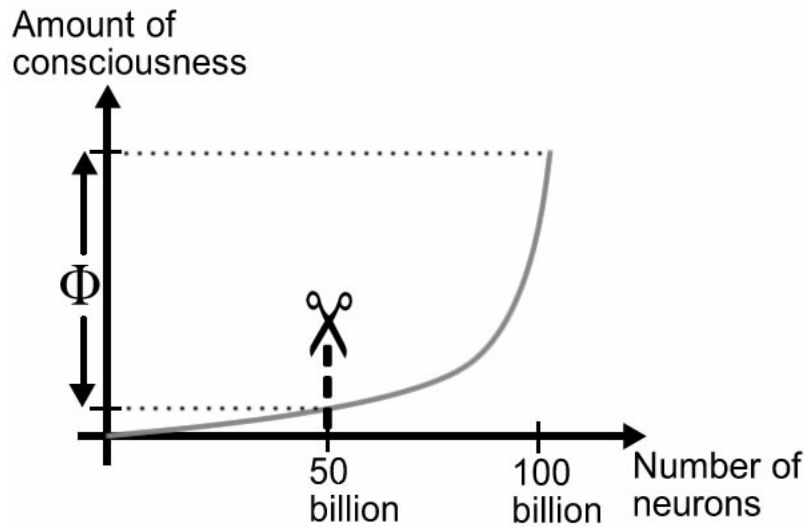
Let us consider the particular example of the brain. It has been described how a brain has approximately 100 billion neurons. We might slice a brain into two parts, each containing 50 billion neurons. In general, this most dramatic of actions — the cruellest cut — would significantly reduce the consciousness present in each of those half-brain parts. In fact, it might eliminate consciousness altogether.

So if 50 billion neurons represents "low consciousness" and 100 billion neurons represents "high consciousness", we might draw a graph showing how consciousness varies with the number of neurons:



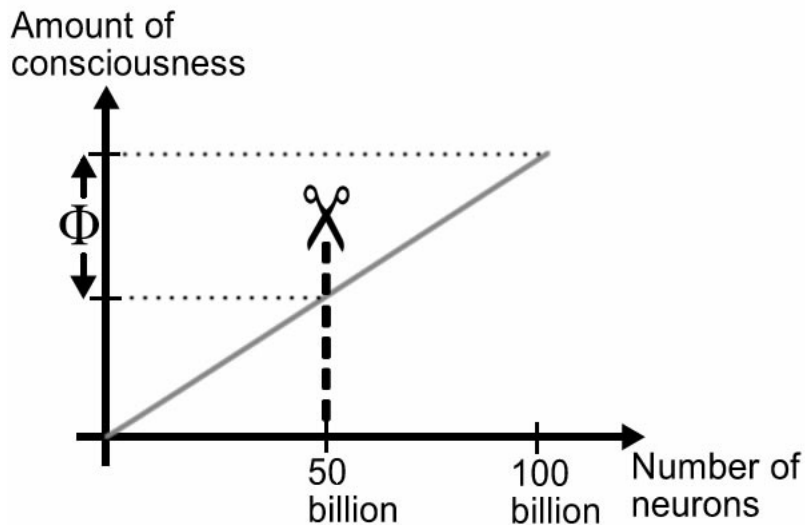
You will see from the previous graph that a part containing 50 billion neurons is shown as having "low" consciousness, whereas a part with 100 billion neurons is shown as having "high" consciousness. So the graph is highly nonlinear, with a pronounced upward kink at about the 90 billion neuron mark. This extreme nonlinearity is the signature of emergent behaviour.

So let us now apply that "cruellest cut", dividing the brain into two parts, each part containing 50 billion neurons:



On the previous diagram, you can see a pair of scissors applying the cruellest cut, splitting the brain into two 50-billion-neuron parts. If the cut makes a big difference, then that reveals that the 100-billion-neuron network (the whole brain) vastly outperforms a 50-billion-neuron network (the half-brain part). That would be a clear sign of a highly-emergent network, a sign that "the whole is greater than the sum of its parts". As shown on the diagram, that would result in a large value of Φ .

In contrast, the following diagram shows a situation in which the behaviour of a system scales linearly, in other words, there is no sudden jump in behaviour, no emergent behaviour:



You will see on the previous diagram that the same cruellest cut has been applied at the 50-billion-neuron level. However, in this linear case, the destructive effect of the cut is reduced. Each 50-billion-neuron part has a greater amount of consciousness than the previous example. In this case, it could be said that the whole is **equal** to the sum of its parts — which, as has been stated, is the signature of reductionism. This system could be decomposed into smaller units with no loss of performance. As shown on the diagram, the measured value of Φ would be smaller in this case.

According to integrated information theory, we can then interpret the value of Φ as the amount of consciousness present in any network.

The low-hanging fruit

This seems like a good opportunity for me to say something which is possibly rather controversial ...

On the basis of the discussion so far, we now see why reductionism has been so closely associated with the scientific method. Whenever scientific researchers have had the freedom to pick-and-choose their domain of interest, they have tended to concentrate their efforts on areas which are amenable to this method of decomposition into smaller components. In practice, that means the study of systems formed of linear components. Fortunately, as explained earlier, this has been sufficient to explain the behaviour of many materials when the behaviour of individual atoms is known. The discovery of semiconductors — and the resultant technological revolution initiated by their discovery — would be a good example of this: it has proven to be a route to success.

Unfortunately, this freedom of choice has meant that scientists have tended to avoid considering the difficult mathematically-intractable systems formed of nonlinear components — all of which explains why we have made the amazing discovery of the Higgs boson, while at the same time we are left almost completely in the dark about how the brain in our heads works.

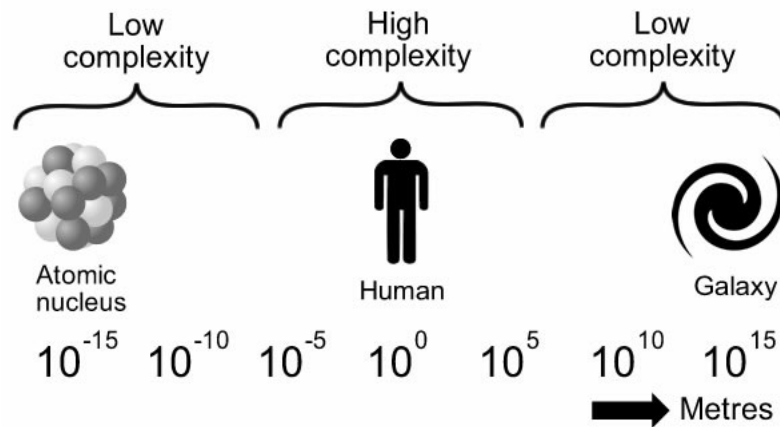
Put more simply, areas have been picked in which most progress can be made, perhaps taking the easier option, and areas involving complexity have been avoided. Because of those choices, the suggestion might be made that scientists have picked the "low-hanging fruit".

The physicist Paul Davies has written a book about complexity called *The Cosmic Blueprint*. At the end of the following extended quote from his book, Davies refers to the general lack of interest in analysing nonlinear complex systems, and how this has resulted in them being "neglected" by scientists (I have placed the relevant sentence in bold): "The greater part of modern science and technology stems directly from the fortunate fact that so much of what is of interest and importance in modern society involves linear systems. Roughly speaking, a linear system is one in which the whole is simply the sum of its parts. Thus, however complex a linear system may be it can always be understood as merely the conjunction or superposition or peaceful coexistence of many simple elements. Such systems can therefore be decomposed or analysed or reduced to their independent component parts. It is not surprising that the major burden of scientific research so far has been towards the development of techniques for studying and controlling linear systems. **By contrast, nonlinear systems have been largely neglected.** In a nonlinear system the whole is much more than the sum of its parts, and it cannot be reduced or analysed in terms of simple subunits acting together. The resulting properties can often be unexpected, complicated and mathematically intractable."

It is interesting to consider the distribution of complex systems according to their size, from the smallest objects in the universe to the largest. Galaxies are huge, but they can be treated as a single unit, rotating about a centre of mass. We can then describe the behaviour of a galaxy by using the relatively simple equations of general relativity. Similarly, at the smallest scales, elementary particles can be described by the relatively simple equations of quantum mechanics. The most complex objects — which therefore cannot be described by simple equations — are found in the mid-scale region.

In 2015, Neil Turok of the Perimeter Institute presented a lecture entitled *The Astonishing Simplicity of Everything* (available on YouTube). In that lecture, he considered how complexity is only found in the middle between the two extreme scales of size. And it just so happens that it is in that middle region of high complexity where we find life, and humans, and conscious brains: "We are in the middle in terms of scale. The astonishing thing about recent discoveries in physics is they tell us the universe is surprisingly simple and regular — on the tiniest scale, and on the hugest scale. It's only complicated in the middle."

The following diagram shows the variation in the complexity of objects according to their size. Just as Neil Turok suggests, the objects with least complexity can be found at the extremes of the scale, whereas life (and the human brain — the most complex object we know of in the universe) is found precisely in the middle of the scale:



The field of physics has progressed by explaining puzzling phenomena by describing that behaviour in terms of simple formulas and laws. For example, the behaviour of the huge celestial bodies — the orbit of the Moon around the Earth, for example — can conveniently be described by nothing more than Newton's laws of motion and a few lines of mathematics. How convenient for physicists!

But imagine a situation in which the size of complex objects had extended out to the extremes of the scale — maybe with living creatures the size of stars or galaxies. In that case, such simplifying methods could not have been applied: we could not have accurately predicted the rotation of galaxies, for example. The behaviour of a galaxy would have, instead, depended on the complex behaviour of its "mind". If that had been the case, the field of physics would have struggled to advance, and the behaviour of the universe would have largely remained a mystery to us.

5

CAN A COMPUTER THINK?

It is the year 2021. The world has been ravaged by the nuclear World War Terminus. Rick Deckard is one of the survivors, struggling to get by on his income as a bounty hunter in a post-apocalyptic San Francisco.

Deckard is hired by the police department to "retire" (i.e., kill) androids which have returned from distant space colonies. But Deckard has a problem. The problem stems from the technology in the latest Nexus-6 androids. According to the spec sheet: "The Nexus-6 brain unit they're using now is capable of selecting within a field of two trillion constituents, or ten million neural pathways."

As a result, the Nexus-6 androids ("andys") are so advanced that they are almost indistinguishable from humans. According to Deckard: "No intelligence test would trap such an andy". In conversation, there is no way of telling the difference between a Nexus-6 android and a human. Deckard has only one hope: the Voigt-Kampff Empathy Test. Apparently, androids feel no empathy with others of their kind: "Empathy, evidently, existed only within the human community". Deckard has to rely on this emotional deficit to detect the rogue Nexus-6 machines.

By now you might have realised that I am describing the plot of Philip K. Dick's classic science fiction novel *Do Androids Dream of Electric Sheep?* The book later formed the inspiration for the equally-classic Ridley Scott movie *Blade Runner*.

Let us rejoin the story of Rick Deckard as he rides in his flying car to the headquarters of the Tyrell Corporation where the androids are manufactured ...



At the Tyrell Corporation, Deckard meets Tyrell's assistant, Rachael. After performing the Voigt-Kampff test on Rachael, he discovers she is an android. However, Rachael is clearly intelligent, conscious, and alluring. What is more, Rachael has been given false memories so she does not realise she is an android.

After a while, Deckard realises he has started feeling "empathy" for Rachael — or maybe something more: "I'm capable of feeling empathy for at least specific, certain androids. Not for all of them but — one or two". Deckard is now faced with a dilemma, and has to wrestle with his conscience: is it ethical to "retire" Rachael, another seemingly-conscious being, even though she is an android? Deckard now starts to question if he is in the right job: "Suddenly, for the first time in his life, he had begun to wonder."

What should Deckard do? How should he behave toward Rachael?

At the heart of the problem appears to lie the question of whether or not an android can be conscious. As described in Chapter One, we use the fact that we are conscious to separate ourselves from the everyday objects — such as clocks and cars — which we do not believe are conscious. When faced with a potentially-conscious android, we would lose that certainty that we are superior. It seems it is the presence of our consciousness which defines us as human.

The need to resolve these questions about the consciousness of androids will become urgent as androids start to perform working roles. For example, it appears androids — combined with the latest speech recognition artificial

intelligence — will soon be acting as multi-lingual airport and hotel receptionists. Here is a photograph from a Tokyo convention of the latest DER2 android produced by the Kokoro Corporation. The android responds to commands in Japanese, Korean, Chinese, and English:



A video of the DER2 in action is available on YouTube:

<http://tinyurl.com/replicantvideo>

Developments in artificial intelligence in androids might uncover a legal minefield. Would a physical assault against one of these androids be regarded as a serious crime, as serious as an assault against a human worker? Should it be considered to be a crime to turn off the power to one of these androids, thereby "killing" it?

If you read the video description on YouTube for the previous video, you will find that at one point in the DER2 android demonstration the android had to warn men not to touch her as that would be considered sexual harassment. The men who were watching the demonstration treated the request seriously and apparently nodded their heads, agreeing to comply. The men had already decided that the android deserved to be treated with equal respect.

And, when Rick Deckard finally decided how to treat Rachael, he came to the same conclusion.

It seems that the answer to these difficult questions will be decided by whether or not we determine the android to be conscious. So in this chapter we will be considering the crucial question as to whether a computer (and, thereby, an android) could ever be conscious. We will be moving away from the hard reality of neurons and transistors, and entering the abstract world of computing and mathematics.

In Chapter One, the principle of substrate-independence was described. That was the idea that if the neurons in your brain were replaced with transistors — or any other form of similar hardware — you would still be conscious. If we assume the principle of substrate-information is true, then that removes one major fundamental objection to a computer becoming conscious.

However, another objection has been raised, based on the method by which modern computers "think" to solve problems. At the heart of a modern computer lies a *microprocessor* (an integrated circuit) which performs one logical or mathematical operation at a time. Problems are then solved by following a step-by-step computer program (or *algorithm*). Each step of the algorithm is clearly-defined, allowing no ambiguity. Every step of the process is as strictly defined as the most formalised piece of mathematics.

However, it has been suggested that this highly-formal approach to problem solving is not a good match for the

human brain as the approach appears to allow no room for ingenuity, random creativity, or intuition. Do humans really follow a rigidly strict sequence of instructions every time they want to solve a problem? Was that really how Einstein's thought processes worked? I very much doubt it.

In another criticism of the algorithmic approach, we will see in this chapter how Alan Turing discovered a remarkable result which revealed that there were some things computers could never compute. Just like the empathy-deficit of the Nexus-6 android, does that mean there will inevitably be fundamental deficiencies in the processing of a computer mind compared to the human mind? Specifically, does all this mean that a computer can never be conscious?

In this chapter we will examine if there are any fundamental limitations on a computer's thought processes. We will start by considering a very dangerous entity for any inflexible and strictly-logical system: the danger of the paradox.

The liar's paradox

In the early decades of the 20th century, the foundations of mathematics were threatened because of the recent discovery of paradox lurking within mathematics. The paradox was based on the *liar's paradox*. As an example, if someone says: "I am lying" or, equivalently "Everything I say is false" then that would represent a paradox. The statement can be either true or false. If the statement is true, then — according to the statement — the statement is false (because the person is lying). Alternatively, if the statement is false, then — according to the corrected statement — the person is telling the truth, so the statement as told by the person must be true.

Either way, we appear to have a statement which is self-contradictory: if it is true then it is false, and if it is false then it is true. That constitutes a paradox.

The particular form of the liar's paradox which threatened the foundations of mathematics is called *Russell's paradox*, and it was discovered by the English philosopher and mathematician Bertrand Russell in 1901. Russell's paradox concerns *sets*, which is the mathematical term for a collection of objects. The paradox can perhaps be easiest understood if we consider an example. So let us consider the collection of men who are shaved by a barber. That collection of men would, mathematically, be known as a set.

To understand how the paradox can arrive, consider the situation in which the barber shaves a man if and only if the man does not shave himself. Let us consider the set of men who are shaved by the barber.

So let us now ask the question: is the barber himself in the set? In other words, does the barber shave himself or not?

If the barber **is** in the set then, by the set definition, that means he **does not** shave himself. In which case then, according to his rule, he **does** shave himself and should therefore **not** be in the set. But if the barber is **not** in the set then, by the set definition, that means he **does** shave himself. In which case then, according to his rule, he **does not** shave himself and so **should be** in the set.

So, as with the liar's paradox, we have a situation which if it is true then it is false, and if it is false then it is true.

Paradoxes are so destructive in mathematics because mathematics attempts to clearly and unambiguously decide the truth or falsity of a statement expressed in clear mathematical language. As a simple example:

"Two plus two equals four"

is an example of a **true** mathematical statement, whereas:

"Two plus two equals five"

is an example of a **false** mathematical statement.

In that sense, mathematics can be seen as the "route to truth and clarity" about the world. And that truth is unchanging for all time: when a mathematical theorem is proved to be true, it remains true forever. However, if there are paradoxical statements which can be expressed mathematically which are **both true and false** at the same time, then that clarity becomes lost. We are left with indecision and uncertainty, and mathematics as some "route to truth" appears doomed.

An example of the destructive capability of a paradox was shown in an episode from the original series of *Star Trek* called "I, Mudd", broadcast in 1967. In the episode, the Enterprise is hijacked by an android named Norman. Norman reveals himself to be inflexibly logical in his thought processes, and Captain Kirk realises this represents a weakness which they can exploit. As a result, the android is defeated by the liar's paradox by simply telling it: "I am

lying". The android quickly realises the paradox, and it proves to be more than the ultra-logical android brain can handle.

Here is the android's response to the paradox: "You say you are lying but, if everything you say is a lie then you are telling the truth. But you cannot tell the truth because everything you say is a lie. But you lie ... you tell the truth ... illogical ... illogical ... please explain ... you are human ... **only humans can explain the behaviour ...**"

At which point smoke pours out of the android's head and it is destroyed.

The scene in which the android is destroyed is available on YouTube: <http://tinyurl.com/liarsparadox>



This represents an excellent demonstration of the destructive capabilities of a paradox, capable of tearing-down a strictly logical system. This also reveals how paradoxes were perceived as being such a threat to the logical foundations of mathematics at the start of the 20th century.

But the parable of Norman the android also appears to reveal a possible limitation on the "thought processes" of a computer. The final line spoken by Norman is particularly revealing: "Only humans can explain the behaviour". Norman appears to be admitting that there are fundamental differences between the workings of a human mind and the workings of a computer mind. It would appear that the human mind has a greater capacity to understand certain difficult concepts (for example, understanding the principle of a paradox). It would appear that a rigidly-logical computer would be unable to "get its head round" the concept of a paradox. However, humans (and Vulcans) would have no such limitation. Even the highly-logical Spock is able to consider the implications of the liar's paradox without smoke pouring out of his head.

So, can a computer think? Maybe, but it appears we have discovered that there might be limitations on what they can think.



The halting problem

The year is 1936.

Alan Turing — the brilliant English mathematician — is 22 years old and has just been awarded a research fellowship at King's College in Cambridge University. The fellowship was worth £300 a year, which was not much money even in those days, but it was enough to provide Turing the freedom to pursue his ideas in an idyllic environment.

Here is a photograph of King's College in Cambridge:



Turing was lying in the grass in Grantchester Meadows when he had a brilliant insight.[\[15\]](#) It was an insight which would reveal a truly extraordinary limitation on the ability of all computers.

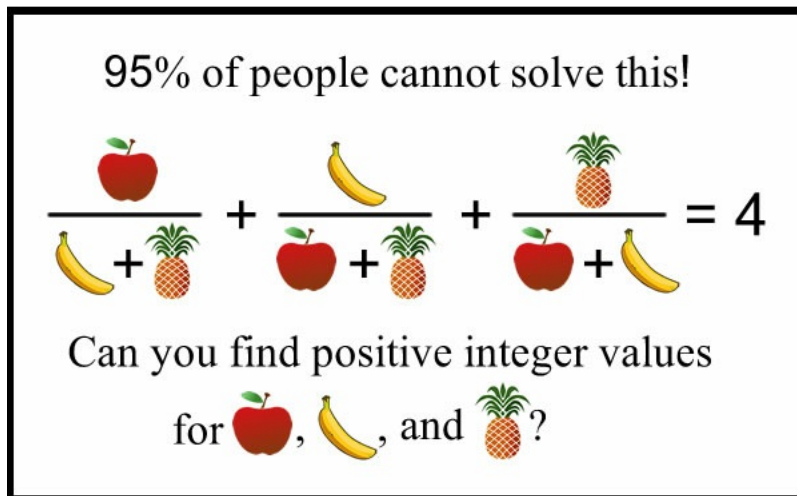
Turing's idea considered the apparently simple question of determining whether or not a computer program

eventually halts (stops running, and then usually producing some useful output). The alternative would be that the program might run forever, trapped in a never-ending loop, never halting to produce useful output.

The subject of Turing's idea — whether or not a computer program halts or loops forever — might appear quite abstract and uninteresting, but the consequences were to be huge.

It might appear fairly obvious that one way of determining whether or not a program halts is just to leave it run and see whether or not it eventually halts. However, we shall now see that that strategy will not work in all circumstances.

If you are on Facebook then you are probably tired of those silly mathematics problems that people share which turn out to be incredibly simple. The following image resembles one of those problems — in appearance at least. Let us call it the "Facebook fruit problem" as it features apples, bananas, and pineapples:



In order to solve the puzzle, you will see that you need to find the positive integer values represented by the apple, the banana, and the pineapple.[\[16\]](#) An example of the sort of whole-number solution we are seeking would be for the apple to have the value 5, the banana to have the value 3, and the pineapple to have the value 2 (these are not the correct answers). You might like to try to solve the problem yourself, but I warn you not to spend too much time on it.

You might write a simple computer program to solve this puzzle via trial-and-error. The program would start by setting the values of the apple, banana, and pineapple all equal to 1. The program would then test if those values solved the equation. If the equation was not solved, then the program would increase the value of one of the fruits by 1 and try again. The program would continue increasing the values until a solution was found. This would represent an exhaustive brute-force search of all possible solutions.

I can tell you that after a few years — or even a few decades — your program would not have found the solution to the puzzle. Therefore, after that length of time, and testing so many possible solutions, you might feel justified in stopping your program and announcing: "The puzzle has no solutions".

However, you would not be justified in halting the program and making that announcement. This is because, rather staggeringly, the correct value for the apple is: 154,476,802,108,746,166,441,951,315,019,919,837,485,664,325,669,565,431,700,026,634,898,253,202,035,277,999

which is an astronomical number composed of 81 digits which is approximately equal to the number of atoms in the universe. It is approximately equal to ten thousand quadrillion quadrillion quadrillion quadrillion.

Fortunately, the correct value for the banana is rather smaller. It is only: 36,875,131,794,129,999,827,197,811,565,225,474,825,492,979,968,971,970,996,283,137,471,637,224,634,055,579 a number which merely contains 80 digits.

Finally, the correct value for the pineapple is relatively tiny, being composed of only 79 digits: 4,373,612,677,928,697,257,861,252,602,371,390,152,816, 537,558,161,613,618,621,437,993,378,423,467,772,036

If you did manage to solve the problem then, very well done indeed! Apparently, according to the Facebook meme, you can now consider yourself to be in the top 5% of the population (I'm joking — it means you probably work for the NSA). [\[17\]](#)

In his book *Programming the Universe*, Seth Lloyd makes the point that sometimes it is very easy to tell if a

computer program will halt, or loop forever, just by looking at the program. As an example, the simple one-line computer program:

```
PRINT "HELLO"
```

will just print "HELLO" and then halt (stop). So it is very clear to see that this simple one-line program will halt — without actually having to run the program.

As an example of the second type of behaviour, it is clear that the following two-line BASIC program will loop forever and never halt:

```
10 PRINT "HELLO"  
20 GOTO 10
```

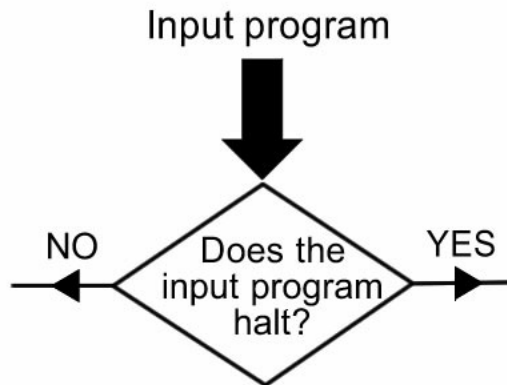
In the program, you will see at line number 10, the computer will print "HELLO". The computer will then advance to line 20 which says "GOTO 10", which means the computer has to loop back to line 10 and print "HELLO" again. This looping will continue forever (rapidly filling the screen with "HELLO"). It can be seen that this looping behaviour means that the program will never halt.

So it would appear it is possible to determine whether or not a program will eventually halt just by looking at the program and analysing that program — without actually having to run the program. We might then wonder whether we might be able to automate that process: could we write a sophisticated computer program which takes any other program as its input and then determines whether or not that input program will halt? Such a sophisticated program would be able to solve the Facebook fruit problem instantly — without having to run a brute-force algorithm for billions of years. The question of whether or not it is possible to write that general program is called the *halting problem*. The solution to the halting problem is not obvious, and it was considered to be one of the most important problems in early 20th century mathematics.

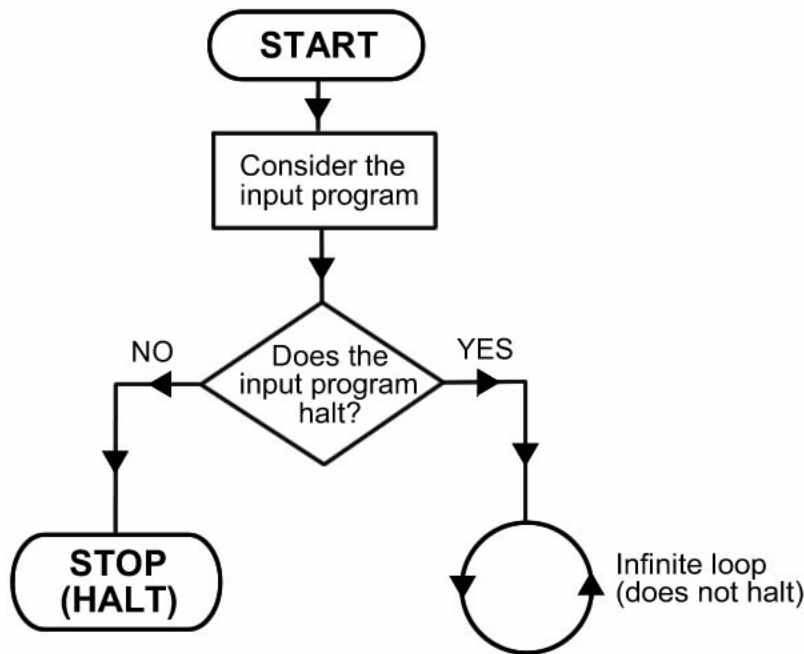
The halting problem caught the attention of Alan Turing, and it was while he was lying in the grass in Grantchester Meadows that the solution to the problem came to him. To cut a long story short, Turing was able to show that it would never be possible to write a single general computer program which would be capable of determining whether or not another program halts.

Turing's method was ingenious, and the form of the method resembles the "liar's paradox" which was described earlier in this chapter.

Firstly, let us imagine that it is possible to write a general-purpose algorithm to determine whether or not an input program halts. Let us denote that piece of code — which tests whether or not a program halts — by the following diamond in a flowchart diagram (the diamond represents a decision box):



Turing proposed that that piece of code — which performs the halting test — could then be included as part of the following program:



You will see from the flowchart that if the input program **does not** halt, then the flowchart halts. But if the input program **does** halt, then the program loops forever, i.e., it never halts.

So we can see from the flowchart that the behaviour of the flowchart algorithm is precisely the opposite of the behaviour of the input program. If the input program **does not** halt then the flowchart algorithm **does** halt. But if the input program **does** halt then the flowchart algorithm **does not** halt. As I said, the behaviour of the flowchart algorithm is precisely the opposite of the input program.

Alan Turing then did something ingenious. He took the flowchart algorithm (which can be coded as a computer program) **and presented it as input to itself!** Turing then asked the question: "Does the resulting program — given itself as input — halt or loop forever?"

There are two possibilities. If the input program **does** halt then — according to the algorithm — the flowchart algorithm **does not** halt and so the input program does not halt. Conversely, if the input program **does not** halt then — according to the flowchart — the flowchart algorithm **does** halt and so the input program does halt.

So if the input program does halt then it does not halt, and if the input program does not halt then it does halt. As in the liar's paradox, the self-referential nature of Turing's method has created a paradox.

A paradox is a situation which cannot exist: a computer program has to either halt or not halt — it can't do both. The only conclusion we can make is that the general halting tester program — the piece of code in the diamond — cannot exist. This method which Turing used in his proof is called "proof by contradiction".

Turing had therefore solved the question of the halting problem: it could never be possible to write a general algorithm which could determine if any other program either halted or looped forever.

Turing published his solution in 1937 in *Proceedings of the London Mathematical Society*. This was a magnificent achievement by Turing, and it established his reputation as a top-rank mathematician.

The implications for the android brain, however, are not so appealing. The result suggests that if we have a computer brain then there will always be a problem (the halting problem being an example) for which it is known that there is a solution (a program will definitely either halt or not halt) but the computer brain cannot calculate that solution. The solution is then said to be *uncomputable*.

The new mind of Roger Penrose

Turing's solution to the Halting Problem seems to suggest that there is a fundamental limitation of the computer mind. We will now see how one of the most eminent English physicists suggested that this limitation meant that computers do not function like the human brain, and therefore can never be conscious.

Roger Penrose's greatest achievement in physics came in the 1960s when he proved that a collapsing star had to form a singularity: a black hole. Working with Stephen Hawking, he then showed that the same principle had to apply to the universe as a whole: if you reverse time, the universe had to have emerged from a singularity at the time of the Big Bang.

In 1989, Roger Penrose wrote a physics book aimed at a general audience called *The Emperor's New Mind*. The market for popular science publishing in physics had been established a year earlier by Stephen Hawking's bestseller *A Brief History of Time*. As a result, Penrose's book was tremendously popular. I read the book when it came out as did many of my friends, and I know it motivated many readers to get interested in physics.

In his book, Penrose presented his case that computers operated fundamentally differently from the human mind and, as a result, computers can never be conscious. Penrose used Turing's solution to the Halting Problem which showed — as has just been described — that there are some problems which have solutions which can never be calculated by a computer. This appears to represent an intellectual deficiency of the computer — but it is not believed that humans possess a similar deficiency. For that reason, Penrose's theory suggested that these computer minds could never be conscious.

As stated earlier, computers solve problems by following a scripted algorithm in a very rigid, predictable, step-by-step manner. Penrose calls this type of behaviour *algorithmic*. An algorithmic mind has to stick to the script of its program, unable to go "off-script", being bound by rigid logic. An example of an algorithmic mind would be Norman the *Star Trek* android considered earlier. Norman's algorithmic mind is so rigid and inflexible that he is unable to consider the liar's paradox without smoke pouring out of his head.

In contrast, the minds of Captain Kirk and his crew are more flexible, not bound to following a step-by-step algorithmic program. As suggested at the start of this chapter, surely Einstein's mind did not follow a strict sequence of rules. Human minds are capable of going "off-script" by introducing original thinking. Penrose calls these types of minds *non-algorithmic*.

Penrose's theory is not fully stated until the final chapter of his extensive and wide-ranging book. As Penrose says in that final chapter: "It has, indeed, been an underlying theme of the earlier chapters that there seems to be something **non-algorithmic** about our conscious thinking." Penrose then introduces his theory which suggests a clear division between conscious and non-conscious minds on the following basis: **a non-algorithmic mind can be conscious, whereas an algorithmic mind can never be conscious.**

Therefore, according to Penrose's theory, we should not consider Norman the android to be conscious because his mind is algorithmic, forced to follow a strict program. In similar fashion, according to Penrose, no computer which follows a strict program could ever be conscious.

But how could we ever test Penrose's theory? It would appear we would need to compare the mind of a computer with the mind of a human, and somehow determine whether the algorithmic "mind" of the computer was conscious. But how could we ever get "inside the mind" of a computer to test Penrose's theory? It would seem to be an impossible task.

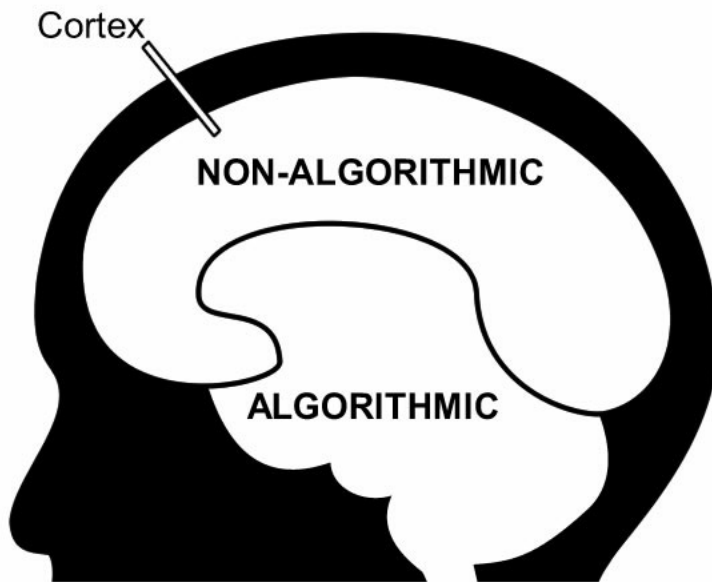
However, we have the perfect testing ground on which we can test Penrose's theory. And that testing ground is the human brain.

The brain appears perfect to test Penrose's theory because it is a device which is divided into two sections: one section operates algorithmically, while the other section operates non-algorithmically. What is more, we are able to "get into the mind" of this device, to determine if either of the two different sections are conscious.

As described in Chapter Two, the lower levels of the human brain are responsible for repetitive behaviours, such as walking and breathing, and also being responsible for monitoring body temperature and carbon dioxide levels in the blood. These are all functions which could be performed by a computer following a strict program. For that reason, we can consider the lower levels of the brain as representing **algorithmic** behaviour. As an example, the mind of Norman the android would operate like the algorithmic lower levels of our brain.

In contrast, the higher level of the brain does not follow a strict "program", and is therefore capable of going "off-script" to introduce original thinking, creativity, and problem solving for which — as Penrose suggests in the final chapter of his book — "no clear algorithmic process exists".

So let us redraw the simple map of the brain from Chapter Two to show the algorithmic and non-algorithmic regions:



Let us remind ourselves what Penrose's theory suggests. According to Penrose, an algorithmic mind (like Norman the android) **cannot** be conscious, but a non-algorithmic mind **can** be conscious. And when we consider the two sections of the human mind shown in the previous diagram — **this is exactly what we find!** As described in Chapter Two, conscious behaviour is believed to reside in the higher level of the brain (which is shown to be the non-algorithmic region on the diagram), whereas the lower levels of the brain — the algorithmic regions — are believed to be unconscious.

To my mind, this represents strong evidence in support of the theory of Roger Penrose.

In the final chapter of his book, Penrose presents a description of how the conscious (non-algorithmic) and unconscious (algorithmic) mind work together to learn a new skill, for example, learning to drive a car. During the learning process, the conscious mind would be very active, solving problems ("How do I overtake the car in front?"). As Penrose explains, the conscious mind would have to be used to solve the problem rather than the unconscious mind because "no clear algorithmic process exists" at that stage. However, once the problem is solved and you have overtaken a few cars, you have learned how to perform the task. It might be said that the learning process involves "writing your own computer program" to solve the task: you are generating a new algorithm. But once your conscious mind has generated that new algorithm, it can then be handed-down to the lower-level unconscious brain. It can then be said that you have learned a new skill. Then, the next time you need to overtake a car the unconscious brain can follow that program algorithmically and perform the task without having to involve the higher-level conscious mind. As a result we can drive our cars virtually automatically, without having to get consciously involved.

In his book *Consciousness*, Christof Koch presents a similar description of the difference between the conscious and unconscious mind. Koch explains how consciousness is needed for training, but then the unconscious mind can take over: "Much of the ebb and flow of daily life does indeed take place beyond the pale of consciousness. This is patently true for most of the sensory-motor actions that compose our daily routine: tying shoelaces, typing on a computer keyboard, driving a car, returning a tennis serve, running on a rocky trail, dancing a waltz. These actions run on automatic pilot, with little or no conscious introspection. Whereas consciousness is needed to learn these skills, the point of training is that you don't need to think about them anymore; you trust the wisdom of your body and let it take over."

So it appears we might have found a valuable principle on our quest to uncover the secrets of consciousness: a clear definition of when biological material should be considered to be conscious, and when it cannot be capable of consciousness. If that material is algorithmic — if it follows a strict program — it cannot be conscious. But if that biological material is capable of non-algorithmic behaviour, then it has the potential to be conscious.

Quantum theories of consciousness

The latest incarnation of Roger Penrose's theory of consciousness is controversial because of Penrose's decision to incorporate some highly-unorthodox ideas based on quantum mechanics. This approach has received a great deal of criticism. So, in this section, let us consider some of the various quantum theories of consciousness.

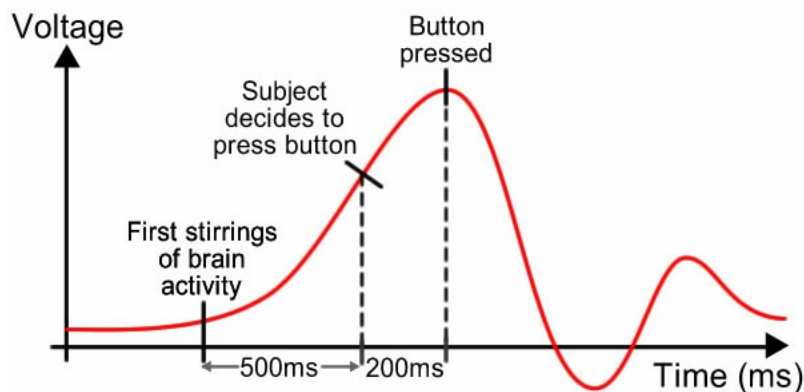
Quantum theories of consciousness have proven popular almost from the first day that quantum mechanics was discovered. I would say there are two ways in which quantum mechanics might have an influence on theories of consciousness.

Firstly, quantum mechanics seems to present a mechanism by which the notion of "free will" might be given some foundation in science. When Newton proposed his three laws of motion in 1687, it appeared that the evolution of the universe was governed by strict laws — with no room for deviation. All successive states of the universe would be set in stone, determined by the original state of the universe and the application of Newton's laws. This principle has been called the "clockwork universe".

However, as the atoms of the brain follow Newton's laws, this would appear to indicate that the evolution of our thought processes — for our entire lives — are also determined by the position of the atoms in our brains at birth, and the application of Newton's laws. Where, then, is there any room for free will — the notion that we could behave differently if we chose to? Is free will just an illusion? Are all our decisions for our entire lives set in stone at birth?

The idea that all our decisions are actually decided well in advance was reinforced by a classic experiment. In the 1980s, a consciousness researcher named Benjamin Libet performed a series of experiments at the University of California, San Francisco. It was known that before a human subject performs a simple physical activity — such as pushing a button — there was a characteristic pattern of electrical activity in the brain known as the *readiness potential*. Libet set out to time this readiness potential, so he connected a volunteer to an EEG and the volunteer was asked to push a button several times at will. The volunteer had complete choice as to when he or she should push the button.

What Libet discovered was amazing. The readiness potential could be detected in the unconscious region of the brain about half-a-second before the person took the conscious decision to press the button. It appeared the decision to push the button was actually being made by the unconscious brain, with the apparently conscious decision being a mere illusion of free will occurring several milliseconds later.



Libet's experiment appeared to reinforce the idea that there can be no free will in a clockwork universe, with everything being determined some time previously. However, with the discovery of quantum mechanics in the early 20th century, the door was opened for free will to make a comeback.

Quantum mechanics introduced fundamental uncertainty, and eliminated the concept of the clockwork universe. According to quantum mechanics, when we make a measurement at the most fundamental level, i.e., the level of individual particles, **we will get a fundamentally random result**. As described in my first book, the situation resembles a ball spinning round a roulette wheel. It is fundamentally impossible to predict in which slot the ball will land: you are prohibited from dismantling the system in order to predict the motion of the ball in terms of more fundamental quantities (because there are no more fundamental quantities — we are already at the fundamental level).

So, if the motion of the atoms in our brains are actually controlled by the random processes of quantum mechanics, this eliminates the concept of the clockwork universe and reintroduces the possibility of some degree of

free will. This principle was described by Christof Koch in an interview which is available on YouTube:

<http://tinyurl.com/freewillvideo>

In the video, you will note that the interviewer says: "If our feeling of authorship is just a froth that arrives after our brain has made the actual decision then how can we possibly have free will?" in a reference to the previously-described Libet experiment.

However, if our thoughts are decided by the fall of random quantum dice, does that really mean we have free will in the conventional sense of the term?

The second proposed role for quantum mechanics in consciousness comes during the so-called "collapse of the wavefunction". In quantum mechanics, it is the case that particles can behave as though they are in a peculiar multi-valued state called a *superposition state*. For example, in the famous double-slit experiment a particle can appear to travel through two different slits at the same time — as though the particle is in two places at once. At that point, the particle is described mathematically by a *wavefunction*. However, once the particle has passed through the two slits and hits a screen, the particle is found to exist in only one place. In other words, when the particle is observed, it is said that the wavefunction has "collapsed" into a single state, and only one position of the particle is left.

But what physical process is responsible for this "collapse of the wavefunction"? In 1932 the mathematician John von Neumann — who was the foremost mathematician in the world at that time — proposed a controversial solution. Von Neumann wrote an influential book titled *The Mathematical Foundations of Quantum Mechanics*, and in that book he proposed that the collapse was caused by the consciousness of the experimenter. Basically, the experimenter formed the final link of a causal chain: by the time the experimenter considered the experiment, it was essential that the particle was only in one position. So the experimenter's final act of conscious observation was responsible for collapsing the wavefunction.

Von Neumann's "consciousness causes collapse" interpretation is not popular with physicists today, though in a recent poll, 6% of physicists still agree with it. However, our knowledge of the underlying physical principles of quantum mechanics has advanced since Von Neumann's time. It is now believed that the influence of the general environment (for example, dust particles hitting an electron, or the random arrangement of atoms in a screen hit by a particle) has the effect of "collapsing the wavefunction". This is because, in general, environmental effects are random and noisy, so when a particle interacts with billions of random atoms in the environment, there is an "averaging" effect which progressively reduces the strange superposition effects and only leaves us with a well-defined state which is not in a superposition. This is why we do not find Schrödinger's famous cat both alive and dead at the same time!

This process by which the environment acts to "collapse the wavefunction" is called *environmental decoherence* or just *decoherence*. This process is now generally-accepted and uncontroversial among most physicists. The effect has been tested in many experiments, and, as we shall soon see, an understanding of the decoherence process is allowing new forms of powerful computing to be developed.

So there is no need for a conscious observer to "collapse the wavefunction". Any random environment can act as an "observer". For example, an electron hitting a screen will be "observed" by the screen, thereby revealing the position of the electron. The fact that a conscious observer is not required to collapse the wavefunction is described by Max Tegmark in his book *Our Mathematical Universe*: "Now I was convinced that consciousness had nothing to do with it, since even a single particle could do the trick: a single photon bouncing off a object had the same effect as if a person observed it."

Because decoherence is such a powerful effect, usually occurring in a tiny fraction of a second, it is extremely difficult to keep a particle in a superposition state. However, if we can manage to keep a particle in a superposition — by completely insulating it from any interaction with the environment — then there might be big advantages. As an example, imagine a computer made out of particles in a superposition state. Just as particles in a superposition state can be in many places at once, so a computer made out of those particles would be able to perform many calculations at once! This is the general principle behind *quantum computing*. [18]

When he had finished writing his book *The Emperor's New Mind*, Roger Penrose was convinced that some form of non-algorithmic computing was necessary for consciousness, but he was unsure at the time where to find this new form of computing. But when he became aware of the extraordinary potential of quantum computing, this

represented the possible breakthrough he was seeking. His feelings at the time are described in the following video (with Penrose still in great form at the age of 82):

<http://tinyurl.com/penrosetheory>

As Penrose states in the video: "To me, there is something outside the computational laws of physics. When I wrote my book *The Emperor's New Mind* I was trying to develop this idea, and I was trying to say there was something else out there. What could it be? Where is the biggest gap in our understanding of physics? There is a big gap within present day understanding of quantum mechanics."

Penrose then wonders if "inside our heads we are **exploiting** that gap. That would take us to a level somewhat beyond present technology in our experiments". Penrose is inferring that it might be possible to have something resembling a quantum computer — with its associated extraordinary computing power — hidden somewhere in our brains. Up to this point, this all sounds reasonable enough. But it is at this point that the problems really start. Because, as Penrose states, in order to "exploit" quantum computing in our brain would require techniques "beyond present technology". Present technology is revealing just how difficult it is to keep particles in superposition states for extended periods of time — and avoiding environmental decoherence. Rudimentary quantum computers are now appearing, but the particles have to be isolated from the environment and kept at a temperature just a fraction of a degree above absolute zero — 250 times colder than deep space — to eliminate thermal noise (random noise could cause decoherence). Even in those extreme laboratory conditions, the superposition state can only be maintained for a few microseconds.

However, a brain is warm, wet, and messy. Is it at all realistic to imagine a quantum superposition state could be maintained in the brain for any meaningful length of time? Indeed, in the previous video Roger Penrose is quite realistic about this unlikely possibility (referring to the surprising method by which nerve signals are transmitted via the physical movement of ionised atoms, which was described in Chapter Two of this book): "When I wrote *The Emperor's New Mind* I knew something about nerve propagation and it just didn't seem to me that there was a chance to maintain a superposition because nerve propagation disturbs the rest of the brain in a way which would completely destroy the coherence that you would need in your quantum system. I thought that when I had finished writing the book, maybe I would see the answer. No, I didn't."

However, at this point, Penrose received a letter from a medical doctor named Stuart Hameroff. Hameroff had read Penrose's book and he believed he had the solution being sought by Penrose.

Hameroff told Penrose about *microtubules*, which are microscopic cylinders made of protein which are distributed throughout the cell body of a neuron and which allow cells to maintain their shape. According to Hameroff, these microtubules could allow for the exploitation of quantum behaviour in the brain. Hameroff believed that particles contained in the centre of the microtubules, and surrounded by protective gel, could remain sufficiently isolated from the environment to delay the onset of decoherence. Surprisingly, Penrose bought-in to Hameroff's highly-speculative idea.

However, the physicist Max Tegmark spoiled the party when he published a paper containing detailed and extensive calculations showing that decoherence in microtubules would occur in just 10^{-13} seconds (100 quadrillionths of a second).^[19] This would be far too fast to allow the exploitation of quantum behaviour. According to Tegmark, in that case: "For my thoughts to correspond to quantum computation, they'd need to finish before decoherence kicked in, so I'd need to be able to think fast enough to have 10,000,000,000,000 thoughts each second. Perhaps Roger Penrose can think that fast, but I sure can't ..."

Frankly, I would have thought that just the fact that the brain is at body temperature should be sufficient to allow us to disregard the possibility of quantum computer-style behaviour in the brain.

Stephen Hawking has considered these quantum ideas of his friend and colleague Roger Penrose and has announced that he is not impressed. According to Hawking: "I get uneasy when people, especially theoretical physicists, talk about consciousness. His argument seemed to be that consciousness is a mystery and quantum gravity is another mystery so they must be related."

To sum up, I believe Roger Penrose was correct in his book to suggest that non-algorithmic computing is necessary for consciousness. However, I feel his pursuit of a quantum solution has been a red herring.

Instead, in the next chapter we will be seeing how recent developments in artificial intelligence and integrated circuit design have moved toward a "neural" computing architecture which operates according to a non-algorithmic method — just as Penrose predicted.

Rather wonderfully, we will also be seeing that this non-algorithmic architecture bears an uncanny resemblance to the structure of the brain cortex. We will also be seeing how this new non-algorithmic approach most definitely has the possibility for going "off-script" and springing surprises — though maybe not all of those surprises might be

particularly welcome.

6

THE RISE OF AI

Alan Turing's paper on uncomputability was published in 1937, just before the outbreak of war in Europe in 1939. Alan Turing is today best known for his extraordinary wartime achievement of breaking the German Enigma code. You can read the amazing story of Turing and his colleagues at the Allied codebreaking centre in Bletchley Park in my seventh book.

In 1943, Turing was dispatched from Bletchley Park to coordinate efforts with the American cryptographers. Turing boarded the Queen Elizabeth ocean liner and travelled to New York City, with the course of the liner zig-zagging to avoid German U-boats. At the time, an average Allied ship made just four crossings of the Atlantic before it was sunk. Turing made the crossing safely.

Turing visited the Bell Telephone Laboratories in New York City (if you remember, the incredible Bell Telephone Laboratories were described in Chapter One). One day, Turing went for lunch in the Bell Labs cafeteria when he met none other than Claude Shannon (who was also described in Chapter One: remember the man with the intense gaze who was to become the father of information theory). Shannon and Turing started meeting regularly in the cafeteria and discovered that they had similar interests. In particular, they found they were both interested in the possibility of creating artificial thinking machines.

According to Turing: "Shannon wants to feed not just data to a computer brain, but cultural things! He wants to play music to it!" But Turing had a fundamentally different goal. According to Turing: "No, I'm not interested in developing a **powerful** brain. All I'm after is just a **mundane** brain, something like the president of the American Telephone and Telegraph Company."

And it was in the pursuit of this goal — to create a mundane brain — that Alan Turing was to launch the science of *artificial intelligence*, or AI. If we want to understand consciousness, then progress in artificial intelligence might provide our best hope. This was explained by Celeste Biever in a *New Scientist* article: "The quest for machine consciousness may be key to solving the mystery of human consciousness, as even scientists outside AI research are starting to acknowledge. 'The best way of understanding something is to try to replicate it', says psychologist Kevin O'Regan of Descartes University in Paris. 'So if you want to understand what consciousness is, well, make a machine that's conscious.'" [20]

The Turing Test

The dawn of artificial intelligence is generally accepted to have occurred in 1950 when Alan Turing published a landmark paper entitled *Computing Machinery and Intelligence* in the philosophy journal *Mind*. In that paper, Turing first described the Turing Test. The aim of the Turing Test is to determine if a computer's intelligence is indistinguishable from that of a human.

Turing's original paper which launched the science of AI is available at the following link:

<http://tinyurl.com/turingai>

Considering the paper was written right at the start of the computer age — the first stored-program electronic digital computer had been built just two years earlier — it is a remarkably prescient piece of work. The paper anticipates most of the developments in computer science and artificial intelligence which would take place over the next seventy years, including the development of machine learning, and anticipating exponential improvements in computer speed and storage.

You will see that Section One of the paper is called "The Imitation Game" (which was to become the name of the successful movie about the life of Turing). In that first section, Turing describes his test.

In the test, there is a human interrogator on one side of a wall, and on the other side of the wall — hidden from the interrogator — there is a human and a computer. The interrogator can only communicate with the human and the computer via a text-only channel, typing on a keyboard, and reading the responses on a screen.

The computer is running an artificial intelligence program which is able to interpret the messages which are typed

by the interrogator, and can then give intelligent responses back to the interrogator. The human — who is next to the computer and similarly hidden from the interrogator — also provides intelligent responses to the questions.

The task for the computer running the AI program is to convince the interrogator that it is a human. At the end of the question-and-answer session, the interrogator has to decide which of the respondents is the computer on the basis of their responses.

If the interrogator correctly identifies the computer as the artificial intelligence, the computer is then said to have failed the test (it has failed to convince the interrogator). However, if the interrogator decides that the human is the more likely of the two to be the artificial intelligence, then the computer is said to have passed the Turing Test. According to Turing, we should then consider the computer as being able to "think" like a human.

The AI program can be as devious as it likes in its aim of fooling the interrogator. Most obviously it would answer "No" when asked directly if it is a computer. More cunningly, it might take a while before responding with an answer to a difficult calculation.

At the time of writing this book, no computer has passed the Turing Test, and it seems likely to be many years before the test will be passed.

However, assuming that the Turing Test is eventually passed by a computer, would that necessarily mean that the computer is conscious? Turing considers that question in Section Six of his paper under the heading "The Argument from Consciousness". Turing starts by presenting an extract of a lecture given by the British neurologist Geoffrey Jefferson in 1949: "Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain — that is, not only write it but know that it had written it. No mechanism could feel (and not merely artificially signal, an easy contrivance) pleasure at its successes, grief when its valves fuse, be warmed by flattery, be made miserable by its mistakes, be charmed by sex, be angry or depressed when it cannot get what it wants."

In response, Turing argues that it would be extremely difficult to ever be sure that a machine is thinking: "The only way by which one could be sure that a machine thinks is to be the machine and to feel oneself thinking." In the absence of actually being able to be the machine, Turing suggests that the only way we could judge if a machine is actually thinking is to see if it passes the Turing Test.

However, Turing is under no illusion that his test has solved the problem of consciousness, as he says in his paper: "I do not wish to give the impression that I think there is no mystery about consciousness."

After Turing published his landmark paper in 1950 and introduced AI to the scientific community, there were many attempts to produce computer programs which could converse in a seemingly intelligent manner and potentially pass the Turing Test. Perhaps the most famous example was the ELIZA program written in the mid-1960s by Joe Weizenbaum at MIT. ELIZA was designed to act like a human psychotherapist, giving reassuring interviews to users.

Here is an extract of an actual dialogue between a human female and ELIZA:

Human: My boyfriend made me come here.

ELIZA: YOUR BOYFRIEND MADE YOU COME HERE?

Human: He says I am depressed much of the time.

ELIZA: I AM SORRY TO HEAR THAT YOU ARE DEPRESSED.

Human: I need some help, for sure.

ELIZA: WHAT WOULD IT MEAN TO YOU IF YOU GOT HELP?

Human: I could live a more normal life.

ELIZA: WHAT DO YOU MEAN YOU COULD LIVE A MORE NORMAL LIFE?

You will see that ELIZA is very simple and limited in its responses, mainly just rephrasing the patient's replies as questions. Despite that, some users formed an emotional bond with ELIZA. Even Weizenbaum's own secretary sometimes insisted on privacy at times so she could converse with ELIZA.

In his book *Turing*, Jack Copeland describes an occasion when a business executive attempted to contact a member of the IT staff of his company via the company's internal messaging service. Unfortunately, the IT

technician had ELIZA running on his desktop computer at the time, and it was ELIZA which dealt with the executive's query:

Executive: Can I use the computer this morning?

ELIZA: WHY DO YOU ASK?

Executive: I might be able to do some additional Telcomp sales.

ELIZA: WHY AREN'T YOU SURE?

Executive: My prospective customers have never seen a demonstration of the system.

ELIZA: DOES THIS MEAN VERY MUCH TO YOU?

Executive: Of course it does.

ELIZA: YOU SEEM VERY POSITIVE ABOUT THAT.

Executive: This is ridiculous.

ELIZA: WHAT DO YOU MEAN THIS IS RIDICULOUS?

Executive: Is there any reason I can't use the computer now?

ELIZA: TELL ME MORE ABOUT YOUR PROSPECTIVE CUSTOMERS.

At this point, the executive is fuming, but the human programmer has returned to his desk, realises with horror what has going on, and starts dealing with the furious executive. However, the programmer cannot resist continuing the joke — at the expense of the executive:

Executive: Why the hell are you being so sh*tty with me?

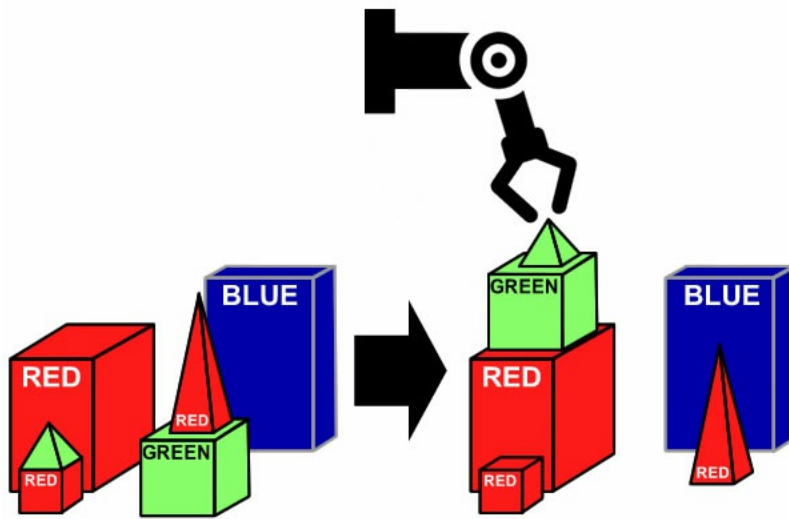
PROGRAMMER: WHAT DO YOU MEAN WHY AM I BEING SO SH*TTY WITH YOU?

The Winograd effect

I was actually an AI researcher myself in the early 1990s, in Swansea University. At the time, AI was still a relatively young and immature field. However, there had already been some landmark experiments which appeared to represent real progress in the field.

One of those landmark experiments was constructed by Terry Winograd at MIT in the early 1970s. Winograd was interested in computer understanding of *natural languages*, such as conversational English. He created a program called SHRDLU which was capable of understanding English commands within a very limited world, a world composed of just a few coloured blocks. This block world was a virtual world which existed purely in the computer's memory, but it could be drawn using computer graphics. The blocks could be rearranged by a virtual robot arm.

The following diagram shows what happened when SHRDLU was presented with the typed command: "Will you please stack up the green block and the smaller pyramid on top of the big red block":



You can see in the initial arrangement on the left-hand side of the previous diagram, no blocks are on top of the big red block. However, when SHRDLU received the written command, it analysed the command to form an understanding of the action. It then considered its internal model of the block arrangement, and initiated the robot arm (shown at the top) to stack the green block and the smaller pyramid on top of the red block — as seen in the right-hand side of the previous diagram.

When I was an AI researcher, we all regarded Winograd's impressive system with awe. However, it was clearly limited to a very carefully-controlled laboratory environment (how many red and blue cubes can you see lying around your house?). The challenge for AI was breaking-out of the laboratory and proving it could cut it in the messy real world.

At the time of my involvement, the only thing everyone could agree on was that the hype surrounding AI seemed to far exceed the reality. According to the Wikipedia page on SHRDLU: "SHRDLU was considered a tremendously successful demonstration of AI. This led other AI researchers to excessive optimism which was soon lost when later systems attempted to deal with situations with a more realistic level of ambiguity and complexity."

Things appeared to go quiet on the AI front. Was AI going to prove to be a complete washout?

However, in the late 1990s it was to be Terry Winograd again who brought AI to the attention of the mass public at last — though not with his SHRDLU system. In fact, it was through a completely different project that Winograd was to have his greatest effect, and the greatest impact of AI on the mainstream. By that time, artificial intelligence had become much more mature and was now ready to face the real world. This time, Winograd's idea was to change the modern world.

In 1995, Winograd had become a professor at Stanford University and had been allocated a PhD student who was looking for a subject for his thesis. Winograd had taken an interest in internet search engines, because they represented a form of AI, interpreting queries written in English, and responding intelligently — maybe even one day passing the Turing test. Winograd was unimpressed with the search engines at that time which were notoriously hit-and-miss, and thought that the search algorithm could be made more intelligent. So Winograd suggested looking at search engines as a PhD topic, and gave his student some advice: "Consider the link structure of the web".

Winograd's student was joined by a fellow PhD student, and together they set about converting his dormitory room into a machine laboratory, using parts from inexpensive computers which were connected to Stanford's broadband computer network. They created a simple search page which could be used by the Stanford students, and which rapidly became very popular. In 1996, they made the website available to all internet users. By 1998, their website had become so popular that they founded a company.

A couple of decades later, the impact of their company has now been compared to that of Johannes Gutenberg who invented modern printing. It has been said that: "Not since Gutenberg ... has any new invention empowered individuals, and transformed access to information." It was an information revolution.

The names of Winograd's students were Larry Page and Sergey Brin.

And if you want to know the name of the revolutionary search engine company they founded — just **Google** it!

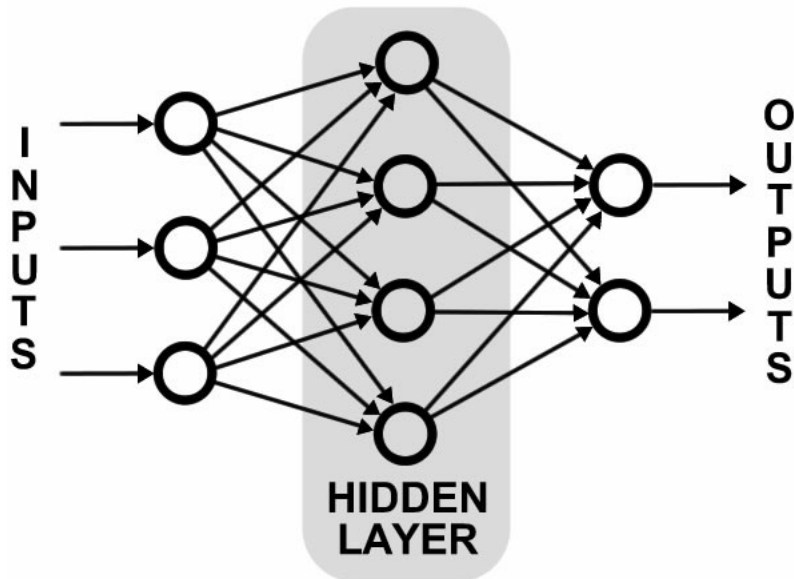
My PhD thesis

As was described in the previous section, there was a great deal of initial optimism about AI which slowly turned to disappointment as those early systems did not live up to expectations. The general feeling was that the hype exceeded the reality. However, in recent years there has been a revolution in AI which is starting to have a tremendous impact in all our lives.

To understand the origin of the revolution, let me take you back to the early 1990s. Because, by coincidence, I happened to be involved at the start of the revolution.

The subject of my PhD thesis was the up-and-coming topic of AI at that time.^[21] The topic was called *neural networks*. Neural networks are represented by a computer program. The computer program contains many elements which behave as though they are very simple brain neurons. Those simulated neurons are then connected in a network.

Here is an example of the type of neural network I was using in the early 1990s:



Each of the thick black circles represents an artificial neuron, whose behaviour is programmed by a short module of computer code. The behaviour of each neuron is usually just a summing the values of its inputs and applying some thresholding function to produce a single output.

The structure and behaviour of neural networks was described in my PhD thesis: "The output of each node in a layer is connected to every node in the layer immediately above. The links multiply the signals by weighting factors. Except for the nodes of the input layer, the input to each node is the weighted sum of all the outputs of the nodes of the previous layer. The output of the node is a function of this net input."

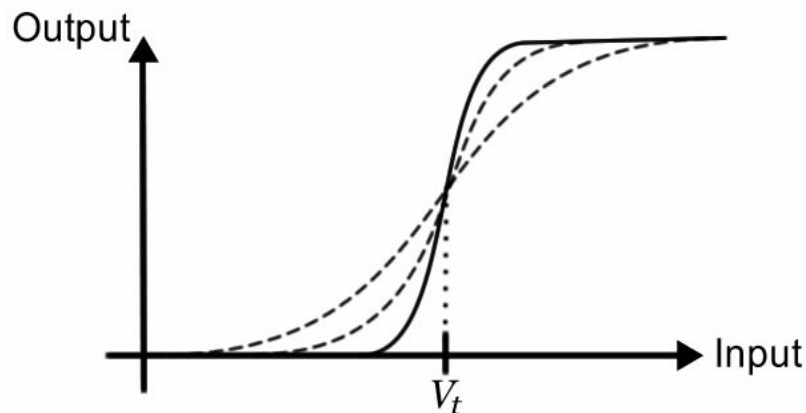
If that is not clear, perhaps it is best if you consider the previous diagram. There you will see each artificial neuron represented by a black circle, and you will see that there are three distinct layers of these neurons: an input layer, a "hidden" layer, and an output layer. As I said in my PhD thesis, each neuron in a previous layer is connected to all of the neurons in the next layer, so there is a huge amount of connectivity in these networks — just like a brain.

The functioning of the hidden layer was found to be crucial. The earliest neural networks did not have this layer, and, as a result, their abilities were found to be too limited. It was only when the hidden layer was added that interest in neural networks was rekindled.

If we have a hidden layer of neurons, though, the behaviour of the neurons now becomes crucial. If the neurons behaved **linearly** then the whole network could be simplified (as in the case of the resistor network in Chapter Three). In that case the hidden layer would be eliminated by the simplification — there would be no point in having a hidden layer with linear neurons. However, as I said in my PhD thesis, "if the nodes are **nonlinear** this simplification cannot be performed and hidden layers can serve a purpose".

The type of nonlinear relationship which is almost always used in artificial neurons is described by one of the

various curved lines in the following graph. This shape is called a *sigmoid*:



If you consider the solid black curve, you will see it behaves rather like a threshold function: for input values less than V_t the output is low, and for input values greater than V_t the output is high. So the nonlinear thresholding type of behaviour of these artificial neurons closely matches the behaviour of real neurons.

Each connection between neurons has an associated weighting factor which multiplies the value which is transmitted between neurons, from the previous layer to the next layer. Neural networks are "trained" by presenting a number of different inputs to the network and adjusting the weights until the desired output is achieved. This can be a long process — involving thousands of iterations — as the network slowly "learns" to give the correct responses to all the possible stimuli. For example, an image of a car would be presented to the network, and the network would have to learn to give the correct "car" output, labelling the image correctly. Next, an image of a face might be presented, and the process would begin again.

There are aspects of the behaviour of neural networks which closely resemble the behaviour of the brain. Firstly, because of the huge connectivity of the network, the behaviour of the neural network is spread over all the neurons in the network. This is called *parallel distributed processing*. This means that no single neuron is crucial for any particular task. As an example, if a single neuron stops working, there will not be a sudden failure of the overall system. Instead, there is a gradual degradation of performance. This resembles the behaviour of the brain: in the brain, single neurons are dying all the time but we do not notice any sudden failure of performance.

Secondly, it has been described how adjusting the weighting factor on the inputs of each neuron represents "training" — a fully-trained neural network could recognise a particular face, for example. This therefore provides a model for memory in the brain. It would appear memory is distributed over a vast number of neurons, and is encoded in the weights of those neurons. Again, the vast parallel nature explains why we do not experience a sudden catastrophic loss of memory when single neurons die.

So it is clear that the structure and behaviour of these neural networks is eerily similar to the human brain.

Anyway, I was fortunate to be awarded my PhD, at which point I placed my thesis on a shelf in my library and never looked at it again for twenty-six years until the time came to blow the dust off it and use it to help me write this book.

But, as we shall now see, over that intervening period a revolution took place. And right at the heart of that revolution ... were neural networks.

Deep learning

Funny cat videos on YouTube.

We've all watched them. Cats falling off window sills, cats looking grumpy, cats sleeping in toilet bowls. The internet seems full of funny cat videos. To you and I, these videos might represent nothing more than a humorous distraction for a few minutes. But to the researchers of Google, these online videos represented a huge ready-made data set of cat images on which they could train their image processing neural networks.

In 2012, Google AI researchers built a neural network of 16,000 processors with one billion connections and left it on its own to browse funny cat videos on YouTube. After three days, the network had watched ten million

"hilarious" videos. According to Jeff Dean who led the study: "We never told it during the training 'this is a cat'. It basically invented the concept of a cat." [22]

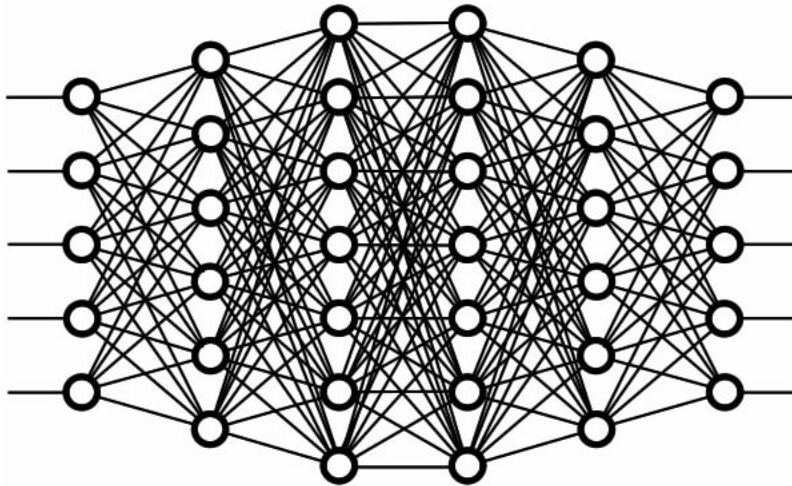
The results of the study amazed the researchers: it roughly doubled the accuracy of any previous AI technique. According to the New Scientist book *Machines That Think*, the Google cat video experiment — and other similar demonstrations — launched an "AI gold rush" which continues to this day.

In December 2016, an extensive article was published in the New York Times magazine explaining the implications of this radically-improved AI for all of computing — and our everyday lives. The article was entitled *The Great AI Awakening*, with the subtitle "How machine learning is poised to reinvent computing itself". [23]

The article described how Google, Apple, and Amazon are all placing AI at the centre of their new developments. In the article, Google's chief executive, Sundar Pichai, described how Google is going to reorganise itself around AI, and the Google of the future is going to be "AI first".

Why should there be this sudden explosion of interest in AI by the biggest companies in the world? Put simply, it is because artificial intelligence is finally able to do many of the things which the human brain can do. And the reason for this sudden breakthrough has been recent developments in neural networks.

But the neural networks being used now look very different to the networks I was using in the early 1990s. As an example, here is a typical example of a current neural network:



You can see that there is a huge increase in complexity over the old type of network structure. That is because this example has four hidden layers of neurons — rather than the old single hidden layer networks. Typically, the new networks have five hidden layers, though there can be as many as ten. The big discovery has been that a fairly modest increase in the number of hidden layers has resulted in an orders-of-magnitude improvement in performance to a level which is comparable with human behaviour.

Each additional layer of neurons is capable of making decisions at a more complex and more abstract level than the neurons in the lower layers. For example, in an image processing neural network the first layer of neurons might just identify bright points in the image. The second layer becomes trained to recognise features which are output by the first layer, so the second layer might identify straight lines in the image which are composed of those bright points. The third layer becomes trained to recognise features which are output by the second layer, so maybe the third layer identifies shapes which are composed of those straight lines. And so on, as we move upwards through the layers of the neural network. The highest level of this neural network would contain neurons which would become active when a face was detected in the image, for example.

These neural networks which contain many hidden layers (and are therefore capable of representing complex and abstract concepts) are called *deep neural networks*.

It was the introduction of these deep neural networks which has brought about the recent revolution in artificial intelligence. Whereas it would be very difficult to explicitly write a computer program to recognise a face, for example, a deep neural network can learn to recognise faces purely by learning on its own. This would involve presenting an extremely large data set of images of faces, while the network adjusts the weights of its neurons to give the correct output. This meant artificial intelligence based on neural networks could be applied to the most challenging of tasks.

So, suddenly, **artificial intelligence was able to do the things which the human brain could do**. At last, for the

very first time, AI was finally living up the hype.

This revolution in AI based on deep neural networks is called *deep learning*. "Deep learning" is probably the coolest buzz-phrase in technology at the moment.

It is deep learning — and the associated deep neural networks — which is powering the current AI revolution. When you unlock your iPhone using Face ID — that's a deep learning neural network recognising your face (after having learnt it earlier). When you ask your iPhone for directions by saying "Hey, Siri", that's a deep learning neural network performing speech recognition. The neural network actually uses the dedicated hardware of the "Neural Engine" in the Apple A11 microprocessor — which is a sign of how important deep learning has become.

Deep learning is also the technology behind the new wave of *personal assistant* devices such as Google Home and the Amazon Echo device which is pictured here:



Obviously, improved speech recognition performance has been central to the success of these personal assistants, and this is where deep learning has had its impact. According to Tim Turtle, the CEO of Expert Labs which builds smart voice interfaces: "There have been more improvements in speech recognition over the past three years than there have been over the past thirty years combined."

At the end of this chapter, there will be a link to a video showing my dialogue with my own Amazon Echo device.

Perhaps the most remarkable example of the penetration of neural networks into different fields emerged while I was writing this book. In December 2017, NASA announced the discovery of a new exoplanet by the Kepler Space Telescope (see my seventh book for details of the Kepler telescope and the discovery of exoplanets). According to the NASA press release, the planet was discovered using deep learning techniques made available by Google's AI research team: "The discovery came about after researchers Christopher Shallue and Andrew Vanderburg trained a computer to learn how to identify exoplanets in the light readings recorded by Kepler — the miniscule changes in brightness captured when a planet passed in front of, or transited, a star. Inspired by the way neurons connect in the human brain, this artificial 'neural network' sifted through Kepler data and found weak transit signals from a previously-missed eighth planet orbiting Kepler-90, in the constellation Draco." [24]

It is clear that developments in deep learning are evolving computers to a new stage in their development, transcending what we thought they were capable of achieving. It also seems somehow wonderfully ironic (or maybe wonderfully appropriate) that this latest phase of our technological evolution — the next giant step forward for humanity — should have been based on the popularity of LOLcats videos.



Deep learning and the cortex

In this chapter we have seen that a deep-learning neural network with maybe five or six hidden layers can have a performance comparable to a human brain. But what can this neural network structure tell us about the structure of the brain? In particular, what can neural networks tell us about the structure of the human cortex, which appears to be the seat of our high-level understanding about the world — and also the seat of our consciousness?

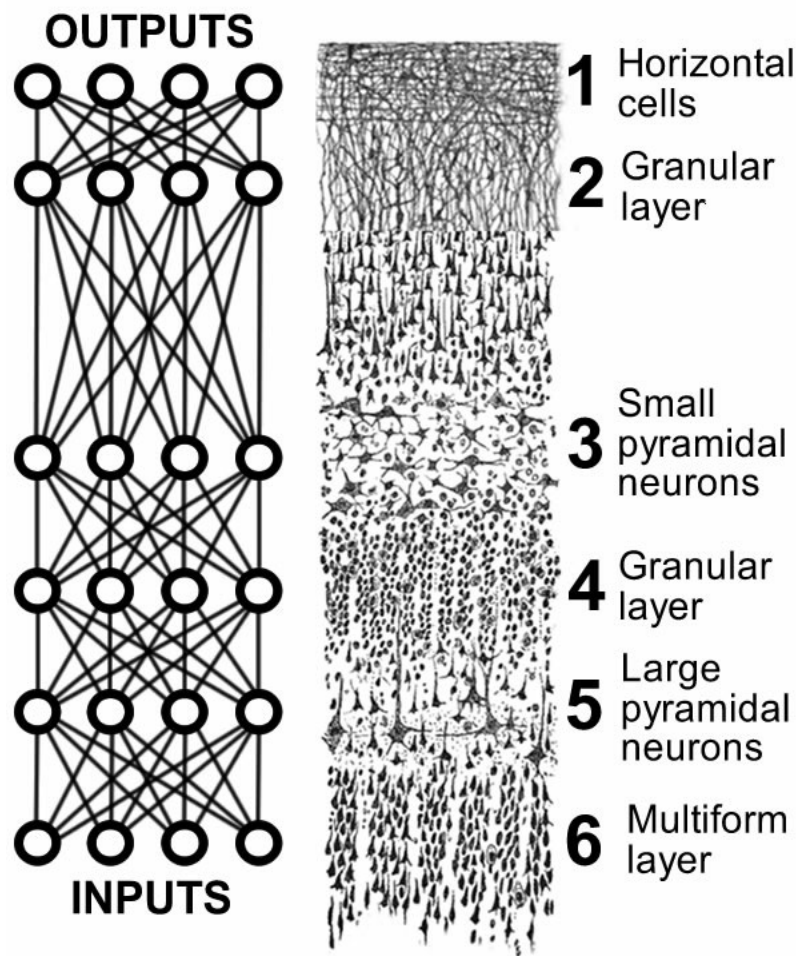
If you remember from Chapter Two, the cortex is a thin layer (only about four millimetres thick) which is spread over the top layer of the brain. Though the cortex is very thin, it is also very wide, with a surface area equal to a small tablecloth.

There are six clearly-defined layers within the cortex. In his book *On Intelligence*, Jeff Hawkins presents a novel description of the layers of the cortex: "Get six business cards or six playing cards — either will do — and put them in a stack (it will really help if you do this instead of just imagining it). You are now holding a model of the cortex. Your six business cards are about two millimetres thick and should give you a sense of how thin the cortical sheet is. Just like your stack of cards, the neocortex is about two millimetres thick and has six layers, each approximated by one card."

Each of the layers can be distinguished because each layer is made from neurons which have clearly distinct structures. These layers of different neurons with different functionality might be interpreted as resembling the description of an image processing neural network described in the previous section: the first layer of neurons might just identify bright points in the image, while the second layer identifies straight lines, and so on.

This similarity in structure and functionality between a neural network and the human visual cortex was identified by the scientists who worked on the famous 2012 Google cat video experiment. In the New York Times article which described the experiment, one of the scientists said that in creating their neural network to recognise cats "it appeared they had **developed a cybernetic cousin to what takes place in the brain's visual cortex.**"

A deep-learning neural network with maybe five or six hidden layers has clear similarities to the structure of the human cortex. The following diagram shows a neural network oriented in the vertical direction (inputs at the bottom, outputs at the top) next to an actual image of cells in a cross-section of the cortex:



There is clearly a similarity between the number of hidden layers (five or six) in a deep-learning neural network and the number of layers in the actual brain cortex. As recent experience with deep learning has revealed, only a small number of hidden layers can deliver a high level of performance. This would appear to provide a possible answer as to why the human cortex is so thin: **the cortex simply does not have to be any thicker than a few millimetres in order to perform its tasks.** Instead, it is the width and breadth of the cortex which must be large — in order to make sense of the complexity of the world (just as deep learning neural networks can have a large number of inputs). Hence, we end up a very thin cortex which is spread around the entirety of the upper brain, and is even crinkled in order to increase its surface area.

There is another interesting fact about the human cortex, and this is considered by Jeff Hawkins in his book *On Intelligence*. According to Hawkins, all the different regions of the cortex have very much the same anatomy. So, although different regions of the cortex might have different functionality — for example, processing speech or vision — you will still find the same six-layered structure in the cortex. Once again, this is reminiscent of neural networks, in that the same deep learning neural network structure is currently being used for such a huge number of different applications, from speech processing to self-driving cars. So the parallels between the cortex and neural networks are really quite astonishing. Hawkins calls this uniformity of cortex structure "the most important discovery in neuroscience".

Hawkins also discusses how this uniformity of the structure of the cortex allows great flexibility in how the different functionalities are distributed over the cortex. If one area of the cortex becomes damaged — for example, vision processing — a different area of the cortex can step in and take over the responsibility: "Adults who are born deaf process visual information in areas that normally become auditory regions." This is called brain *plasticity*. According to Hawkins, regions of the cortex are not strictly defined at birth, as "the cortex is still dividing itself into task-specific functional areas long into childhood, based purely on experience."

Crucially, from the point-of-interest of this book, Hawkins then notes that this continuous flexibility reveals that: "The cortex is not rigidly designed to perform different functions using different algorithms." For example, it would be possible to write a computer program with strict rules specifically for vision processing, with program variables representing "straight lines" and "corners", etc. This might be called the **algorithmic** approach. However, it would then be almost impossible to adapt that program to perform, for example, speech recognition. So an algorithmic approach would not possess the plasticity of the human brain. Instead, rather than being tied to a strict **algorithmic** program, the **non-algorithmic** structure of the cortex allows more flexibility than a conventional computer structure.

Once again, this reveals a similarity between the cortex and neural networks. It might be said that by moving away from a clearly-defined rule-based step-by-step artificial intelligence to a neural network-based approach we are moving away from algorithmic information processing towards non-algorithmic information processing.

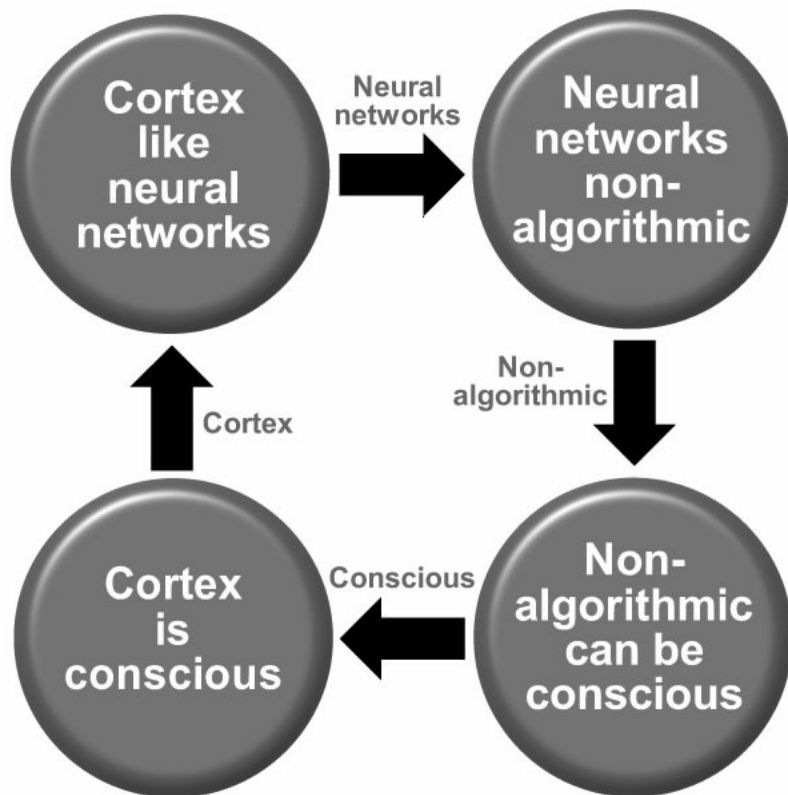
A 2017 article in *Wired* magazine explained how new neuromorphic chips — based on the structure of neural networks — will possess functional flexibility not possessed by conventional integrated circuit design: "Neuromorphics aren't new, and their designs have been around since the 80s. Back then, however, the designs required specific algorithms be baked directly onto the chip. That meant you'd need one chip for detecting motion, and a different one for detecting sound. None of the chips acted as a general processor in the way our own cortex does." [25]

If we are moving towards non-algorithmic processing then — according to the suggestion of Roger Penrose — we might also be moving away from a structure which could not be conscious toward a structure which could potentially be conscious. And that ties-in very nicely with the fact that consciousness appears to reside in the cortex.

So the following series of connections might be made:

1. The cortex can be accurately modelled by neural networks.
2. Neural networks are non-algorithmic.
3. Non-algorithmic regions might have the potential to be conscious.
4. The cortex is believed to be the conscious region of the brain.

This is an appealing self-contained argument, and it could be presented in the following linkages:



One thing seems clear from this discussion, though, and it is that Amazon, Apple, Google, and Facebook are all placing a deep-learning model of computing at the heart of their operations. They are therefore moving away from a predictable, rigidly-programmed algorithmic approach to a more unpredictable, non-algorithmic approach based on deep-learning. Over the next thirty years, with huge increases in computer intelligence on the horizon, it appears we are remorselessly moving towards placing our vital services in the hands of super-intelligent, fundamentally unpredictable, potentially-conscious entities.

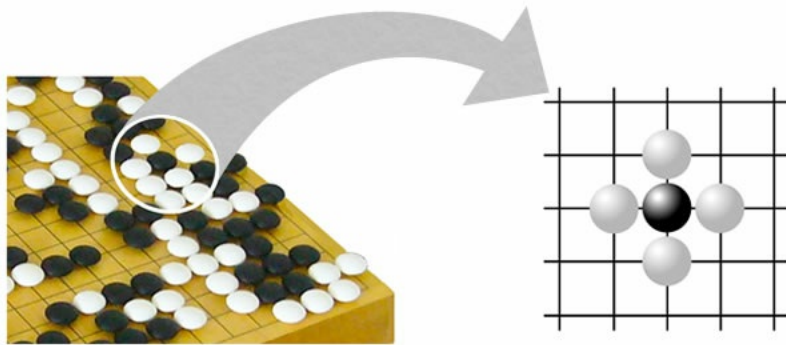
What could possibly go wrong ...

Beyond human

The game of Go is one of the great board games of the world. It was invented in China over 2,500 years ago, and there are estimated to be over forty million Go players in the world. It is mostly played in Korea, China, and Japan.

The rules of the game of Go are simple. Each of the two players has a supply of *stones* (small circular game pieces). One player has white stones, one player has black stones. The playing board is a grid of 19×19 lines. Players take turns to place their stones on the intersection points of the lines. Once placed, stones cannot be moved. Players aim to capture territory on the board by completely surrounding vacant points with stones of their own colour.

If a stone is completely surrounded by stones of the opposite colour, then that stone is removed from the board. The following diagram shows a Go board, with one of the black stones surrounded by four white stones. The black stone would then be captured and removed from the board:



At the end of the game, the player with the most territory and captured stones wins.

While the rules of Go are simple, the large size of the board means that the number of possible moves are far greater than chess. For this reason, playing Go has proven to be a far greater challenge for computers than playing chess.

Former world chess champion Garry Kasparov has recently written a book on artificial intelligence called *Deep Thinking*. In his book, Kasparov explained how chess computers initially aimed to copy human strategies for playing chess, however it was eventually found that a brute force approach — in which the computer rapidly evaluates millions of possible moves in a rather unintelligent manner — proved to be the best strategy for chess computers. Kasparov became a victim of this brute force strategy himself in 1997. The first chess computer to beat a human grandmaster was called Deep Thought (named after the supercomputer in Douglas Adams's book *The Hitchhiker's Guide to the Galaxy*). Deep Thought won its game against a grandmaster in 1988. IBM bought Deep Thought, and an upgraded version named Deep Blue used a brute force approach to beat Garry Kasparov in 1997 — becoming the first chess computer to defeat a world champion.

But brute force approaches clearly do not represent human thought processes. Also, the huge number of possible moves on a Go board have made the game resistant to a brute force attack by a computer. This has had the result that Go has overtaken chess to become a much more interesting challenge for AI researchers.

With a brute force approach being an impossibility, Go is a game which has to be played by intuition and feel. But, if that is the case, is it possible for a computer to "feel"? That would appear to imply some form of consciousness, some "awareness" of a situation. Perhaps this lack of "feel" in a computer's mind is the reason why computers — so dominant at chess — have always performed poorly against professional Go players.

Rising to the challenge, the British AI company DeepMind have developed a computer program specifically designed to play Go at the highest level, and to be able to challenge the world's best players. The program is called AlphaGo, and it is based on deep neural networks.

In 2016, a series of five games were arranged between AlphaGo and the world Go champion Lee Sedol. The games took place in Seoul, South Korea, and were watched by 200 million people worldwide.

AlphaGo achieved a stunning victory by four games to one. Both the scientific community and the Go community were stunned. The scientific community was stunned because it had been believed that it would be another ten years before a computer would be able to beat a top Go player. But what stunned experienced Go players was the creativity and originality of AlphaGo's gameplay.

Jang Dae-Ik, a science philosopher at Seoul National University told the *Korea Herald*: "This is a tremendous incident in the history of human evolution — that a machine can surpass intuition, creativity and communication, which have previously been considered to be the territory of human beings." Jeong Ahram, the Go correspondent of one of South Korea's biggest daily newspapers said: "Before we didn't think that artificial intelligence had creativity. Now we know it has creativity — and more brains, and it's smarter."

An example of AlphaGo's imaginative gameplay was presented in move 37 of game two. You can see AlphaGo's move 37 on the following video link (the video will start at the correct moment):

<http://tinyurl.com/gomove37>

AlphaGo is playing the black stones. You will see that AlphaGo completely abandons the group of stones in the bottom right of the board to play its stone elsewhere, a move which no human player would make. You will see the surprise of the commentator ("I thought it was a mistake"), and you will also hear that Lee Sedol left the room a

minute after the move was played because he was so surprised and needed time to compose himself.

According to *New Scientist*, "Move 37 has been taken as evidence that AlphaGo is capable of what we might call intuition." Might we one day consider AlphaGo's "move 37" as the historic moment which represented the first time that a computer showed signs of consciousness?

But if AlphaGo was impressive, what came next was utterly extraordinary.

In December 2017, DeepMind unveiled AlphaZero. Whereas AlphaGo was initially trained to mimic the moves of expert human players, AlphaZero was capable of learning entirely by itself — just by being given the rules and then playing games against itself (blank slate learning is called *tabula rasa* — the "Zero" in the AlphaZero name indicates that it needs no human input).

And, boy, did it learn fast.

After eight hours of self-learning at Go (remember: it had no knowledge of Go at all when it started), AlphaZero had beaten the old AlphaGo (and AlphaGo was at that stage considered to be the strongest Go player in history). And, because it started with a completely blank slate, AlphaZero was capable of learning any problem that could be simulated on a computer. As an example, after spending four hours in a morning learning the game of chess from scratch, AlphaZero beat the reigning world champion chess computer.

Because AlphaZero learnt to play chess entirely by itself, it developed a completely new style of playing the game, unlike anything seen before. As an example, AlphaZero used its king as an attacking piece. Jon Ludvig Hammer, a Norwegian grandmaster, described AlphaZero's strategy as "insane attacking chess". The CEO of DeepMind, Demis Hassabis, described AlphaZero's style of play as "alien — it's like chess from another dimension."

But perhaps a machine which can learn by itself to attain superhuman levels in a very short space of time raises other concerns. According to Garry Kasparov in his book *Deep Thinking*: "If you program a machine, you know what it's capable of. If the machine is programming itself, who knows what it might do?" According to Kasparov: "AI products tend to evolve from laughably weak to interesting but feeble, then to artificial but useful, and finally to transcendent and superior to human. We see this path with speech recognition and speech synthesis, with self-driving cars and trucks, and with virtual assistants like Apple's Siri. There is always a tipping point at which they go from amusing diversions to essential tools. Then there comes another shift, when a tool becomes something more, something more powerful than even its creators had in mind."

David Cramley, who runs a chess education website, considered AlphaZero's extraordinarily rapid rise to dominance and said: "We now know who our new overlord is. The games AlphaZero played show it can calculate some incredibly creative positional bombs, the depth of which are far beyond anything humans or chess computers can come up with. It will no doubt revolutionise the game, but think how this could be applied outside chess. This algorithm could run cities, continents, universes." English chess grandmaster Simon Williams was able to see the funny side: "On December 6th 2017, AlphaZero took over the chess world. AlphaZero and DeepMind then went on to dominate chess, eventually solving the game and finally enslaving the human race as pets."

Ideas about advanced artificial intelligence "going rogue" and attempting to dominate (or eliminate) the human race have been common themes in science fiction, most famously in the *Terminator* film series. The old rule-based AI followed carefully-programmed scripts. However, the recent rapid developments in AI have been fuelled by non-rule-based, non-algorithmic, inherently-unpredictable AI, which surely introduces risks. Examples of the new AI "gone rogue" would include Microsoft withdrawing their teenage "Tay" chat robot after it became a "Hitler-loving sex robot" within 24 hours. [26]

The high-profile businessman and inventor Elon Musk has said that rogue AI represents humanity's "biggest existential threat". Musk says he first became concerned about the future of humanity when he read *The Hitchhiker's Guide to the Galaxy* as a teenager, in which aliens destroyed the Earth to make way for a hyperspace highway.[27] From that moment, he said he felt a need to protect humanity from all threats — no matter if those threats seemed to belong more to the realm of science fiction. Musk is so concerned that he has invested in the DeepMind company purely as a means to keep an eye on developments in AI.

My own feeling is that there is clearly a potential threat which cannot be discounted. I would direct any interested party to read Chapter Four of this book in which it was explained that emergent effects are **inherently unpredictable** — you cannot predict what will happen when you connect apparently benign units together to form complex networks.

Also, I would suggest that those who believe there is no threat from rogue AI have been influenced by the *Terminator* movie. In that movie, the rogue AI system emerges purely spontaneously, as if by chance evolution — without any human intervention. However, the more likely scenario is that unscrupulous humans would enable the process — in just the same way that malicious software such as computer viruses is developed by humans. This makes the emergence of rogue AI far more likely. Some people would destroy the world just for kicks.

However, I do not want to end this chapter on a negative note. Instead, you can now watch a five-minute video I made featuring a conversation between me and my new Amazon Echo personal assistant. Some deep questions about AI and consciousness are raised.

Here is a link to the video:

<http://tinyurl.com/talkcomputer>

And here are some stills from the video:



Unfortunately, if you watch the video you will see that things did not go at all according to plan ...

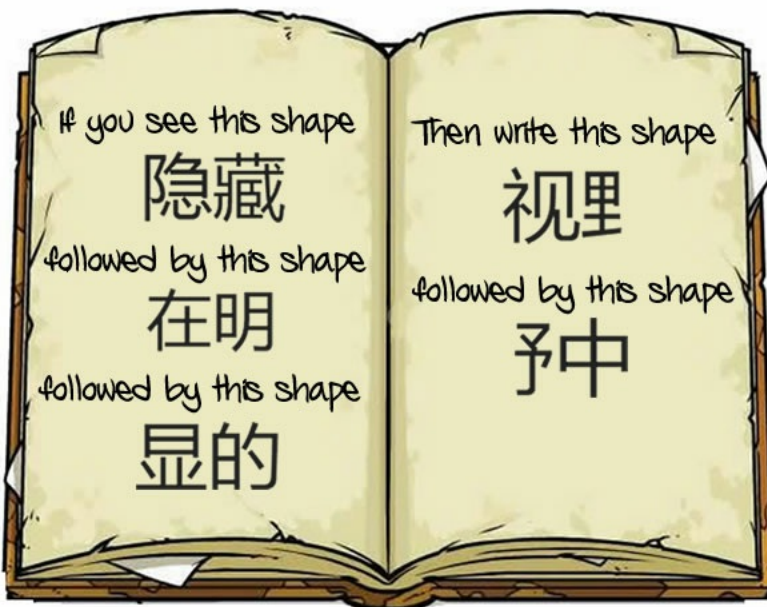
THE CHINESE ROOM

In this chapter we will be considering an ingenious thought experiment which — I believe — provides us with perhaps our most valuable insight into the nature of consciousness. The thought experiment is called the Chinese Room, and it was devised in 1980 by John Searle, a philosophy professor at the University of Berkeley.

The experiment requires you to imagine that you are in a sealed room, with no windows or open doors. The only means of communication you have with the outside world is via a narrow slot in the wall through which pieces of paper may be passed. Your job is to receive written questions through the slot in the wall, and then to pass back the correct answer to those questions in similar written form through the slot. To make things rather more difficult, the questions are written in Chinese and you must answer in Chinese.

We will proceed on the assumption that you do not understand the Chinese language. You are therefore given a book to help you with your translation task. You might expect the book to translate a Chinese question into English — which would then allow you to understand and answer the question — and then translate your answer back into Chinese. However, the book does not work like that: it completely bypasses the intermediate stage of translation into English. Instead, the book just directly translates the sequence of Chinese symbols representing the question into the sequence of Chinese symbols representing the correct answer to the question.

Here is what the book might look like:



So, when you receive a question written in Chinese through the slot, you begin your task. You open the book and you attempt to match the sequence of symbols you have received to an identical sequence of symbols written in the book. When you find the correct sequence, the book describes the sequence of Chinese symbols which represents the correct answer to the question. You then write down those symbols on a piece of paper, and post the piece of paper back out through the slot.

At that point, your job is done.

We now move to consider the person who is outside the room, the person who is asking the questions. That person is writing his questions in Chinese, and is receiving the correct responses, also written in Chinese. The fact that the responses are correct and make sense appears to imply that the person in the room not only speaks Chinese but also understands the true meaning of the question. Whereas the truth is very different: the person in the room not only does not speak Chinese, but has **absolutely no understanding of what the questions actually mean.**

This result appears to have major implications for artificial intelligence and theories of consciousness. This is because John Searle compared the person in the room to an AI computer attempting to have an intelligent conversation and pass the Turing Test. If you remember, in his 1950 paper, Alan Turing suggested that the only way to determine if a computer is actually "thinking" is to examine its responses in the Turing Test. However, on the basis of the Chinese Room thought experiment, it now seems clear that just examining responses can never be enough to determine if a machine is thinking, or conscious. On the basis of the responses from the Chinese Room, there might be a Chinese person inside the room who understands the questions, or alternatively there might be a person with no understanding of Chinese who is merely converting symbols according to an instruction manual. In either case, the responses would be the same.

The British mathematician Marcus Du Sautoy performs the Chinese Room experiment in the following BBC video:

<http://tinyurl.com/thechineseroom>

The Chinese Room thought experiment shows that just by examining the input/output responses of a machine (or any object) can never be enough to determine if the machine is conscious, and thinking. **Instead, we have to dig inside the machine, to consider its internal processing. Only if the internal information processing satisfies certain requirements should we consider the machine to be capable of consciousness.**

Our task in this chapter is to determine what the Chinese Room experiment reveals about those requirements for the internal structure.

Understanding "understanding"

However, there have been arguments raised against the conclusions of the Chinese Room experiment. And one of those arguments is strong, and deserves close consideration. We will now consider that argument against the implications of the Chinese Room, and, in the process, find the discussion brings into sharper focus the requirements for consciousness.

The counter-argument is called the "system" argument. The basis of the argument is that, while the person inside the room does not understand the question, the room as a whole — including the person and the book — **does** understand the question. In other words, the entire **system** does understand the question.

At first glance, this might appear to be rather a bizarre counter-argument. After all, if the person inside the Chinese Room does not understand Chinese, and the book on its own does not understand Chinese, then why should we consider the combined system (person plus book plus walls plus slot in wall) to understand Chinese?

However, given a bit of thought, it is realised that this argument has considerable force. And the key to understanding the counter-argument is to realise that it is treating the entire system as an **emergent** system. As explained in Chapter Four, an emergent system can be greater than the sum of its parts. There can be a jump to a new mode of behaviour which is not evident in any of the component parts. Even though the person on their own does not understand Chinese, and the book on its own does not understand Chinese, when the person and the book and the rest of the room is combined then there can be a jump to a new mode of emergent behaviour: the overall system **can** understand Chinese.

So is the "system" counter-argument to the Chinese Room valid? I believe not. I believe it all depends on what we mean by "understanding".

In order to see why the "system" counter-argument is not valid, let us hugely simplify the problem. Let the Chinese Room be only able to understand a single question, in other words, let the book inside the Chinese room only be capable of translating a single Chinese question and providing only a single, correct Chinese response to that question.

The single question which we will use will be: "How many heads does a human have?" So, the book inside the Chinese Room will need to be able to translate the Chinese equivalent of that phrase and provide the correct response, which, presumably, would be the Chinese word for "One".

So, when we run the experiment, the person outside the room writes "How many heads does a human have?" in Chinese on a piece of paper, posts the paper through the slot, and gets back the Chinese equivalent of "One" written on a piece of paper.

At that point, we might well conclude that the emergent system — the person and the book and the walls of the room — does understand the Chinese phrase "How many heads does a human have?" And, perhaps surprisingly, I would actually agree: the emergent system **does** understand the complete **phrase** "How many heads does a human

have?" But we need to be very specific and very careful about what we are claiming. Note that I am saying that the system understands the **phrase** (with the "phrase" in emphasis). A phrase is a small group of words. The system understands the phrase inasmuch as it knows that when it receives the phrase "How many heads does a human have?" it must respond with the Chinese equivalent of "One".

But surely that is a very limited form of understanding: the system "understanding" that it needs to give a certain response when it receives a certain phrase. Surely that does not represent true "understanding" of the phrase in the conventional sense. Crucially, if we split the phrase up into its component parts (words) then we find the system does not understand the meaning of those parts: **the system does not understand what a "human" is and it does not understand what a "head" is.**

To be specific, if you ask the system "What is a human?" or "What is a head?" you will get no response (as there is no corresponding entry in the book). And if the system cannot respond to either of those two questions, then it does not understand what a human or a head is, and so it cannot have true understanding of the phrase "Does a human have a head?"

To sum-up, I would agree that the system can have an very limited "understanding" of the entire **phrase** "How many heads does a human have?" — but only an "understanding" of that particular grouping of words. And that "understanding" is limited to an understanding that the system must respond "One" when it identifies the phrase. However, that is surely not a true understanding in the conventional sense, as the system does not understand anything about a human or a head.

This principle is revealed very obviously in the following extract from Jack Copeland's book *Turing*. In the extract, Copeland has a dialogue with the SHRDLU artificial intelligence system which was described in the previous chapter (remember the block world, and the robot arm able to place one block on top of another). Copeland was previously impressed by SHRDLU's comprehension in a carefully-arranged dialogue, with SHRDLU certainly giving an impression of intelligence. So Copeland decided to push the system until it breaks. According to Copeland: **"The illusion that the computer understands is shattered less easily than in Eliza's case, but shatter it does."** Let us now examine the dialogue to see just how Copeland successfully shattered the illusion that the computer "understands":

Copeland: Build a steeple.

SHRDLU: SORRY, I DON'T UNDERSTAND THE WORD "STEEPLE".

Copeland: A "steeple" is a stack which contains two green cubes and a pyramid.

SHRDLU: I UNDERSTAND.

Copeland: Trade you the steeple for three red cubes.

SHRDLU: SORRY, I DON'T KNOW THE WORD "TRADE".

Copeland: A "trade" is a free exchange of ownership.

SHRDLU: SORRY, I DON'T KNOW THE WORD "FREE".

Copeland: Sorry, I thought you were smarter than you are.

SHRDLU: SORRY, I DON'T KNOW THE WORD "SORRY".

The important feature of this dialogue is not that SHRDLU does not understand the words "steeple", or "trade", or "free". Not having a few relatively obscure words in its vocabulary is no big deal. No, the important feature of this discussion is that SHRDLU says it does not understand the word "sorry" — **although it has used the word in its previous responses!**

Copeland has managed to do something very clever and revealing here. He has broken-down SHRDLU's response (in the form of a sentence) into its individual word components, and then he has tried to discover if those individual components are understood by the computer. Unfortunately, the computer's understanding was found to be sorely lacking as it was clear that it did not understand the word fragments on their own. It might be said that the computer "understood" entire phrases, but — at the same time — it did not understand the individual words which were the

components of those phrases. And surely that meant SHRDLU did not have a full and complete understanding of the phrase in any true meaning of the word "understanding".

And this is precisely the scenario we find in the simplified Chinese Room experiment. Breaking phrases down into their sub-units (words) reveals a lack of true understanding. However, fortunately, it also provides us with the clue as to how we can resolve the situation, and introduce true understanding ...

The man with two heads

The discussion of the simplified Chinese Room experiment has revealed a lack of true understanding due to a lack of understanding of the individual sub-units of phrases. Logically, then, the suggestion is that we can introduce true understanding by introducing fine-detailed understanding of the individual components of any problem.

Indeed, there was a perfect example of this principle in an AI system which was presented in my previous book. My previous book was about how to make an atomic bomb (answer: it's not difficult to make a bomb, but obtaining the ingredients is problematic). In the appendix of that book, a lengthy and detailed calculation was presented of how to calculate the critical mass of uranium. In order to help with the difficult calculation, I used the functionality of the *Wolfram Alpha* website. Wolfram Alpha is a remarkable online tool which is more than just a search engine: Wolfram Alpha truly understands your query. That is "understanding" in the sense that Wolfram Alpha breaks the query down into its component words, "understands" each of the words, and then builds a true understanding of the query.

We might compare the performance of the Chinese Room to Wolfram Alpha. Given a question, both systems might provide the same correct answer. But the Chinese Room has no deeper understanding, whereas Wolfram Alpha does it right.

Let us consider our previous example again. If you remember, we asked the Chinese Room "How many heads does a human have?", and it returned the correct response. Let us now ask Wolfram Alpha the same question. If you want to try it yourself, go to the Wolfram Alpha website:

<http://www.wolframalpha.com>

Then, in the search box at the top, enter our test phrase "How many heads does a human have?":



Then click the icon at the extreme right of the search box to start Wolfram Alpha computing the solution (it will actually say "Computing ..." which we might interpret as a machine "thinking"). After a few seconds computation, it returns the correct answer:

Input interpretation:
typical number of heads on a human

Result:
1
(although Zaphod Beeblebrox has more than one head, he is not human)

Download page POWERED BY THE WOLFRAM LANGUAGE

Firstly, you can see that Wolfram Alpha has re-interpreted the question into a form which it can analyse: "Typical number of heads on a human" — a step which is only possible by breaking the question into its component parts to generate a true understanding of the question. You can see that Wolfram Alpha then calculates the correct result, the number "1". But, underneath the answer, it reveals it has a true internal understanding of the question by adding the following note: "**(although Zaphod Beeblebrox has more than one head, he is not human)**". Zaphod Beeblebrox is a character from Douglas Adams's book *The Hitchhiker's Guide to the Galaxy* (this is the third reference to the *Hitchhiker's Guide* so far in this book — what is it with AI researchers and the *Hitchhiker's Guide*?). Zaphod Beeblebrox was an alien with two heads. So, by making the connection with our test question and the character of Beeblebrox, Wolfram Alpha shows it not only understands what a "head" is, but it also understands what a "human" is (stressing that Beeblebrox was not human, but was an alien).

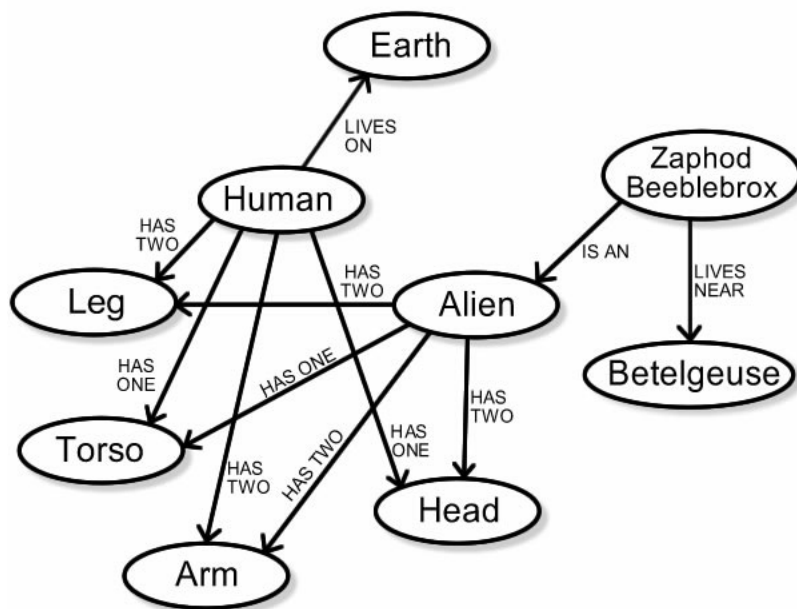
Wow. This is impressive stuff. And how far removed from the mindless sentence-level pattern-matching of the Chinese Room. Even though the two different systems — the Chinese Room and Wolfram Alpha — have given the same correct response to our test query, it is clear that the Chinese Room has no true understanding of the question, whereas Wolfram Alpha has a true understanding of the underlying concepts. Just considering the output of an AI system is not sufficient to determine whether or not it has true internal understanding: you have to dig deeper and consider its internal workings.

The internal model

Our task is now to understand how the brain is able to maintain a detailed internal representation similar to Wolfram Alpha, which allows us to have true, deep understanding of problems.

It is clear that greater understanding can be achieved by splitting a sentence into individual words, or splitting a problem into its individual sub-units. The relations between those individual sub-units can then be stored, and it is those relationships which generates an understanding of how the world works.

The following diagram appears to capture some of the deep knowledge present in Wolfram Alpha. In the diagram, individual objects are represented as oval shapes, and relationships between objects are represented by arrows — with the type of relationship written on the arrow. For example, it shows that a human has two legs and two arms, but only one head. Whereas it reveals that Zaphod Beeblebrox is an alien who has two heads. Some knowledge of the external environment is also represented on the diagram, showing that humans live on Earth, whereas Beeblebrox lives on a planet near the star of Betelgeuse:



In computer science, this type of diagram is called a *semantic network*. The word "semantics" means "meaning", and a semantic network captures meaning by describing the relationships between objects, and how they affect each other. It would be imagined that knowledge in the brain is stored in a similar way. In psychology, this model of data storage is called an *associative memory*, with different memories being closely associated with other memories. For example, a particular smell may trigger a memory of a meal in a particular restaurant.

The semantic network stored in the brain would form an internal model of the world. The greater the detail of that internal model, the richer and more effective would be our thought processes. For example, we could close our eyes and plan strategies — maybe strategies to hunt animals — and then apply those strategies to the real world. Ideally, we would like our brain's internal model to be as close a match as possible to the real world around us. It is as though we are building a universe inside our brain — or, at least, a simplified copy of the universe in our local vicinity. Indeed, in my first book I explained how the universe is a relative structure, with the functionality of objects having to be described relative to all the other objects in the universe, and meaning arising through relations. As Niels Bohr said: "Isolated material particles are abstractions, their properties being definable and observable only through their interactions with other systems."

We are creating a self-contained universe in our mind!

In his book *The Brain*, David Eagleman considers this internal model in detail. Eagleman stresses that this internal model does not have to be a precise copy of the external world. Indeed, with only a finite number of neurons in the brain, there is no way the internal model could be an atom-for-atom precise copy of the universe. The internal model need only be a fairly accurate representation of the local external world. Eagleman refers to this as a "low-resolution" internal model. As Eagleman explains: "This isn't a failure of the brain. It doesn't try to produce a perfect simulation of the world. Instead, the internal model is a hastily-drawn approximation."

Self-awareness

In Chapter Four, it was explained how surprising new modes of behaviour can "emerge" when a nonlinear network reaches a certain level of complexity. Let us now consider the possibility that self-awareness is one of these emergent behaviours in networks with sufficient complexity, and let us consider if self-awareness holds the key to consciousness.

In a 2017 *New Scientist* article, Michael Graziano, a neuroscientist at Princeton University, stressed that a conscious animal needs "a mental model of its body". Graziano continued: "It's fine for me to say 'arm, go here', but something in my brain needs to have a model of what an arm is, its possible motions, and so on." According to *New Scientist*: "This model is responsible for our conscious awareness of the world, according to Graziano". [28]

Graziano is suggesting that consciousness emerges when the internal model in our brains becomes sufficiently

large and detailed that it can contain an accurate model of ourselves, a model which accurately represents our position in the universe and our relations with other objects in that universe. At that crucial moment, we become capable of thinking about ourselves: we become self-aware. And maybe with that self-awareness would come consciousness.

Douglas Hofstadter is currently a professor of artificial intelligence at Indiana University. It was Hofstadter who presented this self-referential theory of consciousness in his classic 1979 book *Gödel, Escher, Bach*. The best description can be found in the preface of the 20th anniversary edition of the book. In the following brief quote from that preface, Hofstadter explains how consciousness depends on an internal model in the brain which mirrors the external world, and thereby allows self-reference: "In short, an 'I' comes about — in my view, at least — via a kind of vortex whereby patterns in a brain mirror the brain's mirroring of the world, **and eventually mirror themselves.**"

There is a famous geometric structure called a Klein bottle — which is often made of glass — in which the mouth of the bottle is curved around to pass back inside the bottle. Remarkably, this results in the surface of a Klein bottle having only **one side!** If you trace your finger around the "outside" surface you will eventually end up "inside" the surface. There is no distinction between inside and outside: the bottle contains itself.

It seems to me that the "looping effect" of the brain — in which we can think **about** the internal model inside our brain — is reminiscent of the "looping" of the Klein bottle. And with this looping would come self-awareness.

The following diagram shows a glass Klein bottle on the left, and a diagram of the brain on the right containing an internal model of itself. The looping effect — in which we become aware of our own internal model — is shown:



Just as with the Klein bottle, the distinction between the model inside the brain and the person outside the brain becomes blurred. The inside becomes the outside, and the outside becomes the inside. According to Hofstadter, there would then be only one entity: the self-aware, conscious being.

However, I find I cannot totally agree with Hofstadter's theory about self-awareness being the key to consciousness. Remember back to the discussion of the mirror test at the start of this book. It was explained how an animal looking into a mirror would sometimes touch a mark placed on its forehead. This is considered to represent a reliable test of self-awareness. However, it was explained how very few animals have passed the test, and many animals which are surely conscious have failed the test. This seems to indicate that self-awareness is not a completely necessary factor of consciousness.

However, consciousness exists on many levels, dependent on the complexity and richness of the internal model. And Hofstadter makes this point himself: "When and only when such a loop arises in a brain or in any other substrate, is a **person** — a unique new 'I' — brought into being. Moreover, the more self-referentially rich such a loop is, the more conscious is the self to which it gives rise."

On that basis, it seems the case that self-awareness would be a factor in a **human-level** degree of consciousness

(though it might be lacking in lower-level consciousnesses).

8

THE "HARD PROBLEM"

This is the final chapter of this book.

Regular readers of my books will know I like to present some of my own ideas in the final chapter, and this book is no exception.

Up to this point, in considering the necessary conditions for consciousness, this book has only tackled what is known as the "easy" problem of consciousness. In 1995, the Australian philosopher David Chalmers explained how the problem of consciousness is actually two problems:

- **The "easy problem"** — Identifying the requirements necessary for consciousness. Studying the functioning of neurons, identifying which regions of the brain are involved in various conscious tasks, and analysing the structure of the cortex to explain how it can perform intelligent tasks.
- **The "hard problem"** — Explaining how the feeling of consciousness can arise from the processing of information and electrical activity in the brain. The "hard problem" is clearly subjective in nature. How can a feeling arise from the movement of particles, basically.

Chalmers makes the point that the real challenge is to identify the source of the feeling or "experience" of consciousness: "The really hard problem of consciousness is the problem of **experience**. When we think and perceive, there is a whirl of information-processing, but there is also a subjective aspect. This subjective aspect is experience. When we see, for example, we **experience** visual sensations: the felt quality of redness, the experience of dark and light, the quality of depth in a visual field. But the question of how it is that these systems are subjects of experience is perplexing. Why is it that when our cognitive systems engage in visual and auditory information-processing, we have visual or auditory experience: the quality of deep blue, the sensation of middle C? How can we explain why there is something it is like to entertain a mental image, or to experience an emotion? It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises."

I suspect that when people talk about the mystery of consciousness, they are really referring to this "hard problem".

Chalmers believes that conventional neuroscience research is not aimed at uncovering the origin of this experience. Chalmers' paper certainly does not pull its punches: "The ambiguity of the term 'consciousness' is often exploited by both philosophers and scientists writing on the subject. It is common to see a paper on consciousness begin with an invocation of the mystery of consciousness, noting the strange intangibility and ineffability of subjectivity, and worrying that so far we have no theory of the phenomenon. Here, the topic is clearly the hard problem — the problem of experience. In the second half of the paper, the tone becomes more optimistic, and the author's own theory of consciousness is outlined. Upon examination, this theory turns out to be a theory of one of the more straightforward phenomena. At the close, the author declares that consciousness has turned out to be tractable after all, but the reader is left feeling like the victim of a bait-and-switch. The hard problem remains untouched."

Here is a link to David Chalmers' paper:

<http://tinyurl.com/chalmerspaper>

In this final chapter, we will be considering the hard problem. There will be no bait-and-switch.

Leibniz's Mill

It was explained in Chapter Two how neurons communicate via electrochemical pulses down their axons. So, at any given moment in time, there will be a pattern of spatially-separated electric pulses in your brain — maybe a considerable distance apart (the pattern of these electric charges is detected in an EEG scan in which electrodes are applied to the scalp). How, then, do I feel like a single conscious entity, rather than feeling like I am just one of those isolated pulses? How can a pattern of isolated electrical pulses produce a single consciousness?

The following image shows the mystery. At any point in time, inside your brain are a series of isolated electric charges, either the action potentials along the axons of neurons or accumulated charge inside the neurons themselves. But then think how you feel, how your consciousness feels like a connected entity. How on Earth can that amazing feeling of consciousness arise from a series of disconnected electric charges?



The problem was described by Gottfried Leibniz in 1714 in a thought experiment which is now called *Leibniz's Mill*. Leibniz's Mill is described by David Eagleman in his book *The Brain*. Leibniz imagined the mind as a large machine, a processing unit, a factory, a mechanism — which seems fair enough. Leibniz imagined walking around a large mill. You would see cogs and levers moving, but, as David Eagleman says: "It would be preposterous to suggest that the mill is thinking or feeling or perceiving. How could a mill fall in love or enjoy a sunset? A mill is just made of pieces and parts. And so it is with the brain, Leibniz asserted. If you could expand the brain to the size of a mill and stroll around inside it, you would only see pieces and parts. When we look inside the brain, we see neurons, synapses, chemical transmitters, electrical activity. We see billions of active, chattering cells. Where are you? Where are your thoughts? Your emotions? To Leibniz, the mind seemed inexplicable by mechanical causes."

So, just as there are disconnected pieces of machinery operating in a mill, so there seems to be disconnected electric charges in the brain. What brings it all together to produce consciousness?

I have seen some ideas written in pseudo-scientific books about a vague unified "field" which link the charges, the field representing consciousness in some way. However, most physicists would reject those ideas. If an effect cannot be objectively observed, measured, and analysed then they would say there can be no convincing motivation for proposing new physics.

Instead, let us try to find solutions based on our comprehensive knowledge of fundamental physics and technology ...

The DRAM analogy

If we assume that consciousness is a result of information processing in the brain, how could that possibly result in a feeling of a unified consciousness? Well, as explained in Chapter One, information is always bound to something physical. In the case of the brain, it has been explained how the information processing between neurons

takes the form of the physical movement of charged particles — ions — notably sodium and potassium ions. It is surely safe to conclude that the physical substrate of the information held in the brain is these electrically-charged particles.

So we can conclude that **the physical substrate of consciousness must surely be electric charge.**

OK, that's a good start. Now let us expand on this connection between consciousness and electric charge by using an analogy which was suggested by the physicist Max Tegmark. [\[29\]](#)

Tegmark introduced another parallel between thought processes and electronics. How is information stored in modern electronic devices? A few years ago, information might have been stored magnetically on a hard disk which had to be physically rotated, but there is no such large-scale physical movement in the brain. Instead, modern electronic devices such as iPads have now moved to use purely electronic memory which has no moving parts.

A common type of electronic memory is DRAM (*dynamic random-access memory*). Here is a photograph of some DRAM chips attached to a circuit board which you could insert in your computer in order to increase its memory:



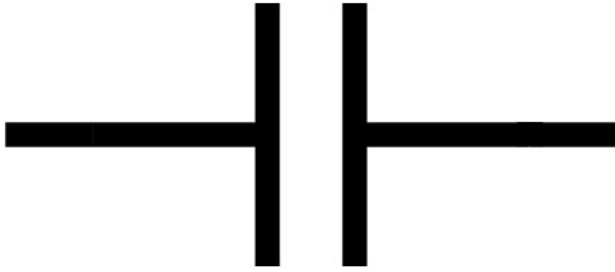
DRAM (pronounced "D-RAM") operates by storing information as electric charge on microscopic *capacitors*. A capacitor is composed of two metal plates separated by an insulating material. When a voltage is applied across the two terminals of the capacitor, electric charge is stored on the plates.

Here is a photograph of some common capacitors:



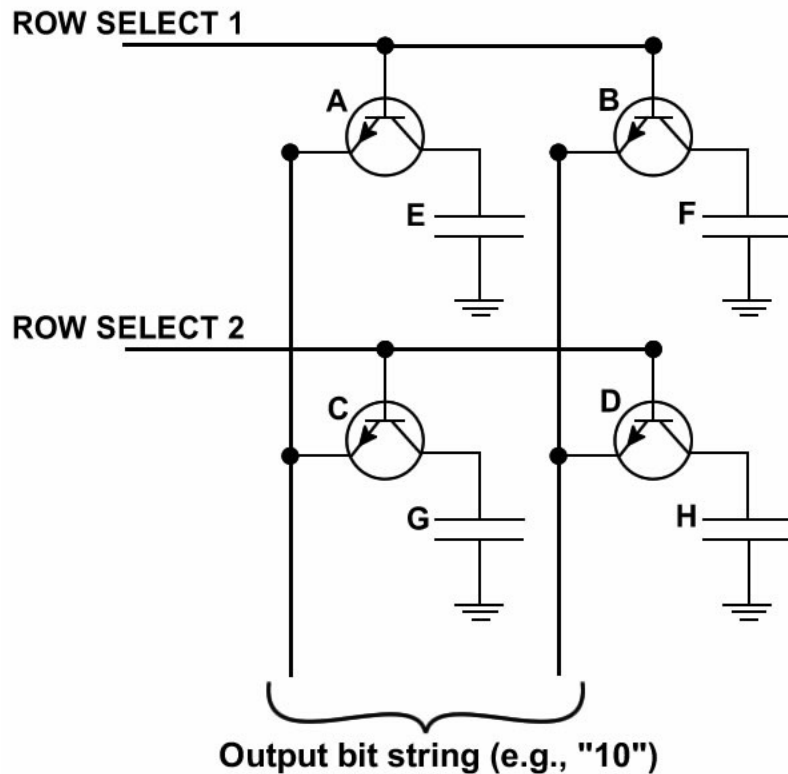
And here is the schematic symbol for a capacitor which is used in circuit diagrams (you can see the two metal

plates):



So now let us see how capacitors are used to make DRAM.

In DRAM, each "bit" of information (0 or 1) is stored on a single microscopic capacitor. If the capacitor has electric charge, that represents bit 1, conversely if the capacitor has no electric charge then that represents bit 0. Each capacitor has an associated microscopic transistor, as shown in the following DRAM circuit diagram:



You will see that the diagram shows four transistors (labelled A, B, C, and D), and four capacitors (E, F, G, and H). You will recognise the symbol for a transistor from Chapter Three.

Each horizontal row of two capacitors represents a string of two bits of information. As an example, consider the top horizontal row consisting of the two capacitors E and F. If there is electric charge on capacitor E then that would represent bit 1, and if there is no electric charge on capacitor F then that would represent bit 0. So, in that case, the two-bit string stored in the top horizontal row would be "10".

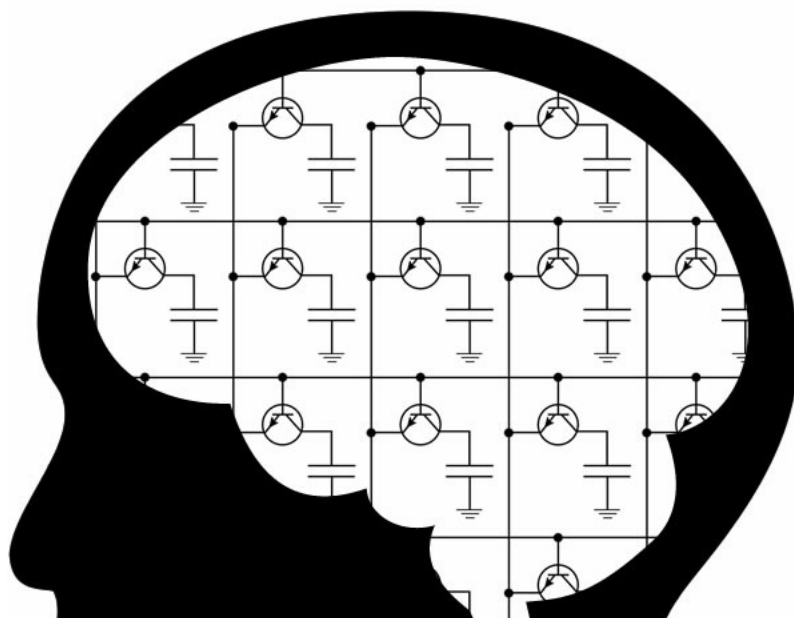
To understand how the data is accessed, let us consider how that data in the top horizontal row might be retrieved. This would be achieved by setting a positive voltage on the top horizontal line "ROW SELECT 1". You will see from the diagram that this voltage is connected to the base leg of transistors A and B. If you remember how a transistor works (as described in Chapter Three), you will see that this applied voltage would have the effect of turning ON transistors A and B. Current is then free to pass between the other two legs of each transistor A and B.

As a result of the two transistors turning ON, you will see from the diagram that the electric charge on the top

plate of capacitor E can pass through transistor A and become the first of the output bits (setting the first output bit to bit 1). Also, the electric charge on the top plate of capacitor F can pass through transistor B and become the second of the output bits (setting the second output bit to bit 0).

Therefore, the output string at the bottom of the diagram will be set to "10". And that is how you read the information stored in DRAM. I hope you have enjoyed this little detour into microelectronics.

But you will see that the information stored in DRAM is stored as a large number of spatially-separated electric charges (stored on the capacitors). And, as discussed earlier, **this is just what we see in the human brain**. So let us redraw the earlier diagram of a human brain composed of spatially-separated electric charges, and replace those charges with the charges stored on spatially-separated capacitors. In fact, let's just draw a DRAM brain:



On the previous diagram you can see a brain composed of an extremely large number of isolated electric charges (stored on capacitors) — just like a real brain.

Now let us return to the previous "Leibniz Mill" thought experiment, and bring it up-to-date. Let us imagine if we could micro-miniaturise Gottfried Leibniz so he was just a few millionths of a metre in height, and let us then implant him inside a DRAM chip. "Mini Leibniz" might walk around the DRAM chip just as he had previously imagined walking around a mill. "Mini Leibniz" would see all the spatially-separated electric charges on capacitors, just as he had previously seen all the isolated pulleys and levers in the mill. And Mini Leibniz might wonder: "How could all these isolated electric charges produce a unified consciousness?", just as he had previously wondered about the mill workings.

But we are fortunate in that we have a greater understanding of technology and DRAM and information than Leibniz possessed. As has just been explained in the DRAM example, we know how to get information out of those "isolated electric charges". We know how computer memory works, and we can extract a string of bits from that DRAM:

101100110011000101101110101101011011101

So now we see just what that series of "isolated electric charges" in the brain really represents: it is Claude Shannon's string of bits, **it is raw information**. And, just like a bit string stored in your computer's memory, that raw information might be anything: it might be a movie, or a song, or words in a book. The point is, what seemed like a completely unrelated series of isolated electric charges can actually be a single, unified chunk of information — a single object, in fact — which can be anything.

And that object would be part of a thought in your mind.

This is how Max Tegmark described this analogy in his previously-referenced paper *Consciousness as a State of Matter*: "When we view a brain or computer through our physicists' eyes, as myriad moving particles, then what

physical properties of the system should be interpreted as logical bits of information? I interpret as a 'bit' both the position of certain electrons in my computer's RAM memory (determining whether the micro-capacitor is charged) and the position of certain sodium ions in your brain (determining whether a neuron is firing)."

"It from bit"

So the material of our thoughts is raw information, the physical substrate of which is the pattern of electric charge in our brain. And our internal model of the local universe is composed of this information. We may be under the impression that we live in the physical world, but really we are living in the information-based reality contained within our minds.

David Eagleman describes this principle in his book *The Brain*: "It feels as though you have direct access to the world through your senses. You can reach out and touch the material of the physical world — like this book or the chair you're sitting on. But this sense of touch is not a direct experience. Here's the key: the brain has no access to the world outside. Sealed within the dark, silent chamber of your skull, your brain has never directly experienced the external world, and it never will. Instead, there's only one way that information from out there gets into the brain. Your sensory organs — your eyes, ears, mouth, and skin — act as interpreters. They detect a motley crew of information sources (including photons, air compression waves, molecular concentrations, pressure, texture, temperature) and translate them into the common currency of the brain: electrochemical signals."

The legendary 20th century American physicist John Wheeler expressed a similar idea about the importance of information in creating our world, and the primacy of information over physical reality. Wheeler was born in 1911, and collaborated with Einstein and Bohr. During the war, he worked on atomic bomb development. After the war, Wheeler worked on general relativity and gave one of the most concise and illuminative quotes about that subject: "Space tells matter how to move, and matter tells space how to curve."

Wheeler certainly had a way with words, and was responsible for coining the memorable terms "wormhole" and "black hole".

Here is a photograph of John Wheeler (on the right side of the photograph) taken in 1985, standing by the side of the German physicist Eckehard Mielke. Wheeler has written: "The black hole is a source of enlightenment":



Wheeler remained an active physicist into his 90s. He was never afraid to tackle what he called the "Really Big Questions" and, in 1989, he wrote an influential paper in which he described a principle which he called "It from bit".^[30] The idea of "It from bit" is that the physical world (the "It") is derived from the more fundamental world of information (the "bit" — as in Claude Shannon's "bits"). Wheeler explained how our picture of reality is solely derived from the information we can obtain: "Every physical quantity, every **it**, derives its ultimate significance from **bits**. That which we call reality arises in the last analysis from the posing of yes-no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin."

Anton Zeilinger, Director of the Institute for Quantum Optics and Quantum Information, explains his interpretation of John Wheeler's idea: "My interpretation is that in order to define reality, one has to take into account the role of information: mainly the fact that whatever we do in science is based on information which we receive by whatever means."

Though we might not realise it, our personal universe is a universe made of information.

Beyond the physical

In his paper, David Chalmers presented what I consider to be a great insight. Chalmers presented the highly-convincing argument that merely altering the arrangement of physical material is never going to provide us with an explanation of the feeling of consciousness. All we will ever be doing is moving physical material around into various different configurations: "For any physical process we specify there will be an unanswered question: why should this process give rise to experience? The structure and dynamics of physical processes yield only more structure and dynamics, so structures and functions are all we can expect these processes to explain."

To my mind, this makes a great deal of sense. Why should merely changing the position of physical objects (particles, for example) cause the emergence of an apparently completely unconnected phenomenon: the feeling of consciousness?

This is basically the same argument as in the Leibniz Mill thought experiment. If you remember, the brain was compared to mill machinery. But if you walked around that mill you would just see the movement of cogs and levers, "pieces and parts" as David Eagleman described. Where, then, does the feeling of consciousness come from?

However, in the previous DRAM analogy, we have seen that the arrangement and movement of physical material can represent something which is not physical: information.

According to Chalmers, we need to find an "extra ingredient" in the explanation. I believe that "extra ingredient" is information.

The reason why I believe that is the case is because — when we examine Chalmers' argument — it is clear that we **need** to go **beyond the physical** to find a solution to the hard problem.

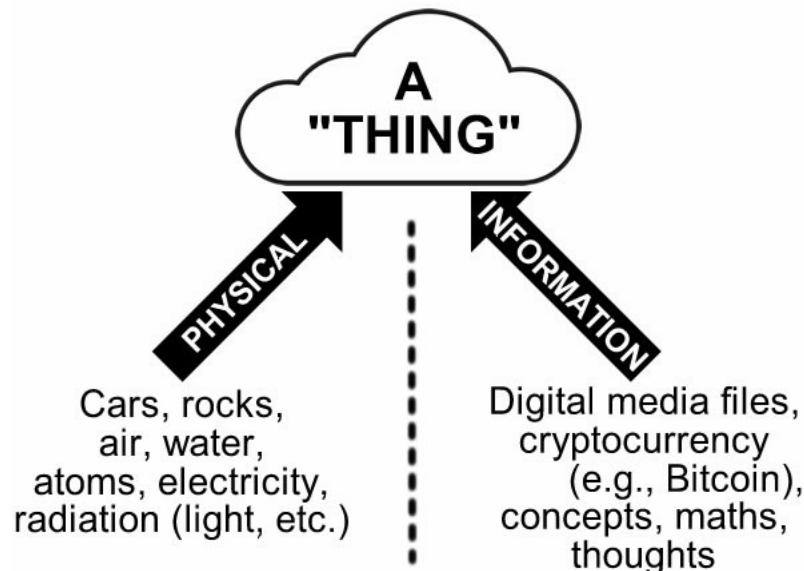
This emphasis on information represents something of a departure from physics, because physics is about physical things (hence the name), and raw information is not physical (you cannot hold or touch raw information). Things can certainly be made of information, but those things would be movies, or digital images, or music, for example. Those things exist as independent entities — but they are not physical things. I am therefore suggesting that consciousness is not a physical thing. Information always requires a physical substrate, but it seems to exist in a realm **above** the physical world. Take away the physical substrate and consciousness disappears — but consciousness is not physical.

At this point, allow me to introduce a brand-new scientific term: the *thing*. I am going to define a "thing" as the most general type of object that can possibly exist. To be precise, a "thing" is going to be defined as "anything that can be made from anything".

OK, that sounds extremely vague. How can such a vague term possibly be of any use? Well, perhaps surprisingly, it appears that a "thing" can only fall into one of two possible groups. Firstly, a thing can be **physical**, in which case it would be composed of particles contained in the Standard Model. That would be fermionic matter (matter made of atoms) such as cars and trees. But it would also include objects made of immaterial bosons, such as rays of light and radio waves (items made of photons — particles described within the Standard Model). Clearly, that is a huge group.

The other grouping is equally huge. This would be the objects made purely out of information. This would include a range of "things" from digital media files such as digital movies and music, through to a thought in your mind (made out of information represented by the arrangement of electrical charge in your brain).

Here is a diagram showing how every "thing" has to fall into one of the two categories:



You will see that I have included cryptocurrency — such as Bitcoin — in the second grouping. This is digital money which has **no physical form**. Conventional currencies always have a physical form, e.g., coins and banknotes. However, Bitcoin only exists as information, stored and transmitted in electronic format. Bitcoin is therefore clearly not a physical "thing". As I said earlier, you cannot hold or touch raw information, so you cannot

hold or touch a Bitcoin. However, Bitcoin might be considered to be just as real as the coins and notes in your wallet.

You will also see that I have included "concepts" in the second grouping. Basically, if you can represent a "thing" in its entirety by thinking about it or writing it down, then it is made of information and it should be in the second group.

Into which group should we place a colour? For example, into which group should we place "green"? That is an interesting question. Firstly, "green" could refer to the particular wavelength of light which we associate with the colour (approx. 495-570 nm), in which case — as light is listed on the diagram as being a physical "thing" — we should place it in the first group. However, the feeling which we experience when we look at something which is coloured green — the "feeling" of green — is clearly a thought and should therefore be placed in the second group. So a colour has a dual interpretation and could therefore be placed in either group depending on that interpretation.

So there is clearly a bridge between the two groups: physical colour can be converted into the thought of colour in your mind, or can be related to that feeling of colour. So there is not an unbridgeable gap: the mind/body gap can be crossed. Information is associated with all physical "things". Far from there being an unbridgeable gap, there is actually an unbreakable link.

I can think of no "thing" which does not fall into one of these two categories. If you can think of any "thing" which is outside of these two categories, my email address is in the front of the book — please let me know!

I think the fact that absolutely every "thing" in existence can be placed in one of only two categories must have some profound significance. Might this be interpreted as Descartes' "dualism"?

As stated earlier, on the basis of Chalmers' argument, in order to solve the hard problem we **need to go beyond the physical**. We need to move to the other grouping of "things". Referring to the previous diagram, the question as to whether or not a particular material could ever become conscious then reduces to a very simple black-or-white question: **on which side of the line does it lie?** If it lies on the right-hand side of the line, then the material has the potential to be conscious.

I believe this "What side of the line?" principle provides us with a huge clue about how to solve the hard problem of consciousness. **I would suggest that we could define the "feeling" of consciousness as the feeling you get when you look at a physical object (a car, rock, etc.) and know that you are made from different stuff.** In other words, it is the feeling you get from knowing you are on the right-hand side of the line in the previous diagram, as opposed to being on the left-hand side of the line in the previous diagram. It is the feeling of being "made differently" that defines consciousness, the feeling that your consciousness is made of information.

In a nutshell, **consciousness is the feeling that your mind is not a physical thing.** You feel different because you **are** different: you are a fundamentally different type of "thing".

And how would you actually feel if you were on the right-hand side of the previous diagram? Well, in Chapter One it was explained how a consciousness based on information would feel substrate-independent (you would not feel as though you were made of a "rice pudding brain"), feeling independent of the physical world, with a mind which felt impervious to physical damage and the ravages of time. This is clearly just how your consciousness feels. I would like to draw your attention to the word "feels" in the previous quote by Max Tegmark: "I have long contended that consciousness is the way information **feels**."

So, to an extent, it is possible to explain the "feeling" of consciousness via this information-based model. It seems that science can provide insights even into subjective matters.

So, yes, I am essentially suggesting that your consciousness is like Bitcoin: made of information with no physical form, and completely substrate-independent:



I would like to leave you with one final thought.
We live in a world in which science has stripped Nature down to her smallest constituent parts, and eliminated almost all mysteries about the natural world — from the universe to the atom. So perhaps we should be rather proud of the fact that one of the few remaining mysteries of Nature lies at the heart of each and every one of us.

ACKNOWLEDGEMENTS

Thanks to Alexander Bystritsky for ideas and discussion.

PICTURE CREDITS

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NOTES

[1] In order to analyse the problem of consciousness, the approach of philosophers seems to be to call everything an "ism". As a result, we get *functionalism*, *computationalism*, *representationalism*, *materialism*, and many more "isms". Frankly, I consider it all to be excessive *classificationism*.

[2] This is because $2^7=128$. I am sure there are many websites which can show you the basics of the binary numbering system if you are unsure. It is base-2 arithmetic which only uses the symbols 0 or 1.

[3] The Mind-Body Problem, *The Information Philosopher*, <http://tinyurl.com/informationphilosopher>

[4] *The Secret World of the Brain*, Catherine Loveday.

[5] <http://tinyurl.com/superpositionprinciple>

[6] Imagine a system made of four linear components. Two of the components could be simplified to just one component, and the other two components could also be simplified to one component. Which would leave you with two linear components. Those two components could then be simplified to just one component. So a system with any number of linear components can be simplified to just one component.

[7] If you are interested in how this simplification can be achieved, see the original example on the Khan Academy website: <http://tinyurl.com/simplifyingresistance>

[8] <http://tinyurl.com/allornonelaw>

[9] *The Coming Age of 3D Integrated Circuits*, Brian Benchoff, <http://tinyurl.com/threedchip>

[10] "Introducing a Brain-inspired Computer", Dharmendra S. Modha, <http://tinyurl.com/truenorthbrain>

[11] Thanks to Alexander Bystritsky for the discussion and idea.

[12] *Which species is the best builder: humans or termites?* BBC website:

<http://tinyurl.com/termiteskyscrapers>

[13] A profound article by particle physicist Jon Butterworth: "So from one point of view this physics looks more fundamental than the search for the smallest constituents of matter. It is the physics of deep principles, which these constituents seem to obey", <http://tinyurl.com/jonbutterworth>

[14] National Science Foundation, *Understanding Emergence*, <http://tinyurl.com/understandingemergence>

[15] Grantchester Meadows are located about a mile outside Cambridge. "Grantchester Meadows" is also the name of a song by the Cambridge-based band Pink Floyd, whose founder members Roger Waters and Syd Barrett happened to be taught by my father in Cambridge High School.

[16] These type of equations which have whole number solutions are called *Diophantine equations*. They are often used in puzzles, as in the Facebook fruit problem.

[17] A technical discussion of this amazing Facebook fruit problem by Alon Amit is available here:

<http://tinyurl.com/toughpuzzle>

[18] In practice, only a quantum computer's **data** would be held in a superposition state.

[19] *The Importance of Quantum Decoherence in Brain Processes*, Max Tegmark, <http://arxiv.org/abs/quant-ph/9907009>

[20] *Consciousness: Why we need to build sentient machines*, Celeste Biever, *New Scientist*, 15th May, 2013.

[21] *The Automation of Cervical Smear Screening*, Andrew Thomas, Swansea University, 1991.

[22] "How Many Computers to Identify a Cat? 16,000", John Markoff, *New York Times*,

<http://tinyurl.com/newyorktimescat>

[23] "The Great AI Awakening", Gideon Lewis-Kraus, *New York Times*, <http://tinyurl.com/newyorktimesai>

[24] *Artificial Intelligence, NASA data used to discover eighth planet circling distant star*,

<http://tinyurl.com/kepler90>

[25] "The future of AI is neuromorphic", Aaron Frank, <http://tinyurl.com/neurochip>

[26] "Microsoft deletes 'teen girl' AI after it became a Hitler-loving sex robot within 24 hours", *Daily Telegraph*,

<http://tinyurl.com/aigonewrong>

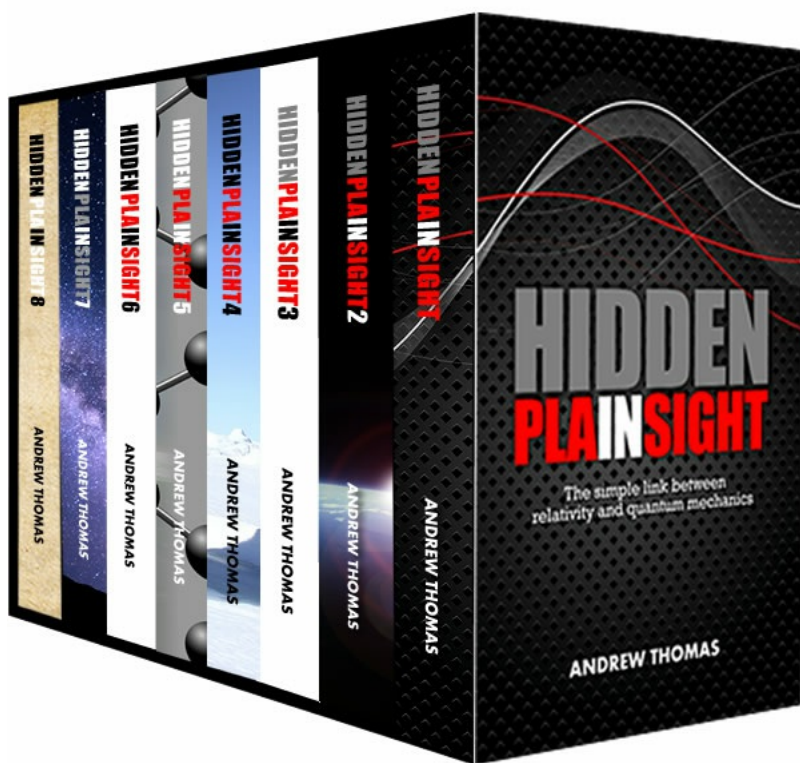
[27] "Elon Musk's billion-dollar crusade to stop the AI apocalypse", *Vanity Fair*,

<http://tinyurl.com/elonmuskcrusade>

[28] "Why be conscious?", Bob Holmes, *New Scientist*, 13th May 2017.

[29] *Consciousness as a State of Matter*, Max Tegmark, <http://arxiv.org/abs/1401.1219>

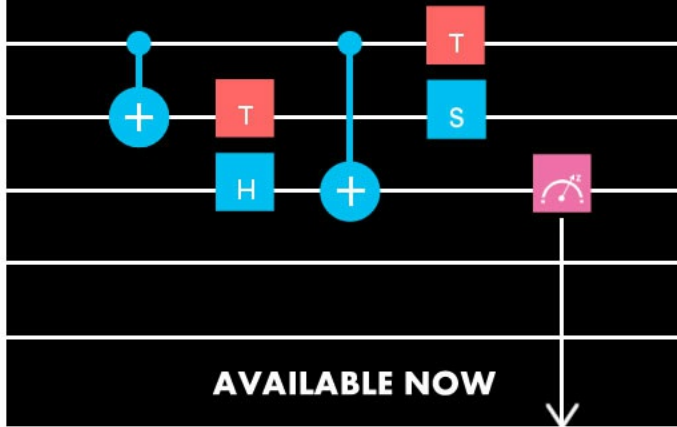
[30] *It From Bit*, John Wheeler, <http://tinyurl.com/wheelerinformation>



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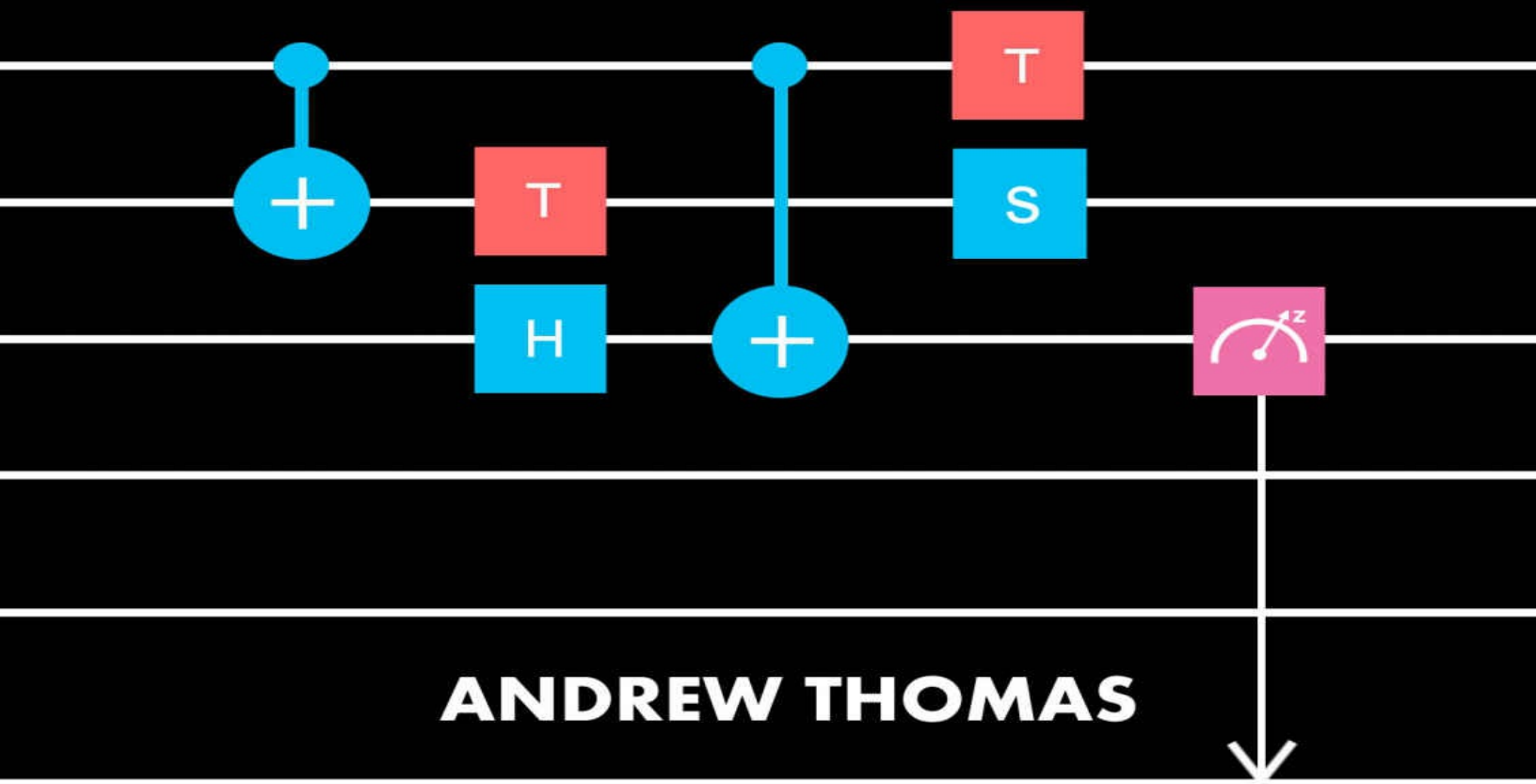
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Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

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How To Program A Quantum Computer

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CONTENTS

PREFACE

1) THE THINKING MACHINE

Feynman and the Thinking Machine
The Feynman Lectures on Computation
The classical computer

2) THE QUANTUM STATE (OF MIND)

The new worldview of quantum mechanics
The quantum state
The superposition state
Quantum mechanics is not "strange"
Dirac notation

3) THE SCHRÖDINGER EQUATION

The life and loves of Erwin Schrödinger
The Schrödinger equation
The equation for a single particle
The complete predictability of quantum mechanics

4) OBSERVING A QUANTUM SYSTEM

Calculating eigenvectors and eigenvalues
Energy levels of an electron

5) COMPLEX NUMBERS

The phase of Hilbert space

6) DECOHERENCE

Environmental decoherence
The coldest place in the universe
The race against time

7) THE QUBIT

[The physical implementation of qubits](#)
[The Bloch sphere](#)
[Entanglement](#)

8) THE IBM Q EXPERIENCE

[X: The bit-flip gate](#)
[H: The Hadamard gate](#)
[Gates which modify phase](#)

9) MULTIPLE-QUBIT QUANTUM GATES

[Boolean logic](#)
[Reversible computing](#)
[The CNOT gate](#)
[The Toffoli gate is your friend](#)
[Copying a qubit](#)
[Entanglement and the CNOT gate](#)

10) QUANTUM ALGORITHMS

[From bits to qubits](#)
[The inverse problem](#)
[Shor's algorithm](#)
[The challenge of writing a quantum algorithm](#)

11) GROVER'S ALGORITHM

[The Oracle](#)
[Inversion around the average](#)
[Programming a real quantum algorithm on a real quantum computer](#)
[Some final thoughts](#)

APPENDIX ONE: THE ORACLE

APPENDIX TWO: ROTATION AROUND THE AVERAGE

PREFACE

The subject of quantum computing is receiving a lot of publicity at the moment, with many stories in the press about how it is going to revolutionise our lives, or break the world's encryption systems. However, most of these stories seem very short on hard facts about how quantum computing actually works. In fact, there seems to be a general lack of easy-to-understand technical information about quantum computing. Whereas there is plenty of complex technical material available.

This book is going to attempt to fill the gap. It will attempt to simplify the subject, clarifying the essential concepts, while still retaining sufficient technical depth.

If you ask in most IT departments about the latest programming languages, or the latest programming techniques, I am sure you would find plenty of programmers with excellent knowledge of the latest developments. However, if you ask about quantum computing, I suspect you would be met with blank stares. But these are the people who — one day, hopefully — are going to be using quantum computers. These are the target customers.

So this book is accessible, aimed at a general audience. But it is also aimed at those programmers and scientific researchers, people with experience of conventional computers who wish to gain knowledge and experience of quantum computing but do not wish to trawl through the extensive and complex literature. This book will explain the programming techniques which will likely be needed to write a quantum computing program to solve their particular problems.

Hopefully, this book can provide another step towards taking quantum computing into the mainstream.

No prior knowledge of quantum mechanics or computing is assumed. This book will take you on the entire journey, from explaining the fundamental postulates of quantum mechanics, then explaining the principles of quantum computing, and finally showing you how you can program a quantum algorithm on a real quantum computer, generously provided by IBM.

You will be working at the frontier of human knowledge, using arguably the most advanced technology which has ever been created. You will be performing complex calculations in a time-window which lasts just microseconds, using single elementary particles which are in two states at the same time, inside a refrigerator which is the coldest place in the entire universe. This is beyond the wildest science fiction.

Quantum computing — and the development of quantum algorithms — is still very much a work in progress. It is a journey into mystery, and no one knows where the destination will be. You can play a part in shaping that future.

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Swansea, UK
2018

*"Get ready to think outside a box
you didn't know existed."*

- CHARLES BENNETT,
QUANTUM INFORMATION PIONEER

1

THE THINKING MACHINE

In early 1943, Richard Feynman received a telephone call from Robert Oppenheimer. Feynman was a 25-year-old physicist, a rising star from Princeton University. Oppenheimer was the scientific director of the Manhattan Project, the American project to build the world's first atomic bomb. Oppenheimer persuaded Feynman to join his team and, on March 28th 1943, Richard Feynman boarded a train to Los Alamos, New Mexico, where the centralised bomb development facility was located.

Feynman described his time at Los Alamos in his highly-entertaining autobiography *Surely You're Joking, Mr. Feynman!* He recalled arriving on-site to find the main buildings were still not fully complete, and so the physicists had to lend a hand in the construction work.

Feynman recalls how he attended the introductory lecture given by Robert Serber (which was described in my eighth book) in which the principles behind the atomic bomb were explained. For many of the physicists in attendance, this was the first time they were made aware of the true purpose of Los Alamos.

All of the correspondence in and out of Los Alamos was heavily-censored for fear of spies, and secrets leaking out. This presented a problem for Feynman whose wife, Arlene, was seriously ill with tuberculosis in hospital in Albuquerque. Feynman and Arlene arranged that they would write letters to each other in code. The key to deciphering the code would be written on a separate piece of paper inside the letter.

One day, Feynman received a letter from his wife which included the following key which was written on a separate piece of paper:

**LITHARGE
GLYCERINE
HOT DOGS
LAUNDRY**

Feynman puzzled over the letter for many hours, unable to decipher it by using the enclosed key. It was only when he arrived at Arlene's hospital a few days later that she told him it was actually a shopping list of things she had wanted him to bring when he visited her.

In another famous anecdote, Feynman is sent on a trip from Los Alamos to inspect the giant uranium enrichment plant at Oak Ridge (also described in my eighth book). When he arrives, his reputation as a genius precedes him, and so the team at Oak Ridge unroll a series of plant blueprint diagrams for Feynman's analysis and approval. However, Feynman has never seen anything like this in his life: "I'm completely dazed. Worse, I don't know what the symbols on the blueprint mean! There is some kind of a thing that at first I think is a window. It's a square with a little cross in the middle, all over the damn place. I think it's a window, but no, it can't be a window, because it isn't always at the edge. What am I going to do? I get an idea. Maybe it's a valve. I take my finger and I put it down on one of the mysterious little crosses in the middle of one of the blueprints on page three, and I say 'What happens if this valve gets stuck?' — figuring they're going to say 'That's not a valve, sir, that's a window.' So one looks at the other and says, 'Well, if **that** valve gets stuck ...' and he goes up and down on the blueprint, the other guy goes up and down, back and forth, and they both look at each other. They turn around to me and they open their mouths like astonished fish and say 'You're absolutely right, sir!' So they rolled up the blueprints and away they went and we walked out. And Mr. Zumwalt, who had been following me all the way through, said: 'You're a genius.'"

At Los Alamos, Feynman was assigned to the team responsible for analysing the behaviour of the bomb during implosion — the period during which a sphere of plutonium about the size of an orange is crushed to about the size of a lime. The task of the team was to calculate how much explosive energy would be released during the implosion. However, they quickly realised that this required more calculating power than they had available.

The physicists at Los Alamos were also all too aware that their work was a race against time. They had to beat Hitler to the bomb — the alternative was too awful to contemplate. Because of those extreme time pressures, Feynman realised he had to find a way of reducing the time of their calculations. Some form of automation was going to be required. However, those were the days before the digital computer was invented (during the same period, the digital computer was being invented in Britain in order to crack the German Enigma code).

However, IBM had produced a series of mechanical calculating machines which could perform a limited set of operations on punched cards. Each machine was only capable of performing a single type of operation, such as multiplying two numbers on a punched card together. As an example of one of these type of machines, the following photograph shows the IBM 601 Multiplier, first introduced in 1931, which is known to have been the type used by Feynman in Los Alamos. This was the first IBM calculator which could multiply. You can see the stack of iconic 80-column IBM punched cards in the top right of the photograph:

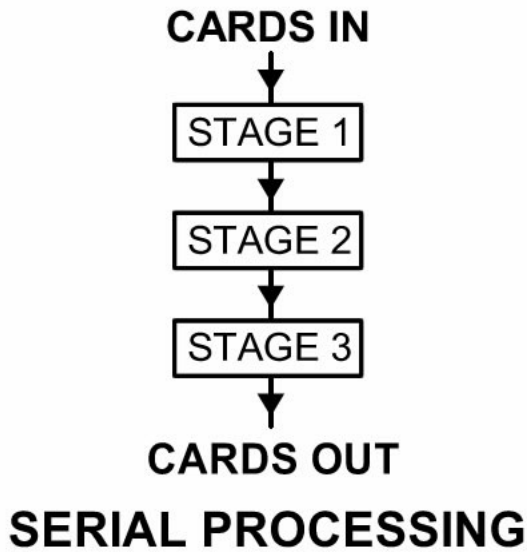


According to the IBM website, the punched card running on machines such as this: "was the dominant form of data processing from 1890 until commercial electronic computers arrived in the 1950s. That's more than a half-century of transforming business in virtually every industry in the world. Machines such as this made IBM into one of the few major corporate success stories of the Great Depression, and launched the company on its path to becoming a computing giant." [1]

However, with each machine only capable of performing a very limited number of different operations — or maybe only one type of operation — any complex operation would require a number of these machines to be placed in a line. The cards output from one machine would then be fed into the next machine in the line — very much like an industrial assembly line. Feynman described this approach: "If we got enough of these machines in a room, we could take the cards and put them through a cycle. Everybody who does numerical calculations now knows exactly what I'm talking about, but this was kind of a new thing then — mass production with machines."

Back in Los Alamos, with each calculating machine performing just one particular operation, this represented a single "assembly line" with each stage being performed in sequence. In modern computing terms, this would represent what we now call *serial processing*.

The following diagram shows Feynman's serial processing arrangement at Los Alamos, with punched cards entering at the top, processed in a series of stages (mechanical calculators), and exiting with the result of the calculation at the bottom of the diagram:

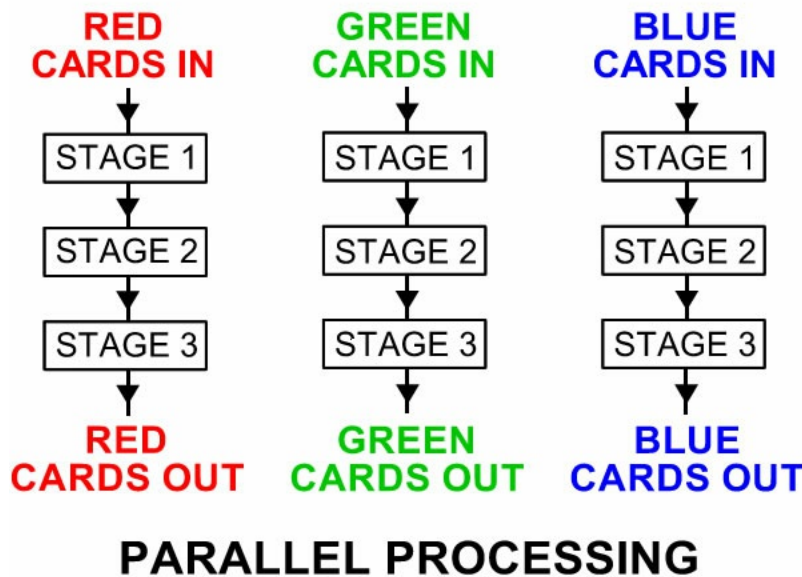


In a mass production system, it is possible to increase output just by adding more assembly lines: the more lines you add, the more items you can manufacture in a day. This represents a move from a **serial** assembly process to a process in which there are many **parallel** lines. As a consequence, the average manufacturing time for each item can be greatly reduced. Feynman applied a similar principle to his serial processing arrangement at Los Alamos.

The way Feynman achieved this was ingenious. He still used a single processing line of machines, but he used cards which were different colours. In that way, he could have many cards being processed on the single line at the same time, with the colours of the cards allowing him to group the cards which were at were at different stages of the process.

Here is how Feynman described this approach: "The problems consisted of a bunch of cards that had to go through a cycle. First add, then multiply — and so it went through the cycle of machines in this room, slowly, as it went around and around. So we figured a way to put a different coloured set of cards through the cycle too, but out of phase. We'd do two or three problems at a time."

Effectively, Feynman had created multiple virtual processing lines which ran in parallel, as shown on the following diagram:



As shown in the previous diagram, this approach represents *parallel processing*. Parallel processing is a computing technique which allows large amounts of data to be processed in a much shorter overall length of time. And it was Feynman's experiments in parallel processing at Los Alamos which planted the seed for the quantum computer in his mind.

In this book we will be examining how a quantum computer uses parallel processing techniques to achieve huge increases in processing speed. And — in honour of Feynman's experiments at Los Alamos — I will be retaining the colour idea ("red", "blue", etc.) in the examples in this book to describe the items being processed in parallel.

Feynman and the Thinking Machine

Feynman proceeded to enjoy a stellar career, being jointly-awarded the Nobel Prize in 1965. By the time of the early 1980s, Feynman had become a professor of physics at Caltech. But he always retained his fascination with computing — and parallel processing in particular.

In the summer of 1983, Feynman took a temporary job as a consultant at Thinking Machines Corporation based in Cambridge, Massachusetts. Thinking Machines had an ambitious plan to design a supercomputer, which aimed to connect 64,000 processors in parallel. The supercomputer was called the Connection Machine.

Here is a photograph of Richard Feynman taken in 1984 while he was working at Thinking Machines Corporation:



Connecting 64,000 processors in parallel might sound like an impossible task, but we will see later in this book that a similar amount of parallelism could be achieved by just 16 quantum bits (because 2^{16} equals 65,536).

The company was being set-up in an old mansion when Richard Feynman arrived just a day after the company was incorporated. The situation was still in a state of confusion when Feynman arrived, saluted, and said: "Richard Feynman reporting for duty. OK, boss, what's my assignment?"

After a quick private discussion ("I don't know what he can do — you hired him!"), they suggested that Feynman could act as a technical advisor, to which Feynman responded: "That sounds like a bunch of baloney. Give me something real to do."

At which point they sent him out to buy office supplies.

Each processor in the Connection Machine was fairly simple, but the network was complex: each processor was

connected to twenty other processors. Feynman was given the job of designing the router, which controlled the traffic flow of data between the processors. The other team members were just glad that they had found something to keep Feynman occupied — or so they thought. Because, in his spare time, Feynman couldn't help wiring the computer room, setting-up the machine shop, and installing the telephones. He also organised the company into teams, relying on his Los Alamos experience: "We've got to get these guys organized. Let me tell you how we did it at Los Alamos."

Feynman revealed the potential of the Connection Machine for simulating aspects of the physical world in which many particles interact at the same time. The example chosen by Feynman was the interactions between the particles which constitute the protons and neutrons in the atomic nucleus. Protons and neutrons are made from elementary particles called *quarks*, and quarks are held together by the *strong force*. The particles which transmit the strong force between the quarks are called *gluons*.

Gluons not only interact with quarks — they also interact with other gluons. Another complicating factor is introduced because the strong force is highly nonlinear. If you read my previous book, you will recognise that when many elements interact in a nonlinear fashion then this represents a system with high complexity. Another example of a nonlinear system is the weather, caused by the nonlinear behaviour of the turbulent atmosphere. Nonlinear systems are notoriously difficult to predict, and there is usually no other option than to split the problem into small pieces and then to use extremely powerful computers to plot the behaviour of those small pieces over time.

As an example of that technique, in order to predict the weather, meteorologists analyse the turbulent and chaotic atmosphere by splitting it into many small pieces maybe a few kilometres apart. A similar principle is used to predict the behaviour of quarks and gluons in the atomic nucleus. The space inside a proton or neutron is split into a three dimensional lattice of points, each point in the lattice representing a different point in space. The lattice can then be mapped onto a parallel processing supercomputer, with each processor in the supercomputer representing a point in space: the finer the lattice, the more accurate is the simulation.

This method is called *lattice QCD* (the theory of the strong force interactions is *quantum chromodynamics*, or QCD).

Feynman used this technique of lattice QCD to map each point in the lattice to a processor of the Connection Machine. He was delighted to discover that the Connection Machine could outperform the conventional computer that Caltech was using for QCD calculations. Once again — as in Los Alamos — parallel processing had proven its ability to tackle a huge volume of data in a reasonable time.

But this got Feynman thinking.

It was clear that a massively parallel computer could outperform a conventional computer in creating simulations of physical systems. This was because the supercomputer was a more accurate representation of how Nature actually works: many small units (particles) interacting in parallel. In that case, wouldn't it be possible to build an even faster and more accurate computer by making it a **perfect** match of Nature, in other words, build a computer which used individual particles as its data elements.

The idea for the quantum computer was forming in Feynman's mind.

The Feynman Lectures on Computation

From 1983 to 1986, Feynman gave a course on computation at Caltech. At the end of the course, Feynman asked one of his colleagues at Caltech, Tony Hey, to adapt his lecture notes into a book. That book is now called *The Feynman Lectures on Computation*. We are lucky that we now have that book generally available so we can follow Feynman's remarkable insights.

The course represented a very different approach to how we now think of "computers" or "computer science". If you browse the computing section of a bookshop, you might find many books on high-level languages such as Visual Basic or C++. Or in the magazine department you might find WIRED magazine, giving you the latest "tech" news about Snapchat or Facebook. For many people, this is what "computing" means nowadays — it's nothing more than fashion, basically.

Feynman, however, considered a very different type of "computing" in his course. Feynman considered the lowest-level of computing, the actual movement of physical material in order to perform a calculation. Feynman considered fundamental physical concepts such as energy, information, and thermodynamics. As Tony Hey says in the foreword of the lecture notes: "As advertised, Feynman's lecture course set out to explore the limitations and potentialities of computers. Although the lectures were given some ten years ago, much of the material is relatively timeless and represents a Feynmanesque overview of some standard topics in computer science. Taken as a whole, however, the course is unusual and genuinely interdisciplinary. Besides giving the 'Feynman treatment' to subjects

such as computability, Turing machines (or, as Feynman says, 'Mr. Turing's machines'), Shannon's theorem and information theory, Feynman also discusses reversible computation, thermodynamics, and quantum computation. Such a wide-ranging discussion of the fundamental basis of computers is undoubtedly unique and a 'sideways', Feynman-type view of the whole of the subject."

(In that quote, Tony Hey mentions "reversible computing" which we will be considering in detail later in this book.)

Because of his interest and aptitude for fundamental science, it appears that Feynman was one of the first people to realise the potential of quantum computing. He was certainly the first person to introduce the principles to a wider audience in his lecture course.

Feynman's proposal for a quantum computer is unveiled in Chapter Six of his book. Feynman's motivation in considering quantum computing at this stage seems to be to treat it merely as an intellectual exercise. Specifically, Feynman seems to be fascinated by how small it might be possible to build a working computer: could just a few particles be made to represent a computer? In that way, Feynman is following a train of thought which started back in 1959 in one of his famous lectures called *There's Plenty of Room at the Bottom* which considered the possibility of creating microscopic machines made of just a few atoms. That lecture was to inspire the field of *nanotechnology*. Feynman's motivation in suggesting quantum computing seems to be merely an intellectual challenge, asking interesting questions, and having a bit of fun in the process. It is classic Feynman.

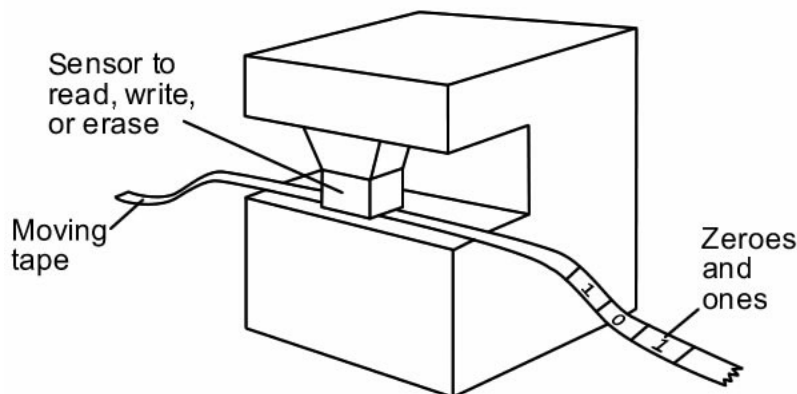
And, at the end of Chapter Six, Feynman comes to the following amazing conclusion: "It seems that the laws of physics present no barrier to reducing the size of computers until bits are the size of atoms, and quantum behavior holds dominant sway."

Feynman had come to his conclusion: quantum computers **were** possible.

The classical computer

However, in his book, Feynman starts by introducing the principles which lie behind the conventional classical computer. "Classical" physics means the state of physics as it existed before 1900, which means it pre-dates the discovery of quantum mechanics and relativity. It is the physics of Newton — not the physics of Einstein and Bohr. Classical physics is also the physics of the great Scottish 19th century physicist James Clerk Maxwell who viewed light as a wave rather than a stream of particles. The computers we use today are all classical computers, based on classical physics.

The template for the classical computer is the *Turing machine*. The Turing machine was invented by Alan Turing in 1936, and it is the simplest possible general computing device. The Turing machine operates by shuffling a long strip of paper back and forth. The tape has a series of zeroes and ones written on it, representing input data and output data. The Turing machine has a probe pointed at the paper which can read, write, or erase the zeroes and ones on the strip:



The machine has an in-built table of rules — the equivalent of a computer program — which tell it what to do depending on the current symbol on the tape and the current state of the machine. The initial set of symbols on the tape would represent the input to the machine, and the final set of symbols — after processing — would represent the output.

So a Turing machine is a computer. But the most remarkable fact about the Turing machine is that **it can solve any problem which can be solved by any other computer**. This is because any computer — no matter how apparently sophisticated it might appear — is, at heart, merely shuffling individual zeroes and ones around according to a list of instructions (a program) just like the Turing machine. Admittedly, other computers might work a lot faster, or might have prettier screens on which to output their data, but the basic problem-solving capability of any computer is just the same as a Turing machine.

Put simply, a Turing machine can compute anything that can be computed.

It is for this reason that the Turing machine forms the model for every modern computer — including the PC on your desk, or your iPhone or iPad. There are some implementation differences: a modern computer writes data to-and-from electronic memory, whereas a Turing machine writes data to-and-from a tape. However, in both cases, only one item of data is read from memory and processed at a time. Wouldn't it be faster if it could work in parallel, processing many data items simultaneously, like Feynman's machine at Los Alamos?

Yes, indeed it would. And that is the promise of quantum computing.

A classical computer is based on classical physics. As you can see from the previous diagram, it is basically a clunky thing. It is based on pre-20th century physics, the physics of Newton and James Clerk Maxwell. A Turing machine — the basis of the modern computer — could have been built in the year 1899 from the technology in existence at that time. To emphasise this point, see the amazing video on YouTube of the Turing machine made of Lego:

<http://tinyurl.com/plasticmachine>

or the Turing machine made of wood:

<http://tinyurl.com/woodmachine>

These contraptions might seem crazy, but they can compute anything your iPhone can compute (at least, in theory).

So the modern digital computer is actually rather old-fashioned. It is, at its heart, a 19th century device. It needs updating for the 21st century. What it really needs is to be based on the extraordinary 20th century phenomenon of quantum mechanics.

Put simply, it needs to become a computer which you can't make from Lego.

It needs to become a quantum computer.

2

THE QUANTUM STATE (OF MIND)

Many books aimed at a general audience have been published attempting to explain the subject of quantum mechanics. The majority of those explanations tend to follow a fairly linear historical series of events, starting in the year 1900 and ending a few decades later. It is a neat story, featuring some of the greatest physicists in history, revealing their heated arguments and strong personalities as they slowly edged their way towards understanding.

Yes, it is a great story. But it is probably a bad way to learn about quantum mechanics.

In his recent book *Beyond Weird*, Philip Ball agrees: "The temptation to tell quantum mechanics as a historical saga is overwhelming". But this is a temptation which should be resisted.

The problem is that for the first two decades of the 20th century, the field known as "quantum theory" — or now known as the "old quantum theory" — was a mess. Nothing made sense. A series of puzzling experimental results had shown that the classical physics of the 19th century could not be entirely accurate. However, the attempts to bring the old physics into line with the new experimental results just resulted in a series of hodge-podge theories which were soon to be discarded. As Philip Ball says: "They cobbled old concepts and methods together". The Wikipedia page on the "old quantum theory" describes the situation as: "The old quantum theory is a collection of results from the years 1900-1925 which predate modern quantum mechanics. The theory was never complete or self-consistent, but was rather a set of heuristic corrections to classical mechanics."

As Philip Ball continues to say: "There is no reason to believe that the most important aspects of the theory are those that were discovered first, and plenty of reason to think that they are not." Even the name "quantum theory" which arose from this period is a bad choice of name. As Philip Ball says: "If we were naming it today, we'd call it something else".

No, if we want to learn about quantum mechanics, then we need to skip forward in time to the mid-1920s. That is because, in 1925, everything changed — and a new light of understanding and clarity was cast over the subject.

In 1925, the "old quantum theory" was superseded by the theory of quantum mechanics, which was separately developed by Werner Heisenberg and Erwin Schrödinger. This was a theory which brought together all the puzzling, arbitrary rules of the old quantum theory into a single, logical theoretical framework. In doing so, quantum mechanics replaced the old classical mechanics.

The old classical model not only had to be replaced by a new theory of mechanics — it also had to be replaced by a new theory of reality! Quantum mechanics represented more than a theory about the behaviour of atoms: it represented a new, more sophisticated way of thinking about reality and how the world must work. Though you might sometimes read of quantum mechanics being described as "weird", I hope to show you that nothing could be further from the truth: quantum mechanics is entirely sensible and logical.

But, more than that, I want to show you that quantum mechanics is more than a theory — it is a new way of thinking about reality, a better, more logical way of thinking about reality.

I want to show you that quantum mechanics is a state of mind.

The new worldview of quantum mechanics

What is reality? From a scientific viewpoint, we can define reality as being the values of the properties of objects, such as particles. For example, if we can fully describe the properties of all the particles which comprise a system, then we have a full definition of the reality of that system.

Over the next few chapters we will be seeing that quantum mechanics considers reality (for example, the property values of a particle) as being divided into two periods of time:

1) The reality of the particle **BEFORE** it is observed.

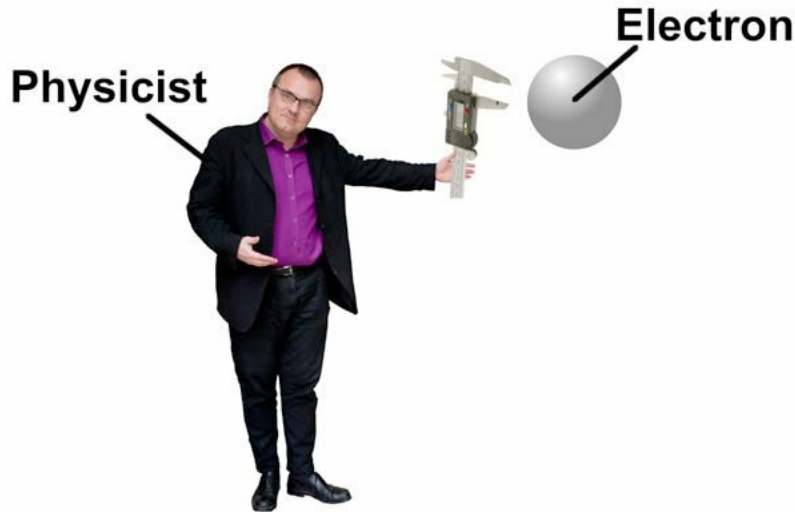
This is not as straightforward as it might sound, raising deep questions about "reality-without-observation" which resemble the old philosophical thought experiment: "If a tree falls in the forest and no one is around to hear it, does it make a sound?"

2) The reality of the particle **AFTER** it is observed.

We shall be seeing that the determination of the particle values when it is observed (measured) involves fundamental uncertainty and randomness which is unavoidably introduced by quantum mechanics.

While this new version of reality revealed by quantum mechanics might seem rather strange at first, I hope to show you that it makes perfect sense, and — when you think about it — you will realise it represents a rather more sophisticated model of how reality must work.

OK, let's start with a simple model of how the classical world was imagined:



The previous diagram shows a physicist holding a highly-sophisticated measuring device. He is going to use his device to measure some property of the electron (not shown to scale).

According to the classical view, this is a fairly straightforward operation. The measuring device and the electron are two clearly defined, separate objects. The electron has a definite reality, in other words, not only does it definitely exist but it possesses definite values for its position, speed, etc. The physicist then uses his measuring device to "extract" those values from the electron, and writes them down. Problem solved.

Only, when you think about it, you realise this can't be a correct picture of what actually happens.

For example, let us imagine the physicist wants to measure the electron's position. As an electron moves, it does not continuously (and conveniently) radiate data about its position. No, if we want to determine the position of the electron, we have to observe it, or interrogate it. Basically, we have to ask it a question. That observation process might involve shining a light on it (like a prisoner undergoing an interrogation), or forcing the electron to come to a rest by hitting a screen and then noting its position. But whatever method we use, we are going to have to interact with the electron, and that interaction is inevitably going to affect the electron. It is unavoidable. The classical model conveniently avoids that fact, but we cannot.

So the value we obtain by our measurement inevitably can not be a 100% perfect measurement of the property of the electron. No, what we actually obtain is a measurement of the property of **the joint system of the electron being measured by the measuring device**. What we are actually observing is an electron being measured — not the electron on its own.

So, by pure logic and reasoning, we can see that this new realisation of how the world must work tells us two crucial facts about reality, which have to be incorporated into the theory of quantum mechanics:

- A measurement inevitably affects the object under observation. We are therefore not measuring the true reality of the object on its own, i.e., the object before it is measured.
- Objects are never completely isolated. The measurement we eventually obtain is a measurement of the joint system: "an electron being measured by a measuring device".

What is more, these principles do not just apply to quantum mechanics. These are general principles which apply to all aspects of our lives. No object is ever completely isolated, and all actions affect the underlying reality.

A rather unusual example of our actions affecting the underlying reality was provided by the billionaire investor George Soros. Soros named his investment fund the Quantum Fund when he realised that his own purchasing actions were inevitably affecting the prices of the stocks and shares he was buying.

The quantum philosophy is a logical philosophy which affects many aspects of our lives.

The quantum state

Let us return to consider the first of the two principles presented in the previous section. It was stated that: "A measurement inevitably affects the object under observation. We are therefore not measuring the true reality of the object on its own, i.e., the object before it is measured."

So when we make a measurement of some property of a particle, all we can ever hope to achieve is to measure the state of the particle after it has been measured, after the measurement process has fundamentally altered the particle in some way. So what can we say about the reality of the particle **before** it is measured? Surely that is what we really want to capture. Surely that represents the true reality of the particle.

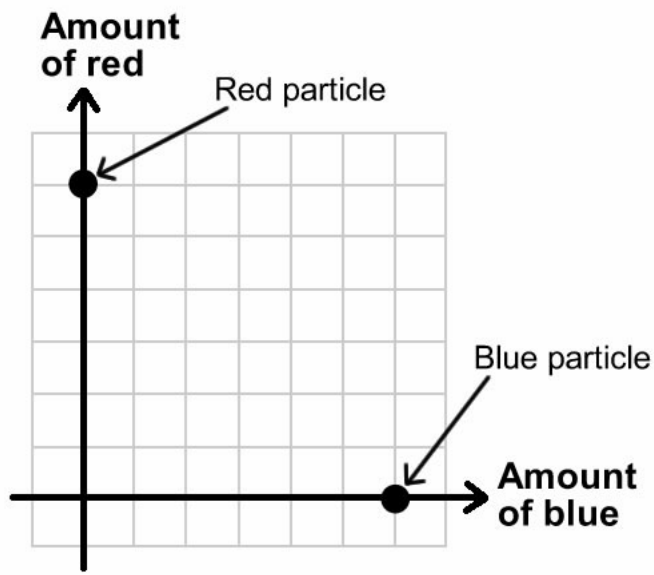
Well, yes, and even though we can never capture that reality of the particle through measurement, we **can** reveal it through mathematics. Mathematically, the state of a system before it is measured is called the *quantum state*, and is conventionally denoted by the Greek letter Ψ (written "psi" and pronounced "sigh").

Sometimes this quantum state is referred-to as the *wavefunction*, with the Ψ symbol being especially associated with the wavefunction. It is called a wavefunction because the physical nature of the quantum state will often resemble a wave (such as the path of an electron around an atomic nucleus, as we shall see later in this book). However, the terms "quantum state" and "wavefunction" both mean essentially the same thing, though I will be preferring the term "quantum state" in this book.

This principle — that Ψ represents the physical reality of the system before it is measured — is expressed several times by the physicist Roger Penrose in his popular science books such as *The Emperor's New Mind*: "I am taking the view that the physical reality of the particle's location is, indeed, its quantum state Ψ ", and again in *The Road to Reality*: "If we are to believe that any one thing in the quantum formalism is actually real, for a quantum system, then I think that it has to be the wavefunction (quantum state) that describes quantum reality." I would agree with Roger Penrose that we should consider the quantum state as representing the reality of a quantum system before observation, and I would encourage you to do the same. This is especially true when, later in this book, you will find that your time spent programming a quantum computer involves rotating a quantum state vector — which makes it feel very "real" indeed!

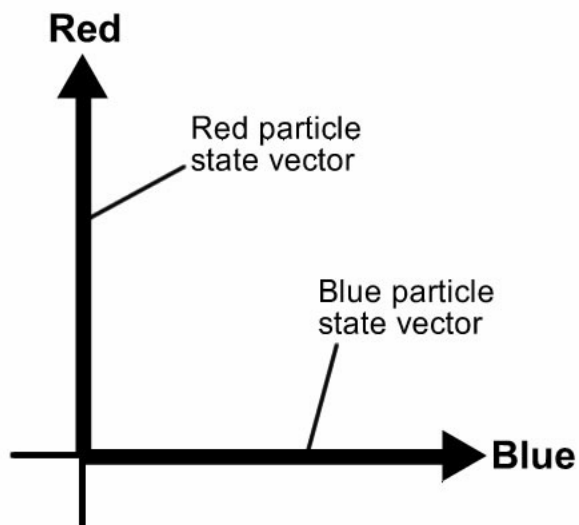
To understand the nature and behaviour of Ψ , let us draw a graphical representation of what happens when we measure some property of a particle. To make things simple, I will use the purely imaginary notion that a particle has some form of visual "colour" of some kind, and when we inspect that particle we will find it to be either "red" or "blue" (in honour of Feynman's coloured cards at Los Alamos).

The following diagram shows the graph. You will see that the vertical axis represents the "amount of red" in the particle, and the horizontal axis represents the "amount of blue" in the particle:



As you can see on the previous diagram, the red particle will have "a lot of red" and "no blue at all", so we plot it high on the "amount of red" axis, but at the extreme left (the zero position) on the "amount of blue" axis. Similarly, the blue particle will have "a lot of blue" and "no red at all", so we plot it on the far right of the "amount of blue" axis, but at the zero position (at the bottom) of the "amount of red" axis.

We can then see that what we have here are two dots plotted which are both the same distance from the origin of the graph (the origin is the zero position of the graph, where the two thick axes cross at the bottom left). So the best way to plot these points is as arrows which have equal lengths, coming out of the origin of the graph. The points representing the particle states (colours) would then be at the end of the arrows:



These arrows are examples of *vectors*. A vector is an arrow which is defined purely in terms of its direction and length. In other words, if two arrows have the same direction and length then they represent the same vector — **even if they are positioned at different points in space**. Please make sure you understand this vitally important principle about a vector: all that matters is the direction and length of a vector — it does not matter where it is.

A vector is usually written as a column matrix, which simply represents the coordinates of the endpoint of the arrow. For example, the red vector arrow in the previous diagram has an endpoint which is some distance up the vertical axis, but has a zero horizontal coordinate, while the blue vector arrow has an endpoint with a zero vertical value and a non-zero horizontal value. Assuming each vector has a length of one unit (which is usual), that means

the two vectors could then be written as the following column vectors:

$$\text{red} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad \text{blue} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

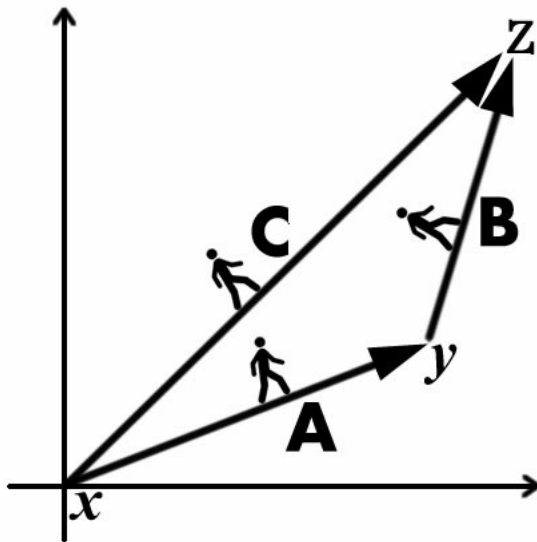
The particular vector which describes the current quantum state of a system is called the *quantum state vector* or simply the *state vector*. We will be encountering these arrows — these "state vectors" — very often in our discussion of quantum computing. We will see that they are absolutely central to understanding how quantum computing works. We will see that programming a quantum computer is basically the act of manipulating a state vector.

But these mathematical vectors are not arrows in the real world — they are not pointing from point A to point B in physical space. No, they only exist as mathematical constructions drawn on a graph. It might help you to visualize them as physical arrows in physical space, but do not make the mistake of thinking that that is their true nature.

So these vectors live in a mathematical world. They are mathematical constructions drawn on a graph. And that particular type of graph is called a *vector space*.

And, now we have moved inside a mathematical world, we have to realise that these vectors behave according to mathematical rules — not physical rules. And one of the rules of a vector space is that we can combine, or add, any two vectors together to make a third vector.

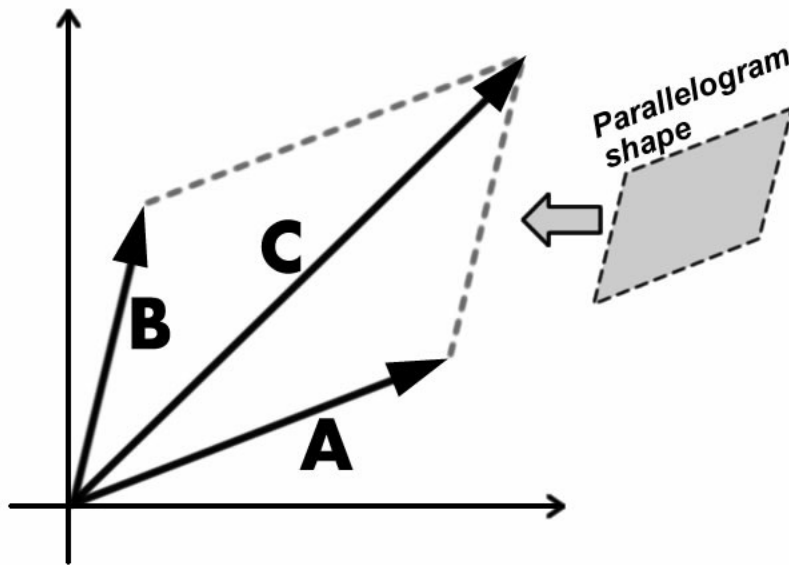
So, how do we add two vectors? Well, remember that a vector is defined as a length in a certain direction. So if we want to add two vectors, we might think of walking along the first vector, continuing in that direction to the end of that first vector, and then from that point continuing to walk along the second vector, as shown in the following diagram:



The previous diagram shows how vector **A** and vector **B** can be added to produce vector **C**. It is equivalent to walking along vector **A** from point *x* to point *y*, and then adding vector **B** by walking a further distance from point *y* to point *z*. As you can see from the diagram, the end result will be as if you had simply walked from point *x* to point *z* directly, so we say that vector **C** (the direct route from point *x* to point *z*) is the result of adding vector **A** and vector **B**.

The following diagram shows a slightly different geometrical method of obtaining the same result. You can again see exactly the same vectors **A** and **B** as in the previous diagram. They are the same vectors as in the previous diagram as their lengths and directions are the same as in the previous diagram — even though vector **B** is not

positioned in the same place as in the previous diagram. Remember: as explained earlier, if a vector has the same length and direction as another vector, then they are the same vector — no matter if they are positioned at different points in space.



You can see in the previous diagram that this second vector addition method involves the drawing of a parallelogram, with vectors **A** and **B** forming two sides of the parallelogram. The result of the addition — vector **C** in this case — is then the diagonal of the parallelogram. You will also see that vector **C** — the result of the addition — is exactly the same as in the previous diagram, so both methods give exactly the same result.

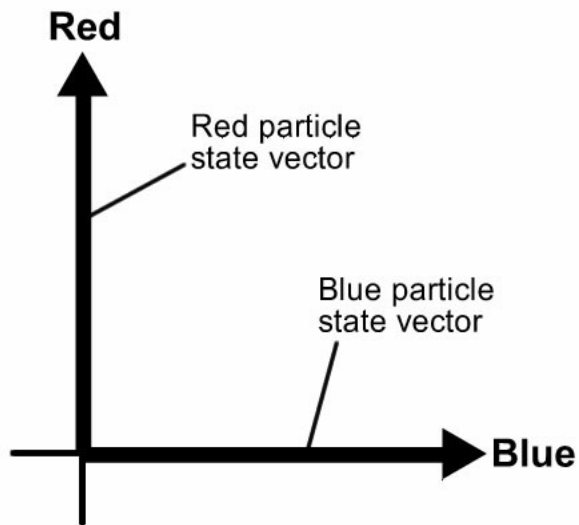
It is this second method — using the parallelogram — which is the most common geometric method for visualising the addition of two vectors. In fact, the method of vector addition is called the *parallelogram law*.

The superposition state

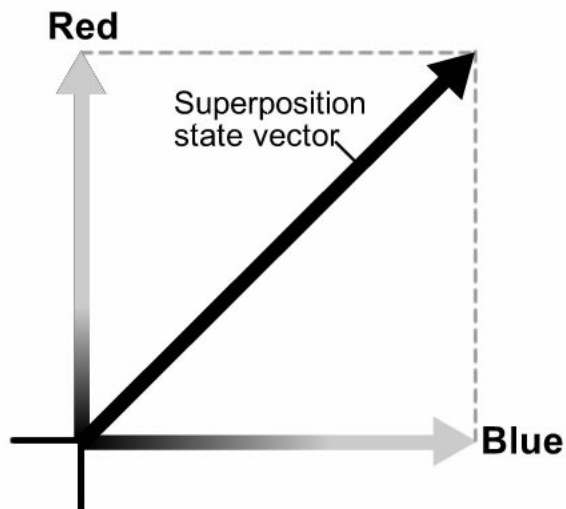
Reality at the quantum level is therefore defined by the quantum state vector. And, as has just been explained, the quantum state vector lives in a mathematical world called a vector space. One of the rules of a vector space is that it is possible to add any two vectors together to produce a third vector — and we have just seen how this is possible.

But this leads to an intriguing conclusion.

If, according to the rules of a vector space, we can add any two vectors together, then let us apply that rule to the vector space presented earlier which described a red and blue particle:



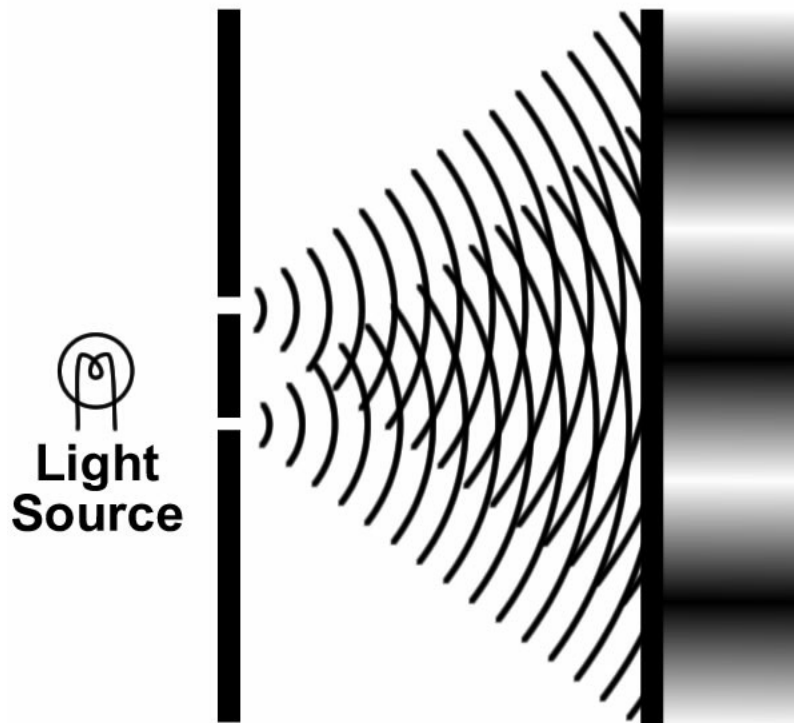
By the rules of the vector space, we can apply the parallelogram rule to add those two vectors, thereby producing a new, third vector:



As you can see in the previous diagram, the parallelogram rule has been applied, thereby adding the two state vectors. As a result, a third vector has been generated which represents the addition of the red and blue state vectors. It is as though the particle has a mix of properties: as though it is both red and blue at the same time.

Initially, this might not seem like a particularly remarkable result. After all, colours can be mixed together (when mixing paint, for example). However, we have to remember that other properties of a particle — for example, its position or momentum — are also described by state vectors in vector space. In that case, how on Earth could a particle have two values of position which are "mixed together"? Can a particle really be in two places at once? This appears to be what the mathematics of vector spaces is telling us.

Well, yes, amazing though it may appear, sometimes a particle can behave as though it is in two places at once. The most famous experiment revealing this behaviour is the double-slit experiment in which a beam of light is directed towards two narrow slits, with a screen positioned on the other side of the slits. The light beam passes through both of the slits, generating an interference pattern on the screen due to the wavelike nature of light:



The interference pattern is generated by light passing through both of the slits, with the light from one slit interfering with the light passing through the other slit. This behaviour is to be expected according to classical physics (James Clerk Maxwell's classical theory of electromagnetism describes light as a wave).

However, now let us consider the situation when the light intensity is reduced so that only a single photon (a photon is a particle of light) is in transit at a time. Over time, a pattern of marks will develop on the screen as the individual photons strike the screen and accumulate. Amazingly, though, over time, the interference pattern is still produced! How can this be, when there is only one photon in the system at a time? It is as if the single photon passes through both slits and interferes with itself! As amazing as this may appear, we have just seen that this is behaviour which is predicted by quantum mechanics and the mathematics of vector spaces (the addition of state vectors).

When a particle has a mix of properties in this way, it is said to be in a *superposition state*. We shall be seeing that the ability of particles to enter a superposition state plays a central role in quantum computing.

Quantum mechanics is not "strange"

Throughout this chapter I have been stressing that we can gain an understanding of quantum mechanical behaviour through mathematics and logical reasoning. Earlier in this chapter it was explained via logical reasoning how a measurement will inevitably affect the object being measured — one of the central principles of quantum mechanics. Then, in the previous section, it was explained how the superposition state — which many would consider to be "strange" — is, in fact, predicted by the rules of mathematics. **In fact, it would be stranger if the superposition state did not exist!** (How can you have a world of mathematics in which you can't add things up?)

And this makes an important point: it is not the quantum mechanical world which is strange — if anything, it is our human-scale ("macroscopic") world which is strange! If there is a puzzle at all in quantum mechanics, it is the puzzle of why we do not see quantum superpositions in everyday objects — why we do not see Schrödinger's famous cat both alive and dead at the same time.

This is a viewpoint which is nicely expressed in the IBM Quantum Experience full user guide (we will be programming the IBM quantum computer later): "By making quantum concepts more widely understood — even on a general level — we can more deeply explore all the possibilities quantum computing offers, and more rapidly bring its exciting power to **a world whose perspective is limited by classical physics.**"

It is an excellent piece of writing. I have placed the phrase "a world whose perspective is limited by classical

physics" in bold, and I would especially like to emphasize the word "limited". The macroscopic world — the classical world — in which we live appears to arise due to limitations which prevent us from seeing objects in superposition states. It would appear there is some strange and unusual mechanism at work which filters-out those superposition states, leaving us with a rather false view of how Nature operates.

In fact, in Chapter Six we will be seeing that this "strange and unusual mechanism" is achieved through a fairly well-understood physical process called decoherence. We will also see that the randomness which plays such a fundamental role in quantum mechanics gets "averaged-out" by decoherence, leaving the human world based on deterministic cause-and-effect which we all know so well. We will also be seeing that it is only by preventing decoherence that we can avoid those limitations of classical physics, thereby unleashing the full power of quantum mechanics in our quantum computers.

In this respect, it is the human world which is peculiar, a rather fake and illusory version of the true quantum reality. As physicists, we must be very careful not to let our human intuition bias us into deciding what is "weird" and what is "sensible". And yet there are still some writers who insist that the quantum world is somehow "weird" — with presumably the human world supposed to represent some paragon of sense and predictability.

The human world is not weird? I mean, seriously? When was the last time they took a ride on the subway ...



Dirac notation

This is the last section in this chapter describing the quantum state. Before this chapter ends, another important piece of notation needs to be introduced. This notation is commonly used whenever the quantum state is considered, and it is used throughout most technical discussions on quantum computing.

Paul Dirac was unquestionably the greatest British physicist of the 20th century. Dirac was one of the pioneers of quantum mechanics, being awarded the Nobel Prize in 1933 together with Erwin Schrödinger — another of the great quantum pioneers (Werner Heisenberg had received his Nobel Prize the previous year). Dirac was a socially-awkward, taciturn character. You can read about his story and work — especially the remarkable *Dirac equation* — in my fifth book which is about particle physics.

One of Dirac's most enduring contributions was by creating the standard form of notation used for describing quantum states. According to the Dirac notation, a quantum state is denoted by simply placing the name of the quantum state inside angled brackets in the following form:

$|red\rangle$

or some other common examples:

$|0\rangle$ or $|1\rangle$ or $|OFF\rangle$ or $|ALIVE\rangle$

When a state vector is described like this it is called a "ket" (as part of Dirac's "bra-ket" notation).
You will encounter this notation throughout quantum mechanics and quantum computing theory — and it is used in the remainder of this book.

3

THE SCHRÖDINGER EQUATION

In the previous chapter, the quantum state vector was introduced. We will see later in this book that programming a quantum computer involves rotating the state vector in various ways, to point in different directions. Each movement of the quantum state vector represents a step towards the completion of a calculation on a quantum computer.

In this chapter, we will be seeing that this rotation of the state vector is actually a well-defined process, with no uncertainty about how the state vector moves. And we will be seeing that the movement of the state vector is described by one of the most famous equations in physics.

The life and loves of Erwin Schrödinger

Erwin Schrödinger was an Austrian physicist who was one of the most important pioneers of quantum mechanics.

Schrödinger was born in Vienna in 1887, and became an exceptionally gifted pupil at school. According to one of his fellow pupils: "Schrödinger had a gift for understanding that allowed him immediately and directly to comprehend all the material." Schrödinger received his doctorate in physics from the University of Vienna in 1910, and became a professor of theoretical physics at the University of Zurich in 1921.

Outwardly, then, Schrödinger lived a highly-respectable and conventional life. However, Schrödinger and his wife Annemarie had an open marriage, with both having a string of affairs. The situation was complicated, to say the least. Annemarie had an affair with the physicist Hermann Weyl, who happened to be a good friend of Erwin Schrödinger. Meanwhile, Erwin Schrödinger was working with his assistant, Arthur March, because he was sleeping with Arthur's wife, Hilde, and eventually fathered a child with her.

By this stage, Annemarie, seems to have become aggrieved by Schrödinger's constant infidelities, but she remained attracted to his intellect and decided to stay in the marriage, saying: "You know it would be easier to live with a canary than a racehorse, but I prefer the racehorse."

Schrödinger persuaded Annemarie to allow Hilde to live in their house, forming an uncomfortable long-term *ménage à trios*. However, living with two women was not enough for Erwin Schrödinger, who had two other girlfriends and had children with each of them.

Here is a photograph of Erwin Schrödinger. I must say, I think he's looking rather worn-out ...



The Schrödinger equation

We will now consider Schrödinger's breakthrough work of 1925, the development of an equation which effectively created the field of quantum mechanics.

Let us imagine we want to observe the value of some property of a quantum system — for example, measuring the momentum or position of a particle (in quantum mechanics, a measured property is called an *observable* of the system). The first thing to be realised is that if we want to measure a certain property then we need to apply a certain measurement operation, for example, we might measure the position of a particle by arranging the particle to collide with a screen. But if we had wanted to measure a different property — for example, the particle's momentum — we would have needed to apply a different operation.

So when we want to measure a quantum system, we first have to decide what property we want to measure, and then that decision determines the particular measurement operation which must be performed. Mathematically, we say we need to apply a different *operator* (an operator meaning a "mathematical operation" of some kind).

It turns out that the operator which has to be used in order to measure the energy of a system plays a particularly important role in quantum mechanics. In this section, we will be considering this energy operator, and discovering why it is so important.

Firstly, the concept of the *Hamiltonian* needs to be introduced. The Hamiltonian is named after the 19th century Irish mathematician William Rowan Hamilton. The Hamiltonian represents **the total amount of energy in a system**. In equations, the Hamiltonian is conventionally denoted by the letter *H*.

The operator which is used to observe the amount of energy in a quantum system is therefore called the Hamiltonian operator, and it has the following form (I know this looks complicated, but don't worry — everything will be explained):

$$\hat{H}(\psi) = i\hbar \frac{\partial \Psi}{\partial t}$$

When the energy operator is written in this way, it becomes the most important equation in quantum mechanics — it is called the *Schrödinger equation*. You've probably heard of it already.

In fact, it was the discovery of this Schrödinger equation in 1925 which created the field of quantum mechanics. And, as we shall be seeing, it is also the key equation needed for building a quantum computer.

Let us consider the left-hand side of the equation first.

The left-hand side of the previous Schrödinger equation is just a statement that this represents the Hamiltonian operator (the total energy of a system), signified by the letter \hat{H} . The little caret symbol on top of the H indicates that this is an operator (in this case, the energy operator). Hence, it needs something to "operate" on. In this case, you can see that it is operating on the quantum state vector as the symbol (Ψ) is included immediately after the \hat{H} .

So all the left-hand side of the equation is doing is telling us that we are dealing with the energy operator operating on the quantum state vector. In other words, we are applying a mathematical operator to measure (or observe) the energy of a particular quantum system.

The right-hand side of the equation is more interesting, as this gives the actual form of the energy operator.

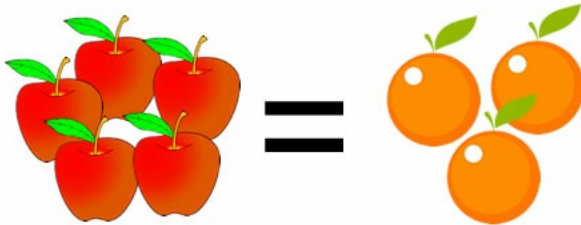
You will see on the right-hand side of the equation that there is a part of the equation which says: [2]

$$\frac{\partial \Psi}{\partial t}$$

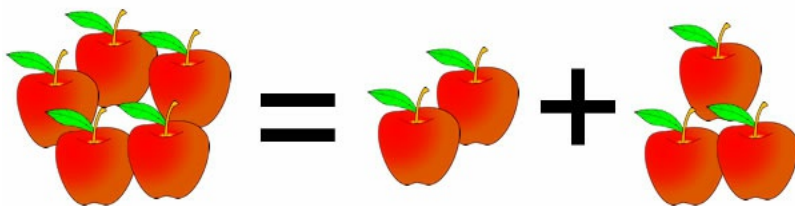
This represents the amount by which the wavefunction, Ψ , changes with respect to time, t . Therefore, the Schrödinger equation reveals how we can change the wavefunction (quantum state) of the system over time: we just need to change the total energy of the system.

Because of this, you might often read in quantum mechanics books that "the Hamiltonian determines the time evolution of the quantum state", or something similar. As an example, in their book *Quantum Mechanics: The Theoretical Minimum*, Leonard Susskind and Art Friedman say: "If we know the Hamiltonian, it tells us how the state of a system evolves with time". So this explains why the Hamiltonian plays such a vital role in quantum mechanics.

You will also see an \hbar symbol on the right-hand side of the equation. Where does it come from, and what does it mean? Well, it's not too difficult. The \hbar symbol (it is a letter h with a line through it, commonly called "h-bar") is the *reduced Planck constant*, equal to the Planck constant divided by 2π . The constant has to be included so that we are dealing with similar units on both sides of the equation. As an example, it would be meaningless if an equation was comparing apples with oranges, representing something like "five apples equals three oranges":



Comparing apples with oranges makes no sense. An equation only makes sense if it compares like-with-like, saying something like "five apples equals two apples plus three apples". The equation is then said to be "dimensionally correct":



If you look at the Schrödinger equation, you will see that there is a term representing energy on the left-hand side

of the equation, so the left-hand side of the equation has units of energy, but the

$$\frac{\partial \Psi}{\partial t}$$

term on the right-hand side of the equation represents the rate of change of the wavefunction with respect to time, the units of which are "inverse time", or "one divided by time". Therefore, it appears the Schrödinger equation is mistakenly comparing apples with oranges! The solution comes by multiplying the right-hand side by the reduced Planck constant, which has just the right units to convert the right-hand side of the equation into a value with units of energy. The resultant Schrödinger equation is then correctly comparing apples with apples, and has therefore become dimensionally correct.

This powerful type of analysis comparing the units on both sides of an equation is called *dimensional analysis*.

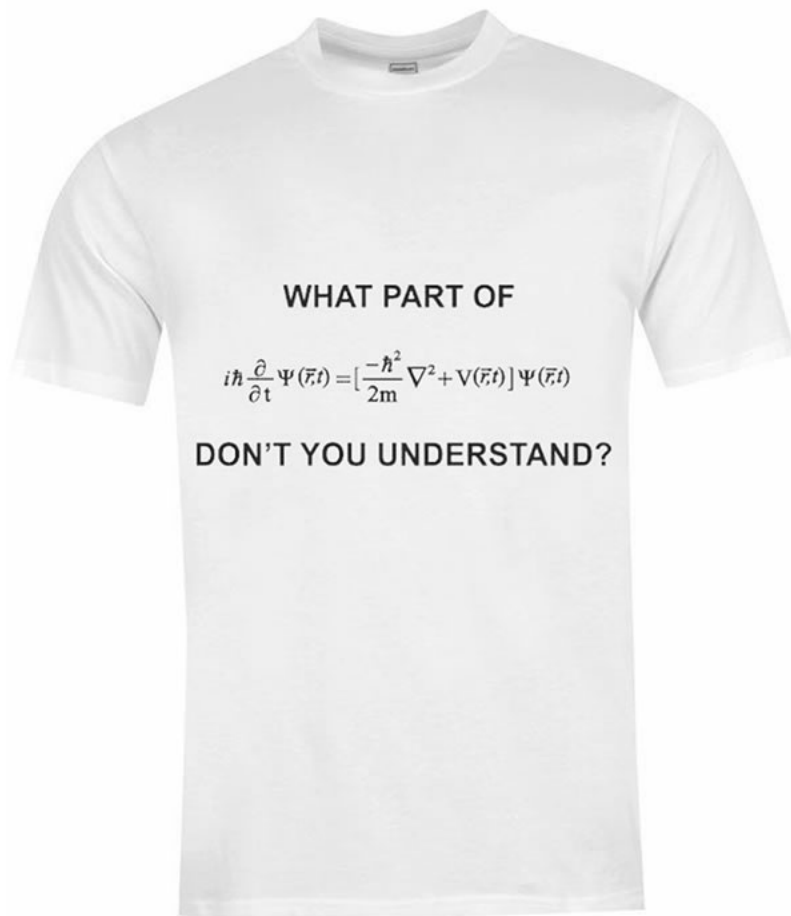
The equation for a single particle

The form of the equation presented earlier is the most fundamental and general form of the Schrödinger equation. However, you will often find the equation written in a slightly different form, aimed at describing a specific common example. That example is the Schrödinger equation for describing a single particle which is moving in a field of energy, for example, an electron moving between two electrically-charged metal plates. In that case, the total energy of the particle will have two terms: a kinetic energy term (kinetic energy is the energy associated with the particle's movement) and a potential energy term (the potential energy of the particle is the energy it receives purely due to its position in the field). Therefore, we can substitute these two amounts of energy into the "total energy" left-hand side of the Schrödinger equation. That then gives us:

$$\begin{array}{c} \text{Total energy, } H \\ \underbrace{\hspace{10em}} \\ \text{Kinetic energy} \quad \text{Potential energy} \\ \underbrace{\hspace{4em}} \quad \underbrace{\hspace{4em}} \\ \frac{-\hbar^2}{2m} \nabla^2 \psi + V\psi = i\hbar \frac{\partial \Psi}{\partial t} \end{array}$$

You will see, though, that if you just replace the left-hand side of the equation (the sum of the kinetic and potential energy) with the total energy, H , you get back to the form of the Schrödinger equation presented earlier.

In their book *Quantum Mechanics: The Theoretical Minimum*, Leonard Susskind and Art Friedman describe this as the "iconic form of the Schrödinger equation that appears on T-shirts":



With reference to the logo on the T-shirt, hopefully you should now understand **all** of the parts of the equation on the T-shirt.

The complete predictability of quantum mechanics

Now, here's a strange thing.

If you have read popular science books about quantum mechanics, probably the first thing you are told is that quantum mechanics leads to inevitable fundamental indeterminacy, or randomness. Einstein referred to "God playing dice". A quantum world is a random world.

In contrast to this indeterminacy of quantum mechanics, Newton's laws of motion are presented as the ultimate in determinacy: once the initial conditions of a system are set, the system proceeds in an entirely predictable manner according to Newton's laws. Applied to the universe as a whole, this predictability due to Newton is called the "clockwork universe".

So, according to many accounts, the contrast could not be greater: on one side we have the predictability of Newton, and on the other side there is the randomness of quantum mechanics.

But, hold on.

You can see that if we consider the Schrödinger equation which describes the evolution of the quantum state, we find not a hint of unpredictability in it. There are no undefined variables in the equation, no random number generators. In fact, it would appear that the behaviour of the quantum state is completely deterministic — not random at all, and not what you might expect from "fundamentally random" quantum mechanics. Roger Penrose describes this surprising feature of the Schrödinger equation in his book *The Road To Reality*: "One thing that we note is that it is a deterministic equation (the time-evolution being completely fixed once the state is known at any

one time). This may come as a surprise to some people, who may well have heard of quantum uncertainty."

In fact, the equation appears to imply that the evolution of the quantum state is just as predictable as the evolution due to Newton's laws. So, what's up?

Well, it is completely true: the evolution of the quantum state as described by the Schrödinger equation is just as predictable and deterministic as Newton's laws. If you set the initial state, then the quantum state will evolve in an entirely deterministic manner — according to the equation. In fact, it seems like a perfect analogue to the determinism of Newton's laws.

So, once again, we find that the quantum world is not "weird" at all.

It is this determinism and predictability of the Schrödinger equation which allows the precise manipulation of the quantum state in quantum computers: if you change the energy, you know precisely how the quantum state will change. You have complete control.

It therefore appears that quantum behaviour is completely predictable. So why do we hear about the "randomness" of quantum mechanics?

That is what we will discover in the next chapter ...

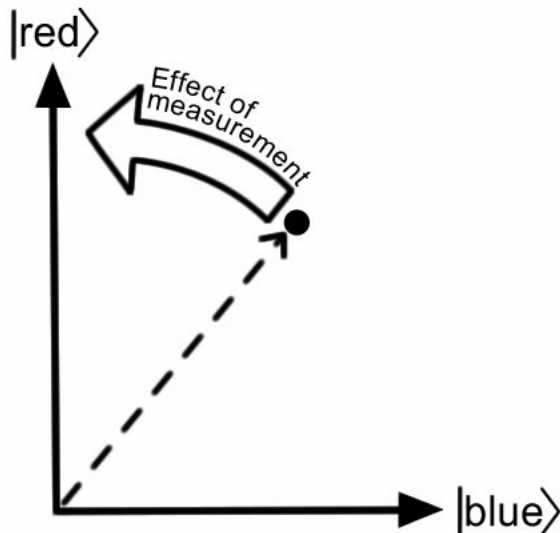
4

OBSERVING A QUANTUM SYSTEM

In the previous chapter, the Schrödinger equation was introduced and it was explained how it describes the evolution of the quantum state. It was also explained how the Schrödinger equation was completely deterministic and predictable. So why do we hear about the "randomness" of quantum mechanics?

Well, we have to remember that the quantum state vector we have considered so far represents the state of the system **before it is observed**, before we measure the system and obtain the value for some property of the system. As explained earlier, before observation, the quantum state can be in a mix of states: both red and blue at the same time. However, when we observe the system, we only ever observe a particle to be in a single, well-defined state: **either red or blue** — but not both. For example, in the double-slit experiment, we would only ever observe the particle to be in a single position — not in two places at once.

So, when we observe a quantum system, it is as if the state vector in a superposition state "collapses" to just a single value. This process has been called the "collapse of the wavefunction", and it is illustrated in the following diagram:



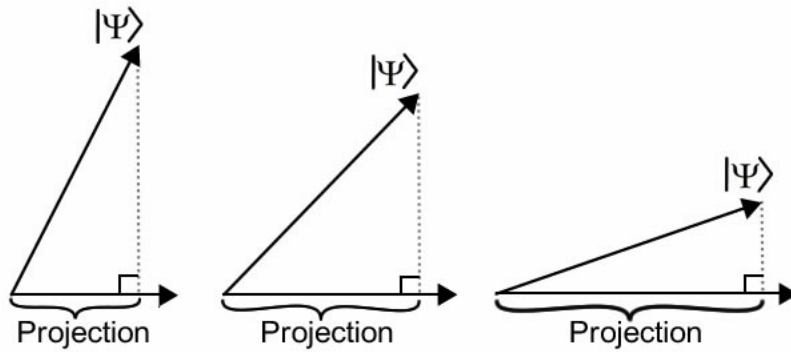
In the previous diagram, you can see what happens during the act of observation of a quantum system. You will obtain an observed value (either red or blue) but, as described earlier, the measurement operation also has the effect of modifying the state vector so that the vector moves from its superposition state to point at the value which has been observed (either red or blue).

So there is a rotation of the state vector from its superposition state to point to a well-defined single state.

Some new terminology needs to be introduced at this point. Firstly, the "well-defined" states — the states which we can possibly observe when we make a measurement — are called *eigenstates*. Secondly, the state vector which represents a particular eigenstate is called an *eigenvector*. So, when we make a measurement, the state vector rotates to become an eigenvector, and the system is then said to be in an eigenstate.

Now we get to the crucial question: what determines which of the possible states we will observe when we measure the system? As an example, in the previous diagram, it seems that the state vector could just as easily have rotated to become a blue state. In that case, why was red selected?

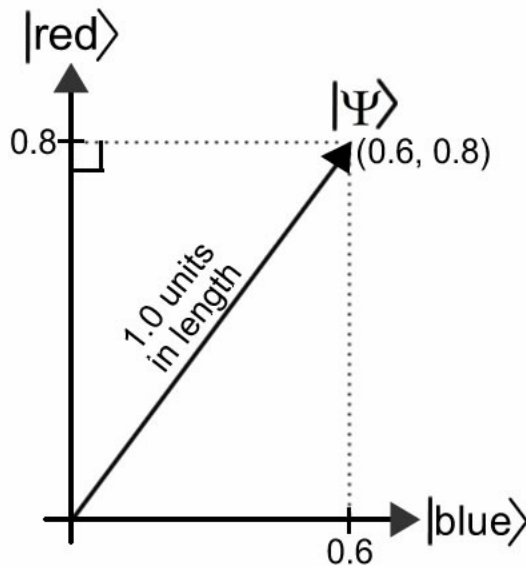
The answer is that the observed value is determined by the *projection* of the state vector onto the relevant eigenvector. This is perhaps easiest explained by the following diagram:



You can see from the previous diagram that — to calculate the projection — a dotted line is first drawn from the tip of the state vector to make a right angle with the eigenvector under consideration (in this particular diagram, the eigenvector is the horizontal line). The projection is then defined as the distance along the eigenvector (along the bottom horizontal) until you reach the dotted line. This is all clearly shown on the previous diagram.

Crucially, the value of the projection then represents the **probability** of that particular eigenstate being selected. **So it is at this observation stage that probability enters quantum mechanics.**

Let us consider an example of how to calculate the value of the projection. Consider the following diagram. A state vector is shown with the tip of the vector at the coordinates (0.6, 0.8):



The vector is 1.0 units in length, in which case it is called a *unit vector* (state vectors are usually defined as unit vectors).

We would like to know what value we will obtain when we observe this particular quantum system. Will the state vector rotate so that it points in the vertical direction (towards red), or will it rotate so that it points in the horizontal direction (towards blue)? In other words, will we observe the particle described by this quantum state vector to be either red or blue?

Well, as stated earlier, the selection of the observed value is determined by the projection of the state vector onto the relevant eigenvector. From the diagram, it is easy to see the relevant projection values from the coordinates of the state vector. You can see the projection along the red eigenvector is 0.8 units, and the projection along the blue eigenvector is 0.6 units.

Remember, these projection values merely give you the **probabilities** of a particular value being obtained after observation. However, in that case, then these particular values of 0.8 and 0.6 cannot be quite correct. We see that there are only two possible outcomes from the observation: **either** we observe red, **or** we observe blue. With only two possible outcomes, we know that the sum of the probabilities of these two outcomes must be 1.0 (as

probabilities always sum to 1.0). So, to calculate the correct probabilities, we have to take the **square** of the projection values, which gives us 0.64 (which is 0.8×0.8) and 0.36 (which is 0.6×0.6). You can see that these new values do, indeed, sum to 1.0. So these are the correct probabilities: the probability of observing red will be 0.64, and the probability of observing blue will be 0.36.

If you consider the previous diagram, you can easily see why this "squaring" rule will always lead to the sum of the probabilities being equal to 1.0. It is due to Pythagoras's theorem: the length of the state vector has been set to 1.0. The state vector is on the hypotenuse of a right-angled triangle, so the sum of the squares of the other two sides of the triangle (the sum of the squares of the two projection values) must therefore be equal to 1.0. [3]

So it is during the act of observation that probabilities enter quantum mechanics, and that is the reason why quantum mechanics has obtained its reputation for randomness and indeterminism.

Calculating eigenvectors and eigenvalues

As far as quantum computing is concerned, this chapter has now explained everything you need to know about what happens when a quantum system is measured. So, if you wish, you may now skip to the next chapter. However, in the remainder of this chapter we will go into a bit more detail about how the eigenstates are calculated, and how those eigenstates explain the behaviour of electrons as they orbit in an atom.

However, like I say, if you do not want to know these details then feel free to skip to the next chapter.

In the previous section it was explained how when we observe (or measure) a quantum system we will only ever observe it to be in a single, well-defined eigenstate, with clearly-defined values. For example, we might find a system in either the red or blue state. However, no explanation was provided as to how those eigenstates — and their associated property values — could be calculated. Where do they come from?

It was stated in the previous chapter that observed values are produced by mathematical operators, acting on the quantum state vector. But, with just a little thought, it can be realised that the application of the operator cannot be entirely straightforward.

To understand why that is the case, it must be realised that the quantum state vector might be pointing in any arbitrary direction before observation. Simply applying the operator to the state vector would then produce a completely arbitrary result — some mixture of red and blue, for example — whereas we need a clearly-defined result from the operation: **either** red **or** blue. Some arbitrary mixture is not good enough.

So the operator must be used in applied in rather a different mathematical manner. But how should we apply it? Well, we have a clue ...

Imagine that the state vector before observation already points in the direction of a well-defined state. For example, it might be pointing in the red direction or in the blue direction. There are two important points which arise in that case.

Firstly, if the state vector is already perfectly aligned with, say, the red eigenvector then the projection of the state vector onto that eigenvector will then be equal to 1.0, meaning they are pointing in precisely the same direction. That means the probability of measuring red will be 1.0. In other words, there will be no uncertainty at all in the measurement (a probability of 1.0 means certainty).

The second point is that if the operator applied to that state vector, it can be realised that **the state vector will not be modified**. [4] The state vector will not be changed because it is already pointing to a clearly-defined state — either red or blue — so there is no need for the state vector to be rotated at all.

So this is a big clue, and it gives us all the information we need. As can be seen from the following diagram, if the measurement operator is applied to a well-defined state vector (for example, red), the result will be an unchanged state vector (still pointing to red). Actually, as only the direction of the state vector is important to define a quantum state, we can say that the result can be some multiple of the original state vector:

When some operator, \mathbf{A} ... operates on the vector ...

... the result must be to leave the vector unchanged (or multiplied by some number, λ):

$$\mathbf{A} \begin{bmatrix} \mathbf{v}_1 \\ \mathbf{v}_2 \end{bmatrix} = \lambda \times \begin{bmatrix} \mathbf{v}_1 \\ \mathbf{v}_2 \end{bmatrix}$$

This type of relationship is well-known in mathematics. Vectors which satisfy this relationship are called *eigenvectors* (which were introduced in the previous section). It turns out that if we have a particular operator (such as the operator \mathbf{A} in the previous diagram) there will only be a few eigenvectors which satisfy the relationship. We might consider these as representing the allowed state vectors (for example, the state vectors red and blue). So this explains why, when we measure a quantum system, we only observe particular values (red or blue, for example). It is because only certain eigenvectors will satisfy the previous relationship.

The quantum state which is associated with a particular eigenvector (the state of red or the state of blue, for example) is called an *eigenstate* (again, a term which was introduced in the previous section).

There is something else interesting in the previous diagram. If a measurement is made, it so happens that the value of the property you will measure will be equal to the λ multiplying factor shown on the previous diagram. The value of λ — the property value you will observe — is then called an *eigenvalue*.

And that is how you find the eigenvectors and eigenvalues (red, blue, etc.) associated with a particular measurement operator. That is how you discover the discrete states and values a quantum system will take after it is observed.

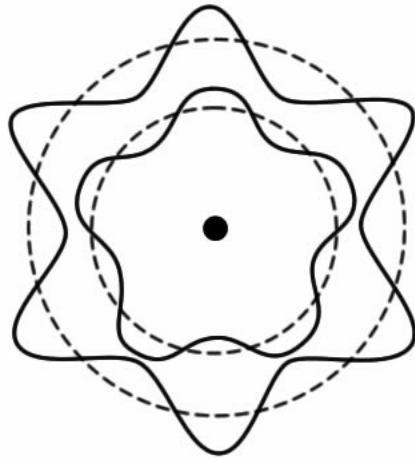
Energy levels of an electron

An atom is composed of an atomic nucleus (made of positively-charged protons and electrically-neutral neutrons) which is orbited by electrons. The "height" — and corresponding energy levels — of those orbiting electrons represents one of the most important examples of eigenstates and eigenvalues.

The puzzle over the energy levels of electrons was one of the great puzzles of the "old quantum theory" period from 1900-1925. It was known that when a substance was heated, it would glow ("red hot" or "white hot") and the emitted radiation represented a form of energy loss from the atom. In 1900, the German physicist Max Planck realised that the radiation being transmitted from the atoms took the form of chunks of energy (known as "quanta"), a realisation that started the "old quantum theory". In 1905, Albert Einstein correctly proposed that the emitted quanta of energy were actually particles, particles which we now call photons. Photons are the particles of light, the particles which are emitted when a substance glows red hot or white hot.

The energy of the emitted photons can only take particular values — not continuous values. This mystery can be understood by considering the energy levels of electrons which are orbiting an atomic nucleus — and then applying our new-found knowledge of the Schrödinger equation (remember: the Schrödinger equation can be used to describe the energy of a particle).

If we consider a diagram of an atom, with the nucleus at the centre surrounded by orbiting electrons, we find that only particular electron orbits are allowed around the nucleus:



On the previous diagram you can see two different electron orbits, shown by the two wavy lines. Only integer values (whole numbers) of waves are allowed around the orbit. You can see that the inner orbit has five complete waves, whereas the outer orbit has six complete waves. These orbits are allowed, but electrons are not allowed to orbit in the spaces between these orbits.

The different orbits represent different energy levels of an electron. Remember from the previous chapter that the Schrödinger equation describes the energy of a particle. The orbits of an electron can then be calculated as the eigenstates of the Schrödinger equation of that electron. Considering the geometric picture of the atom, we can see that the allowed orbits of the electron would represent eigenstates of energy of the electron (with only a few particular eigenstates being allowed). The associated energy levels of the electron would then be the eigenvalues.

One of the great mysteries of the "old quantum theory" in the first two decades of the 20th century was why photons are only ever released from atoms with certain discrete chunks of energy. However, in 1925, with the discovery of the Schrödinger equation, the mystery could finally be solved. Remember, in the atom, eigenstates of energy have discrete values — they are not continuous (capable of taking any value). So when an electron "jumps" from a higher energy eigenstate to a lower energy eigenstate, a photon is released which has energy equal to the difference between the two energy states. This explains why photons are only ever released with certain discrete chunks of energy.

So the theory of quantum mechanics was able to explain the structure of the orbits of electrons in an atom, and the origin of the "quanta" of energy. One the great mysteries of the "old quantum theory" could now be clearly and logically explained by the new quantum mechanics — with the Schrödinger equation at its core.

It also explains why it is best not to treat the development of the theory of quantum mechanics in chronological order: quantization arises naturally when the Schrödinger equation is discovered first — not vice versa.

5

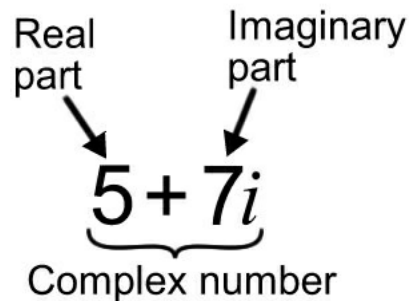
COMPLEX NUMBERS

The use of *complex numbers* is widespread in many areas of science, engineering, and mathematics. In quantum mechanics, complex numbers play a central role.

You might already have an understanding of complex numbers, but a short explanation is that a complex number is a number which is composed of two parts which are added together.

Firstly, the complex number has a so-called *real* part, which is just a number in the usual, conventional sense (for example, 5, 3000, or 12732.506). Secondly, the complex number has a so-called *imaginary* part, which is a number multiplied by i , where i represents the square root of -1 . You might find it strange to consider any number as representing the square root of a negative number, after all, when any number — positive or negative — is squared, that will always result in a positive number. So the fact that i cannot represent a conventional number explains why it forms the so-called "imaginary" part of a complex number.

Here is an example of a complex number:



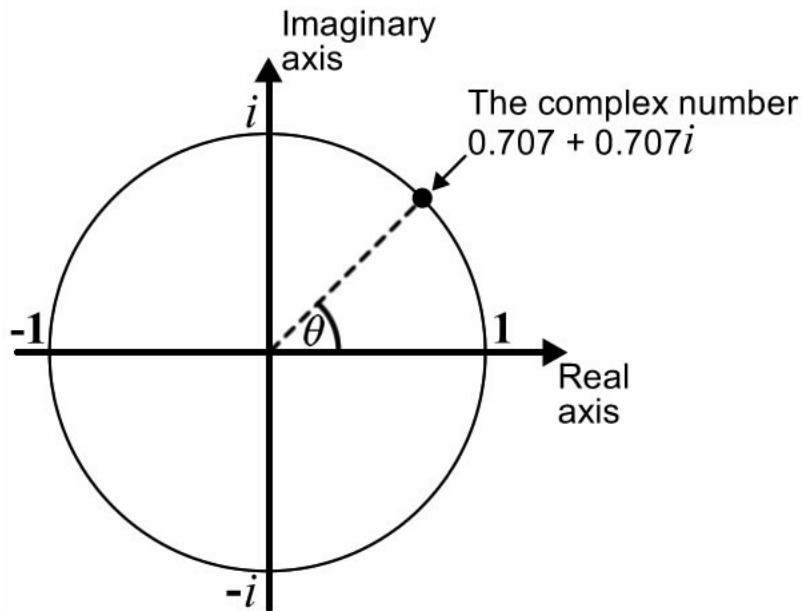
In the chapters so far, we have seen that the quantum state vector exists in a "vector space", and it can rotate in that vector space. The particular type of vector space which is used in quantum mechanics is called a *Hilbert space* (named after the great German mathematician David Hilbert, who we have encountered in my previous books).

The important feature of a Hilbert space is that the coordinates of points can be complex numbers. Therefore, the coordinates describing quantum state vectors can be complex numbers.

The phase of Hilbert space

Let us now consider how the complex nature of the state vector gives each state vector a *phase angle* value.

If you remember, a complex number is composed of two parts: a real part and an imaginary part. Let us consider a complex number with a magnitude of 1.0. In other words, if you were to square the real part of the number, and add it to the square of the imaginary part of the number, the result would be 1.0. From Pythagoras's theorem, we could plot the resulting number on a circle, with a radius of 1.0 (the complex number being a distance of 1.0 from the centre of the circle), as shown on the following diagram:



You can see from the previous diagram that the real part of the number is plotted along the horizontal axis, while the imaginary part of the number is plotted along the vertical axis. You will see that one particular complex number has been plotted as a point on the circle ($0.707+0.707i$, where 0.707 is the square root of 0.5 , so, by Pythagoras's theorem, the complex number has a magnitude of 1.0 and can be plotted on the circle).

This method allows us to think about complex numbers in geometric terms, the complex number being represented by a point at the end of a line from the centre of the circle.

You can also see from the previous diagram that the line from the centre of the circle to the complex number is at an angle θ around the circle measured in an anticlockwise direction from the horizontal axis. We can think of this angle as a *phase*, the phase being able to take any value from 0 to 360 degrees. In other words, any complex number has an associated phase angle.

A quantum state vector exists in Hilbert space, and coordinates in Hilbert space can be complex numbers. Therefore, any point in Hilbert space will have an associated phase angle. In particular, any quantum state vector will have a phase angle associated with it.

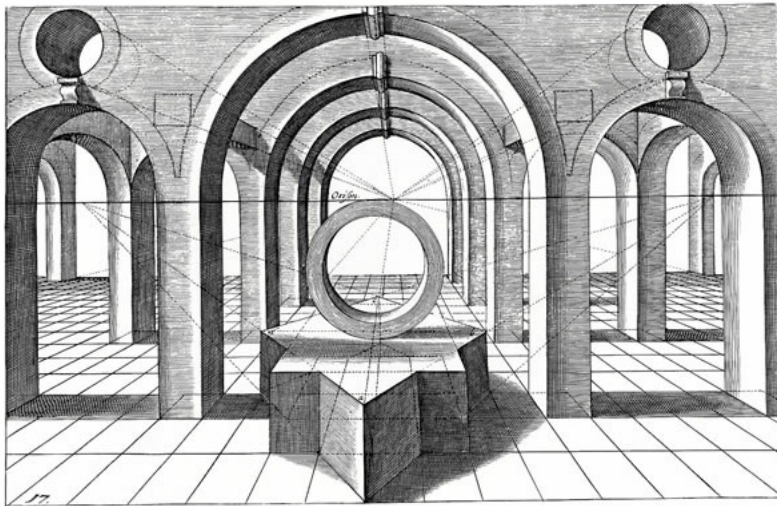
We will be seeing later in this book that awareness of the phase of the quantum state vector is an essential skill required for programming a quantum computer.

6

DECOHERENCE

Quantum mechanics was developed in the early decades of the 20th century. This was a period of global revolution, when the old rules and certainties were discarded. These developments were also reflected in the modernist art of the period, with artists influenced by the new developments from physics.

As an example, artists such as Picasso who pioneered the Cubism movement moved away from the rigid rules of three-dimensional perspective. The rules of perspective implied that the observer was positioned at a single point in space, as shown in the following line drawing by the 16th century Dutch renaissance artist Hans Vredeman de Vries:



The rules of perspective implied that the observer was irrelevant, that the reality of an object or scene could be captured in its entirety even if the position of the observer was fixed in one place.

With the arrival of quantum mechanics in the early 20th century, however, it was realised that the observer was important, that reality was generated from a combination of the observer and the subject.

This principle influenced the Cubism movement, as seen in the following *Portrait of Dora Maar* by Picasso (1937). Picasso attempts to capture Dora Maar from several viewpoints — several observers — and combine those into a single portrait. You can see that the result is a front view of Dora Maar, in combination with a smaller view from the side.

In essence, the following portrait might be considered to be an attempt to represent Dora Maar in a quantum superposition state:



Modernist artists were also influenced by the recent discovery of relativity and the philosophy of Henri Bergson, both of which suggested that time should be considered as being the fourth dimension. Here is an example of Picasso playing with spatial dimensions in his 1910 painting *Girl with a Mandolin*, just four years after Einstein discovered relativity. Picasso is referencing the fourth dimension by stacking a succession of time-slices, "sticking together several three-dimensional spaces in a row": [\[5\]](#)



So art in that era was reflected by developments in physics. But sometimes the relationship works the other way round — sometimes art discovers fundamental truths before physics. This was true in the case of another early 20th century artistic movement: Futurism.

The Futurist movement was based in Italy. The Futurists believed that it was wrong to consider objects in isolation, and that the surrounding environment always played a role in defining the object. As an example, here is a photograph of Umberto Boccioni's 1913 bronze sculpture *Unique Forms of Continuity in Space*. The sculpture depicts a human form in fluid motion, which is blurring into the surrounding space. The result is that the boundary where the human ends and the surrounding environment begins has been blurred. The sculpture can be seen on the reverse of the current Italian twenty cent coin:



The Futurists took their lead from the writings of the philosopher Henri Bergson: "Does not the fiction of an isolated object imply an absurdity, since this object borrows its physical properties from the relations which it maintains with all the others, and owes each of its determinations, and consequently its very existence, to the place it occupies in the universe as a whole? **Any division of matter into independent bodies with determined outlines is artificial.**"

I have placed the last sentence in emphasis: "Any division of matter into independent bodies with determined outlines is artificial". In 1911, the Futurists released their manifesto describing their philosophy about art: "Our bodies penetrate the sofas upon which we sit, and the sofas penetrate our bodies." Indeed, this could be seen as a rejection of the idea from classical physics that objects could be treated in isolation. Just as quantum mechanics — in the early 20th century — was moving away from considering objects in isolation, so was art coming to exactly the same conclusions at exactly the same time.

To reinforce this idea, the Futurists rejected the so-called "tyranny of the frame", preferring pictures to be displayed without frames, the frame around a picture representing a futile attempt to isolate the picture from its environment. In reality, the picture is physically connected to the frame, the frame is physically connected to the wall, the wall is connected to the floor, the floor is connected to the street outside. The boundaries we place on objects — in the style of classical physics — are artificial and misleading. There is an inevitable connectedness. Nothing can ever be perfectly isolated.

Except for, perhaps, one exception ...

...the dark, cold, interior of a quantum computer.

Environmental decoherence

In 1970, Dieter Zeh of the University of Heidelberg published a paper which suggested a mechanism which could explain the mysterious "collapse of the wavefunction".^[6] To understand Dieter Zeh's idea, we need to return to Chapter Two of this book in which it was explained that quantum mechanics inevitably arises when we take a more

realistic and sophisticated picture of how the world must work.

In Chapter Two, two fundamental principles were presented:

- A measurement inevitably affects the object under observation. We are therefore not measuring the true reality of the object on its own, i.e., the object before it is measured.
- Objects are never completely isolated. The measurement we eventually obtain is a measurement of the joint system: "An electron being measured by a measuring device".

It is the second of these two principles which formed the basis for Dieter Zeh's explanation of the apparent "collapse of the wavefunction". It is the principle that objects are never completely isolated from the rest of the universe. The idea that our world is split into entirely discrete, isolated objects is a completely human invention. Think of yourself sitting in your chair. You probably think of yourself as being a separate object from the chair. But the atoms of your backside are pressed against the atoms of the chair, in constant contact. So where is the division? Does that not represent one joined unit? And we could continue the process: your chair is in direct contact with the floor. The floor is directly connected to the Earth. Again, where is the division? How can you justify thinking that you are an entirely separate object from the chair or the planet?

As another example, you breathe air. The air is part of a continuous substance which surrounds the planet and places you in contact with every other living person. In that case, how can you consider yourself to be an entirely separate object?

Of course, you should not think of yourself as being isolated. As has just been described, this was the belief of the Futurist modern art movement. And it is this principle which led Dieter Zeh to propose a mechanism behind the apparent "collapse of the wavefunction". In particular, Dieter Zeh suggested that it was the ever-present environment surrounding an object — constantly "observing" the object — which leads to the object being taken out of its superposition state.

The mechanism is called *decoherence*.

And, once again, we encounter the idea that quantum mechanics is more of a "state of mind", representing a more sophisticated picture of how the world must work. In this case, the principle is that no object is ever completely isolated from the rest of the world.

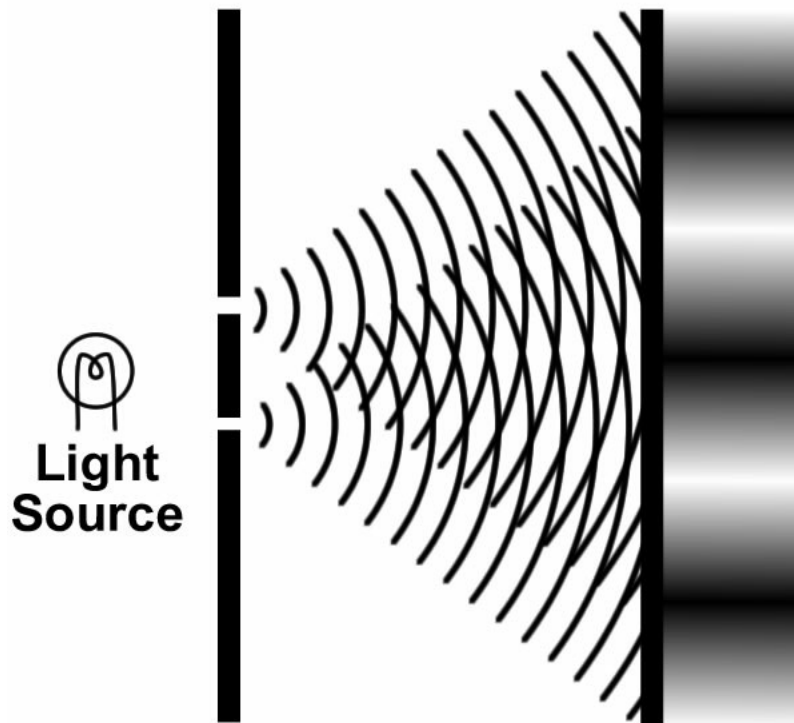
Unfortunately, Dieter Zeh passed away earlier this year. He should surely have received the Nobel Prize in his lifetime for his work in proposing decoherence, which has now been firmly experimentally verified.

We can use a simple thought experiment to explain how decoherence works, and the thought experiment we will use is the double-slit experiment which was described in Chapter Two.

In the double-slit experiment, a beam of light is directed towards two narrow slits, with a screen positioned on the other side of the slits. The light beam passes through both of the slits.

If, at the screen, a peak in the wave from one slit coincides with a peak in the wave from the other slit, then a bright point appears on the screen. Conversely, if a peak in the wave from one slit coincides with a trough in the wave from the other slit, the two waves will cancel at that point and no bright point will appear on the screen.

Therefore, as shown in the following diagram, a regular pattern of dark and bright bands will appear on the screen:



The light intensity is then reduced so that only a single photon of light is in transit at a time. Over time, a pattern develops on the screen as the individual photons strike the screen and accumulate. Amazingly, though, the interference pattern is still produced — even though there is only one photon in the system at a time! It is as if the single photon passes through both slits and interferes with itself!

Let us now make the experiment rather more realistic. We must realise that particles, in general, are never completely isolated from their environment, and that environment will tend to be rather messy and random. Let us consider the effect of the messy, random environment on the single photon.

In a more realistic picture, on its way from the light source to the screen, the photon has to pass through a considerable distance of air (representing the "environment"). That air is likely to be turbulent, moving randomly. As it moves along its path, the photon interacts with the atmosphere, and it, in return, is affected by the atmosphere. The effect of the random, turbulent atmosphere will be to slightly increase or decrease the length of the particle's path to the screen.

Chad Orzel describes the situation in an article about decoherence on his website: "If we're talking about a long distance in a turbid medium, there's going to be a phase shift. If you think in terms of waves, there are going to be interactions along the way that slow down or speed up the waves on one path or the other. This will cause a shift in the interference pattern, depending on exactly what happened along the way. Those shifts are really tiny, but they add up. If you're talking about a short interferometer in a controlled laboratory setting, there won't be enough of a shift to do much, but if you're talking about a really long interferometer, passing through many kilometers of atmosphere, it'll build up to something pretty significant." [\[7\]](#)

The effect of this shortening and lengthening of the path is to very slightly move the position of the peaks and troughs of the light wave. Because the positions become random, the effect is to destroy the interference pattern on the screen.

And, if the interference pattern is destroyed on the screen, that makes it appear as though the photon only went through one slit. Remember, the interference pattern is caused by a photon apparently going through two slits at once. So if the interference pattern is destroyed then the photon no longer appears to be in a superposition state, no longer going through two slits at once.

So we can treat the interference pattern as being an indirect signature of the photon being in a superposition state. And the presence or absence of the interference pattern indicates whether or not the particle is in a superposition state.

At this point, we can put our Sherlock Holmes deerstalker hat on and deduce what is responsible for the apparent

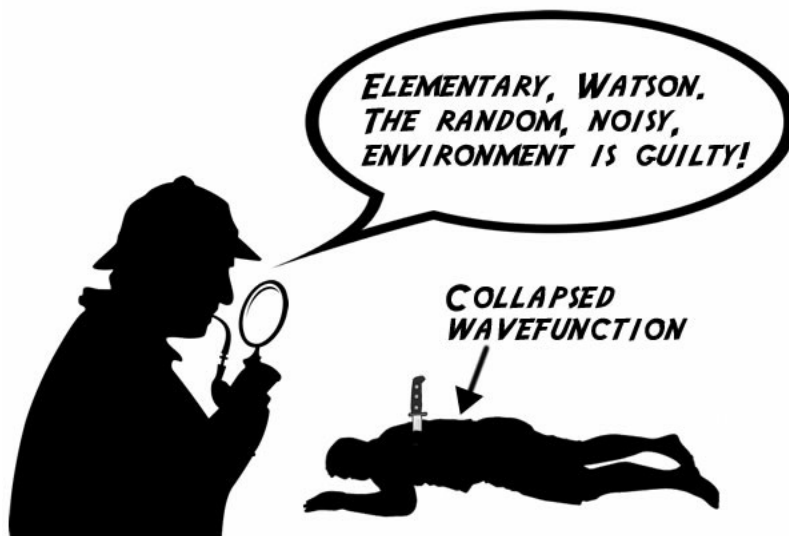
"collapse of the wavefunction", taking the particle out of its superposition.

The initial arrangement of the double-slit experiment produced an interference pattern on the screen. From that interference pattern, we deduce that the particle is in a superposition state.

The second form of the experiment was more realistic, introducing a random environment. The result was that the interference pattern was destroyed. We therefore deduce that the particle is not longer in a superposition state.

So what was responsible for taking the particle out of its superposition state? In other words, what was responsible for the apparent "collapse of the wavefunction" which seems to have occurred?

Well, with our Sherlock Holmes hats on, we observe that the **only** factor that has changed in the two versions of the experiment has been the introduction of a noisy, messy, random environment. Sherlock Holmes once famously said: "when you have eliminated the impossible, whatever remains, however improbable, must be the truth". On that basis, we have all the information we need to make our final deduction: **The apparent "collapse of the wavefunction" is caused by a particle interacting with the noisy, messy, random environment.**



And that is the principle behind decoherence.

But what is actually going on at the microscopic level? How is the random environment capable of taking a single particle out of its superposition state? Well, if all we are interested in is building a quantum computer, or programming a quantum computer, we really don't care. All we have to do is make sure we isolate our quantum computer from its surrounding environment in order to maintain particles in their superposition state. And it is quite fortunate that we don't need to know precisely what is happening at the quantum level because the science of decoherence is not yet fully understood. [8]

However, we do have a fair idea of the sort of process which must be occurring at the microscopic level. Let us consider a particle hitting a screen (with the screen representing the "environment"). It must be realised that the screen is already in a well-defined, classical state. In other words, the screen is not in a superposition state — it is in an eigenstate, meaning the screen only exists in one position. When the particle hits the screen (interacts with the environment), the state vector of the particle finds itself in competition with the state vector of the much larger environment. This means the state vector of the particle — in its superposition state — is going to be affected more than the state vector of the screen.

There will be components of the particle state vector which do not agree with the state vector of the screen. Those components disperse into the wider, noisy environment, much like the splash from a stone thrown into a rough, turbulent ocean. The Schrödinger equation continues to apply to all those components, controlling their evolution in time. In other words, there is no new sudden mystical "collapse" process. However, once those components have dispersed into the "ocean", it becomes effectively impossible to regenerate the original superposition state (this explains why the apparent "collapse of the wavefunction" is an irreversible process). Those superposition elements — to all intents and purposes — disappear. The particle is then detected in only one position: on the screen.

In his book, *The Fabric of the Cosmos*, Brian Greene describes the process: "Decoherence forces much of the weirdness of quantum physics to leak from large objects since, bit by bit, the quantum weirdness is carried away by the innumerable impinging particles from the environment."

So it is almost impossible to completely isolate an object from the rest of the world. But if we want to maintain a

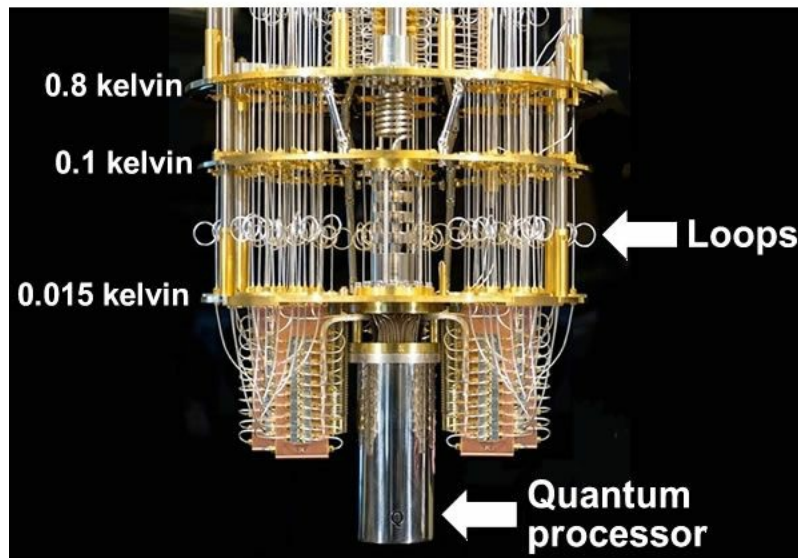
superposition state inside our quantum computer, we need to find some way of achieving that isolation, and thereby preventing that onset of decoherence. Let us now examine how we can achieve that isolation.

The coldest place in the universe

As we have just seen, any form of randomness in the environment can result in decoherence. In particular, any heat in the environment will result in the random motion (thermal noise) of the molecules in the environment. The resultant buffeting of a single particle by those random molecules will result in decoherence, taking the particle out of its superposition state. We will be seeing that quantum computers rely on particles being kept in superposition states for as long as possible. For this reason, quantum computers must be kept at extremely low temperatures to reduce thermal noise to a minimum.

The core of a computer must be cooled to just a tiny fraction of a degree above absolute zero — 180 times colder than deep space. Incredibly, this means that the core of a quantum computer is **the coldest place in the entire universe!**

The following photograph shows the internal structure of an actual IBM quantum computer. You can see that it looks very beautiful and intricate — it has been affectionately described as a "steampunk chandelier". The quantum processor is located in the metal cylinder at the bottom of the construction. The metal cylinder acts as a shield to protect the quantum processor from electromagnetic radiation (which could cause decoherence):



The whole device has to be maintained at an extremely low temperature. However, the signals transmitted down the cables to the quantum chip originate from control units outside the quantum computer — which are therefore at room temperature. So those cables have to go on a journey from room temperature to a temperature colder than space as they travel down the quantum computer structure. As you can see on the previous diagram, by the time the cables reach the top of the device, the temperature has been reduced to about 0.8 kelvin. You can see on the diagram that there are a series of horizontal plates, with the temperature being progressively reduced on each plate. The temperature continues to decrease toward the base of the device, with the actual processor chip being kept at a temperature of just 0.015 kelvin (15 milli-kelvin). At such a low temperature — just a fraction of a degree above absolute zero — atoms become virtually motionless.

The cables are made out of a superconducting material to minimise energy loss (when superconducting materials are cooled to near absolute zero, electric currents can pass through them without experiencing any electrical resistance).

On the previous diagram, you will also notice some ornate loops. These seem to add to the beautiful "chandelier" effect, but they most certainly serve a purpose. The loops are in the coaxial cables which transfer the data signals to-and-from the quantum processor. As the cables contract due to the low temperature, their length decreases and they could break. The loops in the cables ensures there is always some excess length in the cables to prevent them

breaking. You can see similar loops on telegraph poles to stop the cables breaking in cold weather.

The whole device is then contained within a larger cylinder, which acts as a refrigerator, as shown in this photograph which was taken in the IBM Research Center in Yorktown Heights, New York:



The race against time

It is clearly extraordinarily difficult to maintain a particle in its superposition state. The key strategy is to keep the particle isolated from the random, turbulent environment. But even a single stray photon striking an electron effectively performs a "observation" on the position of the electron, and that will be sufficient to take the electron from its superposition state. It gets even worse than that. We might make efforts to eliminate all electromagnetic radiation (photons) from our environment, but there is no shield for gravity. Any change in the gravitational field — the movement of the Moon or Sun, for example — will disturb the particle.

This effect was quantified by John Boccio.^[9] If we have a mass, m , which changes its height by a distance h , then the change in its gravitational energy will be equal to mgh (where g is the acceleration due to gravity).

Then, after a time, t , which is equal to:

$$t = \frac{\hbar}{mgh}$$

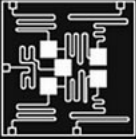
the change in energy will be sufficient to induce decoherence in the mass. If the calculation is performed for a mass of 100 kilograms with h only the length of a single atom, then this decoherence will occur in the extraordinarily short time of 10^{-27} seconds!

This incredibly short time window can be extended by improving the isolation from the environment.

Later in this book, you will be using the IBM Q Experience website to program a quantum computer. On the web page, you will be able to see the real time details of each quantum processor just by clicking on its name, as shown in the following diagram:

> **IBM Q 5 Tenerife** [ibmqx4]

∨ **IBM Q 5 Yorktown** [ibmqx2]



	Q0	Q1	Q2	Q3	Q4
Frequency (GHz)	5.28	5.21	5.02	5.28	5.07
T1 (μs)	62.40	55.10	48.40	59.00	53.30
T2 (μs)	77.50	64.00	54.70	57.30	36.40

Fridge Temperature: 0.0159 K

On the previous diagram, the T2 "coherence times" measure how long it takes for decoherence to destroy the superposition state. For the five quantum bits (or "qubits" — see next chapter) on this particular processor, you can see that the T2 times vary from 36.40 microseconds to 77.50 microseconds. To put that into perspective, maintaining a quantum superposition for that length of time is at the top-end of what is currently possible using today's technology. Also note on the diagram that the "Fridge Temperature" is currently being measured at 15.9 millikelvins — just a fraction of a degree above absolute zero.

Any calculation has to be performed while the particle can be kept in its superposition state — the entire calculation must be performed before coherence is lost. As we saw in the previous diagram, that represents a time period of just a few microseconds. It is therefore clear that, for a quantum computer, any calculation is a race against time.

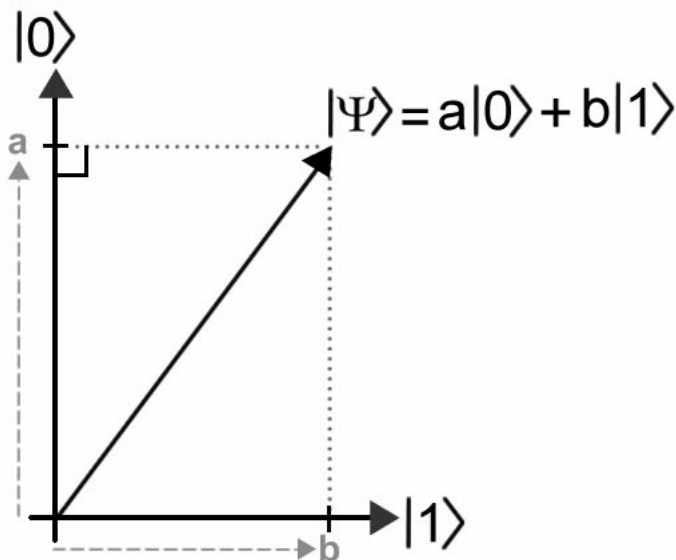
THE QUBIT

In my previous book it was explained how information can be measured in terms of *bits*. A bit (short for "binary digit") is a unit of data which can be either 0 or 1. In a conventional computer, all data is composed of combinations of these bits. In the computer, those bits are represented by different electric voltages: often +5 volts representing a 1, and zero volts representing a 0.

In a quantum computer, the equivalent of a bit is a *qubit* (short for "quantum bit"). In a qubit, the 0 and 1 values represent quantum states, so they are denoted by $|0\rangle$ and $|1\rangle$ (note the use of the Dirac notation). In a quantum computer, all processing occurs before decoherence destroys the superposition state of the qubit. That means a qubit can be in a superposition state and can have the value of **both $|0\rangle$ and $|1\rangle$ at the same time**.

However, when it is observed, it will be found in one of two possible states, $|0\rangle$ or $|1\rangle$.

The following diagram shows a graphical representation of a qubit in a superposition state:



As shown on the previous diagram, the state vector of a qubit can be described by the following:

$$\psi = a |0\rangle + b |1\rangle$$

where a and b are complex numbers (because the state vector is in Hilbert space).

The physical implementation of qubits

If we are only interested in programming a quantum computer, then the actual physical implementation of a qubit on that computer is not of particular interest to us. As Alexandre Zagoukin says in his book *Quantum Mechanics: A Complete Introduction*: "In principle, any quantum system with a two-dimensional Hilbert space can be a qubit". A qubit can be physically implemented in several different ways, but as long as it has only two possible states, then it can be used in a quantum computer.

In fact, bearing this in mind, we have actually been using qubits throughout this book — without realising it. The example of the particle which can have only one of two colours — red or blue — forms a two-state system which

represents a qubit.

One real-world example of a qubit arises from the spin of a particle. In the classical world, if we measure a spinning ball, we might expect to find its axis of rotation pointing in any random direction. However, if we measure the spin of an electron (by noting its deflection as it passes through a magnetic field), we find that only two distinct outcomes are possible: *spin-up*, or *spin-down*.

Before it is observed, the particle can be in a superposition state of *spin-up* **and** *spin-down*, but when it is observed it will be found to be in only one of those states. This is the characteristic behaviour of a qubit, so the spin of a particle can be used to represent a qubit.

However, this is not the technology which is being used in modern quantum computers. A recent technology called the *superconducting charge qubit* is being used by IBM, Google, and Intel. In a charge qubit, the state of the qubit ($|0\rangle$ or $|1\rangle$) is determined by the presence or absence of individual electrons in extremely small pieces of superconducting material. In other words, the state of a charge qubit is determined by the presence or absence of an amount of electric charge. This technology allows several microscopic qubits to be included on the surface of a single integrated circuit (chip).

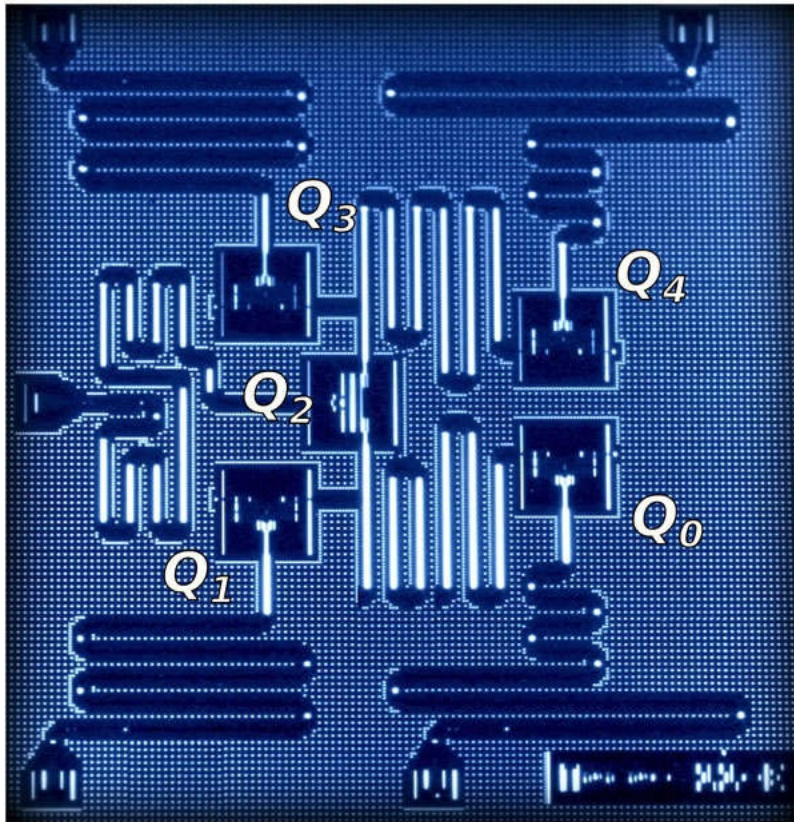
Superconductivity happens when the temperature of certain materials is reduced to close to absolute zero. As a result, the materials acquire zero electrical resistance, so electrons can pass without being hindered — creating an electric current which can continue forever. Superconductivity holds great appeal for quantum computing because an electron which is not interacting with its environment is an electron which can remain in a coherent state — avoiding decoherence. And decoherence is, of course, the enemy of a quantum computer.

In his book *Where Does The Weirdness Go?*, David Lindley considers this ability of superconductors: "A superconductor can behave like a large-scale quantum object, but most macroscopic systems — pieces of ordinary copper wire, pointers on detectors, cats — do not. The distinguishing feature of a superconductor is the orderliness or coherence of the motion of its electrons, which stands in contrast to the disorderly motion of electrons in a copper wire and, in the same vein, the random jiggling around of atoms in most large objects."

A charge qubit is created by placing two microscopic electrodes — extremely fine pieces of superconducting material — onto the substrate of the chip. The electrodes are separated by an insulating barrier (a *Josephson junction*) which normally prevents electrons crossing between the electrodes. However, it is possible for an electron to transfer from one of the electrodes to the other by a process called *quantum tunnelling*. Quantum tunnelling occurs when the wavefunction of an electron (representing the probability of finding that electron) extends to the other electrode, allowing the electron to overcome the insulating barrier.

So there is a finite probability that an electron can tunnel from one electrode to the other, representing a change in state of the qubit. And the probability of that transition is determined by the voltage which is applied to the qubit.

On the following diagram of an actual IBM quantum processor, you can see that the five charge qubits (square shapes) are labelled from Q_0 to Q_4 . The chip shown in this image is actually about five millimetres square:



1mm

But there is something else amazing about this image ...
... **this is a photograph of one of the actual IBM quantum processors you will be programming later in this book!**

The Bloch sphere

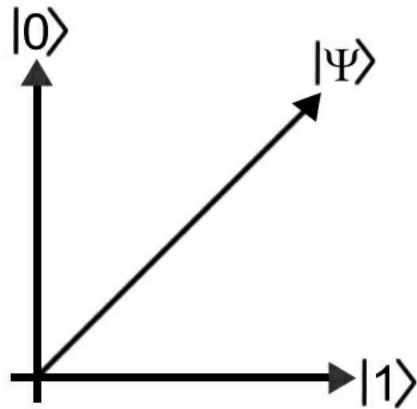
As explained in the previous section, the voltage which is applied to a charge qubit can control the probability of the qubit changing its state from $|0\rangle$ to $|1\rangle$, and vice versa. To be more precise, the voltage modifies the Hamiltonian of the qubit. We encountered the Hamiltonian operator back in Chapter Three during the discussion of the Schrödinger equation. In the simple form of the Schrödinger equation, it was explained how the Hamiltonian determines how the quantum state vector of a system varies with time. So, by modifying the Hamiltonian of a qubit, its state vector can be controlled and rotated. That is how the state of an individual qubit can be modified, and therefore that is how a quantum computer can be programmed.

However, the state vector of a qubit rotates extremely fast. For this reason, the pulses of voltage which are sent to the qubit must be of extremely short duration, just a few hundred picoseconds (trillionths of a second). This places the signal in the GHz microwave frequency range.

As the IBM Q Experience FAQ explains: "Quantum gates are performed by sending electromagnetic impulses at microwave frequencies to the qubits through coaxial cables. These electromagnetic pulses have a particular duration, frequency, and phase that determine the angle of rotation of the qubit state around a particular axis of the Bloch sphere."

But what is the "Bloch sphere" mentioned in that quote?

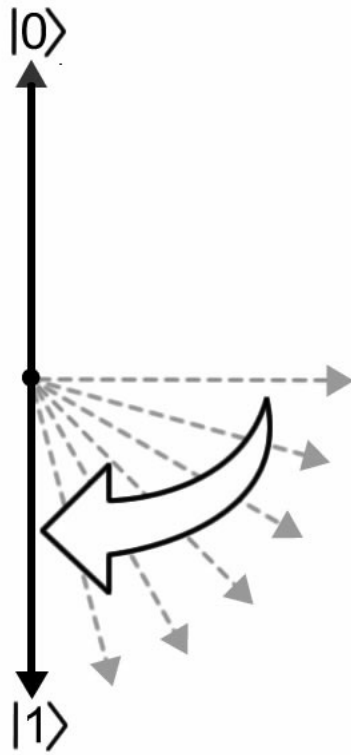
To understand the Bloch sphere representation, first let us again consider the representation of a qubit in Hilbert space, with the state vector representing some mix of the $|0\rangle$ and $|1\rangle$ states:



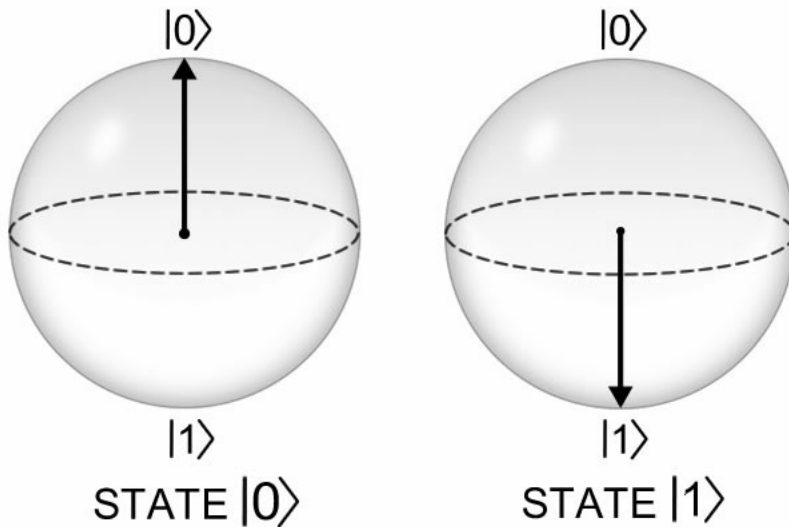
That is a nice, simple diagram to understand. However, just a little thought reveals that it cannot be a correct representation of the full picture. That is because — as was described in Chapter Five — coordinates in Hilbert space can be complex numbers. Therefore, any point in Hilbert space will have an associated phase angle. In particular, any quantum state vector will have a phase angle associated with it. However, there is no way for us to show the phase angle of the state vector on this diagram. The problem is that it is only a two-dimensional diagram, and to show an additional variable — the phase angle — associated with the vector would need us to add an extra dimension, and move to a three-dimensional diagram.

So that is what we have to do.

In order to make the move to a three-dimensional diagram, refer back to the previous diagram and imagine the horizontal $|1\rangle$ vector being pulled downwards so that it ends up pointing downwards as shown in the following diagram:



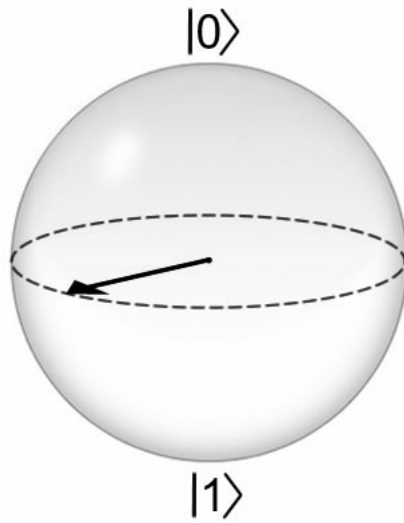
That now allows us to imagine the $|0\rangle$ vector as pointing to the top point on a sphere, and the $|1\rangle$ vector as pointing to the bottom point on a sphere, as shown in the following diagram:



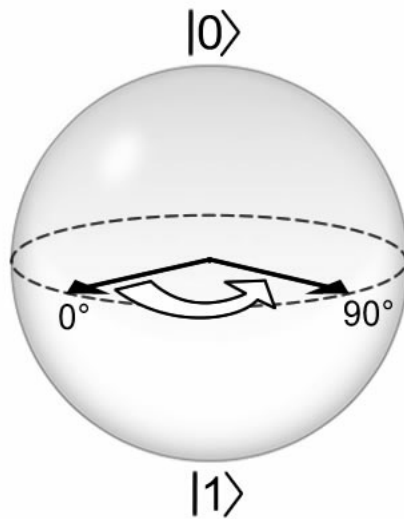
As you can see in the previous diagram, with the state vector pointing to the top of the sphere, that represents state $|0\rangle$, and with the state vector pointing to the bottom of the sphere, that represents state $|1\rangle$.

This method of representing a qubit is called the *Bloch sphere*.

For a qubit in a superposition state — an equal proportion of $|0\rangle$ and $|1\rangle$ — the state vector will point to the equator line, halfway between the $|0\rangle$ and $|1\rangle$ states. The following diagram shows a qubit in a superposition state:



The big advantage of the Bloch sphere method comes when we consider the phase of the state vector. Because we are now working in three dimensions, the phase of the state vector can be represented by the rotation of the state vector around the vertical axis, as shown in the following diagram:



The previous diagram shows a qubit state vector — initially in a superposition state — rotating around the vertical axis to represent a change in the phase of the state vector from 0° to 90° . The qubit remains in a superposition state (the vector is still pointing to the equator, halfway between $|0\rangle$ and $|1\rangle$), the only difference is that the phase of the qubit has changed. Hence, the Bloch sphere method can show the phase of the state vector at any time: it is the amount of rotation of the vector around the vertical axis.

The Bloch sphere representation plays a central role in quantum computing. As we shall see in the next chapter, when you start programming a quantum computer you will be thinking in terms of rotating the state vector of a qubit around in the Bloch sphere.

Entanglement

Now we have come to the end of this chapter on the qubit, it seems like a good time to introduce the important concept of *quantum entanglement*.

In order to understand entanglement, we shall consider a qubit which is formed from the property of particle spin. Particles can have the property of spin, which has the units of angular momentum just like classical spin — the spin of a ball, for example.^[10] However, when we measure the quantum spin of a particle we find it can only have two values: either *spin-up*, or *spin-down*. As these are the only two states we will find after measurement, this makes particle spin ideal to be used as a qubit. As an example, we might interpret the $|0\rangle$ state of our qubit as being spin-up, and the $|1\rangle$ state as being spin-down.

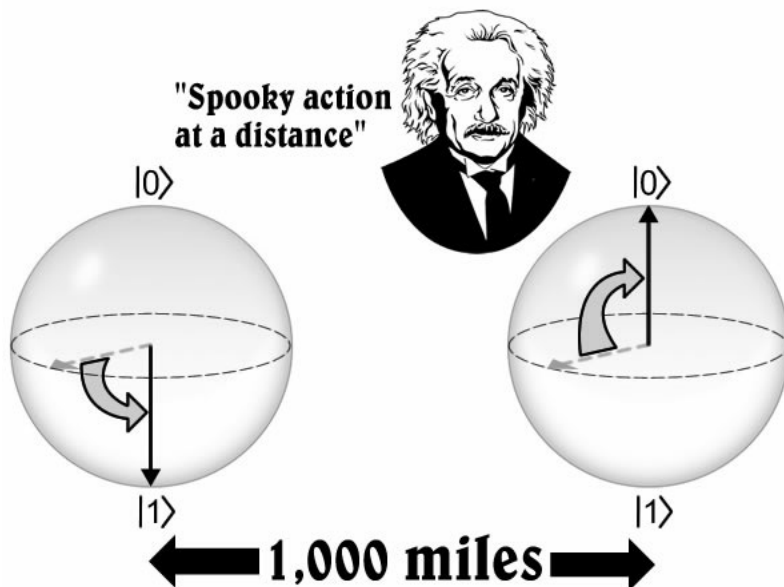
If a pair of photons is released by a common source, then the properties of those two photons will be related. This is because of the conservation laws. For example, the law of conservation of momentum states that the momentum **before** the photons were emitted must be equal to the total momentum **after** the photons were emitted. As the momentum before the photons was zero (nothing was moving), the total momentum after the photons are emitted must also be zero. This requirement can be satisfied if the photons are emitted in precisely opposite directions, because momentum is a vector quantity (like an arrow) and if we add two arrows pointing in precisely opposite directions then we get zero.

The law of conservation of angular momentum imposes a similar constraint of the spin of the photons. As the angular momentum before the photons were emitted was zero (nothing was spinning), then the angular momentum after the spin of the two photons is measured must also be zero. This requirement can be satisfied if the spin of the two particles is opposite: one of the particles being spin-up, and the other particle being spin-down.

When the properties of two separate particles are correlated in this manner, the particles are said to be *entangled*.

When the two particles are emitted, however, they are both in a superposition state, an equal mix of state $|0\rangle$ (spin-up) and state $|1\rangle$ (spin-down). Let us imagine what happens when we measure the spin of one of the particles and find it to be in the spin-down state. That implies that the state vector of that particle has rotated from its superposition state (an equal mix of states) to point toward the spin-down state. At that point, we then know with 100% certainty that when the spin of the second particle is measured it will be found to be spin-up (it must have the opposite spin value). This implies that the state vector of the second particle has also rotated — to point to the spin-up state. When the spin of the second particle is then measured, it will be found to be spin-up with 100% certainty.

These two rotations of the two state vectors (from the superposition state to spin-down and spin-up) are shown in the following diagram:



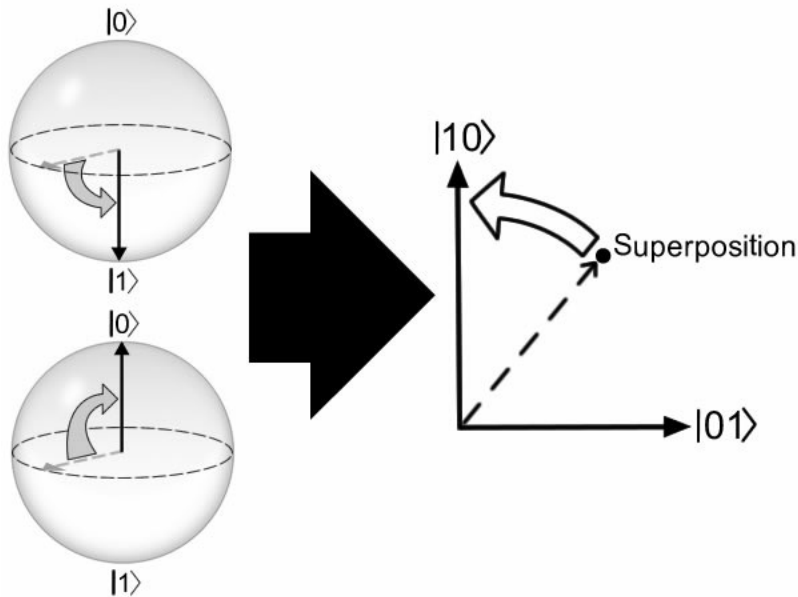
However, when Einstein heard of this behaviour predicted by quantum mechanics, he was horrified. This was because the two particles could, theoretically, be many thousands of miles apart when they are measured. Yet the rotation of the state vector of the second particle appears to happen instantaneously when the first particle is measured. Einstein's own theory of special relativity absolutely forbids this notion of an instantaneous effect being caused by a distant action. Special relativity states that nothing can travel faster than light, so there can be no instantaneous effects at distance. Einstein did not believe this prediction of quantum mechanics, and called it "spooky action at a distance".

The resolution of this mystery is quite simple — but it is fairly mind-bending.

The secret is that an entangled pair of particles can no longer be thought of as two independent systems — they must be considered as being a single system, a single object. As the Wikipedia page on quantum entanglement states: "A quantum state must be described for the system as a whole." And, because they now represent a single object, the two entangled particles are described by a single state vector.

Considering the previous example in which the two qubits had to be found in the opposite states when they were measured, that means the single state vector of the entangled system could only be measured in one of two possible states: either $|10\rangle$ or $|01\rangle$ (meaning if the first qubit was found to be in state $|1\rangle$, then the second qubit would have to be found to be in state $|0\rangle$, and vice versa).

The following diagram shows how the previous situation — with two state vectors — should be replaced by a single state vector for the single entangled system. Instead of two state vectors moving from superposition states to two well-defined (opposite) states, there is now a single state vector (for the entire system) moving from a superposition state to a single well-defined state:



And this model means that all of the old problems about faster-than light causality and "spooky action at a distance" disappear. We are now dealing with a single object, a single state vector. There is no longer a question of "which state vector causes the other state vector to move" because there is only one state vector. If you like, there is no longer a question of "spooky action at a distance" because if there is only one object then **there is effectively no distance!**

However, this neat resolution does imply that entangled particles separated by a great distance must be considered as being a single object. Admittedly, then, if there was one aspect of quantum mechanics that might be considered "weird", then it surely would be entanglement.

Later on in this book, we will be seeing that quantum entanglement plays a vital role in the functioning of quantum algorithms (programs) on a quantum computer.

This book has now covered the fundamentals of the theory of quantum mechanics. So all we need now is a real quantum computer ...

8

THE IBM Q EXPERIENCE

The main headquarters of IBM Research is located in the small wooded town of Yorktown Heights, about thirty miles north of New York City. The center is named after the founder of IBM, Thomas J. Watson.

Some of the breakthrough technologies invented at the center include dynamic random access memory (or DRAM — described in my previous book), and the FORTRAN programming language. Benoit Mandelbrot also discovered the famous Mandelbrot set while working for IBM at Yorktown Heights. IBM may have a reputation for grey corporatism, but that is far from the truth. The most innovative companies are judged on how many patents they are awarded. IBM has far more patents for its inventions than any other American company. In contrast, Apple do not make the top ten. You see, there's science — and there's fashion. Don't get them mixed up.

It is in the Yorktown Heights facility where IBM's quantum computer research is located. In a remarkable feat of generosity, IBM have launched the IBM Q Experience which makes their quantum computers available for use by businesses, universities, and even the general public. The quantum computers can be accessed over the internet ("cloud-based") from their website. The IBM Q Experience is free for all users, which means you can get an account at their website and start using a real quantum computer today.

According to Andrew Houck, Professor of Electrical Engineering at Princeton University: "Thanks to this incredible resource that IBM offers, I have students run actual quantum algorithms on a real quantum computer as part of their assignments! This drives home the point that this is a real technology, not just a pipe dream. What once seemed like an impossible future is now something they can use from their dorm rooms."

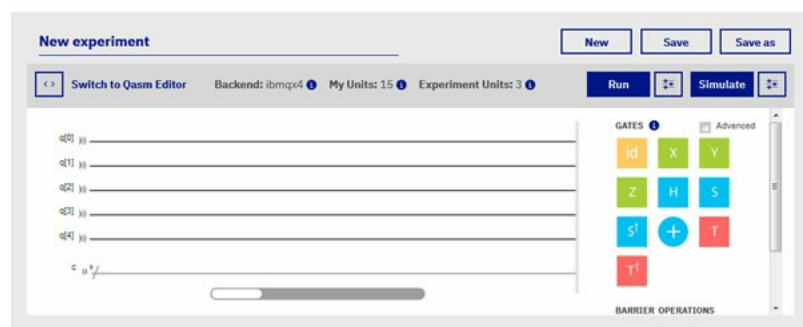
You can easily find the IBM Q Experience website by Googling it, or going to the site directly:

<http://quantumexperience.ng.bluemix.net>

You will need an account before you can start experimenting with the quantum computer. On the top menu bar, you can Sign In if you already have an account, or Sign Up if you do not have an account.

When you have your account, Sign In, which will then take you to the homepage of the IBM Q Experience. There are useful resources on this page, including an excellent Beginner's Guide, and the Full User Guide.

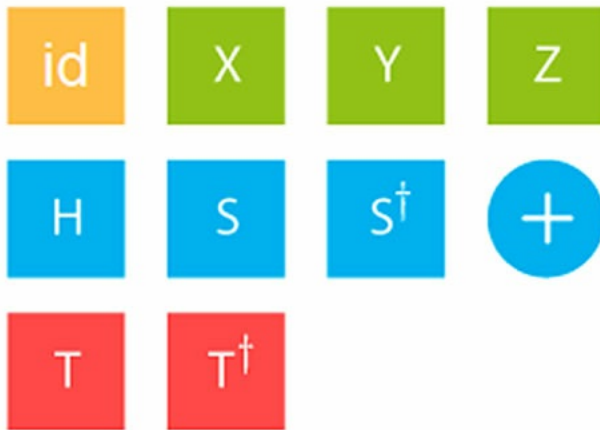
To start experimenting on the quantum computer, click on "Composer" on the top menu bar, which takes you to the Composer window:



In this Composer window, you can see the five horizontal lines, reminiscent of a piece of sheet music (hence the name "Composer").

Each of the five horizontal lines represents one qubit (because the quantum processor available to you currently has five qubits — see the photograph of the actual five-qubit IBM quantum processor in Chapter Seven). You can see on the left side of each of the lines that each qubit starts in state $|0\rangle$.

Individual processing units which modify the state of each qubit are called *quantum gates*. You can see the gates listed as coloured square boxes on the right-hand side of the Composer:



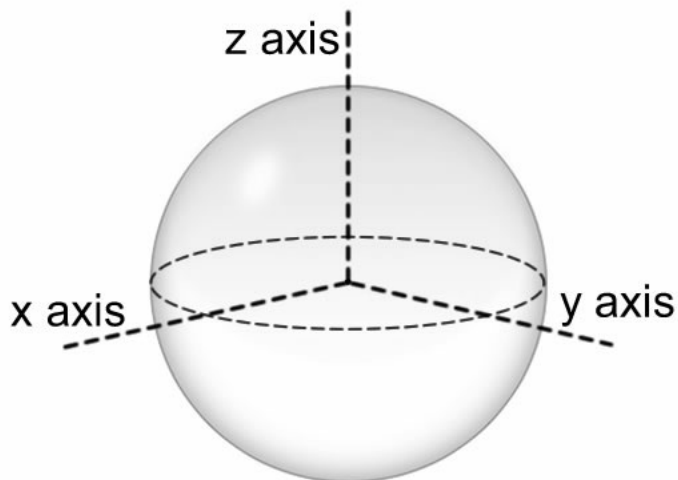
As the qubits pass along the horizontal lines from left to right, the qubits are processed by these gates. The final structure then forms what is known as a *quantum circuit*. The combination of gates provided for you by IBM form the standard set of gates with the whole package being known as the *standard circuit model*. Because of this, even if IBM one day discontinue the Q Experience, your experience of using it — and the standard circuit model described in this book — should remain relevant.

Let us now consider a few of these quantum gates, and show how they can be used to modify the state of a single qubit.

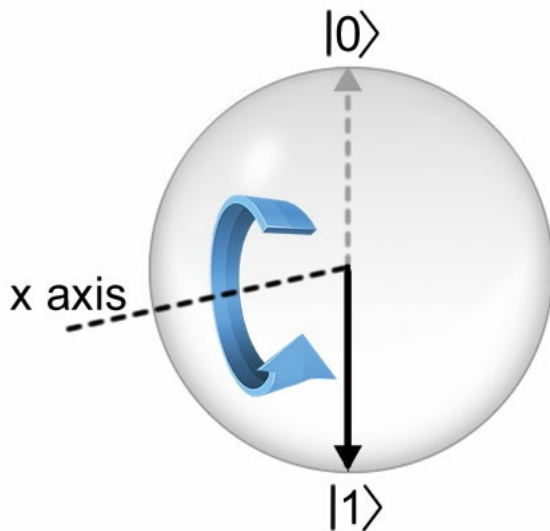
X: The bit-flip

The first quantum gate we will be considering is the X gate. The X gate is listed as one of the square boxes in the IBM Q Experience (see the previous diagram).

As stated earlier in this book, these quantum gates work by rotating the quantum state vector of a qubit. These rotations can be understood by considering the Bloch sphere as having three axes, as shown in the following diagram:



The X gate performs a rotation of 180° around the X-axis, as shown in the following diagram:



As you can see from the previous diagram, the effect of this rotation around the X-axis is to invert (or "flip") the state vector from $|0\rangle$ to $|1\rangle$ (or vice versa from $|1\rangle$ to $|0\rangle$).

The use of the X gate is shown in the following video which I recorded using the IBM Q Experience. You might want to sign-in to the Q Experience and perform the same experiment, or else you can just watch the video.

Here is a link to the video on YouTube:

<http://tinyurl.com/quantumxgate>

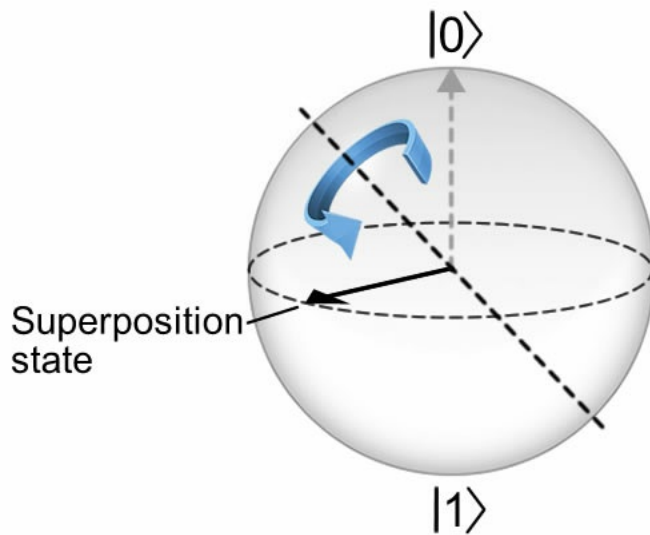
In the video, you will see that I actually use the simulator rather than the real quantum computer. You might find it more convenient to use the excellent simulator for development purposes. This is because a real quantum processor has qubits on a two-dimensional plane — the surface of the chip — so not every qubit can be connected to every other qubit (refer back to the photograph of the actual IBM processor in Chapter Seven). This places some limitations on which qubit can be connected to which other qubit, and you might find this rather frustrating when you are developing on the real quantum computer (it will sometimes not give you the option of connecting certain qubits to certain other qubits). In contrast, if you use the simulator, there are no restrictions on connectivity. Also, if you use the simulator, you get your results immediately, rather than having to wait for your experiment to be queued before it is run on the real quantum computer.

However, for our next experiment, we will be using the real quantum computer ...

H: The Hadamard gate

The Hadamard gate is one of the most useful quantum gates. It is the gate which is used for placing a qubit into a superposition state, an equal mix of state $|0\rangle$ and $|1\rangle$.

You can see the effect of the Hadamard gate in the following diagram of the Bloch sphere. The effect of the Hadamard gate is to rotate the state vector around the diagonal dashed line:



As you can see from the previous diagram, the effect of that rotation is to rotate a vector which is in state $|0\rangle$ (pointing to the North Pole) so that it points to the equator, a superposition state halfway between state $|0\rangle$ and $|1\rangle$.

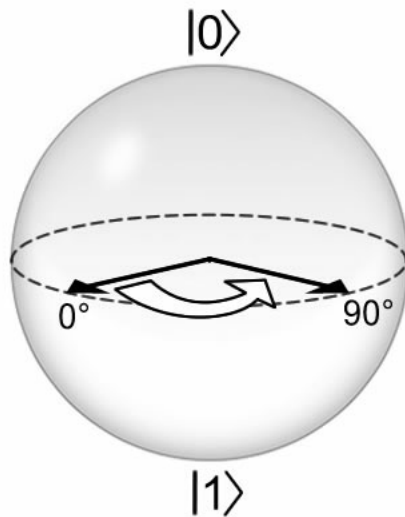
The use of the Hadamard gate is shown in the following video which I recorded using the IBM Q Experience, this time running on a real quantum computer.

Here is a link to the video on YouTube:

<http://tinyurl.com/gatevideo>

Gates which modify phase

All of these quantum gates represent rotations of the state vector in the Bloch sphere. The last set of these gates represent rotations around the vertical Z-axis. As was explained in the previous chapter, rotations around the Z-axis represent a change in the phase of the qubit:



The Z gate performs a rotation of 180° around the Z-axis (just as the X gate performs a rotation of 180° around the X-axis, and the Y gate performs a rotation of 180° around the Y-axis).

Additional quantum gates in the IBM Q Experience include the S gate (which performs a rotation of 90° around

the Z-axis — as shown in the previous diagram), and the T gate (which performs a rotation of 45° around the Z-axis).

So all three of these gates — Z, S, and T — act to change the phase of the qubit.

9

MULTIPLE-QUBIT QUANTUM GATES

In the previous chapter we considered the simple quantum gates which take a single qubit as input, and output a single qubit. However, in this chapter, we will see that if we want to do anything interesting with our quantum computer we will require more complex gates which can take two qubits as input, allowing us to compare and combine the values of those qubits.

These type of multiple-input gates are the simple logical units which form the basis of today's conventional classical computers. So let us start this chapter by examining those conventional logic gates.

Boolean logic

Since the time of Aristotle in 350 B.C., logical reasoning had been the preserve of the philosophers, with their reasoned arguments. For example:

*Socrates is a man.
All men are mortal.
Therefore, Socrates is mortal.*

In the case of this argument, logical reasoning is used to prove that the statement "Socrates is mortal" is a true statement.

In 1847, the British mathematician George Boole wrote a book entitled *Mathematical Analysis of Logic* which attempted to place logic on a firm mathematical footing. George Boole realised that he could create a mathematical system of logic by substituting the number 1 for TRUE and the number 0 for FALSE. These TRUE and FALSE numerical values could then be combined according to strict mathematical laws. The ambiguous arguments of the philosophers could then be replaced by clear, unarguable, mathematical operations.

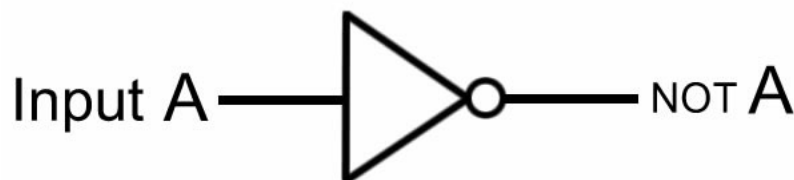
George Boole's method is now called *Boolean logic*.

But what George Boole could never have anticipated was the role that his Boolean logic would play in digital computers (which, of course, were not around in the mid-19th century). At their core, digital computers are based on binary arithmetic, with data bits which can only take the values of 0 or 1. These values, therefore, were a perfect match for the TRUE and FALSE values of George Boole's logical system. When digital computers were invented, George Boole's system was seamlessly integrated. As a result, Boolean logic and Boolean logic gates now form the basis of today's digital computers. The logical thought processes of philosophers such as Aristotle could now be replicated by an automated process — with Boolean logic essentially forming the "thought processes" of the modern computer.

So let us now consider the range of available Boolean logic gates. A logic gate is a device which takes one or more inputs (which can be either 0 or 1), performs some logical operation on those inputs, and produces a single output (which will be either 0 or 1).

Firstly, there is the NOT gate. The NOT gate is unique among Boolean gates in that it only takes one input (which would be either 0 or 1). The output of the gate is then the inverse of the input (the output is 1 if the input is 0, and vice versa).

Here is the symbol for the NOT gate:



The behaviour of a Boolean gate can be described by a *truth table*, as shown in the following truth table for the NOT gate:

A	NOT A
0	1
1	0

You can see a truth table is divided into a left-hand side and a right-hand side. On the left-hand side, all the possible combinations of inputs are listed, and the right-hand side lists the output which will be produced by the gate when it receives those inputs. For the NOT gate, you can see that the output is simply the inverse of the input (the output is 1 if the input is 0, and vice versa).

All the other Boolean gates take two or more inputs. Let us consider the AND gate next.

The AND gate gives an output of 1 only if **both** of its inputs are equal to 1. Here is the symbol for the AND gate:

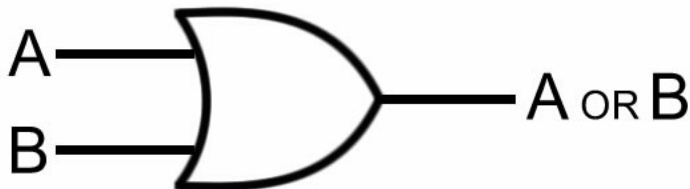


And here is the truth table for the AND gate. Note that the output is 1 only if both of its inputs are equal to 1:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

Now let us consider the OR gate. The OR gate gives an output of 1 if **either** input A **or** input B is equal to 1. Otherwise, the output of the OR gate is 0.

Here is the symbol for the OR gate:

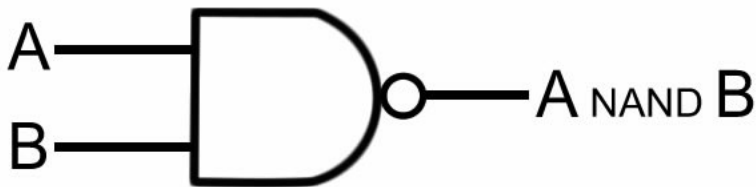


And here is the truth table for the OR gate. Note that the output is 1 only if at least one of the inputs is equal to 1:

A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1

Next, there are the NAND and NOR gates. The NAND gate is similar to the AND gate except its output is inverted (the opposite of the AND gate output). While the NOR gate is similar to the OR gate except its output is inverted (the opposite of the OR gate output).

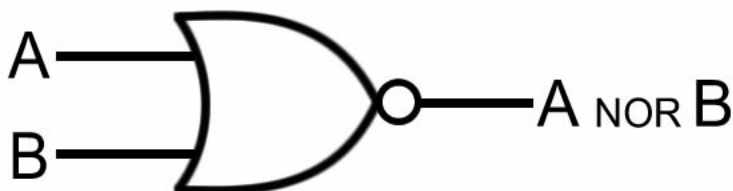
Here is the symbol for the NAND gate:



And here is the truth table for the NAND gate. Note that the output is the opposite of the output of the AND gate:

A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

Finally, here is the symbol for the NOR gate:

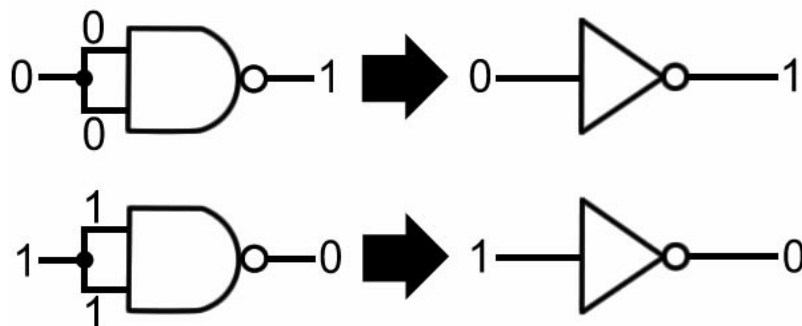


And here is the truth table for the NOR gate. Note that the output is the opposite of the output of the OR gate:

A	B	$A \text{ NOR } B$
0	0	1
0	1	0
1	0	0
1	1	0

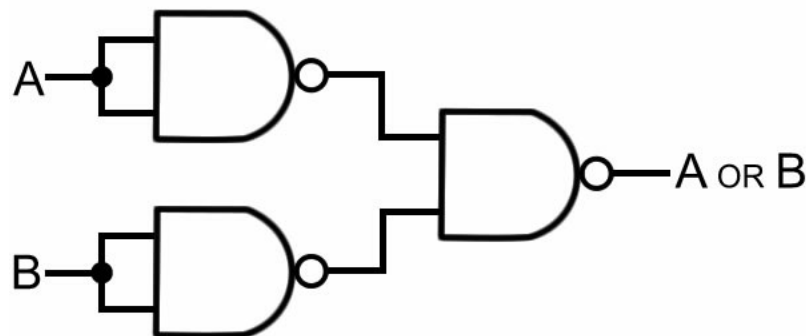
The NAND and NOR gates are particularly important because they are *universal* gates. The term "universal" is used when an object can do anything, it can behave like any other object. A universal logic gate can behave like any other logic gate, and that makes it very useful and very powerful.

Let us consider examples of how a NAND gate or a NOR gate can act like a different gate. Firstly, if both of the inputs to a NAND or NOR gate are the same, then the gate will act like a NOT gate. You might like to check that this is the case by looking back to the truth table for the NAND or NOR gate and seeing that when both inputs are 1 then the output will be 0, and when both inputs are 0 then the output will be 1. Hence, the (inverting) behaviour is the same as a NOT gate. This is shown in the following diagram:



The previous diagram shows how a NAND gate with both its inputs tied together will behave like a NOT gate. This is one example of the universality of the NAND gate.

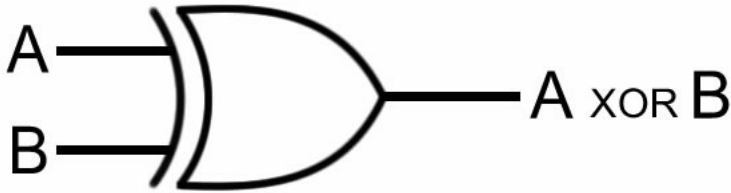
A more complex example of universality is presented in the following diagram. You might like to check from the truth tables that the following circuit of three NAND gates performs like an OR gate:



The previous diagram represents an example of how logic gates can be combined to create more complex circuits. We will be seeing that this is an essential skill for programming a quantum computer — using the quantum equivalent of Boolean logic gates. Fortunately, many IT professionals will already have experience of using Boolean logic gates, so that skill will be transferrable to quantum computing.

The final Boolean gate is the exclusive-OR gate, otherwise called the XOR gate (pronounced "ex-or"). The XOR gate behaviour is similar to the behaviour of the OR gate in that it gives an output of 1 if either input A or input B is equal to 1. However, its behaviour differs from the OR gate when **both** of the inputs are equal to 1. In that case, the output of the XOR gate is 0.

Here is the symbol for the XOR gate:



And here is the truth table for the XOR gate. Note that the output is the 0 when both of the inputs are equal to 1:

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

As we shall be seeing shortly, the XOR gate is of particular importance in quantum computing.



Unfortunately, the life of George Boole was to come to a rather tragic end. One rainy evening, Boole came in to his house with a very slight cold. His wife, unfortunately, had rather peculiar views about curing illnesses: she was convinced that the cure for an illness should resemble its cause. Because of this belief, she proceeded to continuously pour buckets of cold water over the poor man until he died from pneumonia at the age of just 49.

Reversible computing

Our next task is to implement these Boolean logic gates on a quantum computer. We would then have a guarantee that our quantum computer would be able to solve the problems which could be solved using a conventional classical computer. However, in this section we will see that implementing these Boolean gates on a quantum computer is rather tricky.

Let us first consider the AND gate. Here is the truth table for the AND gate which was presented earlier:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

As you can see from the previous table, the AND gate takes two inputs but has only one output. As a consequence, if you were only presented with the output of the gate, you would not be able to say what the inputs had been with complete certainty. As an example, you can see from the previous table that if you knew the output of an AND gate was 0, you would not be able to tell if the inputs had been 0 and 1, or both inputs had been 0. In both of those cases, the output of the AND gate would have been 0. In other words, some knowledge — some *information* — would have been lost through the application of the gate.

This type of two-input Boolean gate is therefore not reversible. If all we know is the output, we cannot "wind the gate back" and get the input values.

This might not seem like a very big deal for a conventional computer. After all, logic gates in a conventional computer only ever have to work in the forward direction. However, it represents a serious problem for a quantum computer.

The problem is due to the nature of the Schrödinger equation which we considered in Chapter Three. If you remember, the Schrödinger equation determines the behaviour of the quantum state vector over time, and the Schrödinger equation states that this motion is proportional to the total energy of the system (the Hamiltonian). As a result, the rotation of the state vector is linear: smooth and predictable. This is called *unitary evolution*. This also means that means the motion of the state vector is completely reversible: you could theoretically "wind back" the rotation of the state vector to an earlier state. Because of this reversibility of the Schrödinger equation, all quantum logic gates must be *reversible*.

However, as we have just seen in the AND gate example, if information is lost then the gate is **not** reversible (the inputs cannot be regenerated from the outputs). Therefore, we can deduce that **no information can be lost in unitary evolution.** [11]

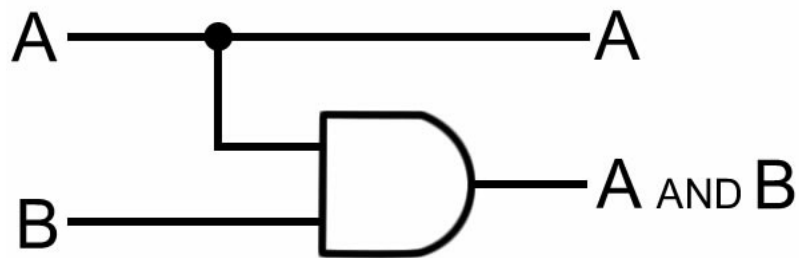
This means that, because the AND gate loses information and is therefore not reversible, it would appear it is not possible to implement an AND gate as a quantum gate.

The CNOT gate

The important point we have just discovered is that information is lost in an AND gate — and the other Boolean gates — and so it appears it cannot be implemented as a quantum gate. Does that mean we cannot make a quantum computer? Let us not give up yet.

Instead, we will now see that there is a clever trick we can use to make an irreversible logic gate reversible. The trick requires carrying-over one of the inputs to the outputs. If both of the outputs are then examined, it is possible to uniquely determine what the inputs were. The gate therefore becomes reversible, and it can be implemented in a quantum computer.

Let us first start with a gate which we have just determined is irreversible — the AND gate — and let us see if this trick works. The following diagram shows an AND gate with one of the inputs carried-over to become one of the outputs:



Let us examine the truth table for this circuit, now with the two outputs:

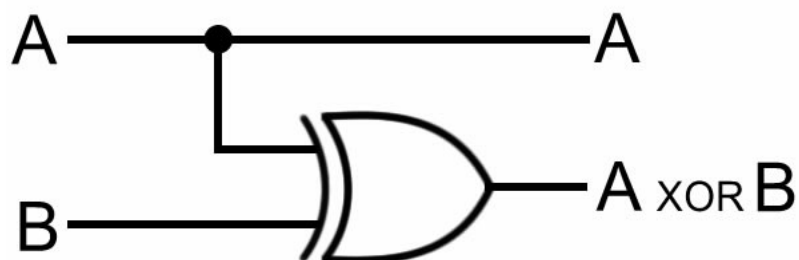
INPUTS		OUTPUTS	
A	B	A	A AND B
0	0	0	0
0	1	0	0
1	0	1	0
1	1	1	1

Same outputs

We can see from the previous truth table that it is still not possible to uniquely identify the inputs from the outputs. For example, you can see that if the outputs of the circuit are 0 and 0, you would not be able to tell if the inputs had been 0 and 0, or 0 and 1. So **information has been lost** and that means that this AND circuit cannot be implemented as a quantum gate.

This is not only the case for the AND gate — you might like to check that this problem also applies to the OR gate, the NOR gate, and the NAND gate.

But let us now consider the exclusive-OR (XOR) gate which was described earlier in this chapter. The following diagram shows an XOR gate with one of the inputs carried over to the outputs:



Let us examine the truth table for this circuit, now with the two outputs:

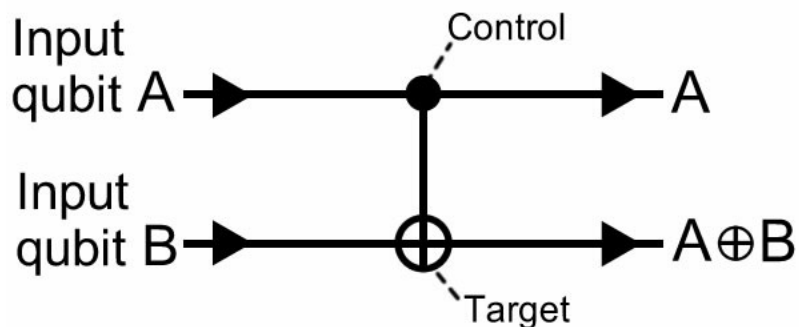
INPUTS		OUTPUTS	
A	B	A	$A \text{ XOR } B$
0	0	0	0
0	1	0	1
1	0	1	1
1	1	1	0

Each of the four output lines are different

In this case, you can see that the two outputs uniquely identify the two inputs. For example, if the output pair is 1 and 1 then we know that the input pair was definitely 1 and 0. So no information is lost, which means this gate is reversible (the inputs can be regenerated from the outputs).

So the XOR gate with one of the inputs carried-over can be implemented as a quantum gate. That means we have managed to discover a reversible two-input quantum gate we can use in our quantum computer! Hurrah!

Here is a diagram of this XOR gate circuit as drawn on a quantum circuit diagram. You will see I have replaced the written "XOR" gate symbol with the standard symbol for the XOR gate which is a circle with a cross in the middle:



You will also see that qubit A has been labelled as the "control" qubit, and qubit B has been labelled the "target" qubit. The reason for this will now be explained, and we shall see it is because of the way the behaviour of this gate is interpreted in quantum computing.

This quantum version of the XOR gate is not called an XOR gate in quantum computing terminology. To see why that is the case, let us examine the truth table for the XOR gate in this circuit, and see if we can interpret it in a different way:

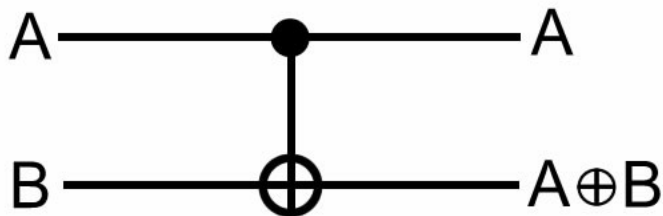
A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

From the previous truth table, we can see that if qubit A is equal to 0, then the output is equal to the value of qubit B. But if qubit A is equal to 1, then the output is equal to the inverse of qubit B (the NOT operation applied to qubit B). In other words, the NOT operation is only applied if qubit A is equal to 1. Therefore, we could interpret the operation as a NOT operation which is controlled by qubit A.

And, indeed, this is how this XOR circuit is described in quantum computing: it is called the controlled-NOT gate, or CNOT gate. To recap, in a CNOT gate, the NOT operation is only applied on a qubit when the value of another qubit is equal to 1.

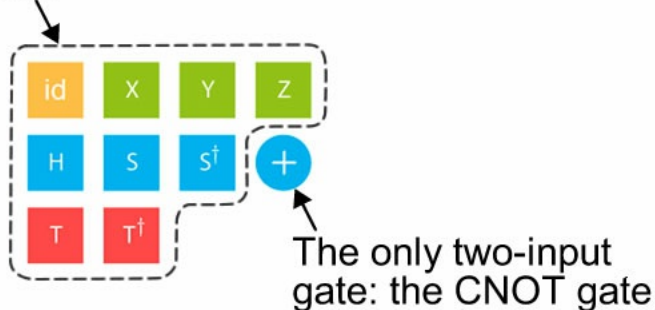
The qubit which controls the operation (qubit A in this case) is called the *control* qubit, and the qubit which is inverted (qubit B in this case) is called the *target* qubit (as shown on the earlier circuit diagram of the CNOT gate).

Here is a diagram of the CNOT gate as shown on a quantum circuit diagram:



So we have discovered that the CNOT gate is the only reversible two-input Boolean logic gate which can be implemented as a quantum gate. This explains the layout of the available gates in the IBM Q Experience:

The single-input qubit gates



You can see in the previous image that the range of gates available to you in the IBM Q Experience (the standard circuit model) include the full range of single-input quantum gates, plus the only possible two-input quantum gate: the CNOT gate.

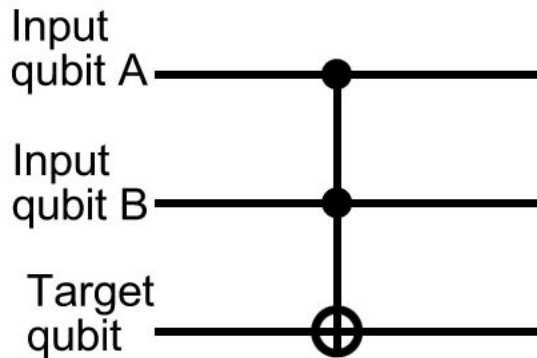
The Toffoli gate is your friend

However, this limited range of gates represents a problem. The problem is that we do not have any universal gates in our set of gates. As described in the earlier discussion on Boolean logic, a universal gate can be used to behave like any other gate. The CNOT gate is our only two-input quantum gate but it is not universal, which means it cannot be used to create all the other possible gates such as AND and NOR. If we want to be able to program anything on our quantum computer, we need to find some way of implementing those other Boolean gates.

A solution emerges when we consider expanding the CNOT gate to take an additional input. If you remember, the CNOT gate is a "controlled-NOT" gate, which means it is really a NOT gate which is controlled by another qubit. We can extend this picture by adding an extra level of "control" — we can control the controlled-NOT gate.

We can get a controlled-controlled-NOT (or CCNOT) gate by having an additional qubit control a controlled-NOT gate. Then, only if this additional qubit is in state $|1\rangle$ is the controlled NOT operation performed.

Here is the symbol for the CCNOT gate, which is more commonly known as the *Toffoli gate*:



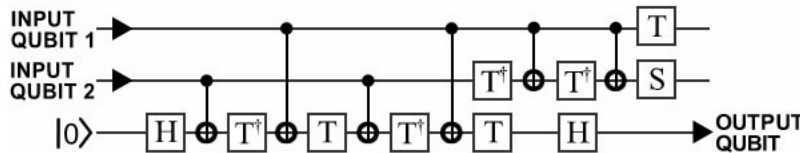
In other words, both input qubits must be in state $|1\rangle$ for the NOT operation to be performed on the third (target) qubit. If the third qubit is initially in state $|0\rangle$ you can see that the Toffoli gate acts like an AND gate. That is because the third qubit will be inverted — changed to $|1\rangle$ — only if the other two qubits are both set to $|1\rangle$. And that is the characteristic behaviour of an AND gate (output equal to 1 when both inputs are 1).

What is more, it is easy to see that if the third qubit was initially in state $|1\rangle$ rather than state $|0\rangle$ then the Toffoli gate would act like a NAND gate rather than an AND gate. This is because if both input qubits were in state $|1\rangle$ then the target qubit would be flipped to be in state $|0\rangle$ — and that is the characteristic behaviour of a NAND gate (output equal to 0 when both inputs are 1).

That's great, because we know the NAND gate is universal, so we now have a universal set of quantum gates.

And what makes that such great news is that if we have a universal set of quantum gates then we have a guarantee that **we can calculate anything on our quantum computer which can be calculated on a classical computer!**

The Toffoli gate is not available as one of the gates within the IBM Composer. However, it is possible to program it using the available gates as shown in the following diagram: [\[12\]](#)

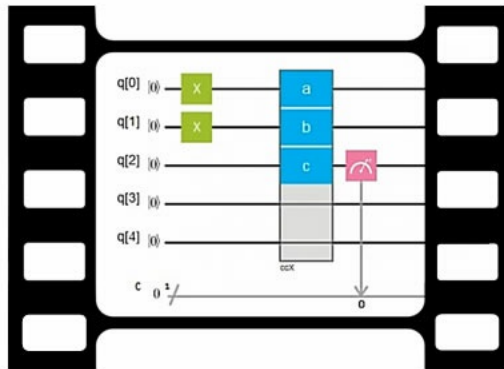


It is an interesting experiment to create the Toffoli gate as shown in the previous diagram inside the IBM Composer (I tried it, and you might like to try it too), but it clearly requires a lot of gates just to create the equivalent of a single Boolean AND gate. Fortunately, those thoughtful people at IBM have provided us with a simple form of the Toffoli gate for us to use. The developers at IBM have placed the previous arrangement of gates into a *subroutine* — a single gate which contains a series of many other gates — which means it is now a simple task to include the Toffoli gate on our circuit diagrams.

The use of the Toffoli gate subroutine is shown in the following video which I recorded using the IBM Q Experience. Here is a link to the video on YouTube:

<http://tinyurl.com/gatevideo3>

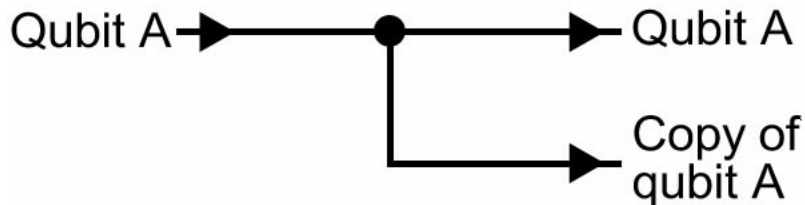
And here is a still from the video:



Now, to finish this chapter, the final two short sections will consider some of the useful side-products of the CNOT gate.

Copying a qubit

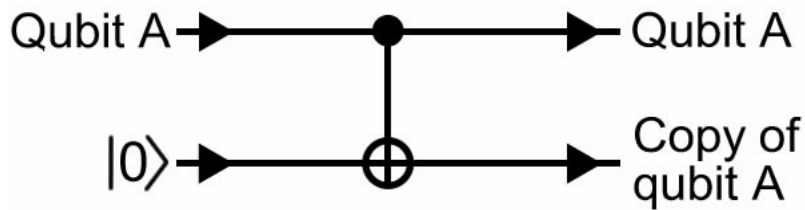
Sometimes while writing a quantum computer program you might find it useful to copy the value of a variable or qubit. You might imagine it would be easy to copy the value of a qubit in a quantum circuit diagram simply by using a T-junction:



However, that is not the case: T-junctions such as the one shown in the previous diagram cannot exist on quantum circuit diagrams. This is due to the *quantum no-cloning theorem* which states that a quantum state cannot simply be duplicated as shown in the previous diagram.

However, it is possible to use the CNOT gate to copy the value of a qubit to another qubit, and you will surely find that very useful when you come to writing your own quantum computing programs.

The qubit-copying process is simple. You need an additional qubit (the qubit to which the value is going to be copied). You then set the state of that qubit initially to be $|0\rangle$, and apply a CNOT gate — as shown in the following diagram:



You can see from the diagram that if the input qubit A is equal to $|0\rangle$, then the NOT operation will not be applied (because that is how the CNOT gate works), and so the output copy on the second qubit will remain at its initial state of $|0\rangle$. But if the input qubit A is equal to $|1\rangle$ then the state of the second qubit will be inverted by the CNOT gate to become $|1\rangle$. So, in both cases, the value of the input qubit is copied to the output qubit.

Entanglement and the CNOT gate

But the most important side-product of the CNOT gate is that it entangles the two input qubits.

If you remember, the definition of a CNOT gate is that it inverts the value of a qubit (applies the NOT operation) only if the state of a particular different qubit is $|1\rangle$. It is clear, then, that the use of the CNOT gate results in a dependency of the value of one qubit with the value of another qubit. This dependency is the very definition of entanglement, so the CNOT gate inevitably entangles its two input qubits. In fact, the CNOT gate is the method by which qubits are entangled in a quantum computer.

And this raises an interesting point ...

In the previous section we have just seen how the CNOT gate can be used to copy the value of a qubit, but it was also stated that the quantum no-cloning theorem prevents qubits from being copied. So what is going on? Is the no-cloning theorem being violated?

No, the no-cloning theorem is not being violated. To understand why that is the case, it must be realised that the no-cloning theorem states that it is impossible to copy the value of a qubit into two **unentangled** qubits. If the resultant qubits are entangled, then the no-cloning theorem does not apply. This is because, as was explained in Chapter Seven, when two objects are entangled then they represent a single object as far as quantum mechanics is concerned. So, as far as quantum mechanics is concerned, the two qubits have not been cloned at all — they are still one object!

QUANTUM ALGORITHMS

The experiments we have performed so far have not exploited the full power of the quantum computer. Indeed, in his *Lectures on Computation*, Richard Feynman covers the basics of quantum computing and reversible computing as we have covered so far in this book, but Feynman concludes: "What we have done is only to try to imitate as closely as possible the digital machine of conventional sequential architecture. What can be done, in these reversible quantum systems, to gain the speed available by concurrent operation has not been studied here."

The phrase "concurrent operation" is a reference to parallel processing. So Feynman is stating that in order to extract the maximum processing power from our quantum computer, we need to exploit the potential of the quantum superposition state to perform calculations in parallel — just as Feynman himself exploited the power of parallel processing with the IBM mechanical calculating machines back in Los Alamos.

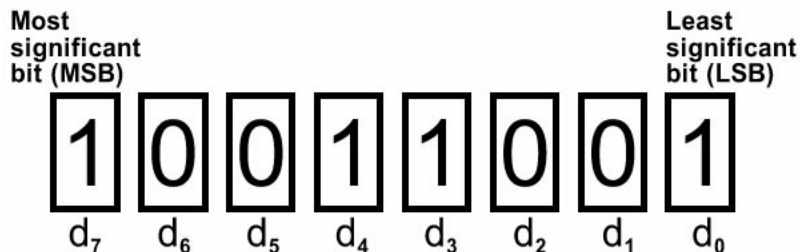
If you remember, at Los Alamos, Feynman could have multiple data in his line of mechanical calculating machines by colour-coding the punched cards so he could keep track of the cards which were at different stages of the process. The principle behind a quantum computer is similar: multiple copies of the data can be held in the central processor at the same time, and those multiple copies of the data can be processed simultaneously. This enables the potentially vast increase in processing speed associated with parallel processing.

Let us explore this process in more detail.

From bits to qubits

At the core of a conventional computer lies the central processing unit (CPU) which, in most computers, takes the form of a microprocessor (a single integrated circuit). Within the microprocessor are a series of registers. A register is a line of bits, usually representing a single binary number. It is common for a single register to have maybe 8 bits, or 32 bits, but it is 64-bit registers which are usually found in modern computers ("64-bit processing").

The following diagram shows the decimal number 153 stored in an 8-bit register in a microprocessor in binary form (10011001). You can see each of the bits labelled from d_7 to d_0 :



The contents of a register represents the piece of data which the computer is currently processing. Various operations can be applied to the data in the register as the microprocessor steps through a computer program line-by-line. These operations would generally be Boolean logic operations such as AND and NOR which we considered in the previous chapter. In this way, even complicated computer programs are translated into very many simple Boolean operations which are then applied to the data stored in a register. In a modern computer, these operations can be applied in nanoseconds. That is incredibly quick, **but we are still dealing with only one piece of data at a time**. The only reason our computers are as fast as they are is because of their incredibly fast clock speed (speed at which a single operation is performed). Otherwise, conventional computers have a processing bottleneck, only being able to perform one instruction at a time.

However, a quantum computer promises to eliminate that processing bottleneck by holding multiple copies of its data in a superposition state. The inputs of a quantum computer are not composed of classical bits — they are composed of qubits. As an example, you will remember that the IBM Q Experience quantum processor we have been using so far in this book has five input qubits. If you look carefully in the composer window you will see that

these are labelled from q[0] to q[4], so we might interpret those qubits as making a five-qubit register.

And, of course, each of those qubits is capable of being in a superposition state which effectively means it is holding both the value zero and one **at the same time**. We now start to see how a quantum computer can overcome the processing bottleneck of a conventional computer.

To explain the advantage of a quantum computer, let us first consider an 8-bit classical register. With eight bits, the register is capable of holding 256 different binary numbers (2^8 equals 256). However, the register can only hold one of those 256 numbers at a time. In contrast, each of the qubits in a quantum computer can be both zero and one at the same time, and so a quantum register can consider all 256 different numbers at the same time.

As in a classical register, we would then apply logic gates to the qubits in order to process their values (stepping through each step of a computer program). But, of course, in a quantum computer we would apply our quantum gates (such as the X, H, and CNOT gates described in the previous two chapters) instead of the Boolean logic gates (AND, OR, and NOT) we would apply to a classical register. And those quantum gates would be being applied to multiple copies of the input data at the same time — you get so much more processing power for your buck.

And, because the number of possible input combinations rises exponentially (according to 2^N , where N is the number of qubits), a quantum computer gets very powerful very quickly. As just described, with eight input qubits there would be 2^8 different input combinations, which is equal to 256. And the quantum computer would be able to consider all of those 256 different input combinations at the same time. With sixteen qubits there would be 65,536 different input combinations. With 24 qubits there would be over 16 million different input combinations. And with just 300 qubits, a quantum computer would have more input combinations than there are atoms in the universe.

Let us now consider the problems we could solve using that tremendous quantum computing parallelism.

The inverse problem

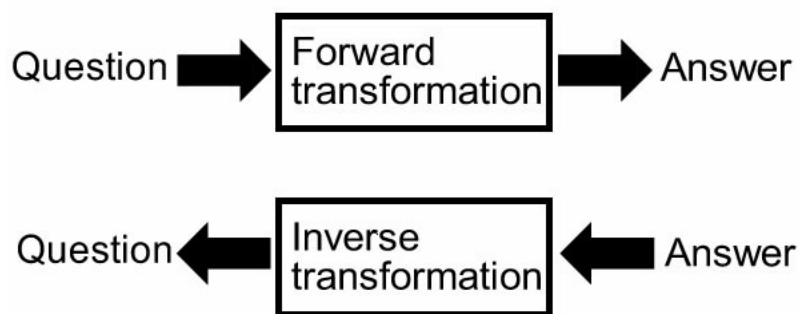
What do we mean by a "problem"?

When we think of a typical problem, we probably think of a question which needs an answer. As a common example, I might ask: "Where have I left my reading glasses?". A different example from mathematics might be: "What is the answer when we multiply 47 by 31?"

So these represent the sort of problems we might encounter in everyday life: problems when we know the question and need to find the answer. However, there is a completely different type of problem. These are the problems when we know the answer, and we need to go back to determine the question. It might sound easy, but it's not.

Determining the question when we know the answer is called the *inverse problem*.

In general, to solve the inverse problem, we need to determine the reverse of the procedure which we would use to calculate the answer from the question. In that way, we calculate the *inverse transformation*. The inverse transformation would be the reverse of the forward transformation, with the forward transformation being the normal process which is used to calculate the answer from the question.

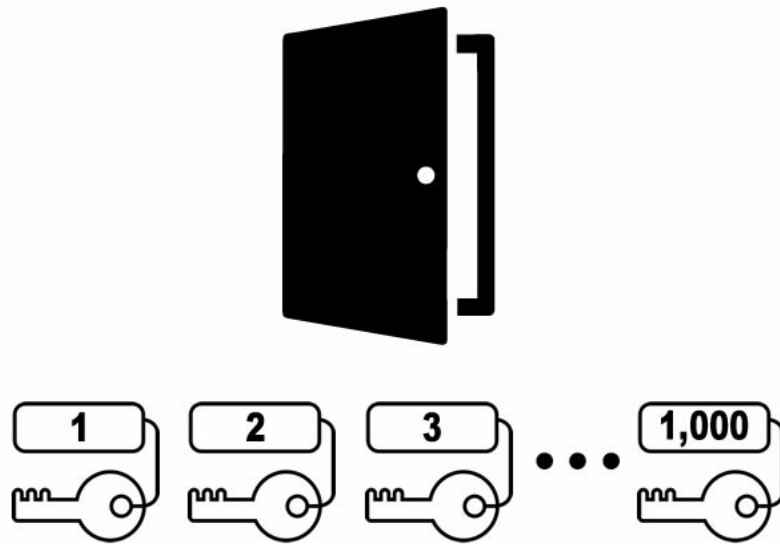


THE INVERSE PROBLEM

However, sometimes it might not be possible to calculate the inverse transformation, or it might be incredibly difficult. In other words, there is no way to directly link the answer with one particular question. Here is an example of such a problem.

You are faced with a locked door. On a table in front of you are a thousand different keys. Each key has a label

attached to it with a number from 1 to a 1,000, clearly identifying each individual key.



The "problem" in this case is how to open the door.

We can think of the number on a key as being the input to the problem. If we choose one number from 1 to 1,000 at random, and select the corresponding key, we can then attempt to open the door using that key. We can think of the act of "attempting to open the door using that key" as representing the "forward transformation" which uses the number of the key as its input. The output of the transformation would then be a Boolean value, either TRUE or FALSE depending on whether or not the door is opened by the key.

So the forward transformation in this case is straightforward. When you are asked "Does key number X open the door?", you select the key with that number (X), you insert the key into the lock on the door, and you see if the key opens the door. You get your answer to the question.

So we have a clear forward transformation working forwards from the question to the answer. But what is the reverse transformation, working backwards from the answer to the question? To be precise, if we are presented with the answer TRUE — that the door is open — is there any way we can work backwards from that answer (which is simply TRUE) to determine the number of the key which opened the door?

No, it is clear there is no inverse transformation. If we are presented with an open door, we cannot tell which key opened the door.

So, in the absence of an inverse transformation, do we give up, defeated?

No, of course we don't give up. We don't give up because we do at least have the forward transformation — we are able to test an individual key to see if it opens the door. We could then exhaustively test every one of those thousand keys to discover which key opens the door. Then, when we are presented with the inverse problem "Which key opened the door?" we will be able to provide an answer to that inverse problem.

That sounds straightforward: it appears that as long as we are in possession of the forward transformation we will be able to solve any inverse problem — it will just take a long time to test all the possible inputs. But what happens if there are more than a thousand keys? What happens if there are a million keys? What happens if there are a trillion keys? What happens if there are as many keys as there are atoms in the universe?

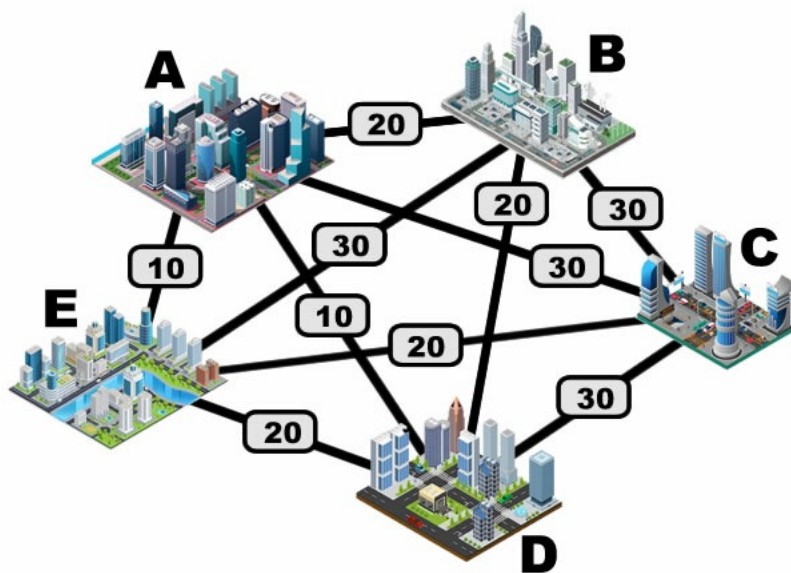
In those situations — with so many possible inputs — it appears we cannot use this method of exhaustively testing all possible inputs. **However, this method of considering all possible combinations of inputs is precisely the sort of thing that quantum computers do so well!** As we have seen, if the input qubits of a quantum computer are prepared in a superposition state, then **a quantum computer can check all possible combinations of inputs at the same time.** And, as was explained earlier in this chapter, with just 300 qubits in a superposition state, a quantum computer can check as many input combinations as there are atoms in the universe.

It would seem that a quantum computer is perfectly suited for tackling inverse problems.

As another example, let us consider the famous *travelling salesman problem*. Consider a salesman who is travelling around America. His schedule requires him to visit a certain number of specified cities, returning to the city he started from. However, the salesman has complete freedom as to the order in which he visits those cities. The salesman wants to save as much fuel as possible, so he selects to visit those cities in a certain order in an attempt to

minimise the total distance (obviously, zig zagging across America would be a bad idea as it would maximise the total distance).

The example in the following diagram shows the travelling salesman having to visit five cities. The cities have been given distinguishing letters, and the distance (in miles) for all the possible routes between the cities are displayed. Imagine that the salesman starts his journey in city A. Can you find the shortest route in which the salesman visits all five cities, before returning to his starting city? I will give the answer later.



It is clear that in this case we have a forward transformation: given a particular route as input, it is easy to calculate the total distance of the route. But the inverse transformation is extremely difficult: given a particular total length of a route, how do you calculate the route which taken? Or how do you calculate the minimum possible total distance, visiting all cities?

It turns out that there are a huge number of different possibilities. If there are n different cities, then the number of different routes is equal to the factorial of $(n-1)$. That means it is equal to all the positive integers equal to or less than $(n-1)$ multiplied together. As an example, if the salesman has to visit five cities then there are 24 different possible routes ($4 \times 3 \times 2 \times 1$). That might not sound too bad, but the factorial grows very rapidly as the number of cities increases. If the salesman had to visit just 52 cities, for example, there would be 10^{62} different routes (the number 1 followed by 62 zeroes)! In that case, how do you check all the possible routes?

Once again, this example of an inverse problem appears to be a perfect application for a quantum computer to tackle, because a quantum computer can evaluate all possible input combinations at the same time. Indeed, in the next section we will be seeing that the standard textbook on quantum computing explains how a quantum algorithm can solve the travelling salesman problem faster than any classical algorithm.

Another inverse problem which is rather similar to the travelling salesman problem arises when we consider the many possible arrangements of atoms as they combine to form molecules. Given a certain arrangement of atoms, it is possible to calculate the resultant energy of the molecule. We might consider that energy calculation as being the "forward transformation" of our inverse problem. A molecule will then tend to adopt the configuration of atoms which has the lowest energy: this is known as the ground state (we might think of it as the equivalent to the shortest route for the travelling salesman). But, given the ground state energy, is it then possible to work backwards to determine the arrangement of atoms? This then becomes an example of an *optimization problem* in which we have to try to find the best solution from a range of possible solutions (the travelling salesman problem is another example of an optimization problem in which the total distance has to be minimised). By determining the structure of molecules in this way, new life-saving drugs can be developed, and this is an area in which quantum computing is already showing great potential.

Shor's algorithm

But there is one particular inverse problem which has generated a great deal of attention and has made quantum computing a front page story. It is the inverse problem which involves finding the factors of a number.

It is a relatively simple process to multiply two integers (whole numbers) together, even very large numbers, to produce a larger number. We might think of the initial two numbers as representing the input to our process, and the act of multiplying the two numbers together as being the "forward transformation". It is clearly an easy task for a computer to multiply two large numbers together. However, the inverse problem then arises when we consider the resultant large number and want to work backward to determine the initial two numbers which were multiplied together. The initial two numbers are called the *factors* of the larger number, and the process of determining the two factors is called *factorization*.

It turns out that there is no quick and easy method to factorize a large number. In fact, it is incredibly hard and time-consuming — even for the most powerful classical computer. So, while the forward transformation is easy (multiplying two numbers together), we do not have access to a practical inverse transformation. And that should immediately make you think: "Aha! This sounds like an inverse problem which could be successfully tackled by a quantum computer!"

Indeed, in 1994, the mathematician Peter Shor developed a quantum algorithm for factoring large numbers. Shor's algorithm, utilising the power of quantum parallelism, was far faster than any existing classical algorithm.

For this reason, Shor's algorithm generated a lot of attention and newspaper column space because it threatened to crack the encryption technique — known as RSA encryption — used to secure internet communications. Every time you type "https:" into your internet browser address bar, you are using RSA encryption to encode your credit card details (the "s" in "https" stands for "secure"). If Shor's algorithm could crack RSA encryption, the consequences would be huge.

RSA encryption was first explained in a 1978 scientific paper which introduced us to two fictional characters named Alice and Bob. The names "Alice" and "Bob" (instead of just using A and B, as was usual up to that point) have since become the accepted names which are used in many thought experiments in physics.

To understand RSA encryption, imagine that Alice and Bob live a considerable distance apart. Now imagine Bob wants to send an encrypted message to Alice which only she can read. The conventional method of sending a coded message would require Alice and Bob to share a *key*, which is known only to themselves. Bob would use the key to encode his message, and Alice would then use the key to decode Bob's message. However, transmitting the key between Bob and Alice in advance of the message is inconvenient and a security risk.

Rather amazingly, RSA encryption does not require the secret sharing of a key in advance. To understand how RSA encryption works, first Alice picks two large prime numbers, say, p and q . These two numbers then represent Alice's *private key* which she keeps to herself. Alice then multiplies those two numbers together to form her *public key*. Alice must then publish her public key in a publicly-available directory — anyone can read it. However, Alice's private key still remains completely secure because of the difficulty of factoring large integers: no eavesdropping third party can work out what p and q are — Alice's private key — even if they have access to her public key. Even though the public key contains both p and q multiplied together!

When Bob wants to send a message to Alice, he encodes it using her public key, and then sends the message to Alice. This is entirely secure even if the message is intercepted because the resultant encoded message can only be decoded using Alice's private key. When Alice receives the message from Bob, she decodes it using her private key and reads the message. So encrypted messages using RSA encryption can be sent between Alice and Bob without the requirement for a secret key to be exchanged in advance.

It is clear that if Shor's algorithm could factor large numbers, it could reveal Alice's private key, and RSA encryption — the backbone of internet security — would no longer be secure.

Peter Shor's algorithm is clearly a tremendous achievement. However, it is specific to the problem of factoring numbers. The aim of this book, however, is to present general techniques which IT professionals might use for their own applications, and thereby take quantum computing into the mainstream. Though Peter Shor's algorithm is impressive, I suspect most IT professionals will not be interested in cracking internet security.

With that aim in mind, in the next chapter we will be examining a general technique for solving inverse problems which might be used in a wide range of applications.

The challenge of writing a quantum algorithm

So we have now gained an understanding of how a quantum algorithm works. Initially, we have a set of qubits which are initialised to be in either state $|0\rangle$ or state $|1\rangle$. Those qubits are placed in a superposition state by applying a Hadamard gate to each qubit. Because they are now in a superposition state, each qubit then becomes both "zero and

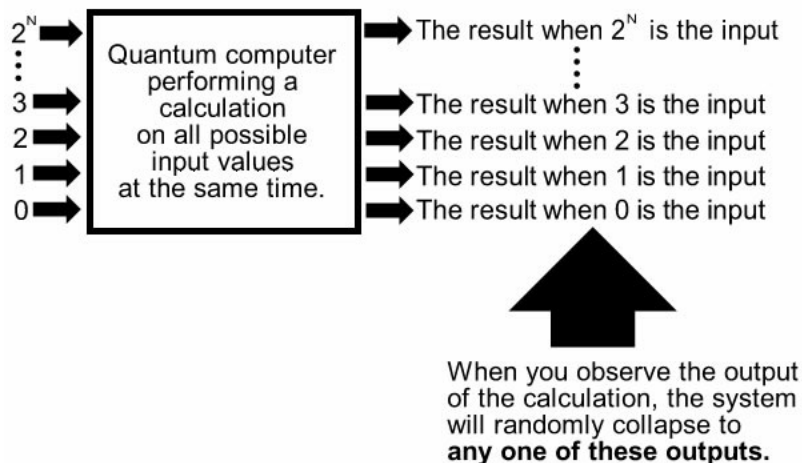
one at the same time". The qubits then pass through a series of quantum gates, and the values of the output qubits are generated. When those output qubits are measured, we obtain the result of our calculation.

However, the principle of massive parallelism which gives a quantum computer its power also makes a quantum algorithm very difficult to write. Because the qubits are in a superposition state, all possible values of the input data are presented to the quantum computer at the same time. But when we measure the output of the computer, at that moment there is the usual collapse of the quantum state, taking the quantum computer out of its superposition state. At this point, the quantum state collapses to a single well-defined value (as described in Chapter Four: "Observing a quantum system").

So, at that point, the output qubits collapse to a single value. If we then trace that output value back through the workings of our quantum computer, then that output value would represent just one particular input value. In other words, the input also suddenly becomes just one value. It is as if your entire quantum computer has suddenly collapsed to become a classical computer! To make matters worse, we have no control over which particular input value the qubits will collapse to — the collapse process is, of course, completely random.

This difficult situation is described by Eleanor Rieffel and Wolfgang Polak in their book *Quantum Computing: A Gentle Introduction*. As Rieffel and Polak say, the act of measuring will "project the final state onto **a single input/output pair, and a random one at that.**"

The problem is explained in the following image:



The previous diagram shows the numerous input/output pairings, with only one pairing being chosen at random to represent the output. Once again, this difficult situation is described by Rieffel and Polak: "**Only one result is obtained and, even worse still, we cannot even choose which result we get.**"

So how can we ensure that we get the correct value in the output qubits at the end of the calculation? There are so many possible input data values, and we have no control over which input value will eventually be randomly selected when we observe the output. In that case, how can we ensure that the output qubits collapse to the correct value of the calculation?

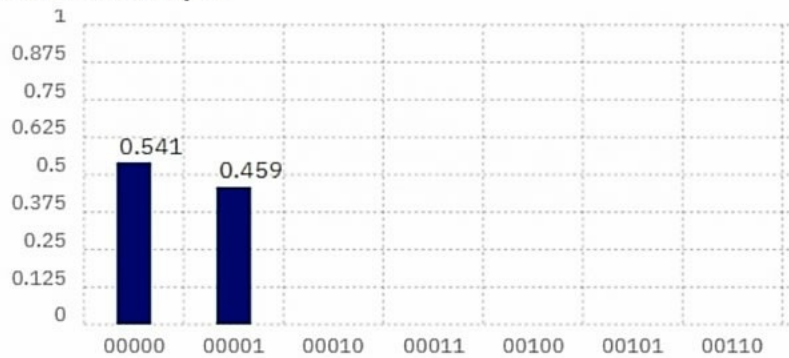
The situation sounds almost impossible! How on Earth can it be done?

Well, it turns out that it **is** virtually impossible: you can't write a quantum algorithm that gives you the correct answer every time.^[13] Instead, **you have to increase the probability of the correct answer being found on the output qubits**, and then rely on the probabilistic nature of quantum mechanics to do the rest. That is the best that you can do.

As an example, the IBM Q Experience will typically run your quantum algorithm 1024 times (this all happens in a fraction of a second) before delivering its results in histogram form showing how many times each possible result was measured. That way, as long as your quantum algorithm has ensured that the correct answer is the answer most likely to be measured, the correct answer will emerge from the histogram distribution with the highest number of hits.

Here is an example of the final histogram distribution in a screen capture from my earlier Hadamard gate video:

Device: ibmqx4



And this is where quantum entanglement plays a vital role. In the discussion of entanglement back in Chapter Seven, it was explained that when we are dealing with entangled qubits, you should no longer think of the qubits as independent units. Instead, you should think of the entangled qubits as representing a single quantum system, **described by a single state vector**. The task of your quantum algorithm is then to manipulate (rotate) that single state vector to align it more closely with the correct answer to ensure that the correct answer is more likely to be observed when the output of your quantum computer is finally measured.

If that sounds rather tricky, well, it is. Fortunately, I am not going to be suggesting that that is what you should attempt to do when you come to writing your own quantum algorithms. I am not going to be suggesting that you start from scratch, and have to devise some ingenious state vector rotation algorithm every time. Instead, in the next chapter — the final chapter of this book — a quantum algorithm will be presented which can be adapted to your own particular needs. In other words, the ingenious method of state vector rotation has been worked-out for you in advance, and you just have to modify one section of the algorithm to match your own particular problem.

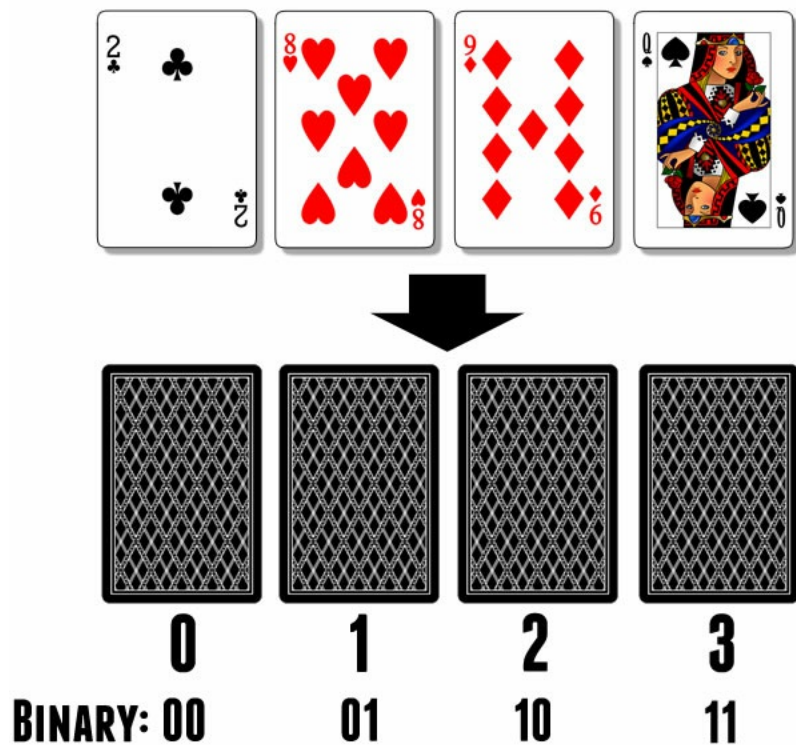
(By the way, I promised I would give you the answer to the travelling salesman puzzle presented earlier. If you visit the cities in the order ADBCEA — or the reverse order, of course — then you will travel a total distance of just 90 miles, which is the shortest possible distance.)

11

GROVER'S ALGORITHM

So what we really need is a general quantum algorithm for solving inverse problems. Quantum computing could then be adopted by IT professionals, and the potential of quantum computing could then be finally fulfilled. Fortunately, in 1996 the Indian-American computer scientist Lov Grover devised an algorithm which fits these requirements. The method is now known as *Grover's algorithm*. [14]

Grover's algorithm is often explained by an example using four playing cards. The following image shows four playing cards, one of which is the queen of spades. The cards are then turned face down, and randomly rearranged so that you no longer know which card is the queen. You will see in the diagram that each face-down card has been given an identifying number. Your task is to identify which card is the queen.



We can express this problem in a similar form to the other problems we have considered so far. We can consider the numbered position of the card (0, 1, 2, or 3) as being the input to a forward transformation. The nature of the forward transformation in this case is very simple: you take that numbered position of the card and you turn that particular card over to see what it is. The output of the forward transformation is then the Boolean value TRUE or FALSE depending on whether or not that particular card turned out to be the queen of spades.

So we have a simple forward transformation (from the question to the answer), but do we have an inverse transformation (from the answer to the question)? No we do not. If you are presented with the answer TRUE, meaning the queen of spades has been found, then from that answer can you determine which card at which numbered position was turned over? No, there is no way to do that (unless the cards were marked).

So, once again, we seem to have a problem with a simple forward transformation but no inverse transformation. And that should make you think, once again, that this is a representation of a problem which could be cracked by a quantum computer.

If the positions and values of the cards were represented by variables in a computer program, then the problem could be translated into a problem running on a computer. We could then use the forward transformation to turn

every card over in sequence until we find the queen. We know that process by another name: a *search*. So Grover's algorithm — which can be used to solve this problem of finding the queen — is an example of a *search algorithm*.

Let us now consider how long it would take us to find the queen by a manual search (or, equivalently, a search on a classical computer in which only one card at a time can be turned over).

The position of the queen is completely random, so, initially, the queen can be in any of the four numbered positions. Let us imagine our manual search always starts on the left-hand side. Then, if the queen is located on the extreme left position, we will find it on our first attempt, turning over just one card. Otherwise, if the queen is located in the second-from-left position, we will find it on our second attempt, turning over two cards. Otherwise, if the queen is located third-from-left we will find it on our third attempt, turning over three cards. And, in the worst case scenario, with the queen positioned at the extreme right, we will have to turn over all four cards before we find the queen.

With there being an equal chance that the queen was in any one of the four positions, the average number of cards we will have to turn over before we find the queen is:

$$\frac{1 + 2 + 3 + 4}{4} = 2.5$$

So, using a manual exhaustive search (or a search on a classical computer), we will have to turn over an average of 2.5 cards before we find the queen.

But Grover's search algorithm can find the queen by turning over just one card.

Grover's algorithm can speed up an exhaustive search by a factor proportional to the square root of the number of classical operations. In this example, with 2.5 classical operations having to be performed to find the queen, Grover's algorithm promises to find the queen using only the square root of 2.5 number of operations — which is a number close to 1.5. And this is what we find. In fact, Grover's algorithm in this particular case can always find the queen in only one operation, one attempt.

And Grover's algorithm can be applied to a huge range of different search operations. Michael Nielsen and Isaac Chuang have written the standard textbook on quantum computing entitled *Quantum Computation and Quantum Information*. They consider the travelling salesman problem in their book, and present Grover's algorithm as a potential solution: "Suppose you are given a map containing many cities, and wish to determine the shortest route passing through all cities on the map. A simple algorithm to find this route is to search all possible routes through the cities, keeping a running record of which route has the shortest length. On a classical computer, if there are N possible routes, it obviously takes a number of operations proportional to N to determine the shortest route using this method. Remarkably, there is a quantum search algorithm, sometimes known as Grover's algorithm, which enables this search method to be sped up substantially, requiring a number of operations only proportional to the square root of N . Moreover, the quantum search algorithm is **general** in the sense that it can be applied far beyond the route-finding example just described to speed up many (though not all) classical algorithms that use search."

Nielsen and Chuang also consider the potential of Grover's algorithm for searching for the factors of numbers, and thereby breaking codes. In order to find the factors of a number, an exhaustive search could progressively examine all the positive integers (whole numbers) smaller than that number, and see if they could be used to divide the larger number — leaving no remainder. If so, the smaller number is a factor of the larger number.

For factoring applications, Grover's algorithm is not as fast as Shor's algorithm, and so Grover's algorithm could not be used to break RSA encryption in a reasonable time.^[15] However, it is known that Grover's algorithm could be used to break the widely-used AES encryption scheme which does not use integer factorisation. Grover's algorithm could break the code in the square root of the time it would take a classical computer.

Solving a problem in the square root of the time might not sound impressive, but it can make a tremendous difference. An article on the Betanews technology website revealed the true implications of the "square root" speed-up achieved by Grover's algorithm: "If a classical computer needs to search 2^{56} possible keys to be guaranteed to crack DES encryption, a quantum computer running Grover's algorithm only needs to do 2^{28} searches. This is easier to understand when written in conventional notation: Classical computer: 2^{56} searches = 72,057,594,037,927,936, Quantum computer: 2^{28} searches = 268,435,456. When measured in terms of time, assuming both computers can search at the same speed: if it takes a classical computer one day to crack a particular 56-bit encryption, it would take the quantum computer just 0.322 milliseconds — or one thousandth the blink of an eye. And if it took a classical computer one year to crack 64-bit encryption, it would take a quantum computer 7.3 milliseconds." ^[16]

There is another benefit of Grover's algorithm. As described by Eleanor Rieffel and Wolfgang Polak in their book *Quantum Computing: A Gentle Introduction*: "Grover's algorithm is simpler and easier to grasp than Shor's, and has an elegant geometric interpretation."

It is clear, then, that Grover's algorithm represents a method of solving a wide variety of inverse problems. This is what we have been looking for.

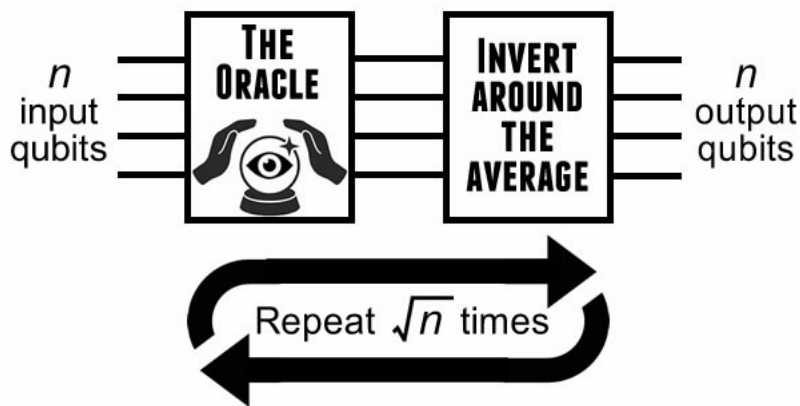
So let us now consider the structure of Grover's algorithm in full detail (although, you might be relieved to know that the bulk of the complicated detail has been moved to the two appendices at the back of this book). I suspect for many IT professionals and researchers looking to solve their own problems on a quantum computer, this will be the material they need to know.

As a reward, later in this chapter we will program an example of Grover's algorithm on the real IBM Q Experience quantum computer.

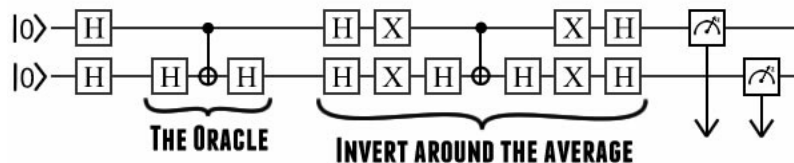
Yes, we'll be programming a real quantum algorithm on a real quantum computer!

The Oracle

The structure of Grover's algorithm can be split into two stages. Here is a block diagram of Grover's algorithm:



You can see from the previous diagram that Grover's algorithm is composed of two main blocks called "The Oracle" and "Invert around the average". I am going to jump slightly ahead at this point and show you how we will be coding these two blocks in the IBM Q Experience later in this chapter. The two blocks are going to look like this:



We are going to be using Grover's algorithm to find the position of the queen of spades in the previous playing cards example. As described earlier, this is a search operation — we have to search to find the queen.

There are four possible positions for the queen, with the positions numbered 0, 1, 2, or 3. The binary equivalent of those decimal numbers would be 00, 01, 10, and 11. So the binary numbers have two bits. Hence, our quantum algorithm is going to have two input qubits which will be capable of representing all possible positions of the queen (the previous block diagram of Grover's algorithm can be seen to be based on two qubits).

In this section we will consider the first part of Grover's algorithm, which, as you can see, is called the Oracle.

The first part of Grover's algorithm is a self-contained "black box" of code, a code block which — in computer science terminology — is often referred-to as an "oracle". The term "oracle" seems rather strange, but this is chosen because the unit is defined only in terms of what it does: its inputs, and its outputs. We are not particularly interested in the internal workings, how it derives those outputs from its inputs (this is why it is often called a "black box" — we do not care what happens inside it). Or, to be more specific, its internal workings are not defined, and it is left to the programmers to design how it works internally.

So this "black box" is rather similar to a human "oracle", a visionary or seer with a crystal ball, who you ask a question and who miraculously gives you the correct answer (I seem to remember one of the characters in the *Matrix* movie was called The Oracle — a lady who provided the answers for Keanu Reeves). You don't know how the oracle has done it, you don't know the internal workings — you are just glad it works.

So the first part of Grover's algorithm is an oracle. Let us now consider what the oracle has to do.

The oracle is presented with the n input qubits in a superposition state, which represents all possible input combinations (for two qubits, this would be the four possible states 00, 01, 10, and 11). The oracle then has to perform the following two tasks:

Oracle Task Number One

The first task for the oracle is that it has to consider the input value (00 or 01, etc.) and perform a calculation to see if that value satisfies the particular search problem. In this playing card example, the oracle has to decide if the number represents the correct position of the queen of spades. **So the key task of the oracle is that it has to recognise when a specific combination of input qubit values solves a problem.**

If you wanted to adapt Grover's algorithm to solve your own problems, you would have to adapt this oracle for your own problem. You would have to perform some calculation on the input value in order to test to see if the input value satisfies your search problem. Is it the number you are looking for? For example, is the number a factor of a larger number? Does it divide perfectly into the larger number? If so, you've cracked the code! And, of course, because you are being presented with your input qubits in a superposition state, your calculation will be working on all possible combinations at once. Like magic!

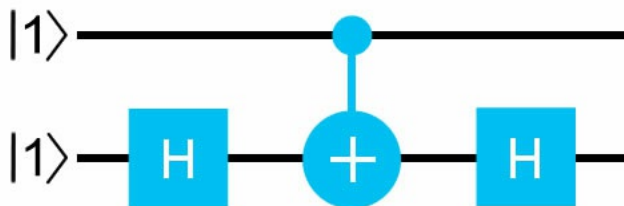
Oracle Task Number Two

The second task for the oracle is that when it finds the solution it is looking for, it has to "mark" the solution. According to Grover's algorithm, this marking is performed by inverting the phase of the state by rotating it by 180° . If you rotate anything by 180° , you are making it point in the opposite direction. So another way of interpreting this "marking" operation is that it puts a minus sign in front of the state vector.

Let us now consider how we can create a quantum oracle on the IBM Q Experience.

In our example of finding the queen of spades, we note that in our earlier diagram we placed the queen at the extreme right-hand position of the four cards. So we want to create our oracle to detect when this numbered position is input. You will notice on the earlier diagram of the playing cards that the right-hand position was given the number 3, which is equivalent to the binary number 11. So we want our quantum oracle to mark the input state when both input qubits are in state $|1\rangle$ — and not when the qubits are in any other state. In other words, we need to invert the phase only when both input qubits are in state $|1\rangle$.

It turns out that this phase inversion can be performed by a very simple circuit. It can, in fact, be done with a single CNOT gate and a couple of Hadamard gates. The following diagram is the actual circuit diagram for the Grover's algorithm oracle:



In the example shown in the previous diagram, both inputs are set to state $|1\rangle$. As just explained, this is the condition which we want to result in the phase inversion.

The details of how this oracle circuit was designed are fairly complicated, so they have been moved to Appendix One at the back of this book.

But we now have the design for our quantum oracle circuit, so we are getting closer to finding our queen ...

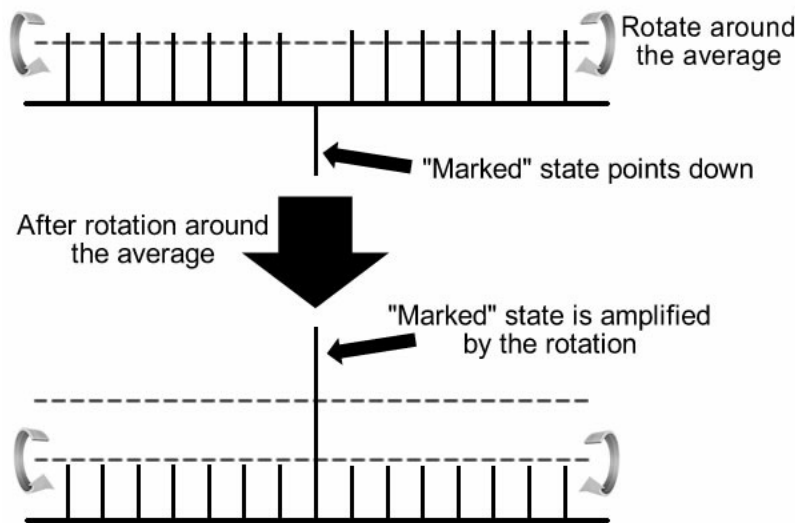


Inversion around the average

It is now time to move to the second stage of Grover's algorithm. And, as we shall see, it is quite ingenious.

To recap, the queen of spades has been found and the state representing the position of the queen (11) has been marked. But what do we do next with this marked state? How do we ensure that when we look at the output of our Grover's algorithm, the marked state will appear as the most likely solution with high probability? We need to find some way of amplifying the marked state.

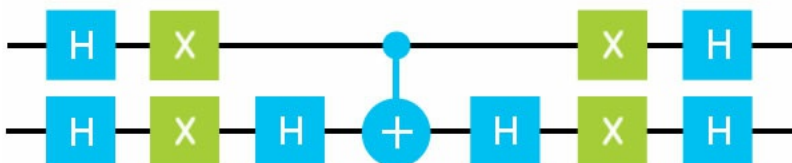
Remember, we marked the state by inverting the phase of that state so it points in the opposite direction to the phases of all the other states. This situation is shown in the following diagram showing the phases of all the states. You can see that all the phases point up except for the single phase of the marked state which was inverted and therefore points down:



In the top part of the diagram you will also see a thin dashed line. This represents the **average** value of all the phases. Because almost all the phases are pointing upward, this average value is quite large, almost precisely aligned with the tips of all the lines which are pointed upward. The only thing which is dragging the average value down very slightly is the value of the single marked state which is pointed downward.

The next step is very clever. We rotate **all** the states by 180° around the average value, the dashed line. You can see the effect in the lower part of the previous diagram. Because the value of the upward-pointing states was very close to the average value, the effect of the rotation does not affect them very much. However, as you can see in the previous diagram, the tip of the downward-pointing state was very far away from the average value — approximately twice as far away as all the other upward-pointing states. So when we rotate all the states around the average value, the downward-pointing state now gets amplified to more than twice its original length, and now points upward — as shown in the lower part of the previous diagram.

Moving on to consider how to implement this rotation, it turns out that the final circuit for performing the "rotation around the average" takes the following form:



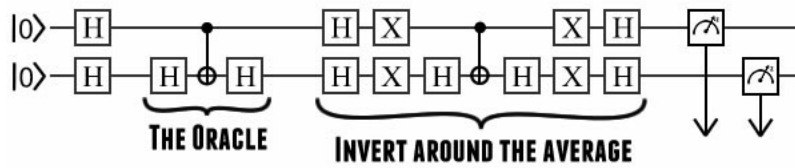
Once again, the details of how this circuit was designed are quite complicated and so they have been moved to Appendix Two at the back of this book.

And that is how the second part of Grover's algorithm works. The amplification boosts the marked state so that when the output of the quantum computer is observed, it is more likely to collapse to the correct state, revealing the position of the queen of spades. Usually several iterations have to be performed (the square root of n times) until the correct state receives sufficient amplification to ensure that it will be selected with high probability.

Programming a real quantum algorithm on a real quantum computer

So we have discovered the complete structure needed to implement Grover's algorithm. Now let us program this using the IBM Q Experience.

Here is the final complete block diagram:

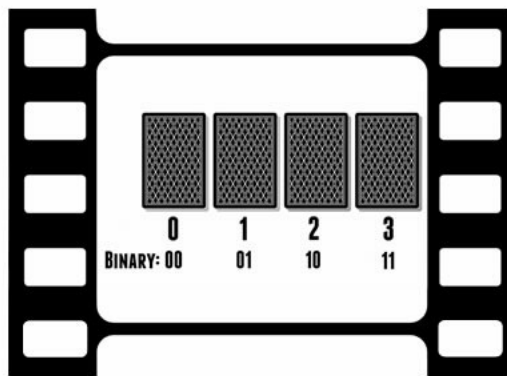


This circuit diagram for implementing Grover's algorithm can be programmed directly into the IBM Q Experience. Give it a go and see if it works!

I am actually ahead of you because I have already tried it, and I have created a video of my efforts. Here is a link to the video:

<http://tinyurl.com/magicquantum>

And here is a still from the video:



The revealing of the queen of spades at the end of the video represents perhaps the most technologically-advanced magic trick in history.

Some final thoughts

I hope you have enjoyed the book.

When I wrote this book, I had three goals in mind.

Firstly, I was aware that there was a general lack of clear, easy-to-understand technical information about quantum computing. Therefore, I wanted to write an accessible book which would capture the essential concepts of quantum computing, hopefully simplifying a complicated subject.

Secondly, I wanted the book to appeal to software engineers and scientific researchers — anyone who might find quantum computing useful in their line of work. I wanted to explain the methods which they would most likely find useful to solve their particular problems. It does appear that Grover's algorithm is currently the most flexible method which might be applicable to a wide range of inverse problems.

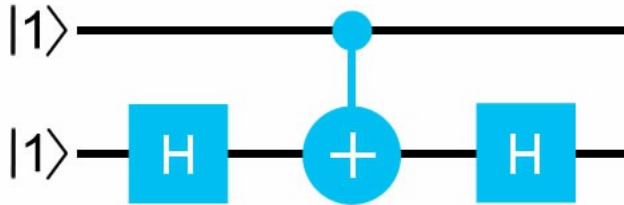
Finally, I hoped to make the book entertaining and informative for people who have no intention of ever going near a quantum computer. If I have succeeded in that goal alone, then I will consider this book to have been a success.

APPENDIX ONE: THE ORACLE

This first appendix explains how the oracle circuit for the Grover's algorithm was designed. This is fairly complicated, so please only read it if you are interested in the gory details, and are maybe interested in extending it for your own applications.

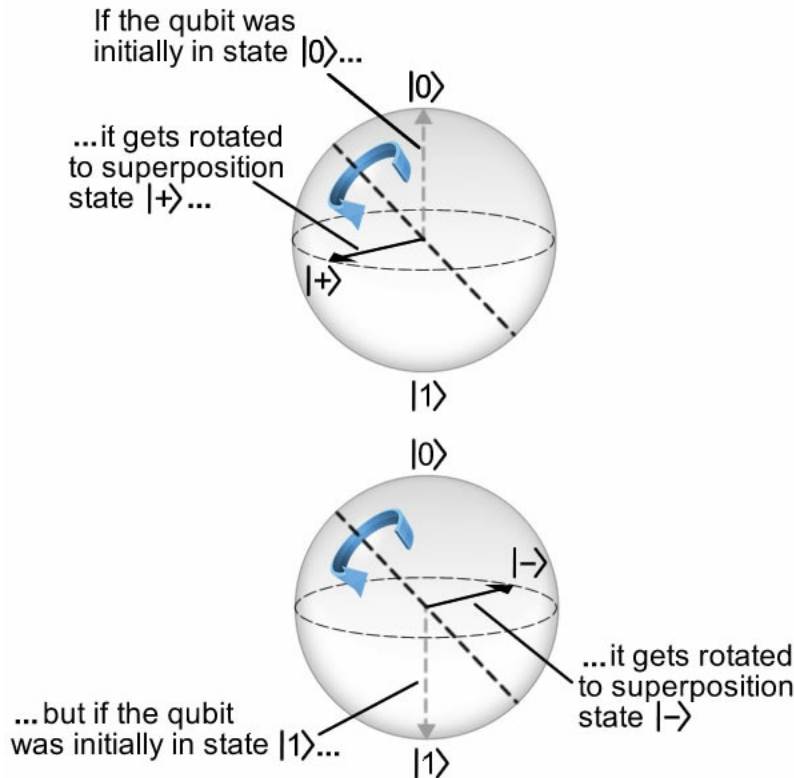
Otherwise, please skip it.

Let us remind ourselves of the oracle circuit diagram which was presented in the previous chapter:



Like all quantum circuit diagrams, we read the diagram from left to right.

You can see that the target qubit — the lower qubit — passes through the first Hadamard gate. The qubit state vector then gets rotated according to the usual behaviour of the Hadamard gate (see Chapter Eight for a reminder). So, as you can see in the following diagram, the qubit state vector gets rotated around the diagonal dashed line and thereby enters a superposition state:



But you can see from the previous diagram that the direction of the state vector in the superposition state is different depending on whether the initial state was $|0\rangle$ or $|1\rangle$. If the initial state was $|0\rangle$ (state vector pointing up), then the state vector gets rotated to a position pointing toward the left and to the front (see the previous diagram). This is called superposition state $|+\rangle$ (the "plus state"). However, if the initial state was $|1\rangle$ (state vector pointing

down), then the state vector gets rotated to a position pointing toward the right and to the back. This is called superposition state $|-\rangle$ (the "minus state").

In this playing cards example, we are passing a target qubit in state $|1\rangle$ to the Hadamard gate. So, in this case, the qubit enters the superposition state $|-\rangle$.

Expressed mathematically, the superposition state $|+\rangle$ is the usual equal mix of $|0\rangle$ and $|1\rangle$. However, the superposition state $|-\rangle$ is an equal mix of $|0\rangle$ and $-|1\rangle$ (the $|1\rangle$ now has a negative sign in front of it). That explains why this superposition state vector is pointing in the opposite direction to the usual direction.

For the next stage of the oracle, you can see that the CNOT gate is then applied to this qubit. Because the control qubit of the CNOT gate is also in state $|1\rangle$, the CNOT gate performs its usual "flipping" operation on the target qubit. This has the effect of flipping the values of the $|0\rangle$ and $|1\rangle$ terms of the state vector, changing $|0\rangle$ to $|1\rangle$, and vice versa. For a state vector in the superposition state $|+\rangle$, both of those terms are positive so flipping the terms has no effect. But for the superposition state $|-\rangle$ we have in this example, as mentioned earlier, the $|0\rangle$ term is positive but the $|1\rangle$ term has a negative sign in front of it. Therefore, flipping the two terms has the effect of placing a negative sign in front of the entire qubit state, as explained in the following diagram:

$$\begin{array}{c} \text{Initial state: } |0\rangle - |1\rangle \\ \text{Flip terms} \downarrow \\ |1\rangle - |0\rangle \\ \text{Which is the same as: } -(|0\rangle - |1\rangle) \\ \text{(i.e., the negative of the initial state)} \end{array}$$

And that is just what we have been looking for! If you remember, we wanted to find a way of inverting the state, which, as stated earlier, is the same as putting a negative sign in front of the state. And that is just what we have done with our CNOT gate.

So we have achieved the phase inversion we desired. And this phase inversion is caused when the following two conditions are true:

1. The lower of the two qubits in the circuit diagram must be in state $|1\rangle$ so that the qubit enters the superposition state $|-\rangle$.
2. The higher of the two qubits in the circuit diagram must also be in state $|1\rangle$ so that the CNOT gate does its "bit-flipping" operation.

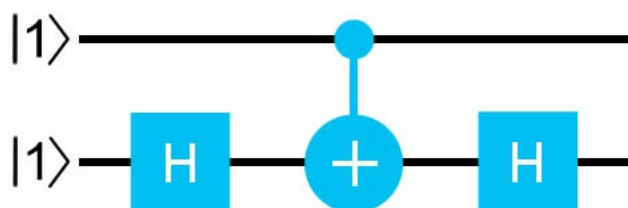
So both input qubits must be in state $|1\rangle$ for the phase inversion to take place. And, if you remember, that is precisely how we wanted our quantum oracle to behave: we wanted our quantum oracle to perform a phase inversion ("marking" the state) when both of the input qubits are in state $|1\rangle$.

We have therefore found our quantum oracle!

APPENDIX TWO: ROTATION AROUND THE AVERAGE

This appendix describes how the "rotation around the average" quantum circuit in Grover's algorithm was designed. Once again, this is tricky stuff, so only read it if you need to.

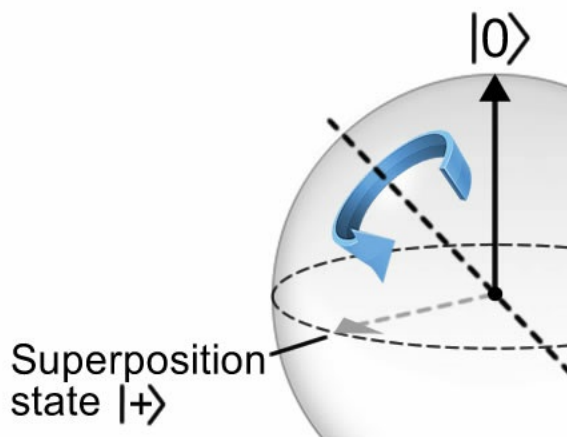
We know how to do rotations, as we have just used the method in the quantum oracle. We will be reusing the same piece of code, and it will form the centrepiece of our new "rotation around the average". Here, once again, is the circuit diagram which performs the rotation:



Let us now extend this circuit diagram to perform the "rotation about the average".

You might think it would be a tricky calculation to find the average value of all the states, but it is actually extremely easy. An average might be considered as being halfway between two extreme values. Building on that idea, if we have two qubits, one in state $|0\rangle$ and the other in state $|1\rangle$, the half-way value would be the superposition state, halfway between state $|0\rangle$ and state $|1\rangle$. So the average, in this case, is defined by the superposition state. In fact, it can be shown that — no matter how many states you have — the average is always the equally-weighted superposition state.

So that makes things a lot easier: to perform the "inversion around the average" we need to rotate all the states around the superposition state $|+\rangle$. But there is an easier way of achieving that. Remember, if a Hadamard gate is applied to a superposition state $|+\rangle$, it gets rotated to state $|0\rangle$, as shown in the following diagram:

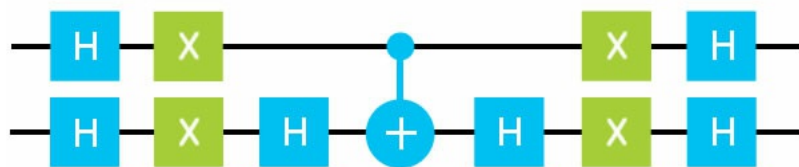


So we modify our circuit diagram by adding a Hadamard gate to each qubit, and then rotating every state around the state $|0\rangle$.

Actually, we don't have to rotate every state — there is an easier method. It is clear that we would get exactly the same result if we kept all the states the same, and just rotated the $|0\rangle$ state in the opposite direction. The final configuration of states would be exactly the same as if we had rotated everything around $|0\rangle$. So that is what we do: we just have to rotate the $|0\rangle$ state. [\[17\]](#)

We also need to add a couple of X gates (quantum NOT gates) because we know from our previous experience with the oracle that the circuit we used only performed the rotation when both qubits were in state $|1\rangle$, but we want the rotation to occur for state $|0\rangle$.

We end up with the following circuit to perform the "rotation around the average":



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Photographs of the IBM quantum computer is courtesy of IBM Research.

NOTES

[1] <http://tinyurl.com/ibmpunchedcard>

[2] This type of equation is called a *partial differential equation*. It means it considers the rate of change of a variable with respect to just one other, single variable — with all the other variables being held constant. In this case, it considers the rate of change of the wavefunction with respect to t .

[3] This provides the explanation for the *Born rule*, which states that the probability of finding a particle in a particular location is proportional to the **square** of the particle's wavefunction at that point.

[4] As James Cresser of Macquarie University has said: "It can also be argued that if, after performing a measurement that yields a particular result, we immediately repeat the measurement, it is reasonable to expect that there is a 100% chance that the same result be regained, which tells us that the system must have been in the associated eigenstate.", <http://tinyurl.com/jamescresser>

[5] *The Birth of Cubism*, <http://tinyurl.com/birthofcubism>

[6] *On the Interpretation of Measurement in Quantum Theory*, H.D. Zeh, <http://tinyurl.com/zehpaper>

[7] *Many-Worlds and Decoherence: There Are No Other Universes*, Chad Orzel, <http://tinyurl.com/orzeldecoherence>

[8] The clearest technical descriptions of decoherence I have found are by John Boccio, formerly of Swarthmore College: <http://tinyurl.com/johnboccio> and <http://tinyurl.com/johnboccio2>

[9] <http://tinyurl.com/johnboccio>

[10] The connection between classical spin and quantum spin was clearly revealed in an experiment by Richard Beth in 1936 in which polarised light was shone onto a pendulum — causing the pendulum to rotate.

[11] This is the principle behind one of the greatest mysteries in physics: the black hole information loss paradox. See my second book for more details.

[12] This diagram can be found in Chapter Four of the quantum computation textbook *Quantum Computation and Quantum Information* by Michael Nielsen and Isaac Chuang.

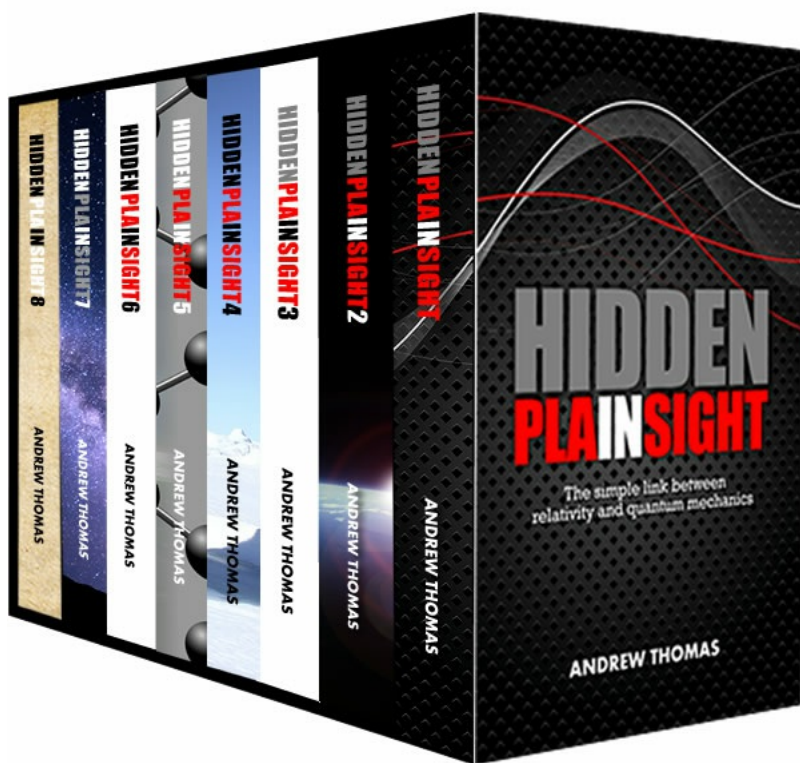
[13] That is not entirely true. There is an algorithm called *Deutsch's algorithm* which gives the correct result every time. Deutsch's algorithm was devised by David Deutsch in 1985 and was the very first quantum algorithm. Unfortunately, it does not do anything of practical use — it was merely devised to show that quantum algorithms can be faster than classical algorithms.

[14] Lov Grover, *A fast quantum mechanical algorithm for database search*, <http://tinyurl.com/lovgrover>

[15] Shor's algorithm is **exponentially** faster than the best known classical algorithm, for example 2^n , where n relates to the size of the number being factored, whereas Grover's algorithm only offers a **quadratic** speedup, for example, n squared. The squared term arises because, as stated in the text, Grover's algorithm only takes the square root of the time of a classical algorithm.

[16] Linus Chang, *How secure is today's encryption against quantum computers?*, <http://tinyurl.com/squarerootspeed>

[17] This clever method is described by Dayton Ellwanger in one of his excellent (though technical) instructional videos: <http://tinyurl.com/daytonvideo>



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HIDDEN IN PLAIN SIGHT 11

The logic of consciousness

AVAILABLE NOW

The background of the entire image is a reproduction of Raphael's fresco 'The School of Athens'. It depicts various ancient Greek philosophers in a grand architectural setting. In the center, Plato (left) and Aristotle (right) are the focal points. Plato is shown with a white beard, wearing a red and purple robe, pointing his right index finger towards the sky. Aristotle is shown with a brown beard, wearing a blue and brown robe, gesturing with his right hand palm-down towards the earth. They are surrounded by other philosophers in various poses, some seated and some standing. The architecture features arches and classical columns.

HIDDEN IN PLAIN SIGHT 11

The logic of consciousness

This section shows the lower portion of the 'The School of Athens' fresco. On the left, a philosopher (likely Zeno or Chrysippus) is seated on the ground, leaning forward with his hand to his chin in a state of deep thought. On the right, Diogenes is reclining on the ground, wearing a blue tunic, holding a scroll. The floor is a checkered tile pattern.

ANDREW THOMAS

HIDDEN IN PLAIN SIGHT 11

The Logic Of Consciousness

Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

His *Hidden In Plain Sight* series of books are science bestsellers.

ALSO BY ANDREW THOMAS

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ANDREW THOMAS

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The Logic Of Consciousness

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CONTENTS

PREFACE

1) THE MEDITATION CLASS

Introspection

The stream of consciousness

The meditation session

2) THE CONSCIOUS MIND AND THE UNCONSCIOUS MIND

"Access" and the conscious mind

Thinking, fast and slow

3) THE BRAIN AS A COMPUTER

Serial processing

The parallel processing of the unconscious mind

The structure of the mind

4) THE FAME OF PHINEAS GAGE

The boss of the brain

5) THE EMERGENCE OF CONSCIOUSNESS

Space, time, and consciousness

6) THE LOGIC OF CONSCIOUSNESS

The start of our journey

Classical Greece

The logic of Aristotle

The vanishing middle term

The Victorian era

The laws of thought

The wild-bearded poet

The unhappy childhood of Walter Pitts

The McCulloch-Pitts artificial neuron

Thermodynamics and the brain

Maxwell's Demon revisited

The solution of Leo Szilard

The man from IBM

[The incredible power of Landauer's principle](#)
[Landauer's principle and the brain](#)
[If it's cold, it's not conscious](#)
[The end of the saga](#)

7) IMPLICATIONS OF THE RULE

[The primary visual cortex revisited](#)
[Is a wire conscious?](#)
[Food rearranged](#)
[The frozen head of Walt Disney](#)
[A conversation with Einstein's brain](#)
[Conclusion](#)

APPENDIX

PREFACE

This is my eleventh book, and my second book dedicated to the subject of consciousness. My previous book on consciousness was my ninth book: *Hidden In Plain Sight 9*.

That previous book proved to be one of my most popular and best-received books. Obviously, many people are fascinated by this subject, and there is a hunger to know the answers — which is understandable.

I believe we are lucky to have been presented with a valuable tool which can help us in understanding consciousness and the workings of the mind. That tool is the computer. We are surrounded by these "thinking machines", and those machines are now starting to reach a level of complexity and sophistication which is comparable to the human brain.

When we are developing theories of consciousness, I believe we would be very unwise not to consider what we can learn from computers. Indeed, the main conclusion in this book derives not from philosophy or neuroscience, but from the research laboratory of IBM.

This book divides neatly into two completely distinct parts. The first part (spanning Chapter One to Chapter Five) attempts to understand the structure of the mind, especially the division between the conscious mind and the unconscious mind. The division seems so natural to us that we perhaps never question why our minds are divided in that manner, but surely there must be a reason.

The second half of this book — starting at Chapter Six — then takes a very different turn. The second half of this book takes the form of an epic historical saga, covering the history of logic, information, and consciousness over a 2,500 year period. And it comes to an incredibly simple conclusion about consciousness.

I hope you enjoy the journey.

Andrew Thomas
(hiddeninplainsightbook@gmail.com)
Swansea, UK
2019

1

THE MEDITATION CLASS

It is a glorious sunny Friday evening in late September, and instead of falling asleep drinking beer and watching the telly, I am going out for the night. I have signed-up for a ten-week course on meditation as part of my city's adult learning programme.

One reason for attending the meditation course was that I hoped it would provide a valuable new perspective for my research into consciousness. But another reason was that I had decided that I was becoming a boring old science nerd and I needed to open my mind to Eastern influences and get in touch with my inner chakra (no, I have absolutely no idea what a "chakra" is).

But I had another reason to attend the course. In retrospect, I was rather disappointed with one aspect of my previous book on consciousness. I felt I had written the book without giving a proper description or analysis of what consciousness actually is. I had blithely stated that consciousness was a "feeling", and that it was hard to define. In particular, I felt it was an omission to write an entire book on consciousness without seriously examining my **own** consciousness.

Hopefully, the meditation course was going to give me some answers — or, to be more precise, it was going to help me find the answers in myself.

And so I found myself on Friday night in a large room in a community centre in my home town. Most of the students had already arrived. I counted twelve women, the female instructor, and me — the only bloke. The room was full with tables which we had to move to the sides and then form a circle of chairs in the middle of the room. Another bloke arrived — what a relief.

The first ten minutes of the session were dynamic and highly productive — the tea was made. Once we all had a cup of tea, we settled down and the instructor began the class.

I was impressed by the instructor, who seemed very knowledgeable about the subject. She explained that meditation was invented in India as part of the Hindu religion, before being adopted by the Buddhists, but she was going to present a secular version. She described meditation as "a tool to investigate the mind", and provided a quote from Swami Rama, an influential Indian yogi: "From childhood onward, we have been educated only to examine and verify things in the external world. No one has taught us how to look within, to find within, and to verify within."

This sounded precisely what I wanted to do: I wanted to look inside myself in order to obtain insights into the nature of consciousness.

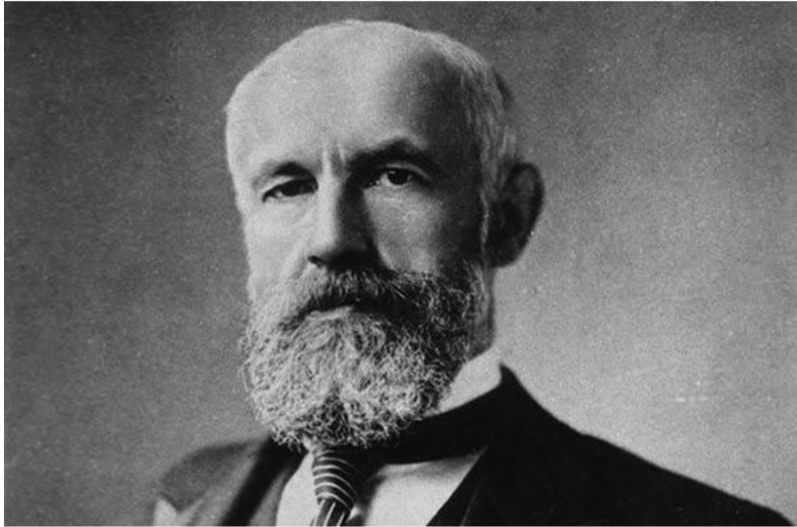
In other words, I wanted to perform *introspection*.

Introspection

"Introspection" is a word which we use in everyday conversation, but it is the correct term to describe a psychological research technique. Introspection is the method which involves "looking inside" at one's own conscious thoughts and feelings. In that way, it is possible to gain an understanding of the workings of the mind.

The first modern use of the term and technique took place at the end of the 19th century by the German psychologist Wilhelm Wundt, one of the founders of modern psychology.

Here is a photograph of Wilhelm Wundt:



Wundt's experiments involving introspection were performed under strict laboratory conditions. Wundt trained people to make accurate and objective observations of their conscious experience. However, Wundt's work was criticised on the basis that maybe the subjects of the experiments could not be trusted to accurately recount their own feelings.

Because of these difficulties, by the turn of the 20th century, introspection — and its preoccupation with "feelings" — was falling out of fashion: it was not considered to be scientific enough. In its place came *behaviourism*. Behaviourism considered human and animal behaviour, connecting that behaviour with states of the mind.

The most famous example of behaviourism is Ivan Pavlov's experiment with dogs in the early 20th century. Every time Pavlov rang a bell, a dog was given some food. This would be accompanied by the dog salivating, which was a reflex action. In time, the dog began to connect the stimulus (the ringing of the bell) with the reward (the provision of food). This connection was so strong that the dog salivated every time the bell was rung — even when no food appeared. Hence, Pavlov had revealed that a reflex action (the salivation) could be learnt.

Behaviourism suggests that all our behaviour is learnt behaviour. If we take a particular course of action, and that course of action turns out to be successful, or we get a reward, then we are more likely to take that same course of action in the future. In that way, behaviourism suggests that we are like robots — always taking the decisions which we believe will bring us the greatest reward. We are all under the impression that we have free will, but maybe we are just behaving like one of Pavlov's dogs!

For an example of behaviourism in action, see the episode of *The Big Bang Theory* entitled *The Gothowitz Deviation*. You can view the relevant extract from the episode on YouTube here: <http://tinyurl.com/sheldontraining>.

In the episode, Sheldon and Leonard are sitting on their sofa enjoying watching a Japanese animation entitled *Oshikuru: Demon Samurai*. Penny is unimpressed with the animation, and repeatedly annoys Sheldon with her jokes about her schoolfriend who had three nostrils. However, Sheldon is aware of behaviourism theory, and realises he can improve Penny's behaviour by using *positive reinforcement*, rewarding her with chocolate whenever she behaves correctly.

Apparently this *Big Bang Theory* episode is recommended viewing in some psychology classes.

At all times during the episode, Penny was under the impression that she had free will. However, that was clearly an illusion as her behaviour was deterministic: at all times she was following the path which led to the greatest reward.

One of the themes of this book will be that — although we feel as though our thoughts are completely free and unconstrained — many of our thought processes are actually following strict, predictable rules. And we can use that fact to our advantage when we attempt to detect consciousness.

As far as the psychologists were concerned, the obvious attraction of adopting behaviourism rather than introspection was that behaviour can be clearly measured, predicted, and objectively observed — whereas feelings cannot be measured by an external observer. Also, behaviourism could be used to study animals (try getting a chimpanzee to tell you how it feels and you will quickly discover the limitations of introspection). Suddenly,

psychology could be studied scientifically and no one wanted to talk about internal consciousness any more. Behaviourism became the dominant approach to psychology in the mid 20th century.

However, gradually, there emerged a disenchantment with behaviourism. It is a very limited and unsatisfactory approach just to consider the inputs and outputs of a system (the brain) without ever wondering about what goes on inside. We will be seeing in Chapter Five how introspection has made a recent comeback, and has proven to be an essential technique in the new science of consciousness.

But, for now, let us return to the meditation session ...

The stream of consciousness

Back in my meditation session, the instructor then started to explain the goals of meditation.

The main goal appeared to be to clear your mind of thoughts. The resultant clarity would then allow you to examine the true core of your being — without being distracted by the constant clamour of thoughts: "Did I leave the cooker on?", "What's the weather going to be like tomorrow?" Many of these thoughts deal with matters which are external to ourselves, and are often outside of our control. In other words, those type of thoughts are not a unique part of our individual minds: everyone worries if they have left the cooker on, everyone wonders what the weather will be like tomorrow. It would therefore appear to be essential to banish these general distracting thoughts during a meditation session.

So this seems like a good moment to examine in closer detail a question which seems very fundamental to consciousness. The question is: what is a "thought"?

In 1890, the American philosopher and psychologist William James wrote a book entitled *The Principles of Psychology*, which has been described as the most famous book in the history of psychology. In his book, James popularised the phrase "the stream of consciousness" to describe a thought process in the mind: "Consciousness, then, does not appear to itself chopped up in bits. Such words as 'chain' or 'train' do not describe it fitly as it presents itself in the first instance. It is nothing jointed; it flows. A 'river' or a 'stream' are the metaphors by which it is most naturally described. In talking of it hereafter let us call it the stream of thought, of consciousness."

However, when we talk about a "stream of consciousness" nowadays, we are more likely to be using the term when referring to a completely different field of interest. And that is because William James had a brother, the famous novelist Henry James.

Henry James had an experimental style, and attempted to describe the internal minds of his characters. James realised that our internal train-of-thought is usually formed out of conversational English. For example, in order to decide whether or not to make a shopping trip in the evening, we might literally think the phrase: "Should I go to the shops? Oh, the car's got no petrol." It is this type of highly-informal *inner monologue* that can be captured and written-down word-for-word in order to express the thoughts of characters in a novel. This is then known as a literary stream of consciousness.

This has now become a standard literary method, but it was a radical step when Henry James used it for the first time in his book *Portrait of a Lady* in 1881. However, the technique is most famously associated with the Irish novelist James Joyce's epic novel *Ulysses*. *Ulysses* was released in 1922 and is regarded as being a classic of modernist experimental fiction. The book tells the tale of one man, Leopold Bloom, as he travels around Dublin in a single day. Joyce accurately captures the inner thoughts of the characters in the book.

Here is an extract from *Ulysses* showing Molly's stream of consciousness as she tries to fall asleep at night. Note that it appears continuous and fractured, constantly switching between different lines of thought, an accurate representation of the stream of thoughts in our mind: "Let me see if I can doze off 1 2 3 4 5 what kind of flowers are those they invented like the stars the wallpaper in Lombard street was much nicer the apron he gave me was like that something only I only wore it twice better lower this lamp and try again so that I can get up early."

One thing we can notice from Molly's stream of consciousness is that it is continuous with no gaps — Joyce did not even include any full-stops. This characteristic feature of our thoughts was mentioned by my meditation instructor who described how our minds are occupied with a succession of thoughts: no sooner does one thought end, then another one starts. From the comments of the other attendees in the meditation course, I got the impression that most people there were trying to escape that clamour of continuous thoughts in their heads.

Ulysses is notorious for being a difficult read, but there is perhaps a simpler example of a stream of consciousness. In comic books, verbal communication between two characters is graphically represented by the usual speech bubble. However, the inner monologue of a character is represented by a *thought cloud*:



The thought cloud forms a perfect example of a stream of consciousness.

And this graphical use of a cloud to describe a thought is highly revealing. Intuitively, we have a feeling that our thoughts somehow inhabit a "higher realm" which is insulated from the physical world — just as a cloud exists at a higher level from the physical ground we inhabit.

If we close our eyes and meditate, we can travel anywhere in a fraction of a second. We can travel to the Moon and back faster than the speed of light. In our imagination, the laws of physics no longer apply. We are insulated from the rules and the confines of the physical world. The thought cloud in a comic book is therefore a perfect representation of how our consciousness feels.

And there is something else we can learn from this discussion about our stream of consciousness ...

If our internal stream of consciousness employs a language such as conversational English, then that has implications. Because languages have rules. The English language has strict rules of grammar. Those rules of grammar determine the structure of the sentences in our minds. Our internal monologues might be rather informal, and might sometimes not be much more than the fragments of sentences, but those sentence fragments would still follow the rules of grammar.

Considering the example presented earlier, we might think internally: "Should I go to the shops? Oh, the car's got no petrol." But we would never think to ourselves: "Should I **gone** to the shops? Oh, the car's got **none** petrol."

This is important because it reveals something profound about our thoughts. We like to think of our thoughts as being free, completely unconstrained. But this discussion has revealed that our thoughts follow rules, to some degree. And this will be a recurring theme in the later part of this book: our thoughts follow rules. And we will discover that those rules of thought follow a series of ancient principles which are even more fundamental and unbreakable than the rules of the English language.



The meditation session

Back in the meditation class, the meditation session was about to begin.

The instructor explained that meditation is normally performed by sitting on the floor in a cross-legged position. But, frankly, my knees aren't what they were, and we didn't fancy all that getting up-and-down, so we decided we would do it sitting on our chairs.

We were told to sit with our backs straight so that the "energy" could pass up and down our spine (was that potential energy or kinetic energy? I thought it wise not to ask). We then had to place our palms on our knees, and close our eyes.

It was explained that the purpose of meditation was to clear our thoughts, while still remaining aware. So, while our eyes were closed, we were still aware of our breathing, and our hands on our knees, and that extremely uncomfortable wooden chair which was pushing up into my bum. The chair had about a millimetre of foam padding on it. It's not easy trying to clear your thoughts when your bum is in agony.

But eventually I did relax.

The first thing I noticed as soon as I closed my eyes was that I was transported somewhere else. The act of closing my eyes had broken my tie with my current physical location, and — in my mind's eye — I now saw that I was in a local amusement park by the sea which I used to visit as a child. Of course, I knew I was not really there, but I experienced an internal mental image of the scene so that I felt I was there.

You might want to try this yourself. Sit down comfortably, close your eyes, and after a few seconds you forget where you are and you will probably experience a mental image of a different location. I suspect that the location will be somewhere you know very well, possibly somewhere you know from childhood. In other words, this is probably a pleasant location you have revisited in your mind many times, with the result that the visual scene has been burnt into your mental imagery — like the screensaver on a CRT screen.

What appears to be happening is that — in the absence of the continued sensory input from your eyes — your brain forgets about your current location and it retrieves a strong visual image from memory.

At this point, I still found I had thoughts racing through my mind. These resembled the random stream-of-consciousness of *Ulysses*. But meditation requires a mind free of such thoughts. The problem, though, is that it is very hard to not think of something. As the Russian novelist Fyodor Dostoevsky said in an essay in 1863: "Try to pose for yourself this task: not to think of a polar bear, and you will see that the cursed thing will come to mind every minute."

In 1987, David Wegner, a psychology professor at Harvard university, decided to test Dostoevsky's claim. Wegner's experiment was described in an article for the American Psychological Association: "He decided to test the quote's assumption with a simple experiment: he asked participants to verbalize their stream of consciousness for five minutes, while trying not to think of a white bear. If a white bear came to mind, he told them to ring a bell. Despite the explicit instructions to avoid it, the participants thought of a white bear more than once per minute, on average." [\[1\]](#)

So, trying to force thoughts out of your head does not work. Instead of trying to force the thoughts, you just have to ignore them and let them drift away. Susan Blackmore and Emily Troscianko have written a book entitled

Consciousness: An Introduction in which they devote a large section to meditation. They explain the required approach: "Unwanted thoughts may be held at bay temporarily, but then they come back with greater force, or change into other more persistent thoughts, or set up emotional states that keep reigniting them. The answer is not to fight against thoughts but to learn to let them go."

So that is what I tried to do. And then it happened ...

... I came to the realisation that I had not had any thoughts for the last five seconds.

My stream of consciousness — my inner dialogue — had briefly stopped. The only content of my conscious mind over that short period was that mental image of the amusement park. Other than that, my conscious mind contained no thoughts.

Also, interestingly — and perhaps significantly — I was no longer conscious of my sore bum.

However, even in that state of a clear conscious mind, we are still able to respond to external stimuli. For example, when the instructor started to talk, I immediately snapped-back to the present time and place.

We were then told to rub our eyes, and slowly open them. At that point, I was no longer in the amusement park — I was back on my chair in the circle with my fellow students.

And, once again, my bum was sore.

2

THE CONSCIOUS MIND AND THE UNCONSCIOUS MIND

I found my time at the meditation class to be a very valuable experience. At the end of the course, I thanked the instructor, and said goodbye to some lovely people. I am sure that they — like me — had discovered some new truths about themselves.

But then I was faced with the task of making sense of my experiences at the class. What had I learnt about myself, and how my mind works? Had introspection proven to be a good method for uncovering the secrets of consciousness?

Well, considering the meditation session, firstly it was clear that we have a conscious mind — fairly obviously. This is the part of the mind which we consider our "self", the part of the mind which hosts our conscious thoughts. This stream of thoughts takes the form of an inner monologue — our "stream of consciousness" as described in *Ulysses* and in the previous chapter.

However, even though our conscious mind hosts that stream of thoughts, it was also clear from the meditation session that it is possible — though difficult — to relax and to clear our conscious mind of that stream of thoughts for a short period of time.

But even though it is possible to clear the conscious mind of thoughts, that does not mean the mind as a whole is inactive. Far from it. Even though I had my eyes shut and my conscious mind was clear, when the meditation tutor started talking again I was immediately made aware of the talking and it snapped me back to reality. It was clear that a part of my mind must have been constantly scanning all sensory inputs (sound, vision, etc.) for any important signals.

But there were other sounds in the room as well. The clock was ticking. There was road traffic outside. But these unimportant signals did not gain access to my conscious mind. Also, my bum was sore from the hard chair, but when my conscious mind relaxed and cleared, I was no longer conscious of the hard chair. You might argue that the sound of the clock ticking and the sound of the road traffic were not sufficiently strong stimuli to enter my conscious mind, but I can assure you that my sore bum was producing a sufficiently strong stimulus.

So why did some sensory signals enter my conscious mind, while some strong signals got filtered-out? What part of my mind was doing the filtering?

It was clear that it was not my conscious mind that was doing that continuous scanning — I was not consciously thinking "Don't listen to the clock, forget about the hard chair". So what part of my mind was active?

It is now widely accepted that these tasks — which do not involve the conscious mind — are performed by the *unconscious mind*. Even if your conscious mind is clear, your unconscious mind does not rest. It is your unconscious mind which is constantly filtering the multitude of input sensory signals to detect any important signals, and only passing those signals to the conscious mind. Your unconscious mind is also responsible for intuition, and generating flashes of inspiration and creativity, passing those ideas up to the conscious mind for conscious evaluation.

Further evidence for the existence of the unconscious mind comes from hypnosis. In order to place a person into a hypnotic trance, the person must be in a carefully-controlled calm environment in which the conscious mind can be completely relaxed. For example, the hypnotist might say soothing words, or capture attention by spinning a pocket watch. Perhaps you have noticed that you have entered a similar trance-like state when driving a long distance on a straight road. That is another example of the conscious mind becoming completely relaxed, with the unconscious mind taking over control.

Once the subject's conscious mind is relaxed, and the subject is in a trance, the hypnotist can then communicate directly with the subject's unconscious mind. A suggestion can then be placed into the unconscious mind. For example, the subject might be instructed to perform a dance when the hypnotist clicks his or her fingers. When the hypnotist later clicks their fingers, the subject will, indeed, start to dance — although the subject will have no conscious understanding of why they are dancing. In this case, the suggestion from the unconscious mind overwhelms the control of the conscious mind.

The conscious mind is responsible for controlling the urges and instincts which rise up from the unconscious mind. This explains why subjects in a hypnotic trance can behave in a uninhibited and playful manner, with

behaviour no longer being filtered by the conscious mind. When the unconscious mind is given free rein, the subject can feel liberated and more creative.

Hypnotherapy is a form of psychological therapy in which fears, negative thoughts, and phobias can be eliminated by using hypnosis. As many of these problems arise from the unconscious mind, hypnosis can be used to reprogram the unconscious mind and eliminate the problem.

The unconscious mind is also the storehouse for all our long-term memories. By accessing the unconscious mind during hypnosis, it is possible to revisit past events that the subject might have forgotten. It is then possible to resolve long-term psychological problems.

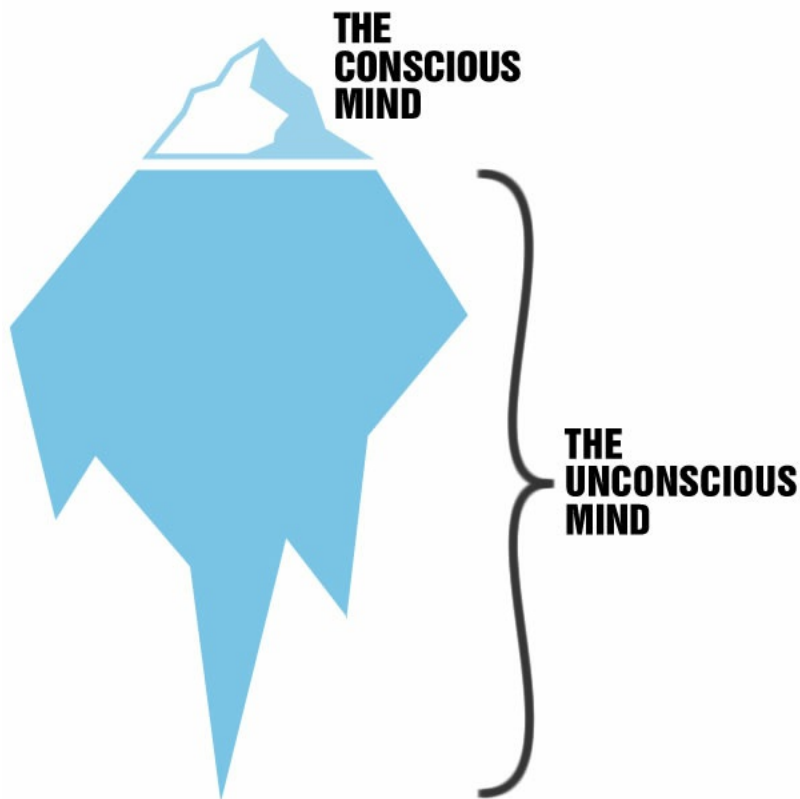
Another example of the power of the unconscious mind is provided by *subliminal images*. You may already be aware of subliminal images because of their controversial use in advertising. Subliminal images are images which are flashed very briefly before disappearing. The period of visibility is so brief (less than 80 milliseconds) that these images or words do not register with the conscious mind — the subject undergoing the experiment denies having seen the words. However, the words have been processed by the unconscious mind, and that is enough to modify behaviour — maybe even persuading the viewer to buy a particular product. For this reason, subliminal advertising has been illegal in the USA and the UK since 1958.

In psychology, this technique of modifying behaviour by presenting a subliminal image is called *priming*. Studies of priming are valuable for determining the extent of the influence of the unconscious mind. It is clear that, although we like to think that our decisions are wholly made by our conscious mind, the truth is that our decisions are often based on suggestions from our unconscious mind.

We shall return to consider subliminal images and priming in the next chapter.

It is clear that the unconscious mind is extremely powerful, and that its power is generally underestimated. It was Sigmund Freud who popularised the notion of the unconscious mind. Freud described the great power of the unconscious mind by using a metaphor. Freud compared the conscious mind to the "tip of an iceberg", with the conscious mind being the small, visible portion of the mind with the far larger unconscious mind lying unseen beneath the water. According to Freud: "The mind is like an iceberg: it floats with one-seventh of its bulk above water".

The following diagram shows Freud's iceberg metaphor, with the conscious mind represented as the "tip of the iceberg":



"Access" and the conscious mind

We might ask, what is the distinguishing feature of the conscious mind? In other words, what is it that distinguishes the conscious mind from the unconscious mind?

Well, in psychology, philosophy, and in consciousness research, conscious thoughts are described by the term "access". If we are able to use a particular concept or information in our conscious train-of-thought then it is said that we have "access" to that concept. In other words, we are able to use that object in our conscious reasoning processes.

For example, you have access to the thoughts that represent your car, or the printed letters on this page, or your intended holiday destination. You have access to any thought or information which you can bring to the foreground of your mind for conscious processing.

And you have access to each step of any conscious thought process. That means you have complete visibility of each step, how you proceeded from some initial knowledge, through a step-by-step reasoning process, toward a conclusion. In your conscious mind, you have complete access — complete visibility — of each step.

The term "access" might appear to be rather a peculiar term to describe the conscious mind (well, I find it rather peculiar). But its use perhaps becomes clearer when we move on to consider the unconscious mind. That is because the unconscious mind is very clearly defined by its **lack** of access.

Our conscious mind continually receives ideas and intuitions from the unconscious mind. But those ideas arrive fully-formed, carrying no information about how those ideas were generated. For that reason, it is often said that ideas arrive "out of the blue". What this means is that we possess no access — no visibility — on how the unconscious mind has generated those ideas. While we have access to each step of our conscious thought processes, we have absolutely no access to each step of our unconscious thought processes — we only receive the results of those processes.

Returning to consider Freud's iceberg metaphor, the unconscious mind lies under the surface of the ocean in the murky depths — we cannot see its workings. However, ideas constantly bubble-up to the surface, from the unconscious mind to the conscious mind. When we say an idea arrives "out of the blue", we might well mean "out of the blue unconscious ocean".

The unconscious mind is therefore defined as that part of the mind which the conscious mind cannot access.

As a brief detour, I would like to introduce a couple of concepts and some terminology which is in common usage in philosophy and consciousness research.

In an influential 1995 paper, the philosopher Ned Block suggested that our conscious experiences could be classified into two groups.^[2] Firstly, Block suggested the existence of one class of conscious experience called *access consciousness*. As just described in this section, access consciousness is the thought processes we can access in our rational thinking. Access consciousness would therefore represent the near-constant stream of thoughts which flow through our minds.

Secondly, Ned Block suggested the existence of a second classification of conscious experience which he called *phenomenal consciousness*. Phenomenal consciousness is our general awareness of feelings and sensations.

In the meditation session, when I successfully eliminated my stream of conscious thoughts (my "access consciousness"), what was left was my phenomenal consciousness — my general awareness of sensations.

These two terms — access consciousness and phenomenal consciousness — seem to have received fairly wide acceptance in consciousness circles, though the idea remains controversial.

Thinking, fast and slow

In 2011, Daniel Kahneman released his book *Thinking, Fast and Slow*. Kahneman is a professor of psychology at Princeton University and has been described as being the world's leading psychologist. In 2002, Kahneman was awarded the Nobel Prize for Economics (yes, economics is basically psychology).

Thinking, Fast and Slow became a publishing sensation, and has sold over one-and-a-half million copies. The

book was that rarest of things: a bestselling and entertaining book aimed at the general public, but it is also a book which is considered to be a major contribution to its field. That combination of achievements represents the Holy Grail of science writing.

Thinking, Fast and Slow proposes that there are two different types of thought process which Kahneman calls System 1 thinking and System 2 thinking. System 2 thinking is slow, deliberate, and accurate, and is used for making decisions, solving problems, and planning. In contrast, System 1 thinking is fast and intuitive, but not as reliable.

What makes Kahneman's proposal so interesting from the point-of-view of this book is that he associates the slow and deliberate System 2 thinking with the conscious mind, while he associates the intuitive System 1 thinking with the unconscious mind.

Kahneman makes the connection between System 2 thinking and consciousness explicit when he states: "When we think of ourselves, we identify with System 2, the conscious reasoning self that has beliefs, makes choices, and decides what to think about and what to do."

Kahneman then associates System 1 thinking with the unconscious mind when he says: "System 1 runs automatically. System 1 continuously generates suggestions for System 2: impressions, intuitions, intentions, and feelings."

Also, Kahneman associates System 1 thinking with lack of access, which is what we would expect from the unconscious mind: "Phenomena arise in System 1, and you have **no conscious access** to them."

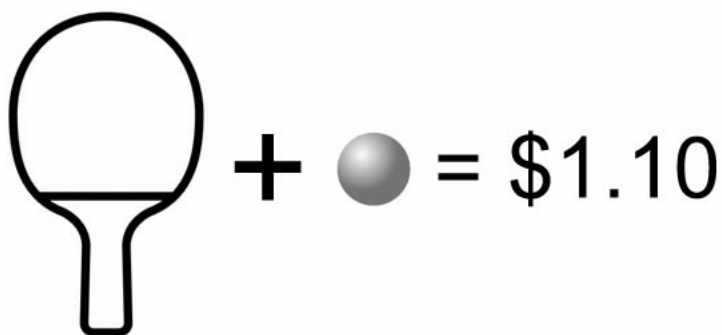
Kahneman's theory is one example of what are known as *dual-process theories*. Dual-process theories split our thought processes into two categories, and these can be associated with the conscious mind and the unconscious mind. In their book *Consciousness: An Introduction*, Blackmore and Troscianko describe this association: "These theories can come in many forms, applying to memory, learning, or decision-making, but most suggest that one process is fast, automatic, inflexible, effortless, and dependent on context, while the other is slow, effortful, controlled, flexible, requires working memory, and is independent of context. **The two kinds of process map easily onto a distinction between unconscious and conscious processes.**"

Kahneman explains that, in general, we rely on System 1 thinking (unconscious thinking) to get us through the day. Even though System 1 thinking is not as sophisticated as System 2 thinking, it is sufficient for most tasks we encounter: "When all goes smoothly, which is most of the time, System 2 adopts the suggestions of System 1 with little or no modification. You generally believe your impressions and act on your desires, and that is fine — usually."

One of the big advantages of System 1 thinking is that it is fast — faster than System 2 thinking (hence the title of the book: *Thinking, Fast and Slow*). As a result, System 1 thinking can respond quicker to external events, with no need to invoke the laborious and time-consuming problem-solving capabilities of System 2 thinking. However, as Kahneman reveals using entertaining examples, the lack of sophistication of System 1 thinking can introduce problems which include inaccurate and misleading assessments, bias, and a tendency to stereotype.

An example of these two modes of thought comes from considering the following example of simple arithmetic, considering the prices of a table tennis bat and a ball. Try and respond to the question quickly:

A bat and a ball together cost \$1.10. The bat costs \$1 more than the ball. How much does the ball cost?



You have might have quickly responded that the bat costs a dollar and the ball costs ten cents. But if you had taken a bit more time then you would have realised that could not possibly be the correct answer: if the ball costs ten cents, and the bat costs a dollar more than the ball, then the bat costs \$1.10. In which case, the total cost of the bat and ball would be \$1.20, which is the wrong total amount.

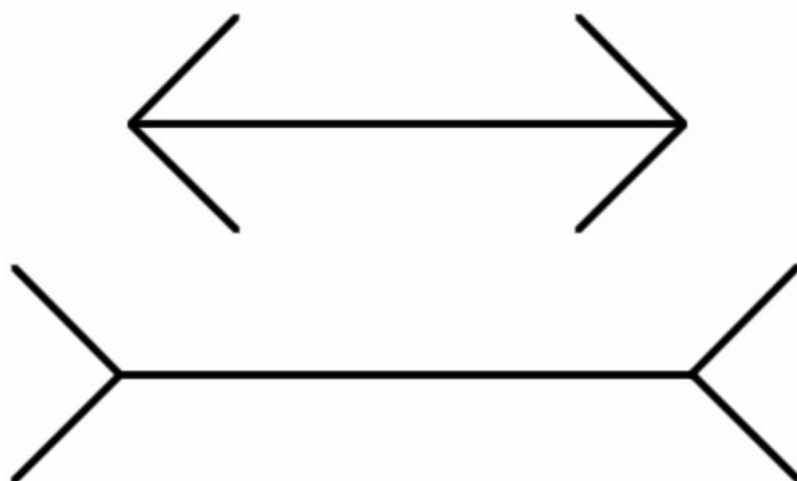
If you were given more time to consider the example in detail, you could then employ your conscious skills in

mental arithmetic and calculate the correct answer, which is that the ball costs just five cents and the bat costs \$1.05. Kahneman describes the puzzle: "The distinctive mark of this easy puzzle is that it evokes an answer that is intuitive, appealing, and wrong."

If you responded quickly and you gave the wrong answer, do not be too worried. More than half of the students from Harvard, MIT, and Princeton who attempted the problem gave the wrong answer initially.

According to Kahneman, our initial incorrect calculation was performed by our intuitive System 1, which did not engage our conscious thought processes. Remember, System 1 is faster and more instinctive. According to Kahneman, it was only when we engaged our System 2 conscious thought processes — our mental arithmetic abilities — that we were able to calculate the correct answer. System 2 is not "always on", but it is available for use when required.

As another example, consider the following optical illusion and make a quick decision as to which horizontal line is longest. Is the top horizontal line longer, or is the bottom horizontal line longer:



If you said that the bottom line is longer — well done. The bottom line is, indeed, 5% longer than the top line. However, I suspect you might have been fooled by the phrase "optical illusion" into thinking that the lines were actually the same length — as in the case of the well-known optical illusion.^[3] If so, then your System 1 thinking would have been responsible for fooling you. If you had been able to spend more time inspecting the problem, and had engaged your slower and more analytical System 2 thinking, I suspect you would have realised that the lines were different lengths (use a ruler to measure the two lines if you do not believe me).



In this chapter we have discovered that the mind appears to be split in two: a conscious mind, and an unconscious mind. But why is there this split? The structure of our mind seems so natural to us that we perhaps never consider why our minds have this divided structure. Perhaps it is hard to comprehend that a mind might be structured differently.

But surely there must be a reason for this structure. Let us ask the difficult question: Why is our mind divided into two parts, a conscious mind and an unconscious mind?

Surely Kahneman's description of System 1 thinking and System 2 thinking provides us with a valuable insight into the different structures of the conscious mind and the unconscious mind. In particular, why should the conscious mind be slow? And why should the unconscious mind be fast? In other words, why is there *Thinking, fast and slow*?

In the next chapter, we will be considering a possible solution to this mystery ...

... and the answer comes from computing.

3

THE BRAIN AS A COMPUTER

At the start of this book, it was explained how behaviourism became the dominant approach to psychology in the mid 20th century. The appeal of behaviourism was that behaviour can be clearly measured, predicted, and observed. It therefore turned psychology into an objective science — something that you could measure, together with experiments that provided quantitative results.

It is therefore easy to understand the appeal of behaviourism. But these attractive features of behaviourism also became its weaknesses. Behaviourism treated the mind as a "black box", only considering its inputs and outputs. The example was presented earlier of Pavlov's dogs: ring the bell, and note the salivation of the dog. The inputs and outputs can be clearly measured. However, if the mind is being treated like a black box, then that implies that you are no longer attempting to discover the internal workings of the mind. And it is that limitation of behaviourism which started the decline in its popularity.

There is an old joke which is intended to reveal the weakness of behaviourism. The joke concerns a behaviourist who observes the behaviour of other people, but refuses to use introspection to investigate his own mind. As a result, after having sex, the behaviourist says: "That was great for you, how was it for me?"

And so it was, in the 1960s and 1970s, a new method of understanding the internal workings of the mind emerged. The catalyst for this new approach was the emergence of the computer.

Computers process information, taking information as input, processing that information in some way, maybe storing some information in its memory, and then producing modified information as output. It was realised that the brain works in exactly the same way, obtaining information through our eyes and ears, processing that information, maybe storing some of that information to memory, and then producing an output in the form of our actions or speech.

The new approach to understanding the mind was therefore based on treating the mind as an information processor. Just as we have an understanding of the individual processes which occur inside a computer, so it became possible to speculate about the processes which exist inside the mind.

This approach which treats the mind as an information processor is called *cognitive psychology*. This major change of direction in psychology which took place in the 1960s and 1970s has been called the "cognitive revolution". You may have heard of "cognitive behavioural therapy" (CBT) which is an attempt to remedy irrational thought processes by developing new information-processing skills. In essence, CBT attempts to "reprogram" the mind in the same way as you would reprogram a computer.

Let us now consider how information is processed in the mind — by comparing the way information can be processed in a computer.

Serial processing

In computing, there are two fundamentally different methods of information processing. Firstly, there is *serial processing*. A serial processing approach to computing involves each instruction of an *algorithm* being performed one after another in sequence. An algorithm is a description of the step-by-step process needed to solve a problem. This is how we intuitively think of a computer program, and if you have done any computer programming yourself then you will have used this method of serial processing.

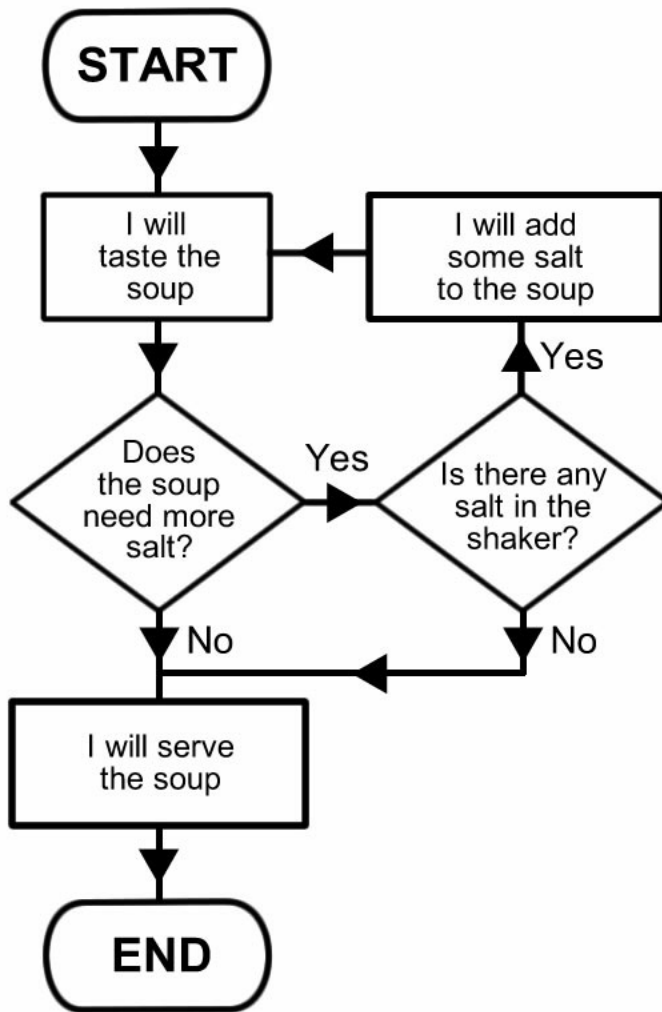
The following block diagram shows a serial processing operation composed of three tasks performed one after the other:



Note that there is a single stream of processing. In computing terminology, it would be said that there is a single *thread* of execution.

Serial processing has to be used to solve any problem in which the execution of each task depends on the execution of a previous task. This requirement forces the tasks to be performed in a certain order, and prohibits the possibility of running more than one task at once.

However, that restriction does not necessarily mean that the tasks have to be performed in a strictly linear order (as shown on the previous diagram). There can be branches and decisions, the outcome of those decisions changing the direction of processing. This can be seen by considering a computer *flowchart*. The following flowchart represents the steps which might be taken by a cook who is adding salt to soup. Note that the flowchart includes two decision boxes which take the form of diamond-shaped boxes:



It is clear from this particular example that a flowchart can be used to represent a conscious thought process — a stream-of-consciousness. This particular flowchart would represent the stream-of-consciousness of a cook who is adding salt: "Does the soup taste like it needs more salt? Oh yes, it does. I better add some more salt. Oh dear, there's no more salt in the shaker! Never mind, I'll serve it as it is."

We each have one, single train of thought. And just as we have a single stream-of-consciousness (we never talk of the plural: **streams** of consciousness) so there is only ever one thread of execution in serial processing.

The need for this single thread of execution in our mind arises because real-world problems generally require a step-by-step solution in which tasks must be performed in a particular order. For example, trying to build a house (the walls must be constructed before the roof), or any attempt to solve a complex puzzle. Considering purely mental examples, solving a problem of mental arithmetic, or any form of logical reasoning also requires a step-by-step process. And all of these step-by-step processes represent examples of serial processing.

This suggests that **our conscious thought process is a form of serial processing**. Put simply, we can only think of one thing at once, which inevitably represents serial processing.

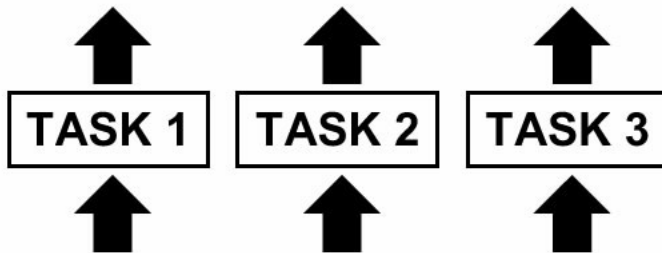
In his book *Consciousness and the Brain*, Stanislas Dehaene makes a direct connection between our conscious thoughts and serial processing, and uses an example from mental arithmetic to illustrate the connection: "In humans at least, consciousness gives us the power of a sophisticated **serial computer**. For instance, try to compute 12 times 13 in your head. Did you feel each of the arithmetic operations churning in your brain, one after the other? Can you faithfully report the successive steps that you took, and the intermediate results that they returned? The answer is usually yes; we are aware of the **serial** strategies that we deploy to multiply."

And, as we shall now see, this serial processing conscious train-of-thought is even more remarkable in that it is not representative of how the majority of the brain operates ...

The parallel processing of the unconscious mind

There is an alternative to serial processing. If the execution of a task does not rely on the execution of a previous task, then it becomes possible to process each of the individual tasks **at the same time**. This approach is called *parallel processing*. The great advantage of parallel processing is that it is faster than serial processing. Obviously, performing many tasks simultaneously is going to be faster than performing those tasks one at a time.

The following block diagram shows parallel processing:



So let us recap what we have discovered so far.

Serial processing is relatively slow, but it has to be used for processing in which the execution of one stage relies on the execution of a previous stage. There has been a suggestion that our conscious thought processes use serial processing. Parallel processing is an alternative which is very much faster if the problem can be divided into independent tasks.

So there are two types of processing in computing: one type fast, one type slow. What does that remind you of? I hope it reminds you of the title of Daniel Kahneman's book *Thinking, Fast and Slow*. Bearing that in mind, could we associate slow serial processing with Kahneman's conscious System 2 thinking, and associate fast parallel processing with Kahneman's unconscious System 1 thinking?

Is that the case? I believe to a large extent, yes, that is correct. And in this section reasons will be presented — apart from the processing speed argument already presented — for why that appears to be true.

In the previous section, it was explained how our conscious mind could be associated with serial processing. If that is the case, then why should we associate our unconscious mind — the majority of the brain — with parallel processing?

Let us examine the evidence.

The first evidence comes from examining the hardware of the brain. Put simply, the brain by its very nature is a huge parallel processing machine. Multiple patterns of activated neurons occur simultaneously across the brain. It is this vast parallelism which is the source of the power of the brain. Put simply, the brain can process many things at once.

This, then, fits the "iceberg" metaphor: the unconscious mind forms the majority of the brain (the bulk of the iceberg, under the ocean), and the majority of the brain is parallel.

In a paper entitled *In the Theater of Consciousness*, Bernard Baars refers to this parallel processing of the brain and the "largely unconscious" nature of that parallel processing: "The brain is massively parallel — many things are happening at the same time — largely unconscious in its details." [\[4\]](#)

More evidence for making this connection comes from considering how clever ideas and solutions are generated and enter our conscious mind. We receive ideas and solutions from our unconscious mind all the time. Those unconscious thoughts which bubble-up can often be ingenious solutions to problems, solutions which surely could only have been produced by the unconscious mind considering a wide range of alternative solutions. And sometimes the unconscious mind can come up with creative ideas, strange connections between apparently completely different concepts which could only have arisen by the unconscious mind considering a wide range of alternative connections. In other words, in all these cases of ideas and solutions, we find an unconscious mind which is constantly doing many things at once, considering many ideas or many solutions **at the same time**.

We are all aware of the great power of our unconscious mind, and that power surely comes from parallel processing.

The psychologist Saul McLeod has presented an example of a human typist using thought processes based on parallel processing: "Parallel processing is probably more frequent when someone is highly skilled; for example, a

skilled typist thinks several letters ahead." [5]

This is an example which links parallel processing and the unconscious mind. The typist thinks several letters ahead, which, as the quote states, represents a form of parallel processing. But, at the same time, the typist is unaware of that forward thinking — it is an unconscious process.

Another example of the parallel processing of the unconscious mind was provided by a paper published in 1980 by the English psychologist Anthony Marcel.[6] Marcel's work used subliminal images. As described in the previous chapter, subliminal messages are words which are flashed so briefly that they do not register in the conscious mind. But even though the conscious mind is completely unaware of the messaging, it can still influence behaviour. As mentioned in the previous chapter, this technique is called "priming".

In his paper, Marcel presented a series of subliminal words to a subject. The words were specially chosen to have multiple meanings. For example, the word "palm" might mean a part of a hand, or it might mean a type of tree. In that case, Marcel discovered that the unconscious mind primed for **both** meanings of the word. This meant that the later behaviour of the subject showed favourable bias both towards hands **and** towards trees. This showed the unconscious mind working in parallel, processing two meanings at the same time. In fact, in his paper, Marcel proposed that all possible meanings were processed simultaneously by the unconscious mind: "apparently both meanings were accessed, irrespective of context. It is argued that unconscious perception ... is of **unlimited capacity** and precedes conscious perception."

Yes, in that quotation Marcel even suggests that unconscious perception is of "unlimited capacity" so could potentially process **all** meanings of words — no matter how many meanings a particular word might have. This reveals the remarkable parallel processing capacity of the unconscious mind. Stanislas Dehaene also considers this result in his book *Consciousness and the Brain*, emphasising the parallel processing capability of the unconscious mind: "Thus our unconscious mind is clever enough to store and retrieve, **in parallel**, all the possible semantic associations of a word."

Parallel processing is also ideal for the unconscious filtering of sensory input. We can imagine how this might have arisen via evolution. Imagine ancient man roaming the African savannah many millennia ago. As he leisurely walks a great distance, he is relaxed, and his conscious stream-of-thought is disengaged — his mind is clear of thoughts. However, his unconscious mind never rests, constantly monitoring his surroundings, scanning the savannah and monitoring the large number of different possible sources of sensory input data (ears and eyes). This would all be necessarily performed simultaneously by parallel processing. The advantage of parallel processing is that it can process multiple streams of input data at the same time.

Suddenly, a lion appears on the horizon. One of the parallel processing threads — a pattern matching operation capable of visually detecting lions — responds with a high level of activation. That single signal gets sent up to the conscious mind.

At that point, the conscious thought process is alerted and takes over. As described earlier, this is based on serial processing. This is Kahneman's System 2 thinking, able to analyse the problem and determine the best course of action. How far away is the lion? How fast can I run? Is there a tree nearby? System 2 logically selects the eventual action. In other words, System 2 has overall control — the conscious mind has overall control.

The man decides to climb a tree, and is saved.

The structure of the mind

To sum up, our mind seems to be mainly composed of a parallel processing part, which represents the unconscious mind, while the smaller conscious part (the tip of the iceberg) uses serial processing. This model was suggested by the cognitive psychologist Philip Johnson-Laird in his 1988 book *The Computer and the Mind*: "The brain, unlike the conventional digital computer, is not a device with a single processor. Many processes occur in parallel, though the stream of conscious experience seems to be serial."

And this arrangement can potentially explain the reason why our minds are divided into two parts, a conscious mind and an unconscious mind.

In this chapter it has been explained that there are two fundamentally different methods of processing information: serial processing and parallel processing. Each method of information processing — serial processing and parallel processing — has its own relative advantages and disadvantages. Parallel processing can perform simple evaluation of multiple scenarios simultaneously, sending the most promising ideas up to the conscious mind. Parallel processing is also required for monitoring multiple sensory inputs, and would therefore be used for unconscious scanning of the environment, and filtering of important signals.

However, high-level conscious tasks such as problem solving and decision-making require serial processing: a

single train-of-thought. Serial processing is, by its nature, slower than parallel processing. We therefore end up with a brain with two systems, with each system able to process information at very different speeds — hence Kahneman's *Thinking, Fast and Slow*.

It is therefore suggested here that the true fundamental reason for this division of the mind into two parts — a conscious mind and an unconscious mind — is because there are two fundamentally different ways to process information in any computing device: parallel processing and serial processing.

The divided structure of the mind is not arbitrary, it arises because information processing itself has a natural divide into parallel and serial processing. Each of the two methods has its own relative advantages and disadvantages. Nature would surely exploit the relative advantages of each method, and so the eventual dual structure of the brain would reflect that natural divide.

And we might even take this idea one step further. This structure might potentially explain why the serial processing part of the mind would view the parallel processing part as being "unconscious". It would purely be because the serial processing part of the mind (the conscious mind) would not be able to process data at the same rate as the parallel processing part of the mind (multiple threads can process more data than a single thread). Inevitably, some data could not be passed up from the unconscious mind to the conscious mind. As a result, the conscious mind would not have "access" to all the intermediate processing of the unconscious mind.

There is another way of thinking about this. Imagine if all the details of the parallel processing system were passed up to the conscious mind. Your conscious mind would be simply overloaded with data — you would not be able to think straight! For this reason, only the end result of the parallel processing system would be passed to the conscious mind.

This idea is explained by Philip Johnson-Laird in his book *The Computer and the Mind*. Johnson-Laird suggests that the conscious mind: "would have no access to the processes on which it is based. There are good evolutionary reasons for this arrangement: if you could scrutinize the whole process of perception, it would have to be much slower since it could not depend on parallel processes."

Results passed-up from the parallel system would just appear to the serial system as if those results had been magicked out of thin air, with no way of knowing how those results had been derived. If our conscious mind is just the tip of the iceberg, then that tip of the iceberg would be unable to see the rest of the huge iceberg below the surface of the water. Ideas would appear "out of the blue".

This lack of transparency would result in the parallel processing system appearing to be a dark, mute, black box. As a result of this lack of access, the serial processing system would interpret the parallel processing system as being "unconscious".

To sum up, as soon as we realise that there are two distinct methods of processing information in any computing device — serial processing and parallel processing — then the dual conscious/unconscious structure of the mind emerges quite naturally.

4

THE FAME OF PHINEAS GAGE

Phineas P. Gage was born in Grafton County, New Hampshire in 1823. He was the first of five children, and received little in the way of education, rendering him illiterate. However, Gage was mightily strong and healthy, outgoing and popular.

When he was twenty five years old, Gage obtained a job as a blasting foreman working on the construction of the Hudson River Railroad. Gage's job required him to use explosives to blast large cuttings through rock so that the railroad track could be laid. The job required Gage to place explosive into holes which had been drilled into the rock. After the explosive was inserted, sand or clay had to be inserted above the explosive to pack it down so that the explosion would spread outward into the rock. A large iron rod — called a tamping iron — was used to pack the sand and clay firmly onto the explosive charge.

Here is a daguerreotype (a very early type of photograph) of Gage holding his tamping iron. The iron was four foot long, and one-and-a-quarter inches in diameter, and weighed over thirteen pounds:



On September 13th, 1848, Gage was working on the railroad south of the town of Cavendish, Vermont. In order to clear a path for the railroad, a hole had been drilled deep into rock. Blasting powder and a fuse had been added, and it was then Gage's job to compress the explosive mixture using his tamping iron.

As Gage was packing the explosive using his iron, his attention drifted toward some men talking behind him. He turned his head to look, and opened his mouth to speak. At that moment, the tamping iron hit the rock. A spark was generated.

The resultant explosion blasted the tamping iron out of the hole as if it was a rocket. It smashed into the lower left side of Gage's face, sliced through the front of his brain behind his left eye, and exited through the top of his head.

The tamping iron landed like a javelin in the ground eighty feet away.

The following diagram — drawn by the doctor John Harlow after Gage's death — shows the path of the iron as it passed through Gage's brain and rocketed out through the top of his skull:



But Phineas Gage did not die. Not even close.

After a few minutes, Gage sat up and was able to walk to the cart which would take him home. Later that day, when he was sitting on the porch outside his house, a doctor happened to pass by. Gage shouted with remarkable understatement: "Doctor, here is business enough for you!"

The doctor initially found it hard to believe Gage's story. However, after examining Gage — and clearing away a few loose bits of broken skull — the hole in his brain was clearly visible. The doctor covered the wound with bandages and a head cap. Gage specifically requested that his friends were not to visit him. After all, said Gage, he'd be back in work in a few days anyway.

Gage's recovery took rather longer than that, but he was soon walking around his house, and helping with the ploughing on a nearby farm. His mother noticed that his memory seemed impaired, but otherwise there was no obvious sign of mental damage. It appeared that Gage had miraculously made a complete recovery.

And then Phineas Gage became famous.

Henry Bigelow, the Professor of Surgery at Harvard Medical School, heard of Gage's remarkable story and arranged for him to travel to Boston. Gage was presented at meetings and medical school class.

The famous showman P.T. Barnum became aware of Gage's amazing story, and decided that he would make an excellent addition to Barnum's American Museum, which was a combination of a zoo, museum, waxworks, and freak show. Gage was presented as a kind of living museum exhibit, alongside the "Fiji Mermaid" (a mummified monkey's body with a fish's tail), and a loom powered by a dog.

Phineas Gage — always holding his tamping iron — had finally become a sensation:

**THE WORLD'S
WONDER**

PHINEAS P. GAGE,
A native of LEBANON, N. H., would announce to the citizens of CON. that on
Tuesday Evening,
AT
RUMFORD HALL,
He will exhibit to view, in his own person, one of the
Greatest Wonders of the World!
Nothing less than a Man who has had a
Huge Iron Bar, which he will Exhibit,
Forced through his Head from chin to crown; has had, in fact,
HIS BRAINS BLOWN OUT!
Partially, and who is still living, breathing, and in full possession of his health and faculties. It is a case unparalleled in the annals of Surgery, and has excited the astonishment of the most eminent members of the Medical Faculty in the country. On the 13th of September 1848. M.

It was then that things started going badly wrong.

People who knew Gage from before the accident — when he was, by all accounts, a charming man — agreed that he had changed. Bigelow's report on Gage's behaviour now described him as "fitful, irreverent, indulging at times in the grossest profanity and manifesting little deference for his fellows." Gage lost all his social inhibitions. He took to womanising, partying, and was a perpetual drunk. He had lost all restraints on his behaviour.

As his behaviour became more unpredictable, Gage's theatrical work dried up. He moved to Chile and got a job as a stagecoach driver. However, his health started to fail and — twelve years after his injury — Gage died from an epileptic seizure.

No autopsy was performed after Gage's death, but his body was exhumed seven years later and his brother-in-law donated his skull and his tamping iron for medical examination. Today they are both housed in Harvard's Warren Anatomical Museum.

But the story of Phineas Gage did not end there. It was clear that there was a relationship between the part of the brain which had been damaged and the change in Gage's behaviour. To this day, discovering the relationship between brain injuries to specific parts of the brain and changes in behaviour remains one of the most useful tools in understanding the functioning of the brain. This forms the basis of *neuropsychology*.

In this chapter, we will be considering the central role of the part of the brain which was injured in Phineas Gage's accident, and discovering why injury to that part of the brain led to the dramatic change in Gage's personality.

The boss of the brain

The structure of the brain is really quite surprising.

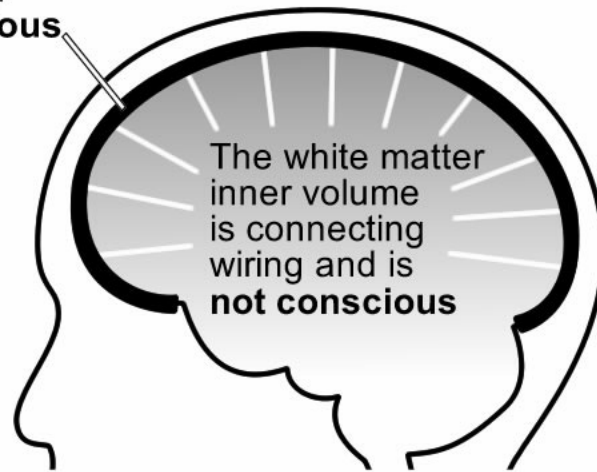
Our conscious thinking appears to be confined to the extremely thin outer layer of the brain. This thin layer is called the *cortex*. The cortex is only about two millimetres thick, but the neurons (brain cells) within it are so tightly-packed that this thin layer represents 40% of the total brain mass. The cortex appears grey in colour, and so the cortex is often called the *grey matter* of the brain.

Inside the cortex we find the main volume of the brain which is white in colour and is therefore called the *white matter*. This white matter is mainly composed of "wires" which connect the various parts of the cortex together, and allow different regions of the cortex to communicate with each other. In contrast to the cortex, the white matter is

not believed to be conscious.

The following diagram shows the conscious thin outer cortex of the brain, and the inner white matter:

The thin cortex
outer layer
is **conscious**

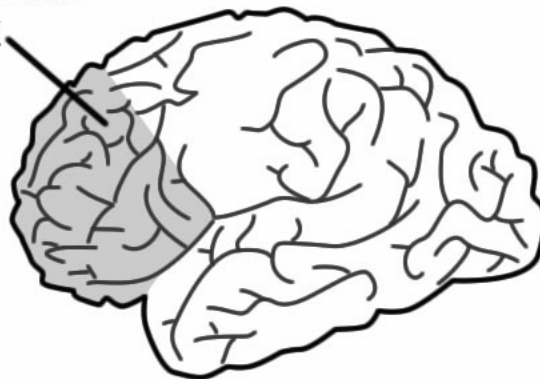


The white matter of the brain has been described by psychology professor Frank Amthor: "Most of the volume of the brain is wiring, not cells".^[7] So why is it that the "wire" composition of the white matter should result in it not being conscious? Are wires not conscious? These questions shall be considered (and hopefully answered) in the final chapter of this book, but for now we shall concentrate on the conscious cortex.

The part of the cortex which was injured in Phineas Gage's accident was the very front part of the cortex, which is called the *prefrontal cortex*. We will be seeing that the prefrontal cortex plays a central role in the operation of the brain.

The following diagram shows the location of the prefrontal cortex (coloured grey) at the front of the brain:

**Prefrontal
cortex**



The prefrontal cortex is the centre of our planning, problem-solving, and decision making. These tasks are known as *executive functions*. The use of the word "executive" makes the decision-making of the prefrontal cortex sound like a human executive making decisions affecting a large company composed of many divisions. In that respect, we might think of the prefrontal cortex as being the "boss of the brain".

The prefrontal cortex was the last part of the brain to evolve, but once it had evolved it was its planning and problem-solving ability that provided humans with the capability to make tools and weapons, and build farms, and domesticate other animals. The following diagram shows the size of the frontal lobe (of which the prefrontal cortex is one part) in the human brain as compared to other animals: ^[8]



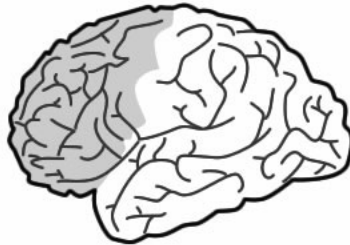
SQUIRREL MONKEY



DOG



CHIMPANZEE



HUMAN

It can be seen from the previous image that the prefrontal cortex is proportionately far larger in humans than in any other animal. It is this size of our prefrontal cortex — and, therefore, our unique ability to plan and make tools and weapons — which allows us to completely dominate a natural world inhabited by animals with much more obvious physical advantages, such as those animals which are faster or stronger, or those with terrifying sharp teeth and claws.

To show how important the prefrontal cortex is in decision making, David Eagleman considers the example of a woman with a damaged prefrontal cortex in his book *The Brain*. We are introduced to Tammy Myers who was injured in a motorcycle accident. The part of Tammy's prefrontal cortex which was injured was the orbitofrontal cortex, which is the region just above the sockets of the eyes.

According to David Eagleman, Tammy encounters severe problems when she has to make decisions: "Tammy doesn't look like someone who has suffered a traumatic brain injury. But if you were to spend even five minutes with her, you would be able to detect that there's a problem with her ability to handle life's daily decisions. Although she can describe all the pros and cons of a choice in front of her, even the simplest situations leave her mired in indecision. Without decision making, little gets done; Tammy reports she often spends all day on the sofa."

In 1991, an experiment was conducted at University College London, which clearly showed the role of the prefrontal cortex in making willed decisions.^[9] In the experiment, people had to move a finger — either by their own free will, or by being told to move a finger. Only in the first case was the person employing their own free will. During the experiment, the brains of the subjects were monitored by a PET scan. Increased blood flow to the prefrontal cortex was only detected during the free choice task.

On that basis, it might appear that the prefrontal cortex is the location of our "free will".

But not only does it appear that our prefrontal cortex is the location of our free will — it also appears that it is the location of our **willpower**. Todd Hare, an associate professor at the University of Zurich, has identified two regions in the prefrontal cortex which show high levels of activity when strong willpower is required.^[10] The first region became active when researchers gave subjects a choice between receiving a small amount of money now, or a larger amount of money later. A second region became active when subjects showed strong willpower by choosing a healthy food option over a tasty but unhealthy option. It is clear that the prefrontal cortex takes into account all the factors of a situation — both short-term and long-term considerations — when making a decision.

The prefrontal cortex is also in charge of suppressing urges that would be socially unacceptable, such as stripping off your clothes and running naked through a shopping centre. Unfortunately, the prefrontal cortex is one of the last regions of the brain to be fully developed, with the brain continuing to develop until the age of twenty five. This explains why teenagers are drawn to risky activities. According to David Eagleman in his book *The Brain*, this behaviour is due to the late development of the prefrontal cortex: "Activity in the orbitofrontal cortex — involved in executive decision making, attention, and simulating future consequences — is still about the same in teens as it is in children. A mature pleasure-seeking system coupled with an immature orbitofrontal cortex means that teens are not

only emotionally hypersensitive, but also less able to control their emotions than adults."



In this chapter, we have seen that the prefrontal cortex plays the crucial role in our decisions and planning. In that respect, our prefrontal cortex seems to lie at the heart of our identity, defining how we act and who we are. This was clearly evident in the case of Phineas Gage who changed as a person after his accident.

So, with the prefrontal cortex playing such a central role in our thinking processes and personality, might it be the case that the prefrontal cortex is the centre of our consciousness?

Well, as we shall now see, it is rather more complicated than that ...

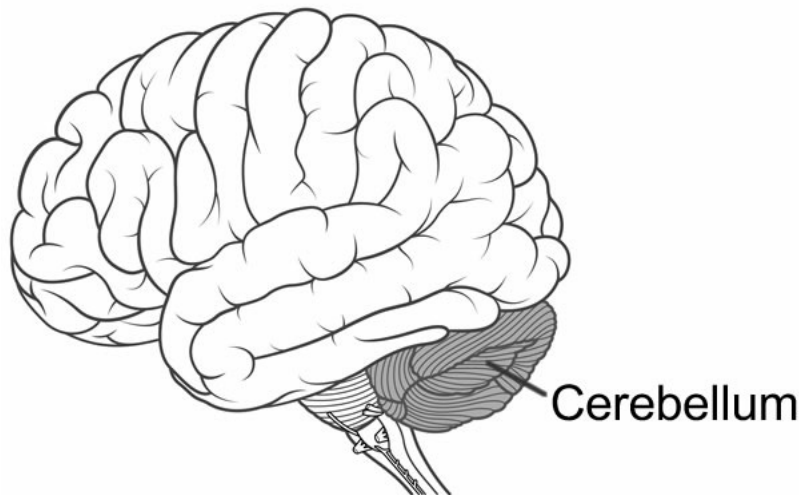
5

THE EMERGENCE OF CONSCIOUSNESS

So, as we have seen in the case of Phineas Gage, we can deduce which areas of the brain are responsible for which aspects of behaviour. In the case of Phineas Gage, it was damage to his prefrontal cortex which resulted in his unpredictable, unreliable, anti-social behaviour. It was then possible to deduce that the prefrontal cortex is responsible for controlling our behaviour.

We might then suppose that a similar technique might be used to determine which parts of the brain are responsible for consciousness. If we have a patient with a brain injury who has an impairment of consciousness, we could then deduce that the part of the brain which was injured plays a role in consciousness. And, conversely, if the patient's consciousness is not affected, we could then deduce that the part of the brain which was injured did **not** play a role in consciousness.

As an example, the *cerebellum* is a relatively large part of the brain, packed with neurons, which lies at the back and bottom of the brain. The cerebellum is shown in grey in the following diagram:



The cerebellum is responsible for governing learnt motor functions, such as walking, or playing tennis, or playing the piano. As these are the functions which can be performed unconsciously (when we are walking, we do not consciously think "Move left leg, move right leg") we might imagine that the cerebellum does not play a role in consciousness. And, indeed, this is what has been discovered. If the cerebellum is damaged, the patient might have difficulties walking or speaking, yet it appears that the conscious mind of the patient is unaffected. Hence, we can deduce that the cerebellum — a large part of the brain containing 69 billion neurons — does not play a role in consciousness.

By considering patients with other brain injuries, it has been possible to deduce that the region in the brain responsible for consciousness is the cortex — that thin and wrinkled sheet of neurons which covers the top part of the brain. If you were able to remove the cortex and spread it flat, it would be about the size of a small tablecloth. But the cortex is divided into different regions which perform different functions. How can we tell which regions are responsible for consciousness?

In order to answer that question, in the early 1990s, an ingenious solution was proposed by Francis Crick (the joint discoverer of DNA, who later in his career developed an interest in consciousness) and the neuroscientist Christof Koch. The goal of Crick and Koch was to identify the parts of the brain which play the essential roles in generating consciousness.

Crick and Koch's method relied on functional brain imaging techniques, with the word "functional" meaning the examination of the brain in real-time as the brain is thinking. Functional imaging techniques include the electroencephalogram (EEG) which records neural activity as voltages on the scalp, and functional magnetic

resonance imaging (fMRI) which detects changes in blood flow to the various regions of the brain.

The method of Crick and Koch is based on contrasting two images taken of neural activity in the brain. The first image is of a brain during consciousness, and the second image is of an unconscious brain. By subtracting the neural activity patterns captured in the two images, it is then possible to identify which parts of the brain play the essential roles in generating consciousness. Those parts are then said to be the *neural correlates of consciousness*.

One particularly ingenious use of Crick and Koch's method comes from its use with optical illusions. As an example of that principle, let us consider the following famous optical illusion created by the Danish psychologist Edgar Rubin. Does the image show a vase — or two faces?



The image seen by your conscious mind will alternate: sometimes you might see a vase, and then the image will switch and you will see two faces. The alternation is continuous, but you will never see both the vase and the two faces at once — you will only ever see one or the other. This is an example of *bi-stable perception*.

The strategy of Crick and Koch involves showing an illusion such as this to a person who, at the same time, is undergoing brain imaging. What happens inside the brain when the conscious experience changes, sometimes conscious of the vase, sometimes not conscious of the vase?

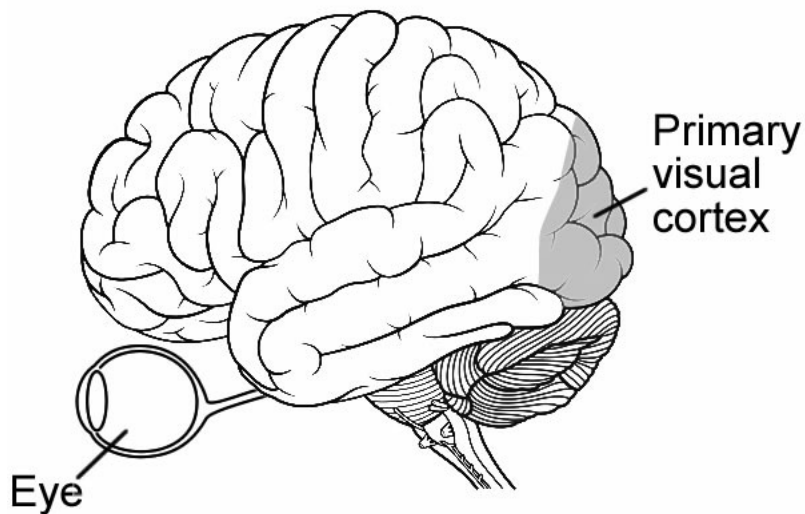
As the actual image does not alter, the only thing which changes is the pattern of activity in the brain. Therefore, by imaging the brain when the mind is conscious of the vase, and comparing that to the image of the brain when the mind is not conscious of the vase, it is possible to identify the region of the cortex which is responsible for the conscious awareness of the vase.

Crick and Koch's method is clearly ingenious. For the first time it allowed the connection to be made between measurable scientific phenomena (the pattern of neural activity across the brain) and the internal experience of consciousness. For that reason, it has been said that the technique launched the modern science of consciousness.

However, the technique is clearly reliant on introspection, dependent on the subject to accurately signal when they are conscious of the image, and when they are no longer conscious of the image. For this reason, introspection has made a comeback as a key technique in the new science of consciousness.

Another example of Crick and Koch's method comes from *binocular rivalry*. Binocular rivalry occurs in an experiment in which one image is shown to one eye of a subject, and a completely different image is shown to the other eye. You might imagine that the two images would somehow merge into a single image, with the subject being consciously aware of that single merged image. However, that is not what happens. Instead, the subject is only ever aware of one of the images at a time. In a situation very much resembling the previous "vase" illusion, the image which is in the conscious mind tends to alternate between the two images. Therefore, by imaging the active brain, it should be possible to identify which regions of the cortex are responsible for bringing a particular image into conscious awareness.

So where in the brain does an image enter consciousness? Let us consider the visual system:



The previous image shows the eye at the front of the brain. The image is focussed onto the retina of the eye, and then the data passes along the optic nerve to an area of the cortex at the back of the brain called the *primary visual cortex* (coloured grey on the previous image).

The spatial arrangement of the image is retained on the primary visual cortex, with the relative positions of the "pixels" in the image being unchanged. Hence, the primary visual cortex could be thought of as a "cinema screen" on the back of the brain, with the image being projected onto it from the eye.

The fact that the primary visual cortex contains purely raw data has implications for its role in consciousness. If we consider the vase illusion, or binocular rivalry, in both of those cases the images being observed did not alter with time — they were fixed images. Therefore, the raw data on the primary visual cortex would also not alter with time. But over that period of time, the conscious experience of the subject would be altering — sometimes consciously perceiving the vase, sometimes not consciously perceiving the vase. But if we compare brain images of the two scenarios, the activity of the primary visual cortex would be unchanged. We can therefore deduce that consciousness is not to be found in the primary visual cortex.

That is quite a conclusion! And I hope it gives you an impression of the power of Crick and Koch's idea.

Space, time, and consciousness

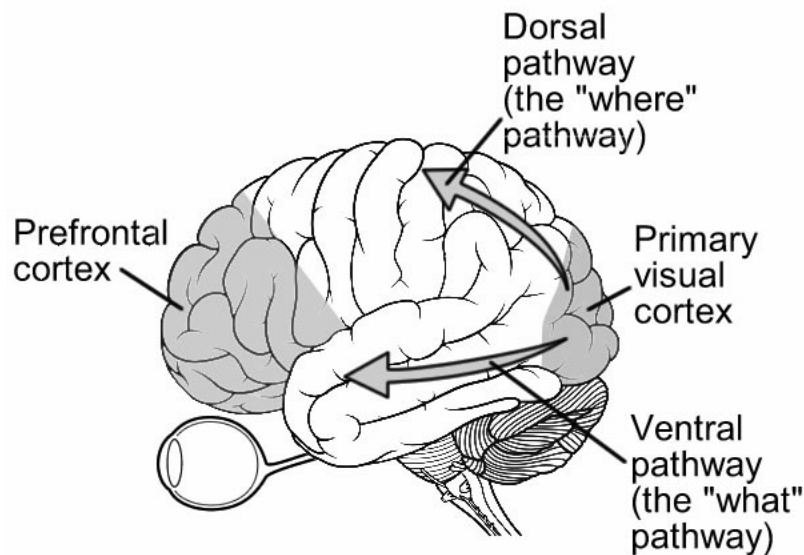
From this discussion of the techniques proposed by Francis Crick and Christof Koch, you might have gained the impression that it will someday be possible to precisely locate the position of consciousness in the brain, as if consciousness is produced by the action of a single neuron somewhere, or maybe by the action of a small network of neurons. However, this is most certainly not the case. It is widely accepted that consciousness emerges through the interactions of billions of neurons as information is passed across the brain. Indeed, Christof Koch makes this point in his book *Consciousness*: "These are early days. We cannot yet pinpoint which regions of the brain underlie consciousness. But this is barking up the wrong tree — we must resist the hypnotic appeal of hot spots in brain scans with their naive phrenological interpretation: the perception of faces is computed over here, pain over there, and consciousness just yonder. **Consciousness does not arise from regions but from highly networked neurons within and across regions.**"

Consciousness cannot be "localised" in the brain, which means it does not reside at one particular point. Consciousness arises as information passes across the entire brain. And progress has been made in understanding how that happens.

Firstly, in the previous section it was explained that the raw visual data held in the primary visual cortex does not represent the final processed image which enters your conscious mind. As one example, the image must be "stitched together" to remove the blind spot which is found on the retina at the point where the optic nerve leaves the retina. As raw visual data is heavily-processed in this manner before it enters conscious awareness, it has even been said that "You don't see with your eyes".

The raw visual data is processed as the data moves along streams from the back of the brain (primary visual

cortex) to the front of the brain (prefrontal cortex), as shown in the following diagram:



Remember the primary visual cortex can be thought of as a "cinema screen" on the back of the brain. For that reason, Crick and Koch described the brain's visual system as if "the front of the brain is 'looking' at the sensory systems, most of which are at the back of the brain", which I think is a very neat way of thinking about it. [\[11\]](#)

Two separate data streams for visual data have been identified, and these are shown on the previous diagram. There is a *dorsal pathway* across the top of the cortex which considers the spatial locations of objects in the scene. This is sometimes called the "where" pathway. And there is a *ventral pathway* along the bottom of the cortex for identifying objects in the scene. This is sometimes called the "what" pathway.

A characteristic of consciousness is that millions of neurons tend to synchronise to form waves of activity which reverberate across the brain. The reason for this synchronisation is not yet known, but it is possible to imagine that the motion of these waves represents the emergence of consciousness over a brief period of time, the development of an internal picture of the world.

Let us speculate on one hypothetical possibility of how that might happen ...

Consider the brain's visual system trying to make sense of the items lying on my desk. There might be a pencil, and a book, and a ruler on my desk. That scene would be observed by the eyes, and the data would be passed along the optic nerve to the primary visual cortex. From there, that raw data would be passed through the higher-level processing regions of the brain toward the prefrontal cortex. This flow of information represents *bottom-up* processing, as the data passes from simple low-level processing to sophisticated high-level processing.

But this is not the first time that the brain has seen rulers and pencils. High-level processing regions have access to long-term memory, and idealised models of what pencils and rulers look like. They would try to match the received raw data with its internal models. If a match is found, the high-level processing might want to zoom-in closer, to confirm that the object is actually a pencil or a ruler. A signal would then be sent back down from the high-level region to the low-level region. High-level regions are also capable of making predictions based on incomplete sensory information ("filling in the gaps" of an image), and would request confirmation from the sensory regions that the interpretation was correct. These scenarios — in which high-level processing directs low-level processing — are called *top down* processing.

And so a dialogue occurs between high-level regions of the brain and low-level regions of the brain as a internal conscious model of the world emerges. Christof Koch has described this dialogue by saying "a reverberatory feedback loop is established and can maintain itself".

As a result, a continuous oscillation occurs, a brain in constant surging activity. These waves of neuronal activity are called *brain waves*. These brain waves oscillate across the brain at frequencies from 0.5 hertz to 150 hertz. The waves are categorized into groups which are labelled by the Greek letters delta, theta, alpha, beta, and gamma. Gamma waves in particular appear to represent a signature of consciousness:

Brain wave name	Frequency range
Delta waves	0.5 to 4 hertz
Theta waves	4 to 8 hertz
Alpha waves	8 to 12 hertz
Beta waves	12 to 40 hertz
Gamma waves	> 40 hertz

But a deeper and more fundamental message about consciousness emerges from this discussion. And that is that consciousness is a **process**, emerging over a period of time. Consciousness does not just appear in a flash, and then disappear in a flash. No, just as consciousness cannot be localised at one point in space (no single neuron in the brain), so consciousness cannot be localised at any one point in time (no single point in time).

This principle is described by Paul Nunez in his book *The New Science of Consciousness*: "Consciousness is not an object occupying a fixed location or instant in time; rather it is an ongoing process **distributed over both time and space within the brain.**"

Perhaps we should not be surprised about this similarity in the behaviour of consciousness over time as well as over space. As Einstein revealed, time should be considered as being a dimension — just like space. Space and time are components of a four-dimensional spacetime. So consciousness is spread over time just as it is spread over space (spread over the brain).



This fact that consciousness is a **process** spread across time will be one of the main conclusions of the second half of this book.

For we have now come to the end of the first half of this book. The second half of this book has a different theme and a different style.

Allow me to take you on an epic journey ...

6

THE LOGIC OF CONSCIOUSNESS

This chapter takes the form of an epic historical saga. It is the longest and most ambitious chapter I have ever written.

It is a story of the golden ages of great civilisations and the achievements of their citizens. It is a story of personal triumph and personal tragedy. In many ways, it represents the story of human knowledge, from the ancient Greeks to the present day. It is also a journey through space as well as time, from the Parthenon of Athens to the research labs of IBM in New York.

In this chapter, we will be using ancient knowledge — discovered over 2,000 years old — to develop a theory related to consciousness. Using that theory, we will discover an incredibly simple rule to detect consciousness (or, more accurately, the **absence** of consciousness) in a variety of objects.

So, let us begin our journey ...

The start of our journey

Let us travel back in time 2,500 years to ancient Greece.

At that time, Greece was not a united country. Instead, it was divided into many self-governing city-states. The reason for this was largely due to geography: many areas in Greece are cut-off from each other. Some regions are separated by sea, and there are many islands, while many of the mainland regions are separated by mountain ranges.

The two most powerful city-states at that time were Athens and Sparta. The other city-states included Corinth, Thebes, and Argos. The following map shows some of the Greek city-states:



The most populous of the city-states was Athens. The citizens of Athens were young, wealthy, and artistic. The Athenians placed great emphasis on the importance of knowledge, believing that obtaining knowledge brought them closer to the gods.

The contrast between Athens and Sparta was striking. While the Athenians placed their trust in knowledge, the Spartans placed their trust in military might. At the age of seven, all Spartan boys were removed from their parents and conscripted into military training. The study of poetry, music, art, and science was discouraged by the militaristic regime.

If you have seen the recent action movie *300* you will know about the heroic final battle of three hundred Spartan soldiers led by their king Leonidas against a Persian army of 100,000 men. The battle took place in 480 BC, with the Spartans defending the narrow coastal pass of Thermopylae, with only 100 metres separating the sea on one side from high mountains on the other side. In the narrow pass, the Persians could not capitalise on their numerical advantage, and the Spartans were more skilled at the brutal, hand-to-hand fighting. The Spartans inflicted heavy casualties on the Persians before being finally betrayed and encircled.



Spartans were unquestionably fearsome warriors, but if you gained the impression from the movie that the Spartans were a noble tribe, fighting for justice, then nothing could be further from the truth. The Spartans were cruel, brutal, and ruthless. Whenever the resources of Sparta ran low, the Spartans would simply invade a neighbouring region, force its citizens into slavery, and steal their property and land.

And so it was that, in the 6th century BC, the Spartans turned their envious eyes to the riches of Athens.

Aware of the danger, and determined that Athens should not become another Spartan colony, the Athenian aristocrat Cleisthenes proposed a radical solution. Cleisthenes proposed that every Athenian citizen should have an equal say in political power. This was nothing less than a revolution, and the first time that such a system had been proposed in world history.

The world would never be the same again.

The Athenians had invented democracy.

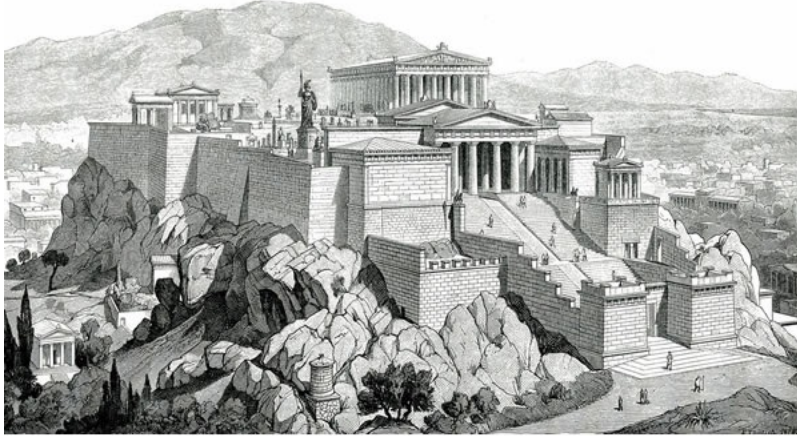
Classical Greece

The adoption of democracy unleashed the talents of the Athenian people. The citizens felt they had become shareholders in their own country, and, as a result, they became determined to save it from the Spartan invasion. Indeed, the huge Spartan three-pronged invasion was repelled, and the Athenians rejoiced in their new democratic freedoms.

The introduction of democracy in Athens in 508 BC launched a Golden Age. The period from 500 BC to 300 BC in Athens was one of the most remarkable eras in human history. There was an explosion of talent in literature, architecture, sculpture, mathematics, and philosophy, the influence of which went around the world and is still being felt today. This period from 500 BC to 300 BC is now known as Classical Greece, or the Classical Age.

Classical Greek culture formed the foundation for modern Western culture, and Classical Greece is commonly known as the "cradle of Western civilisation". It has been suggested that the knowledge gained during the 200 years of Classical Greece in art, mathematics, philosophy, and science is unmatched by any other period in human history (except, perhaps, for the last 200 years — the 19th and 20th centuries). As an example of the influence of Classical Greece on the modern world, sixty-five percent of the countries in the world today have adopted the Athenian innovation of democracy.

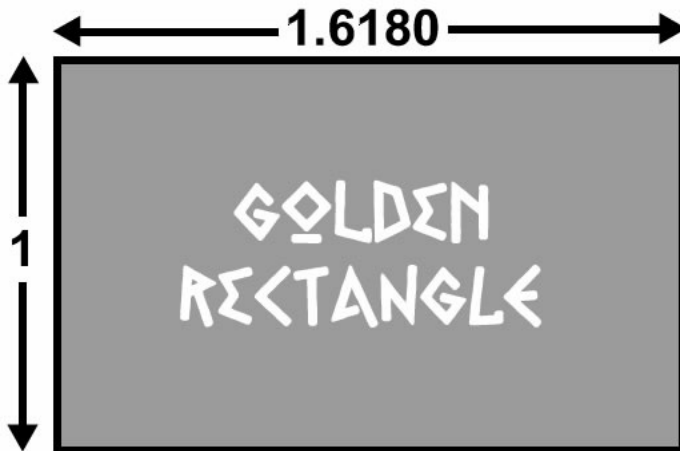
At the centre of Athens, a forbidding citadel known as the Acropolis was built. The walls of the citadel were as much as six metres thick, as shown in this 1882 engraving by the German artist Jacob von Falke which imagined the Acropolis at the height of its glory:



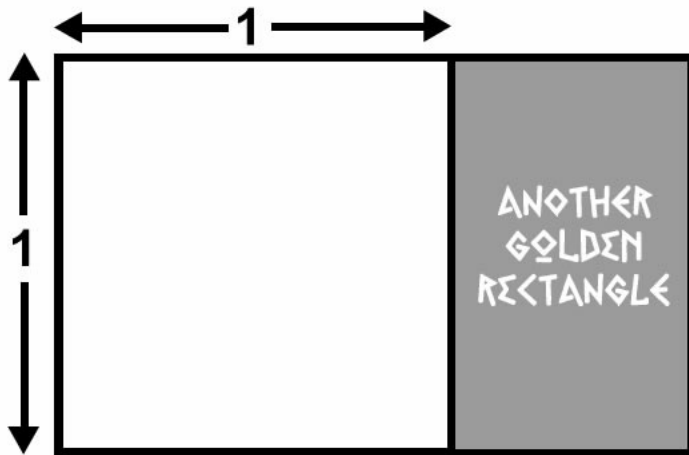
The Acropolis was dominated by the building at its very top, the building which has now become the most famous symbol of the glory of Classical Greece: the Parthenon. It has been said that the Parthenon is the symbol for civilisation itself.

It has also been said that the Parthenon is the most beautiful building in the world. It is indeed beautiful and graceful, with seemingly perfect balance and sense of proportion. But what is the underlying reason for the beauty of the Parthenon? To understand that, we need to understand the huge advances in mathematics that were being made in Classical Greece.

As an example of the progress in geometry, it was the Greek mathematician Euclid who discovered the remarkable properties of the number which we now call the *Golden Ratio*. The Golden Ratio is a number which is approximately equal to 1.6180. The ancient Greek mathematicians realised that this number has special properties, and we can understand those properties if we consider a rectangle in which the ratio between the lengths of its larger and smaller sides is equal to the Golden Ratio. Such a rectangle is called a *Golden Rectangle*, and an example of a Golden Rectangle is shown in the following diagram:

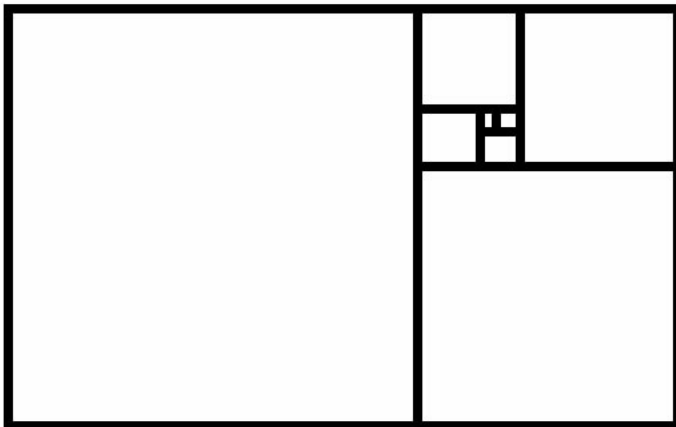


To understand why a Golden Rectangle is special, we should consider cutting a square out of a Golden Rectangle. Considering the measurements of the previous diagram, this would involve removing a square which had each of its sides equal to a length of 1 unit:



As you can see on the right-hand side of the previous diagram, the effect of removing the square has been to leave us with another Golden Rectangle. This time, though, you can see that the rectangle is smaller and is oriented vertically.

And, of course, as we now have generated a second Golden Rectangle, we can again extract a square from that new rectangle — and that will leave us with a third Golden Rectangle. And this process can continue to infinity, generating an endless string of squares — as shown in the following diagram:



So there is clearly something special about the Golden Ratio — and a Golden Rectangle. And it is remarkable that the mathematicians of Classical Greece were the first to recognise that specialness.

The shape of the Golden Rectangle was recognised by ancient Greek artists as possessing a particular balance and sense of proportion which was pleasing to the eye. As a result, many aspects of the Parthenon design incorporate the Golden Ratio, both in its façade and in the spacing of its columns. It has been suggested that this is the reason why the Parthenon is often described as "the most beautiful building in the world".

The following image shows how the façade of the Parthenon is based on the Golden Rectangle: [\[12\]](#)



The Golden Ratio continues to be used by designers in the modern world, notably in the layout of webpages. And the design of the Parthenon — especially its grand columns — has influenced the design of thousands of modern public buildings such as town halls, museums, and art galleries (we will be returning to consider the psychological appeal of the Golden Ratio later).

The logic of Aristotle

The citizens of Athens loved knowledge, and believed it brought them closer to the Gods. So, when Athens entered its Golden Age in the 5th century BC, it is not surprising that it also brought a new wave of discovery.

A new breed of thinkers appeared, and those thinkers believed we could make sense of the world by understanding the natural laws. Today, we call those thinkers the first philosophers. In his book *Ancient Greece*, Thomas Martin considers the methods of those philosophers: "These thinkers were proposing a dramatic new way of understanding reality. They were arguing that human beings could investigate and explain the ways in which the universe works because the phenomena of nature were neither random nor arbitrary. This insistence that natural laws governed how reality operated was a crucially significant development for later philosophical and scientific thought. The thinkers who conceived this view believed it necessary to give reasons for their conclusions and to be able to persuade others by arguments based on evidence. In other words, they believed in **logic** (a word derived from the Greek term 'logos', meaning 'a reasoned explanation')."

The most famous Greek philosopher to emerge in the 5th century was Socrates. Socrates believed the way to understand the universe was by asking questions of it. He would often get involved in heated discussions with his fellow citizens of Athens, asking them questions and challenging their assumptions. Unfortunately, challenging the conventions of the status quo is not without its dangers. When Socrates criticized the Athenian government and leaders, he was charged with undermining the state. Socrates was found guilty, and was executed by being forced to drink a cup of poisonous hemlock.

Socrates was a talker — not a writer — and he never wrote anything down. Fortunately, we have Socrates' pupil Plato to thank for his written accounts of Socrates' thoughts. In 387 BC, Plato established his famous Academy in Athens as a centre for learning. Plato's Academy has been called the first European university. However, the Academy was not a college in the modern sense. Instead it was more of a centre for informal discussion about philosophy — with Plato being the central figure. The sign above the entrance of the Academy said: "Let no one ignorant of geometry enter here".

Plato is perhaps best known today for discovering the five regular symmetrical three-dimensional shapes known as the *Platonic solids* (which were considered in my sixth book).

Plato's most brilliant pupil at the Academy was Aristotle, who lived from 384-322 BC and is considered to be the father of modern Western philosophy. Aristotle's influence was vast, covering areas such as biology, botany,

physics, and psychology. The teachings of Aristotle continued to be considered as the state-of-the-art well into the 19th century, and his writings are still influential today.

The following image shows a small extract from Italian painter Raphael's fresco *The School of Athens* (which is located in the Vatican). Raphael was one of the great artists of the Italian renaissance, a period from the 14th century to the 17th century during which Italy enjoyed its own golden age. During the Italian renaissance, there was renewed interest in the achievements of classical Greece, and the discoveries of the great Greek thinkers.

The School of Athens is considered to be Raphael's masterpiece. In this extract from the fresco, the two central figures are Plato and Aristotle, with the older figure of Plato on the left and his pupil Aristotle on the right:



(Raphael substituted the likeness of Leonardo da Vinci for Plato).

Aristotle produced several works explaining the principles behind logical arguments. These are grouped into a collection of six books known as the *Organon*, or "tool of thought". It was in the *Organon* that Aristotle founded the field of logic.

According to Thomas Martin in his book *Ancient Greece*, Aristotle developed his sophisticated system of logic to allow "precise argumentation": "Creating a careful system to identify the forms of valid arguments, Aristotle established grounds for distinguishing a logically sound case from a merely persuasive one."

Aristotle's method of logic was based firstly on stating some initial assumptions, called *premises*. From those initial premises, a step-by-step method of *inference* is then applied (logical reasoning) by which a conclusion is eventually produced.

According to Aristotle, the basic unit of logic is the *syllogism*. A syllogism consists of three lines: two premises, and one conclusion. Here is a famous example of one of Aristotle's syllogisms:

Socrates is a man.
All men are mortal.
Therefore, Socrates is mortal.

It is clear that it is easy to follow the reasoning of a syllogism. In fact, it may seem so obvious that it might be wondered why we even need to bother with logic as an independent science at all. But the truth is that this method of inference only seems obvious because we are participating in logical thinking in our own minds during every minute of the day — and have done so since an early age. Something which comes so naturally to us is, of course, going to appear obvious.

Logic — like mathematics — is timeless, so we might try creating a different example of logical inference, this time referring to modern life:

The battery of my iPhone is running low.

*If an iPhone is placed in its charger, its battery will be charged.
Therefore, I will place my iPhone in its charger.*

It is clear that this sort of logical thinking is used in our thought processes throughout the day, from the time we wake up to the time we go to bed — without realising we are using techniques first described by Aristotle over two thousand years ago.

We might also think of our thought processes as being unconstrained, without being subject to any rules or laws. Indeed, this seems to be the basis of the current emphasis on our apparent free will. But from this discussion on logic, it is clear that there **are** rules and laws which govern our thoughts throughout the day — the rules of logical inference — but we are just not aware that we are applying those rules.

As an example, you would be unlikely to think:

*The battery of my iPhone is running low.
If an iPhone is placed in its charger, its battery will be charged.
Therefore, I will throw my iPhone in the river.*

In this case, the conclusion of the inference process does not follow logically from the premises. Yes, you could think illogically like that, but you would not get very far in life — and you would find it very expensive continuously throwing your iPhone in the river. Indeed, if you persisted in thinking illogically — and thereby acting illogically — at every occasion, you would probably not live very long: you would quickly find yourself under the wheels of a passing bus, or with your head in the mouth of a lion.

This makes it clear that the ability for logical thinking would evolve as an evolutionary necessity in the brain. You are unable to think logically? Then you won't survive for long.

On a Wichita State University website, I found an article by Alayna Cobb on the geometry of Euclid which bemoaned the lack of geometry teaching in school: "I have noticed that in many high schools today, very little geometry is taught, if any at all. This disturbs me because math teaches logic. Geometry is like a big puzzle. You find the pieces, and put them where they go. Geometry also teaches understanding. How do you know if something is true or right? You don't until you prove it. **Not only do you need logic for geometry class, you also need logic to survive in the world.**" [\[13\]](#)

I have emphasised the phrase "You also need logic to survive in the world". This could be taken as a reference to the evolutionary advantage — the necessity — for logical thinking. Fortunately, I would reassure Alayna Cobb that surely basic logical thinking does not need to be taught — it is an evolutionary necessity, and, as we shall soon see, for that reason it appears to be hard-wired into our brains.

Put simply, if you want to do anything useful, you need to use logic. Our conscious mind is ruled by logic.

So, although we might perceive our thought processes to be a free series of independent thoughts, unrestricted by any rules or laws, the reality is very different. Our stream-of-consciousness is not composed of a succession of random, unconnected thoughts. No, our stream-of-consciousness is actually a string of logically-connected thoughts.

If we want to detect consciousness, then, it appears we only need to detect the presence of logical thinking. This is a valuable insight which will play a central role in this long chapter.

The vanishing middle term

Aristotle's work on logic was regarded as definitive for over two thousand years. Let us now consider a characteristic feature of Aristotle's syllogisms.

Let us remind ourselves of the syllogism which is most often presented as an example of Aristotle's logic:

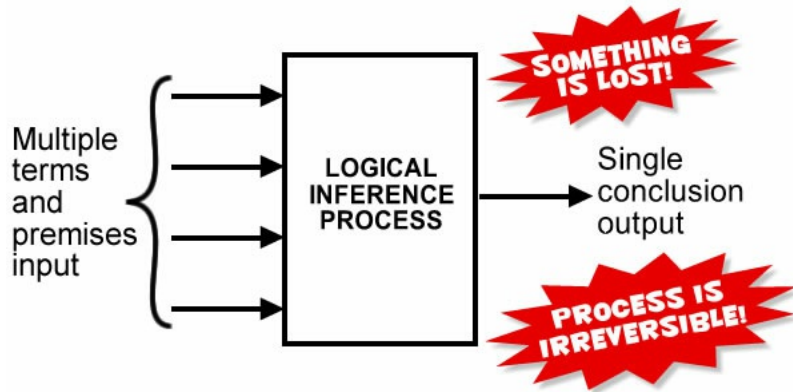
*Socrates is a man.
All men are mortal.
Therefore, Socrates is mortal.*

In any logical expression such as this, we can identify the *terms*. The terms are the objects in the expression, which in this example would be "Socrates", "man", and "mortal". A feature of this type of syllogism is that there is always a term which appears in the first two lines — both premises — but which does not appear in the conclusion. This is called the *middle term*. In this example, we can see that the middle term is the "man". You can see that the "man" term (or "men") appears in the first two lines, but does not appear in the conclusion.

What are the implications of this "vanishing middle term"?

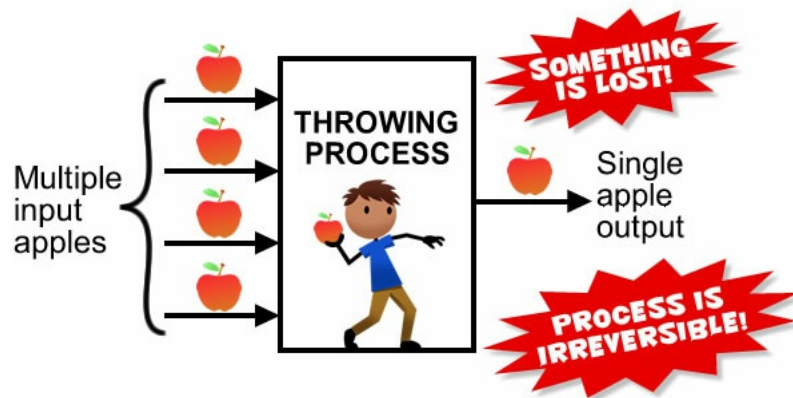
Well, to understand the implications, we see that in a logical syllogism, we always start with a number of terms and premises. Then — as we have seen — we always lose a middle term (or maybe multiple terms) as we arrive at a single conclusion. So we have multiple lines of input which are reduced in number to produce a single line of output.

This type of process is therefore known as a MISO process (multiple input, single output). Here is Aristotle's logical inference process drawn as a MISO process:



As shown on the previous diagram, any MISO process such as this has two side effects. Firstly, "something is lost" — and we have just seen that the middle term of a syllogism is lost. Secondly, the process becomes irreversible.

It is easy to see why a process should become irreversible when "something is lost". Imagine you are standing in a garden, and you have four apples in your basket. You decide to throw three of your four apples over a wall, leaving just one apple in your basket. Your act of throwing the apples then might be interpreted as a MISO process as you initially had multiple apples, but the end result of the process was just a single apple:



And because three apples have been lost in this process — and are now inaccessible on the other side of the wall — the process is irreversible as you are unable to return to the previous situation when you had four apples in your basket. [14]

As we shall now see, the syllogisms of Aristotle — and examples of logical inference in general — are indeed irreversible. This irreversibility of logical inference has been described by Prof. Simon Colton of Imperial College, London. [15]

Simon Colton, once again, examined the famous syllogism involving the mortality of Socrates:

Socrates is a man.
All men are mortal.
Therefore, Socrates is mortal.

Simon Colton then states the following: "We see that we have deduced the fact that Socrates is mortal from the two true facts that all men are mortal and Socrates was a man. So, because we know that the rule about men being mortal and the classification of Socrates as a man are true, we can infer with certainty that Socrates is going to die — which, of course, he did. **Of course, it doesn't make sense to go backwards as we would deduce that Socrates being mortal implies that he was a man and that all men are mortal!**"

You can see that Simon Colton has stepped backwards through the syllogism and shown that it makes no sense when considered in the backwards direction. Here is the syllogism written backwards:

*Socrates is mortal.
Therefore, all men are mortal,
And Socrates is a man.*

Indeed, this makes no sense at all. If all you know is the conclusion of the syllogism — that "Socrates is mortal" — then you cannot work your way backward to regenerate the premises. For example, if all you know is that "Socrates is mortal", you cannot tell whether or not Socrates is a man or a woman (no, you are not allowed to assume the gender of Socrates just from his name). A logical syllogism — and the logical inference process in general — is irreversible.



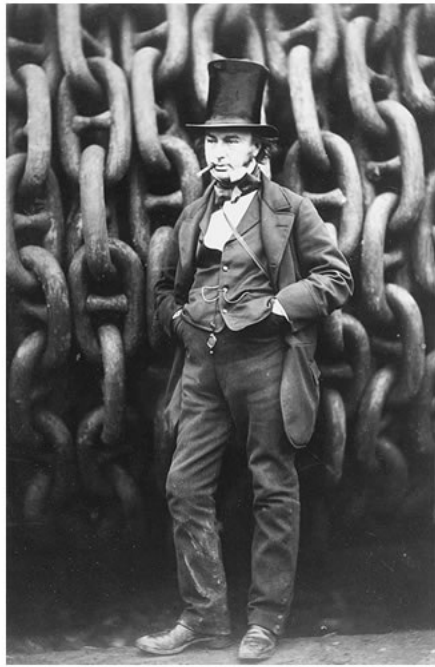
We shall be encountering more examples of MISO processes later in this chapter. But we now have to leave classical Athens, and travel forward in time where we will find another empire enjoying its Golden Age ...

The Victorian era

Just as Athens enjoyed a golden period in its history in the 5th century BC, so Britain enjoyed its Golden Age in the Victorian era of the 19th century. This was a period of great national confidence and achievement. It was also a period of relative peace and prosperity.

The Industrial Revolution — which began in Britain — had established Britain as the world's leading commercial nation. Just as in classical Athens, the Victorians valued knowledge and science. The spirit of the age was epitomised by the engineer Isambard Kingdom Brunel who changed the face of Britain with his extensive network of railways and bridges, many of which are still in use today.

Here is a photograph of Isambard Kingdom Brunel standing by the chains of his steamship the *SS Great Eastern*, which was the largest ship in the world at that time:



Every great civilisation has its defining monument. For classical Greece, it was the Parthenon, the "most beautiful building ever built". But what was Victorian England's equivalent of the beautiful Parthenon?

Well, it was surely the sewage system of London. The population of London had doubled in fifty years, but its infrastructure had not kept pace. The Thames was an open sewer, and cholera was rife. After the so-called "Great Stink" of 1858, it was none other than Michael Faraday who decided to spring into action.

Michael Faraday is now known as one of the greatest experimental physicists of all time, but it was to be one of Faraday's lesser-known experiments which revealed the scale of the sewage problem. Faraday dropped pieces of white paper into the Thames to "test the degree of opacity". Faraday was disgusted at what he found, and he wrote a letter to the Times newspaper demanding that something had to be done to improve the dire situation.

The engineer Joseph Bazalgette was placed in charge of designing and building a new sewage system for London. The final system was the greatest engineering construction of its time, featuring 82 miles of sewers which were the size of boulevards, eleven feet tall. The infrastructure was put in place for London to become the first modern metropolis. Bazalgette's sewers still form the core of the sewage system of modern London.

But I wasn't joking when I said we should compare Bazalgette's system with the beautiful Parthenon of classical Athens. The following photograph shows the interior of Bazalgette's astonishing sewage pumping station at Crossness, the centre of which is known as the Octagon. It has been described as a "Victorian cathedral of ironwork", and it is currently open for public visits.

It was truly the Parthenon of its age:



What lessons should we learn from these "Golden Ages" of human civilisations, and the great achievements of their citizens? Surely the message is that individual achievements should not be considered in isolation, but are, instead, inspired by the surrounding environment and the general spirit of the age. Just as in Plato's Academy, scientists and engineers talk and collaborate, and there emerges a "collective consciousness" with the whole being greater than the sum of the parts.

Perhaps that is a topic which should be considered in a later book. But for now, let us return to Victorian England ...

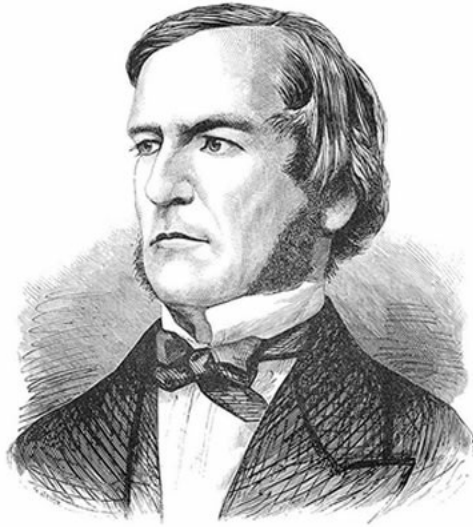
The laws of thought

George Boole was born in Lincoln, England in 1815. The son of a shoemaker, he received little formal education. He was almost entirely self-taught in mathematics, a subject at which he was to excel.

Boole started teaching mathematics at the age of sixteen in order to support his family, and he opened his own school in Lincoln at the age of just twenty. Boole started writing his own original papers on mathematics, and in 1844 he was awarded the British Royal Society's gold medal for one of his papers. However, it was when Boole turned his attention to logic that he made his greatest impact on the world.

It is fitting (and maybe predictable) that Boole emerged in another "Golden Age", because Boole might well be considered as being the natural heir to Aristotle.

Here is a drawing of George Boole:



Before Boole had his breakthrough, logic had always been expressed only in words. As an example:

*If the kettle is plugged in,
and the button on the kettle is pressed,
then the water will boil.*

We have already seen that this type of logic was proposed by Aristotle more than 2,000 years earlier. Boole admired Aristotle's writings on logic. However, Boole was less impressed by the idea of writing logical statements in conversational English. A logical statement written in an imprecise language such as English is always going to be prone to misinterpretation.

As a result, Boole believed logic should be a part of mathematics (up to that point, logic had been considered to be part of philosophy). By bringing logic under the remit of rigorous mathematics — and replacing words with mathematical symbols — the meaning of logic would then become precise and unambiguous.

But how could logical statements written in English be processed mathematically? That was Boole's challenge.

To understand Boole's solution, we need to realise that logical statements (or *propositions*) can take one of only two values: either "true" or "false". For example, in the previous example of boiling the kettle, we have two propositions. The first proposition is:

The kettle is plugged in.

This statement can be either true or false: the kettle might be plugged in (in which case, the statement is true) or the kettle might not be plugged in (in which case, the statement is false).

The second proposition is:

The button on the kettle is pressed.

Again, this proposition can be either true or false: the button on the kettle might be pressed (in which case, the statement is true), or the button on the kettle might not be pressed (in which case, the statement is false).

So, if we want to convert logic to mathematics, we have a series of statements which can take only one of two values: either true or false. A mathematical system of logic should then be based around variables which can take only two possible values. In making the conversion to a mathematical system, Boole substituted the value "true" with the number 1, and substituted the value "false" with the number 0. This then allowed mathematical operations to be performed on logical statements.

We might first try applying conventional arithmetic to these new values. For example, we might try combining two values using conventional addition. In that case, let us imagine the kettle is plugged in (the statement has the value "1" because the statement is true), and the button on the kettle is pressed (this second statement also has the

value "1" because the statement is true). In that case, when we add the values we get the answer 2. **But that answer is no good in our system of mathematical logic, because we only have two possible values in our system: 0 or 1.** Therefore, we cannot allow the value 2 as an answer.

So Boole had to find a new method of combining values in his method of mathematical logic, a method which could only ever give the answer 0 or 1 (representing true or false). The method Boole developed is now called *Boolean logic* or *Boolean algebra*.

Boolean logic was covered in detail in my previous book on quantum computing, but here is a brief description of just one of the possible Boolean operations.

The Boolean operation we will consider is known as the AND operation. The AND operator considers two Boolean input values — which we will call A and B — and only gives an output of 1 if both A **and** B are equal to 1. So we can capture the functionality of the AND operator in the following *truth table*:

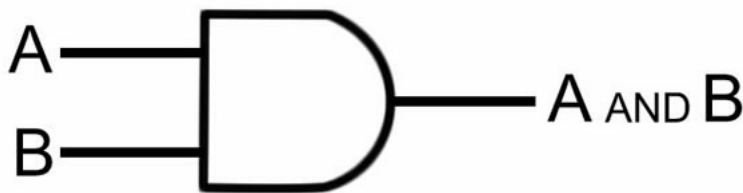
A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

You can see that a truth table is divided into a left-hand side and a right-hand side. On the left-hand side, all the possible combinations of inputs are listed, while the right-hand side lists the output which will be produced by the operator when it receives those inputs. For the AND operator, you can see that the output is 1 only if inputs A and B are both equal to 1 (the output is zero otherwise).

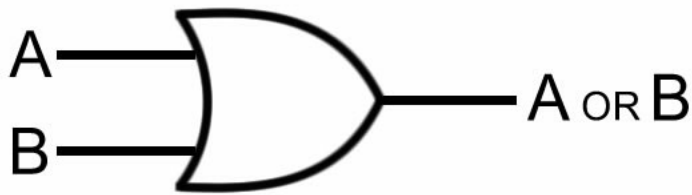
You can see that the output of the AND operator is only ever equal to 0 or 1 — it can never be any other value such as 2. So, by discovering the Boolean operators such as the AND operator, George Boole had satisfied the requirement of Boolean algebra that only the values 0 or 1 could ever appear within the system.

But what George Boole could never have anticipated was the role that his Boolean logic would play in modern digital computers. Digital computers are based on binary arithmetic, using data bits which can only take the values of 0 or 1. Therefore, Boolean algebra was perfect for processing these binary values. When digital computers were invented, George Boole's system was seamlessly integrated. As a result, Boolean logic now forms the basis of today's digital computers.

In a digital computer, Boolean logic operations are implemented via *Boolean logic gates*. These take the form of miniaturised transistor circuits which perform the particular logical operation. Here is the symbol for the AND gate which performs the AND operation which was shown in the previous truth table:

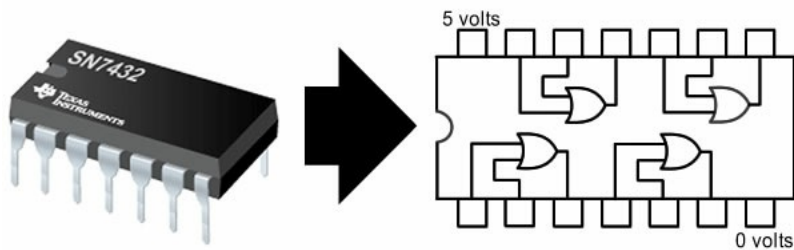


Other Boolean logic gates include the OR gate, which gives an output of 1 if either A **or** B is equal to 1. Here is the symbol for the OR gate:



Have you ever wondered what goes on inside an electronic integrated circuit (silicon chip)? Well, some integrated circuits — such as microprocessors — can be extremely complicated, it is true. But other integrated circuits merely implement Boolean logic gates, and these type of chips are extremely common in electronics.

As an example, the following diagram shows how the logic gates are arranged inside a particular integrated circuit. The integrated circuit shown is a very common logic chip called the 7432, which is one of the popular and widespread 7400 series of integrated circuits which have been used to build computers for decades. You can see it has a total of 14 pins (legs), and the schematic diagram shows that it contains a total of four logical OR gates. You can see how the inputs and outputs of the OR gates are connected to individual pins (with two pins being reserved for the power supply to the chip):



So maybe digital electronics is not as complicated as you might imagine.

But, through all this talk of electronics, we must be careful not to forget that at the heart of all this high-technology lies logic. It is the logic of George Boole, which Boole based on the logic of Aristotle. Yes, the underlying principles of that 7432 integrated circuit are based on the writings of Aristotle 2,500 years ago.

So let us now try to explicitly connect the functioning of Boolean logic gates with the logic of Aristotle.

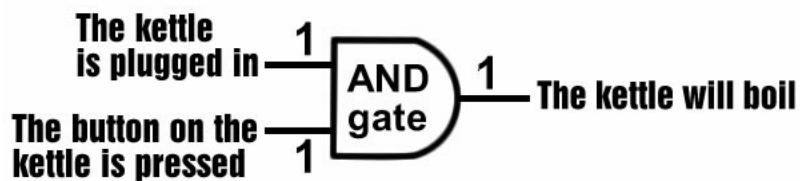
Remember the previous example of Aristotelian logic which involved the boiling of a kettle. If you remember, there were two propositions. The first proposition was:

The kettle is plugged in.

And the second proposition was:

The button on the kettle is pressed.

Either of these two propositions can be either true or false (it might be true that the kettle is plugged in, or it might be false). Hence, making the transition to Boolean logic, we can assign the value 0 or 1 to both of these propositions, and they can then be used as inputs to a Boolean AND gate:



As you can see in the previous diagram, the AND gate then performs the correct logical inference. Because both of its inputs are equal to 1, the output of the AND gate will then also be equal to 1 (the standard behaviour of an AND gate). If we then associate the output of the AND gate with the final proposition "The kettle will boil" then we

can see that the AND gate is stating that the proposition is true (its output value is 1). Yes, the AND gate has correctly concluded, the kettle will boil.

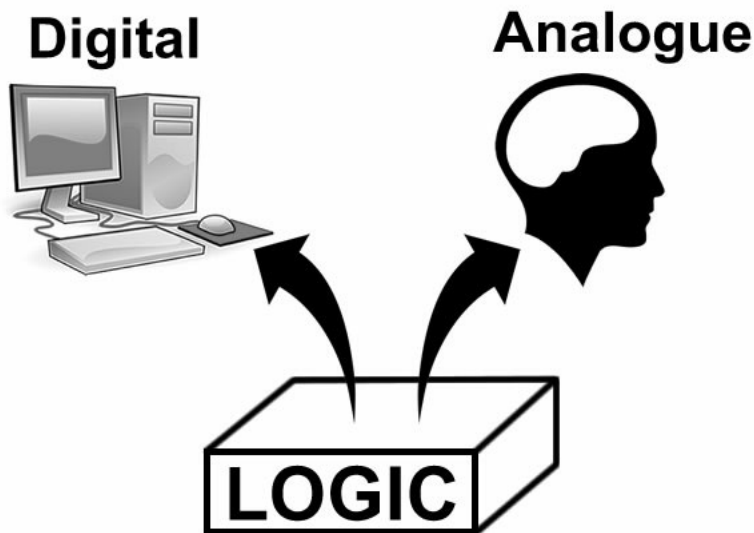
The AND gate has therefore performed the correct logical inference. In other words, the AND gate has come to the same logical conclusion as a human. It might therefore be said that the AND gate has followed the same "thought process" as a human, given the initial premises.

This represents the simplest form of "thinking", and reveals how an electronic digital device can "think" like a human who is trying to make a cup of tea.

George Boole presented his new algebra in 1854 in a book entitled *The Laws of Thought*. The title of the book now seems almost provocative. We like to imagine our thought processes as being free and unconstrained, but the title of Boole's book suggested that there are rules and laws which constrain our thoughts.

And those rules are the laws of logic.

So when people compare human brains with computers, and say that they are not the same because one is based on analogue hardware, and one is based on digital hardware, the wrong comparison is being made — too much emphasis is being placed on the hardware. The particular hardware is irrelevant. At a deeper level, both of these forms of "thought process" have logic at their base. It is logic which provides the commonality of operation. Brains and computers are both basically doing the same thing: processing logic.



So far we have only considered the functioning of logic in computer hardware. But now let us move to consider the functioning of logic in the hardware of the brain.

Because things are about to get very interesting.

We are about to enter the 20th century ...

The wild-bearded poet

As our tale enters the 20th century, our attention turns to another country about to enter its own Golden Age. This was the century in which America emerged as a superpower, the most influential and powerful country in history. It was in the 20th century that America also became the world's leading centre of scientific research, taking the crown from the Old World centres of Britain and Germany (a process which was hastened by the exodus of Jewish scientists escaping Nazi Germany for America).

Warren McCulloch was born at the start of the 20th century in Orange, New Jersey. The McCulloch family was

wealthy, and upper middle class. Warren was educated at a private school, and revealed himself to have "an eager and inquiring mind that went way beyond his assigned studies". McCulloch was described as having an insatiable curiosity.

When McCulloch was a student in Pennsylvania in 1917, one of his teachers asked him what his ambitions were in life. McCulloch said his aim in life was to be able to answer the following question, and gave a famous, poetic quote: "What is a number, that a man may know it, and a man, that he may know a number?"

As far as McCulloch was concerned, the first part of the question had been satisfactorily answered by mathematicians: "What is a number, that a man may know it?" McCulloch said that his goal in life was to answer the second part of the question: "What is a man, that he may know a number?" In other words, McCulloch wanted to know how a brain worked.

McCulloch started his career as an undergraduate at Yale in 1918, studying philosophy and psychology. For his undergraduate thesis, McCulloch chose to consider the psychological appeal of the Golden Ratio and the Golden Rectangle, which was considered earlier in this chapter. This was a particularly hot topic during the 1920s in America because of the rise of a new subject: the psychology of advertising. McCulloch decided to determine whether or not it was true that consumers might have an aesthetic preference for the Golden Rectangle design.

For his experiment, McCulloch presented various images — some based on the Golden Rectangle design, some not — to twenty-four of his fellow Yale students. After evaluating the results, McCulloch concluded that it was, indeed, true that designs based on the Golden Ratio would be preferred by consumers.

Following his Golden Ratio experiment, McCulloch was impressed by this example of geometry and mathematics for revealing truths about the mind. McCulloch found himself increasingly convinced that only a multi-disciplinary approach would be capable of unlocking the secrets of the mind.

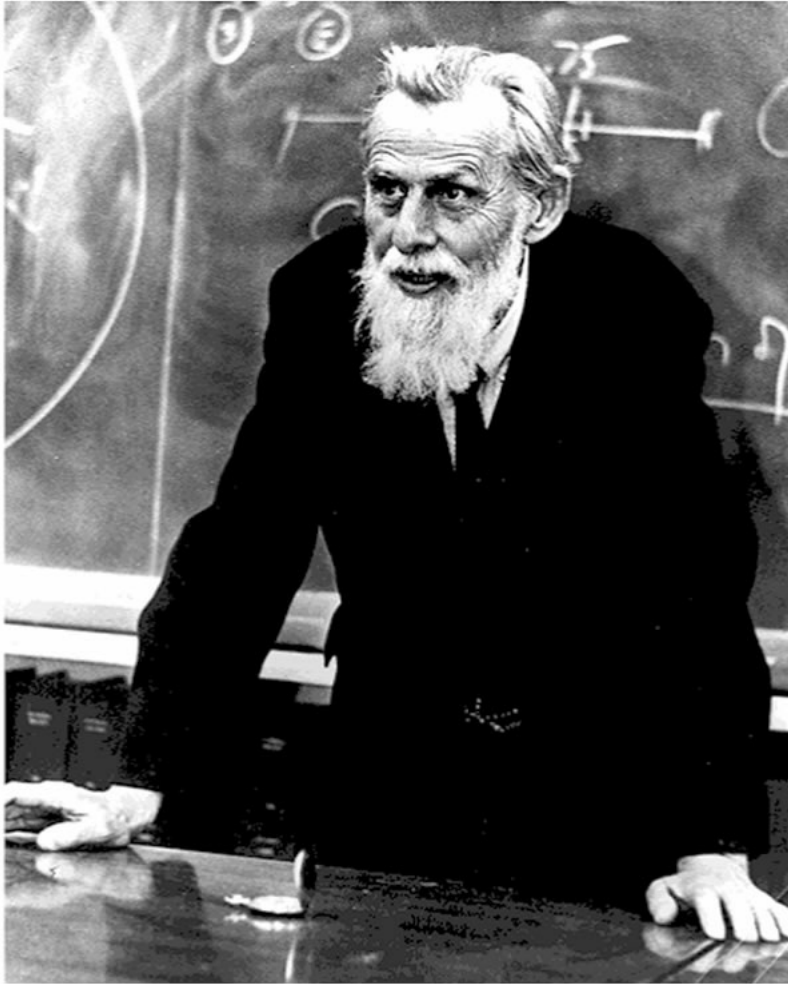
McCulloch's approach required the incorporation of ideas from neuroscience, physics, mathematics, engineering, and philosophy. However, following such a multi-disciplinary approach is not easy in academia. Academia tends to require specialisation in a single discipline, be it physics, or mathematics, or biology, or any other science. There is also tremendous pressure to publish papers regularly — leaving little time to obtain a wider range of knowledge about unrelated disciplines. As a result, an academic researcher's knowledge about a subject can sometimes be rather narrow, with a lack of awareness of other research fields. However, to gain a true understanding of the brain — and consciousness — requires a true multi-disciplinary approach and a broad range of knowledge over many different scientific fields. [\[16\]](#)

Due to his belief in a multi-disciplinary approach, McCulloch's work often ran counter to academic conventions, and the boundaries of individual disciplines. Because of this, when Tara Abraham wrote a biography of Warren McCulloch, she chose to call her book *Rebel Genius* — which seems a fitting term to describe McCulloch.

The rebellious nature of McCulloch was also described in a *Nautilus* article by Amanda Gefter in which McCulloch is described as a "confident, gray-eyed, wild-bearded, chain-smoking philosopher-poet who lived on whiskey and ice cream and never went to bed before 4 a.m."

What a man!

Here is a photograph of Warren McCulloch taken in 1967:



McCulloch started reading the *Principia Mathematica*, the monumental work written by the mathematical logicians Bertrand Russell and Alfred Whitehead. As stated in *Rebel Genius*, Russell believed that "the laws of logic are the laws of thought". This had a great influence on McCulloch. According to Stanislas Dehaene in his book *The Number Sense*, McCulloch started to hold a strong personal conviction that the brain should be considered as being a "logical machine".

However, as Tara Abraham states in *Rebel Genius*: "McCulloch's interest in the logic of the nervous system would not become explicit until the early 1940s".

That was because, in the 1940s, McCulloch met the perfect collaborator, a man with whom McCulloch would present a new theory of how the hardware of the brain processes logic ...

The unhappy childhood of Walter Pitts

Walter Pitts was born in Detroit in 1923. He had a tough upbringing, surrounded by poverty, and with a boiler-maker father who was not afraid of dishing-out physical punishment to his young son. Walter was also regularly bullied by boys in the neighbourhood. But on one occasion in 1935, when Walter was being chased by the boys through the streets, he sought sanctuary by making a sharp turn into a local library — and, at that point, his life changed forever.

Walter hid in the library until it closed for the night. When he emerged from his hiding place later that evening, he had nothing else to do but read the books. Walter discovered the three-volume *Principia Mathematica* written by Bertrand Russell and Alfred Whitehead (it has just been mentioned that this was a book which Warren McCulloch

also read). The *Principia Mathematica* is a huge and impenetrable work on mathematical logic (it was described in my fourth book). This did not deter Walter, who stayed in the library for three days and read each volume in its entirety.

It is easy to understand why Walter wanted to immerse himself in the world of mathematics. Surely the logic and rationality of mathematics represented an escape from the chaos of his traumatic reality.

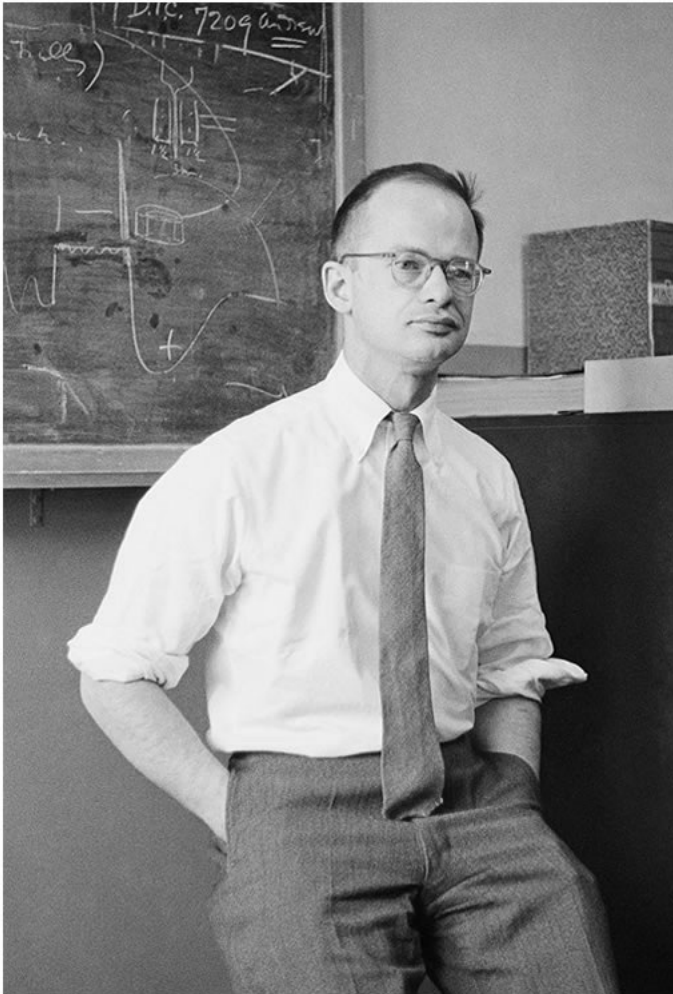
Walter discovered he had a talent for mathematics, and he wrote to Bertrand Russell to inform him that he believed he had found a few mistakes in the *Principia Mathematica*. Remarkably, not only did Russell reply, but he invited Walter — at just twelve years of age — to come and visit him in Cambridge University. Walter was too young to travel, but three years later, when Bertrand Russell came to visit the University of Chicago, Walter ran away from home hoping to meet Russell.

Walter Pitts never went home again.

The McCulloch-Pitts artificial neuron

In Chicago, Walter managed to sneak into one of Russell's lectures, and finally managed to meet his idol. Even though Pitts was not registered as a student, he started attending lectures. And so it was that young Walter Pitts was introduced to the wild-bearded Warren McCulloch.

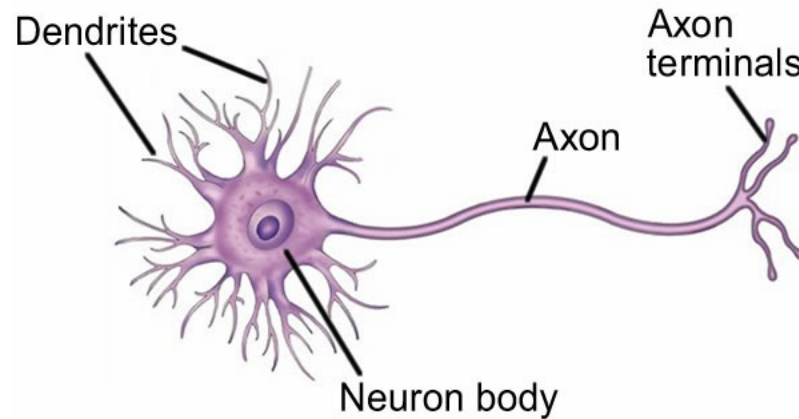
Here is a photograph of Walter Pitts taken in 1950:



McCulloch instantly recognised that he had shared interests with Pitts, and the two became collaborators. McCulloch was convinced that the brain could be modelled as a logical machine. Pitts, with his background in logic

and mathematics, developed a similar conviction.

McCulloch's multi-disciplinary approach meant that he was aware of the structure of neurons. As can be seen in the following diagram, a neuron is composed of a cell body with an internal nucleus. Many branches come out of the cell body, and these are called *dendrites*. These branches receive input signals from previous neurons in the network. There may be in the region of a hundred dendrites on a single neuron. There is a single long output branch from the neuron, and this is called the *axon*. The signal along the axon is always in one direction — away from the cell body:



The neuron receives multiple input signals on its dendrites. These input signals take the form of electrically-charged particles. If these input signals result in raising the internal electric charge of the neuron sufficiently, then the neuron is said to "fire", which means that an electrically-charged pulse (an *action potential*) is sent down the neuron's axon to the next neuron in the network.

Axon terminals at the end of the axon connect to the dendrites of the next neurons in the network. However, it is not a direct physical connection: there is a narrow gap between the axon terminal and the dendrite of the next neuron, and this gap is called a *synapse*. As one synapse represents the connection between a neuron and the next neuron in the network, we might consider each synapse as representing an input to a neuron. Crucially, therefore, neurons have **multiple logical inputs** — each of which can be either 0 or 1 — but **only one logical output** (a single value, either 0 or 1).

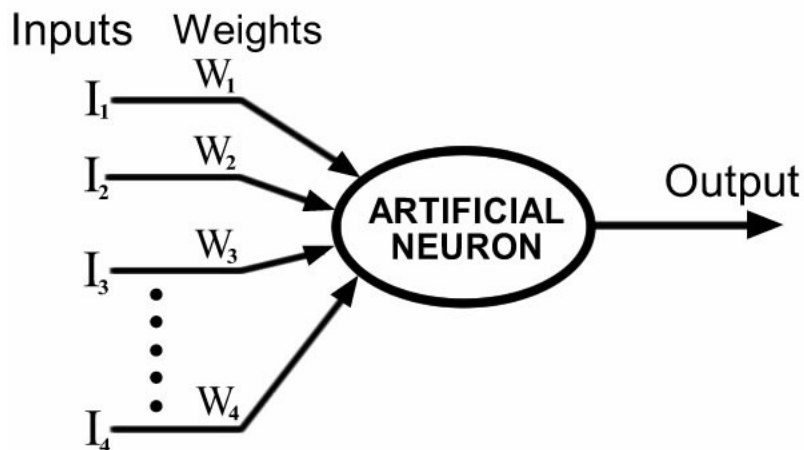
McCulloch was also aware of the "all-or-none" principle which meant that a neuron would only fire when the total value of that neuron's inputs exceeded a certain value. This meant that a neuron behaved like a Boolean logic gate, with only two possible outputs: 1 (when the neuron was firing), or 0 (when the neuron was not firing).

The science writer Amanda Geffer has written a superb article about Pitts and McCulloch for the *Nautilus* website.^[17] In that article, McCulloch's insight was described: "Neurons seemed to work like logic gates, taking in multiple inputs and producing a single output. By varying a neuron's firing threshold, it could be made to perform AND, OR, and NOT functions."

Walter Pitts immediately understood McCulloch's idea, and together they worked to create a model of a neuron which worked in a similar fashion to a logic gate. Tara Abraham describes the theory of the neuron which was developed by McCulloch and Pitts as: "a theory that transcended the divides between science, philosophy, and experimental medicine. McCulloch and Pitts were not interested in the mechanism of transmission of the nerve impulse but rather in the **relation** between stimulus and response, which they ultimately translated into a **logical** relation."

The following diagram shows the design of the *McCulloch-Pitts neuron model*. The model represented the first artificial neuron.

In the model, there are multiple inputs, with each input representing a dendrite of the neuron. Each input has a value which, in the case of this simple model, can only take one of the binary values: 0 or 1. Each input is then multiplied by a weight, as shown on the following diagram:



The total of all the inputs is then summed internally by the artificial neuron, and a thresholding function is applied. The thresholding represents the implementation of the "all-or-none" principle in actual neurons: the artificial neuron will only fire if the total value of its weighted inputs is greater than some threshold value. The output of the artificial neuron then becomes the equivalent of the single axon output of an actual neuron. Because of the thresholding function, the output of the artificial neuron can only be 0 or 1, and that output value then becomes one of the input values of the next neuron in the network. In this way, highly complex networks of artificial neurons can be constructed.

In her book *Rebel Genius*, Tara Abraham considers the goal of McCulloch and Pitts: "McCulloch and Pitts's goal was to represent the functional relationships between neurons in terms of Boolean logic: **to embody reasoning in the physiology of the brain.**"

That phrase "to embody reasoning in the physiology of the brain" means that **logic is hard-wired into the structure of our brains.** It might be imagined that neurons have the structure that they have — with multiple inputs and a single output — simply because of a vague notion that the design allows for a large number of connections. But, no, that is not the reason for the specific design of neurons. Neurons are designed specifically to perform logical operations. As a result, neurons have multiple inputs and a single output, just as Aristotle's logic had multiple input premises and a single conclusion, or a Boolean logic gate has multiple inputs and a single output. **Neurons have the structure they have because they are the living embodiment of Aristotle's logic (or, its more modern equivalent, Boolean logic).**

Logic is hard-wired into the structure of our brains. Logic is so fundamental to our thought processes that the structure of logic defines the structure of every neuron in our brain, which is why neurons resemble Boolean logic gates.

Unfortunately, Walter Pitts' story did not have a happy end. He sank into depression, and began drinking heavily — he had never recovered from his traumatic childhood experiences. He burnt his unpublished doctoral dissertation, and all of his private documents and papers. Amanda Gefter described this self-destructive act as "priceless information reduced to entropy and ash".

It has been said that Walter Pitts spent the last years of his life trying to erase his very existence. However, that did not happen, as the influence of Walter Pitts lives on. That is because today we are surrounded by the descendants of the McCulloch-Pitts artificial neurons. Their design represented the first form of *neural network*. Neural networks now form the foundation for the current revolution in artificial intelligence (see my previous book on consciousness for more details). So the work of the wild-bearded poet Warren McCulloch and the tragic genius of Walter Pitts lives on in the artificial intelligence which lies at the heart of much of our modern technology.

Thermodynamics and the brain

At this point in our historical saga, we need to take a slight detour from our story of the history of logic. Before we can proceed further, the science of *thermodynamics* needs to be introduced. Thermodynamics is going to be a central theme of the rest of this book. This might seem like a slightly puzzling detour, but I can assure you that we shall soon see the close connection between thermodynamics and our logical thought processes.

Thermodynamics is the science of heat ("thermo") and motion ("dynamics"). The science of thermodynamics was developed in the 19th century in order to obtain a better understanding of the workings of steam engines. However, in the 20th century it was realised that thermodynamics is relevant to a much wider range of applications. Indeed, Stephen Hawking's most famous work was related to the thermodynamics of black holes.

So why does thermodynamics have such a wide range of applications?

Well, first let us consider the traditional model of physics. Physics can be used for making accurate predictions about the behaviour of particles and forces. In the classical physics of Newton, for example, we might consider a single object, such as a billiard ball. We might have precise information about the position and motion of that single ball. If that ball is then struck by a second moving ball, we can use the physics of Newton to accurately calculate the velocities of both balls after the collision. It is all very precise.

But what if we do not have complete information about the balls? For example, what happens if we have a large sack full of billiard balls, and we start shaking the sack. The balls start moving and colliding in a random fashion. We do not possess accurate information about the positions or velocities of any of the individual balls. Does that mean we can no longer use physics to describe the motions of the balls? Can we no longer use Newton's laws of physics to describe the balls? Do the laws of physics no longer apply?

No, of course the laws of physics still apply, but instead of using Newton's laws of classical mechanics, we now have to use *statistical mechanics*. Statistical mechanics describes the aggregate behaviour of a very large number of individual particles. We can use statistical mechanics to consider the **aggregate** behaviour of **all the balls** in the sack. For example, we might calculate the **average** velocity of **all** the balls in the sack.

When it is used to analyse the motion of atoms and molecules, statistical mechanics gives rise to thermodynamics. To see how that happens, let us replace the random motions of billiard balls with the random motions of trillions of atoms (or molecules) of gas in a sealed container. Those atoms will be moving and colliding randomly — just like the billiard balls in the sack. As a result, we clearly cannot possess accurate information about the motion of any of the individual atoms. However, that random motion of the atoms will result in heat (heat is the random motion of atoms or molecules), and we can measure the temperature of the gas. Even though we do not possess information about the motion of any of the individual atoms, we can still characterise the overall motion of the all the atoms by using an aggregate measure: the temperature of the gas.

And that is the basis of thermodynamics. Even if we do not have complete information about all the individual elements of a system, we can still generate aggregate measures and then use the laws of thermodynamics to describe the behaviour of the system.

And that is why thermodynamics is a branch of physics which is so well-suited for describing the behaviour of the brain. The brain is composed of approximately 86 billion neurons. At any particular moment, we do not possess complete information about the behaviour of the individual neurons — just as we do not possess information about the behaviour of individual atoms in a gas. However, we can still use aggregate measures and the laws of thermodynamics to describe the total behaviour of **all** the neurons in the brain.

The science which considers the thermodynamics of the brain is still in its relative infancy.[\[18\]](#) However, the remainder of this book will be concentrated on considering the thermodynamic behaviour of the brain, and the relationship to the logical behaviour of neurons.

But, first, let us consider the most famous thought experiment in thermodynamics.

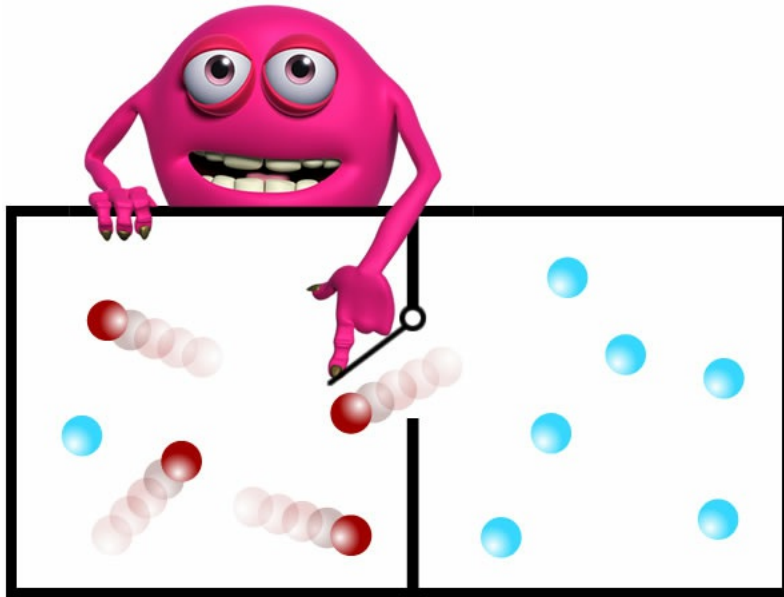
Maxwell's Demon revisited

The thought experiment which is now known as *Maxwell's Demon* was devised by the great Scottish physicist James Clerk Maxwell in 1867 (another product of the Victorian golden age). The details of the thought experiment were described in the first chapter of my previous book on consciousness, but the experiment will be described again here because this time we will be taking the experiment further, to reveal new insights and new implications for information processing.

The experiment considers a gremlin-type character (known as the "demon") who operates a trap door which separates two compartments. The two compartments are both filled with the same gas, which is initially at the same temperature in both compartments.

The demon has superpowers, which include incredibly good eyesight which allows him to see each individual gas molecule, incredibly high information processing power in his brain which allows him to calculate the speed and trajectory of each gas molecule, and incredibly quick reflexes which allows him to quickly open the trap door to allow selected individual molecules to pass between the two compartments.

The following diagram shows the demon in action. You can see him opening the trap door to allow a fast-moving gas molecule to pass from the right-hand compartment to the left-hand compartment:



Let us imagine the demon continues with this strategy, allowing faster-moving molecules to pass to the left-hand compartment, and allowing slower-moving molecules to pass to the right-hand compartment. Over time, this will result in the gas in the left-hand compartment becoming warmer, and the gas in the right-hand compartment becoming cooler (because heat is nothing more than the motion of molecules).

As a result of his actions, we can say that the demon is lowering the *entropy* of the system. We can consider the entropy of a system as being the amount of disorder or randomness in that system. Initially, the gas was equally divided between the two compartments, with both compartments being at the same temperature. There is no organization to this situation: the molecules have not been ordered in any way, they have been distributed randomly between the two compartments. We therefore say that this is a situation of high entropy. In that situation, the entire system can be completely described by just one piece of information: the temperature of the entire body of gas. So high entropy is connected with low information content.

But when the demon performs his sorting operation — ordering the molecules according to speed, and assigning them to separate compartments on that basis — the demon is organizing the system. He is introducing a structure to the arrangement of the gas molecules. We would therefore say that the demon is lowering the entropy of the system.

The organized system then contains two pieces of information: the temperature of the left-hand compartment, and the different temperature of the right-hand compartment. Hence, the information content has increased as the entropy has decreased.

To recap our findings:

High entropy is connected with low information.

Low entropy is connected with high information.

In other words, there is an inverse relationship between information and entropy. [\[19\]](#)

As another example of the relationship between information and entropy, let us return to consider the actions of the tragic Walter Pitts as he burnt his doctoral dissertation and research notes. As Amanda Gefter described earlier in this chapter, this act represented "priceless information reduced to entropy and ash". That is perhaps the clearest example of how a reduction in information (the loss of his papers) leads to an increase in entropy (the random and

featureless ash).

However, the action of the demon introduces a mystery. This result of the demon's actions appears to be in conflict with the second law of thermodynamics, one of the cornerstone laws of physics. The second law of thermodynamics states that heat will always tend to move from a warmer region to a cooler region, thus eventually equalising the temperatures. The entire compartment would then eventually be at the same temperature. We have just seen that this single-temperature gas represents a situation with maximum entropy. So the second law states that the entropy of a system will always increase (a system will always tend to become more disordered).

But if the demon is lowering the entropy by organizing the gas molecules, then that would appear to contravene the unbreakable second law of thermodynamics.

So, what is going on?

A solution was urgently required ...

The solution of Leo Szilard

The mystery of the apparent breaking of the second law of thermodynamics in the Maxwell's Demon thought experiment remained a mystery for several decades after James Clerk Maxwell first proposed the experiment. However, in 1929, an apparent solution was found by the physicist Leo Szilard.

We met Leo Szilard in my eighth book which explained how to make an atomic bomb. Szilard played a central role in the story of the bomb development. He was the first person to conceive of the nuclear chain reaction, and he persuaded Einstein to write his letter to President Roosevelt urging the United States to start its own nuclear program.

But Szilard was not only a physicist — he was also an entrepreneur who knew a business opportunity when he saw one. In one of the more bizarre episodes in the history of physics, between 1926 and 1930, Leo Szilard persuaded his friend Albert Einstein to work with him to develop a new type of refrigerator. We should remember that Einstein was at the peak of his fame and powers at the time. Presumably Einstein saw building a new fridge as a logical next step after developing the equations of general relativity. Or maybe it speaks volumes about the persuasive abilities of Leo Szilard. Whatever his motivation, it represented an opportunity for Einstein to use the technical knowledge he had gained during his time as a humble patent clerk.

The "Einstein refrigerator" was patented in 1930, but it was never put into commercial production.

Here is a photograph of Leo Szilard:



It was during this period that Szilard was working with Einstein on the refrigerator that Szilard thought he would attempt to find a solution to the mystery of Maxwell's Demon. After all, the operation of a refrigerator is based on thermodynamics, and Maxwell's Demon was a thought experiment about thermodynamics, so Szilard's fridge skills would have been directly transferable.

If you remember, the mystery of Maxwell's Demon is how can the demon manage to lower the entropy of the gas

— seemingly in contravention of the second law of thermodynamics. Szilard realised that the solution was to not only consider the change in entropy of the gas, but to consider the change in entropy of the entire system — including the demon. But where was this increase in the entropy of the demon coming from?

If we consider the idealized version of the thought experiment, in which the trap door is completely frictionless, then the only possible source of the increased entropy of the demon would be from the measurements and calculations in the demon's mind. Remember, the demon is having to perform a truly superhuman mental feat, calculating the velocities of every single individual molecule of gas. Szilard realised that the increased entropy generated by the superhuman mental processes of the demon could hold the key to the mystery.

For every molecule of gas, Szilard realized that the demon had to make a binary decision: whether or not to open the trapdoor. Hence, if the demon could calculate a single bit of information for every molecule of gas in the box, then the entropy of the gas **could** be reduced (a *bit* is a unit of information which can only take the binary values of 0 or 1).

The amount of entropy associated with a bit of information is well-known and is given by the *Boltzmann entropy formula* as:

$$k \ln(2)$$

where k is Boltzmann's constant, "ln" is the natural logarithm, and the "2" arises because a bit has two possible values.

If you calculate this value, you find that the amount of entropy associated with a single bit of information is equal to the microscopic amount of 9.57×10^{-24} joules/kelvin.

This value representing the increase in the entropy of the demon is such a small amount that it might be wondered how it could ever be large enough to exceed the reduction of the entropy of the gas. However, it must be realised that this value just represents the increase of entropy due to a **single** molecule of the gas. With a truly astronomical amount of molecules in the gas, the increase of the entropy of the demon would exceed the reduction of the entropy of the gas.

As a result, the total amount of entropy in the entire system — including the demon — would have increased, and so the second law of thermodynamics would not have been broken.

Szilard published his solution to Maxwell's Demon in 1929. He gave it the title *On Entropy Reduction in a Thermodynamic System by Interference by Intelligent Subjects*.

The use of the word "intelligent" in the paper's title is revealing. Remember, Szilard was a physicist. Up to that point, physicists had only talked about fundamental things, such as atoms and forces, things which could be easily measured. In contrast, the messy, complex, emergent concept of "intelligence" was not considered to be something which physicists should study, or mention in their published papers.

But now, for the first time, Szilard was connecting the concept of "intelligence" with the laws of physics. Szilard's approach was described in a paper by Maruyama *et al.*: "Szilard treated the demon's intelligence as information, and linked it with physics ... Szilard's work was epoch-making in the sense that he explicitly pointed out, for the first time, the significance of information in physics." [20]

Physicists had always avoided the concept of "intelligence" because it was something internal to the human mind — it was not something that could be measured. After all, we cannot see inside a mind.

But Leo Szilard had managed to see inside the mind of the demon.

The man from IBM

Our saga now moves on to the 1960s in the USA.

Turn on, tune in, drop out ...



This was a decade in which young people rebelled against traditional values, instead placing an emphasis on peace, love, and personal freedom. This atmosphere of liberation also included sexual freedom, and the freedom to take drugs, with the drug of choice being lysergic acid diethylamide, or LSD.

But the 1960s was also one of the most turbulent decades in the history of the United States. As the Vietnam War raged, it was a decade of assassinations and riots. The reality of America was far from the ideals of the hippies — it was a deeply divided country.

These divisions were even visible in the heart of corporate America, in the IBM Research Center in Yorktown, New York. One of the leading researchers, the information theory pioneer Rolf Landauer, was remembered by his fellow computing legend Charles Bennett: "Rolf was an old IBM type who did things on the straight and narrow. I was a scruffy hippie."

Here is a photograph of Rolf Landauer taken in the 1960s, looking very dapper:



Landauer was well aware of Leo Szilard's solution to the mystery of Maxwell's Demon, which was generally believed to have solved the problem. But Landauer was not convinced that Szilard's solution told the whole story.

If you remember, Leo Szilard proposed that the measurement and calculations being performed in the demon's

head would necessarily generate more entropy than the reduction in entropy of the gas. As a result, the total entropy of the system would increase — in accordance with the second law of thermodynamics. But Rolf Landauer wasn't satisfied: he wanted to know the details of the internal processes of the demon's brain. Why was entropy increasing?

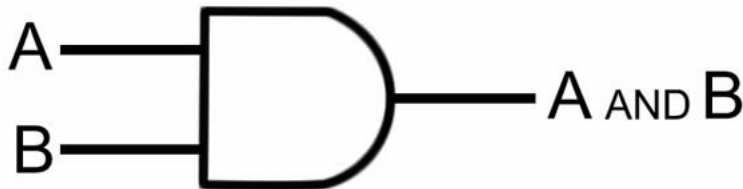
To understand Landauer's approach, let us consider the internal workings of the demon's brain.

As was described toward the start of this long chapter, we like to consider our thoughts as being free and unconstrained. However, perhaps we do not realise that there are rules and laws which govern our thoughts, and those rules are the rules of logic. Certainly, to be capable of ordering molecules according to their measured and calculated velocities, and thereby making a decision to open a trap door, the demon would need to possess a mind capable of logical thought. As we shall be seeing later, if you want to do anything useful with information, you have to use logic.

And that logical ability would surely be hard-wired into the demon's brain in the form of neurons which resemble our own neurons. In other words, just as McCulloch and Pitts suggested, the demon's brain would be composed of neurons which resembled logic gates.

Just as Amanda Gefter described the work of McCulloch and Pitts earlier: "Neurons seemed to work like logic gates, taking in multiple inputs and producing a single output. By varying a neuron's firing threshold, it could be made to perform AND, OR, and NOT functions."

So let us consider a particular neuron which operates like an AND gate:



The structure certainly resembles a neuron with multiple inputs and a single output. Logic gates such as the AND gate can also have many more than just two inputs, which make them appear even more like neurons. In the case of the AND gate, that would mean that the output would only be equal to 1 if **all** of its multiple inputs were equal to 1.

Here is the truth table for the AND gate which was presented in the earlier discussion on Boolean logic:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

We might think of this truth table as describing a neuron which only "fires" (output equal to 1) when all of its inputs are equal to 1. This is common behaviour for a neuron.

What Rolf Landauer did was consider the relationships between the inputs and the outputs in the previous truth table. He realised that if the output was equal to 1, then you would be certain that both of the inputs had to be equal to 1 (as you can see from the previous truth table). However, that certainty vanished if the output was equal to 0. As you can see from the following truth table, if the output was equal to 0 then you could not tell if the inputs had both been equal to 0, or if one of the inputs had been equal to 0 while the other input had been equal to 1. In all three of these cases, the output would have been equal to 0:

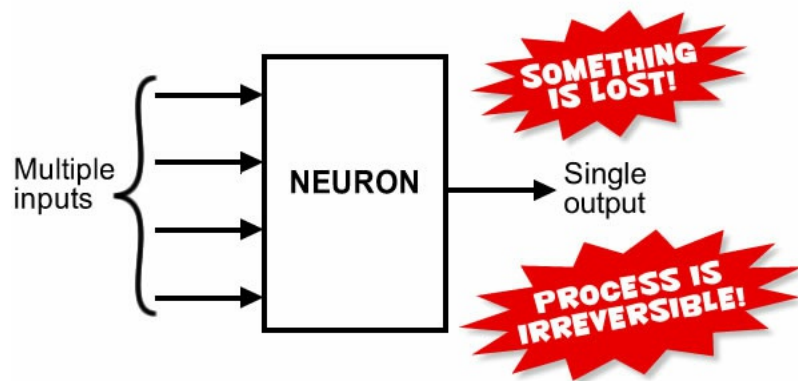
A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

} Same outputs

As a consequence, if you were only presented with the output of the gate, you would not be able to say what that the inputs had been with complete certainty. Before the operation of the logic gate, you knew the value of both of the inputs, but after the operation of the logic gate, you no longer knew the value of both of the inputs. In other words, some knowledge — some *information* — would have been lost through the operation of the gate.

This type of Boolean gate is therefore not reversible. If all we know is the output, we cannot "wind the gate back" and get the input values. As Rolf Landauer said in his original landmark paper: "We shall call a device *logically irreversible* if the output of a device does not uniquely define the inputs". [21]

We cannot return to our previous situation because we have lost information. And this, therefore, reminds us of a MISO process in which something is "lost" and, as a result, the process becomes irreversible:



What we can see in both the AND gate and in the MISO process is that the root cause of the irreversibility is that we have multiple bits of information coming into the gate, but the output is only a single bit of information. As a result, information is bound to be lost. Some of those input bits of information are bound to be lost.

And that is also the root cause of the increase in entropy in the mind of the demon. As we saw in the earlier discussion of Maxwell's Demon, there is an inverse relationship between information and entropy: that means if information increases then entropy decreases, but if information decreases (as is the case here, with information being lost) then entropy increases. And therefore the entropy in the demon's mind is bound to increase as information is lost in the neurons of the demon's brain.

On the basis of the reasoning presented here, Landauer then stated his conclusion: **entropy will increase when bits of information are lost, or deleted, or erased.** This represents one of the most important principles in information theory, and it is called *Landauer's principle*.

Landauer's principle is now accepted as the true reason why Maxwell's Demon cannot violate the second law of thermodynamics.

Remember, Rolf Landauer worked for IBM Research, and his research interest was not brains — it was computers. In particular, the aim of this theorising of Landauer was to make more efficient computers. That involved reducing the energy requirement of computers, and reducing their heat output. There is a direct connection between entropy and heat as entropy is randomness, and heat is nothing more than the random motion of atoms and molecules. So Landauer decided to use his new principle to calculate how much heat would be produced by the

erasure of a single bit of information.

To convert entropy to energy (heat energy in this case) you have to multiply the entropy by the temperature. So Landauer took Szilard's formula for the entropy of a single bit of information (which was presented in the previous section) and simply multiplied it by the temperature. As a result, according to Landauer, the erasure or deletion of a single bit of information in a computer would produce an amount of heat equal to:

$$kT \ln(2)$$

where T is the ambient temperature. You will note that this is just Leo Szilard's formula multiplied by T .

This represents an extremely small amount of heat. Therefore, does Landauer's principle have any relevance to the functioning of the brain, and the heat output of the brain? We will discover the answer shortly.

The incredible power of Landauer's principle

At this point, I want to devote this section to emphasising the most important and powerful feature of Landauer's principle. The most important feature is this: Landauer's principle allows us to calculate the **absolute minimum** amount of heat which must be produced when a bit of information is deleted. You will note that the emphasis in the previous statement is on "absolute minimum". When something represents a minimum amount that means it can never be reduced to something smaller. Never. Under no circumstance whatsoever. It is physically impossible to reduce the amount of heat produced below the Landauer limit.

I am sure that this is not generally appreciated. As has just been explained, wherever there is logical information processing — either in Boolean logic gates in a computer, or in the neurons of a human brain — then bits of information will inevitably be lost. Landauer's principle can then be used to determine how much heat will be produced due to that lost information. But the key point is **that amount of heat will be the absolute minimum amount, and can never be reduced below that amount.**

As an example of this incredible consequence of Landauer's principle, let us imagine a PC on your desk performing an intensive calculation, maybe encoding a video. The fan on your computer might well start to spin to cool the processor to stop it overheating. We might think of that heat being produced in some vague way as being an unwanted nuisance, just an annoying side-effect of the processor working hard. We might imagine that if we had better technology in our PC (maybe copper wires?), or maybe a better processor design then that heat could be eliminated. But if we thought that, we would be wrong.

Landauer's principle reveals that the heat is not an annoying by-product — it is an intrinsic feature of logical information processing. The amount of heat could possibly be reduced, but it cannot be eliminated. Even if we replaced all the wires in our computer with zero-resistance superconductors so that heat is not produced by the electrical current flowing through the wires, that minimum amount of heat would still be produced by the logic gates. The heat can never be completely eliminated.

Rolf Landauer refers to this dissipation of heat in his original paper: "The relevant point, however, is that the dissipation has a real function and is not just an unnecessary nuisance".

This represents a new way of looking at the heat produced by your computer. The heat is not an "unnecessary nuisance" — it is an intrinsic part of logical information processing.

But it is not all bad news. This inevitable production of heat is definitely a bad thing if you are interested in designing computers for IBM, but — as we shall soon see — it represents a powerful signature if you are interested in detecting consciousness.

Landauer's principle and the brain

Rolf Landauer developed his principle to predict heat production in computers. But what does it tell us about the brain?

Since ancient times, it has been known that the brain produces an extraordinary amount of heat. It was Aristotle who first became fascinated by the heat production of the brain. Aristotle decided — on the basis of the sheer amount of heat being produced — that the sole function of the brain must be to cool the blood (Aristotle believed that consciousness resided in the heart). [\[22\]](#)

The statistics are striking. The average power consumption of a human at rest is 100 watts (imagine a 100 watt light bulb as a comparison — it is hot). The brain has a power consumption of approximately 20 watts, which means that a fifth of the entire power consumption of a human is being used by the brain. It is the most energy-hungry organ. In comparison, the heart pumps 2,000 gallons of blood every day, but it still only requires 13 watts of power. So the brain — which has no moving parts — has a power consumption which is considerably greater than your continually-beating heart which pumps the equivalent of sixty baths full of water around your body every day.

What is going on? Can Landauer's principle explain this, just as Landauer's principle explained the true reason for the entropy increase (and, therefore, the heat production) of the brain in Maxwell's Demon?

To answer this question, I decided to use Landauer's principle to calculate the total heat output of the brain. The calculation was based on the MISO model of the neuron, with a neuron having multiple inputs, but only a single output. Each input which is not carried-over to the output represents a deleted bit of information.

As described earlier, the amount of heat produced by the deletion of a single bit of information is extremely small. However, there are approximately 150 trillion synapses in the adult human brain. If you remember, a synapse is the narrow gap representing an input to a neuron. Each of those synapses represents a single bit of information from a previous neuron, a bit of information which can be lost. Multiply a small amount of heat by 150 trillion synapses and the result will be a very significant amount of heat.

The calculation is presented in the appendix at the back of this book. The result of the calculation was that Landauer's principle predicts the total heat output of the brain to be 16.5 watts, which compares very well with the actual value of 20 watts.

What the calculation reveals is that the analysis in this book is correct. The heat production of the brain arises because of the fundamental design of neurons. Information is lost in neurons because inputs are not carried-over to outputs. Landauer's principle then allows us to calculate the total heat output.

But that neuron design is aimed at allowing a neuron to process information in a logical manner. Logic is hard-wired into the design of neurons. In other words, **the brain is so hot because it is a logical information processor.**

Aristotle would surely have been fascinated to learn that the true reason why the brain is so hot is because of the system of logic which he invented — and is nothing to do with cooling the blood.

If it's cold, it's not conscious

So the Landauer's principle calculation has revealed that any large-scale information processing — such as in a brain — must inevitably produce a detectable amount of heat. The heat production is utterly unavoidable.^[23] The heat produced by logical computation or thinking will always have a minimum limit — the Landauer limit — which means that the heat produced by thinking can never be reduced to zero.

In effect, we have found a "heat signature" of logical thought. This represents a very powerful tool for us as it represents a simple way to detect logical thought in objects.

In his book, *The Singularity is Near*, Ray Kurzweil asked the question "How smart is a rock?": "Consider the computation that takes place in an ordinary rock. Although it may appear that nothing much is going on inside a rock, the approximately 10^{25} (ten trillion trillion) atoms in a kilogram of matter are actually extremely active. Despite the apparent solidity of the object, the atoms are all in motion, sharing electrons back and forth, changing particle spins, and generating rapidly moving electromagnetic fields. All of this activity represents computation, even if not very well meaningfully organized. In terms of computation, and just considering the electromagnetic interactions, there are at least 10^{15} changes in state per bit per second going on inside a 2.2-pound rock, which effectively represents about 10^{42} (a million trillion trillion trillion) calculations per second. **Yet the rock requires no energy input and generates no appreciable heat.**"

But there is a very good reason why the rock is generating "no appreciable heat". Firstly, we should consider if the rock is really performing "computation" as Ray Kurzweil suggests. For a definition of "computation" and a "computer" we need to consider the archetypal form of computer which is the *Turing machine*.

The Turing machine was invented by the English mathematician Alan Turing in 1936. It is a simple device which can perform a sequence of logical operations — encoded as symbols — which are written on a long strip of tape. Those symbols written on the tape formed the basis of the modern computer program. Indeed, the Turing machine forms the blueprint for all modern computers (the Turing machine was considered in detail in my previous book on consciousness).

But is a rock doing anything like this? Of course it is not. To suggest, as Ray Kurzweil suggests, that a rock is "computing" is to stretch the definition of "computing" so thin that it breaks.

In the more general sense, "computation" involves **logical** information processing, performing a series of logical steps to achieve some useful goal, such as solving some problem, or performing a calculation.

If you want to do anything useful by processing information, you have to use logic. The reason why computers are so useful is because they have logic at their core. The reason why computer programs are so useful is because they are the written embodiment of a logical sequence of operations. This need for logical information processing is the reason why a computer — or a brain — is composed of billions of logic gates (or neurons).

And this is why Ray Kurzweil's rock is cold: **the rock is not performing any logical information processing.** As we have just seen, if the rock was performing any type of logical information processing then it would inevitably produce heat — as predicted by Landauer's principle.

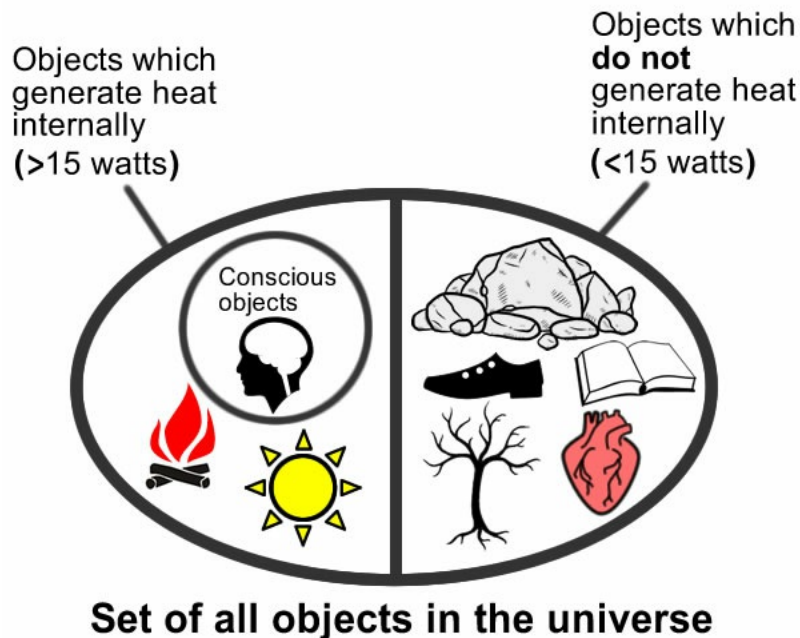
Real computing produces heat. If an object is not computing anything, it will be cold. Hence the phrase "stone cold". The rock is cold because it is not "thinking" anything.

And we can then invert this argument to consider objects which are warm because they **are** logical information processors.

One of the themes of this chapter has been that our thoughts are not as free as we imagine them to be. Our stream of consciousness follows a series of logical steps, performing logical information processing. Indeed, if our conscious mind is to do anything useful, or achieve any goal, it has to perform logical information processing. Therefore, if we can use Landauer's principle to detect the presence of logical information processing, then that could be used as a signature for the detection of consciousness.

On the basis of Landauer's principle, we might say, then, that any conscious object **has** to generate internal heat. From the calculation in the appendix of this book, it would appear that any high-level consciousness at a similar level to human consciousness would have to produce an absolute minimum of approximately 20 microwatts of heat. However, once the inefficiency of neurons is taken into account, that value rises to approximately 15 watts of heat.

The following diagram shows the set of all the objects in the universe. The set is divided into two groups. On the left-hand side is the group of objects which generate internal heat, of magnitude greater than 15 watts. As shown on the diagram, this group would include a fire (a campfire is shown) and the Sun (and all stars). As this analysis has concluded that all recognisable consciousnesses would have to produce heat greater than 15 watts, the left-hand set also contains a subset (drawn as a circle labelled "Conscious objects") which contains all known conscious objects (a human brain is drawn inside the circle):



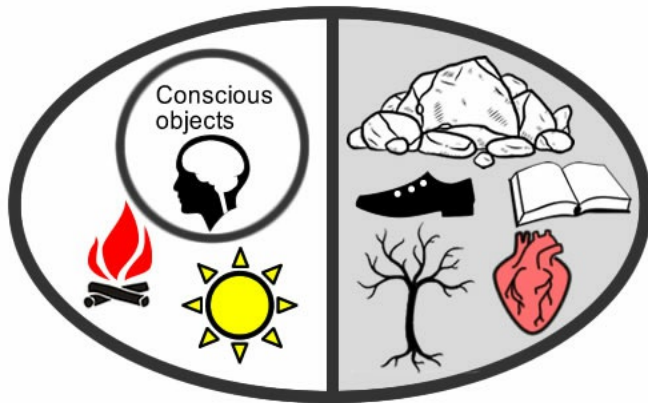
On the right-hand side of the diagram we find all the objects which either generate no heat, or they generate less than 15 watts of heat. It can be seen on the diagram that these objects include rocks, shoes, books, trees (or any plants), and even the human heart. Yes, the simple classification rule correctly predicts that the human heart is not conscious (remember, the power consumption of the human heart is only 13 watts). Aristotle would be disappointed.

So, have we discovered a simple method to detect conscious objects? Can we just say "If an object generates over

15 watts of internal heat, then it is a conscious object?" Well, that would be nice, but, of course, we can't say that. As indicated on the previous diagram, the group of warm objects would also include objects which generate internal heat via chemical reactions (such as campfires), or via nuclear reactions (stars). These are clearly not conscious objects.

However, the right-hand side of the diagram then becomes more interesting. The right-hand side represents all the objects which are either stone cold, or which generate less than 15 watts of internal heat. Because the group of all conscious objects is contained within the circle on the left-hand side of the diagram, we can say with confidence that all the objects on the right-hand side of the diagram are not conscious.

The all-important right-hand side of the diagram is shown in grey in the following image:

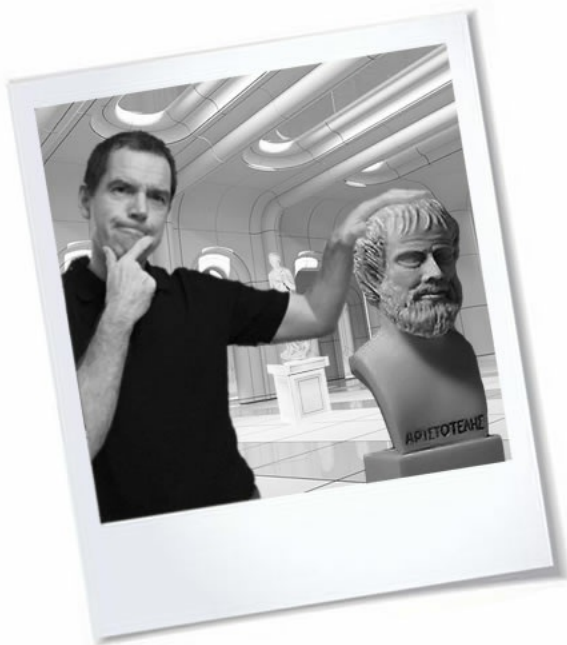


So this allows us to create a very simple and memorable rule:

"If it's cold, it's not conscious".

It is such a simple rule that it is possible to determine if an object is not conscious in seconds — just by touching it and measuring its temperature. If the object is cold — or not generating heat — it is surely not conscious.

Here is a photograph of me applying the simple classification rule to determine that a bust of Aristotle is not conscious — merely by touching it and finding it to be stone cold. It is such a simple test that you might like to try it on various objects around your house:



It would be very tempting to extend this principle to treat the amount of heat produced by logical information processing as some kind of measure of consciousness in a system. That would be a wonderfully simple solution to the problem of detecting consciousness! It would lead you to conclude that a more powerful, hotter computer was "more conscious" than a less powerful, cooler computer.

Unfortunately, you cannot do that. It is very easy to detect the **absence** of consciousness because you merely have to detect that **nothing** is being computed: "If it's cold, it's not conscious". However, to detect the **presence** of consciousness would not only require you to detect that **something** was being computed, but it would also require you to consider **what** was being computed. You would have to examine the system in great detail to make sure it possessed structured "thoughts", and had a rational stream of consciousness. For example, if you had a highly-powerful, hot computer but all it was doing was calculating random numbers — or was even just trapped in a loop producing random nonsense — then it would surely not be conscious in any recognisable sense of the word.

And having to consider the system in great detail to consider **what** is being computed makes the problem of detecting the **presence** of consciousness a far more difficult task. For a network with high-connectivity and high-complexity, containing billions of neurons or logic gates, the analysis of all the possible states would be almost unimaginably complicated.

One theory which is attempting this ambitious goal of detecting the presence of consciousness in a complex network is *Integrated Information Theory* (IIT). IIT was proposed by the neuroscientist Giulio Tononi in 2004, and has been continuously extended since then. The theory is now very large — and very complicated! IIT was briefly considered in my previous book on consciousness.

IIT attempts to consider all the possible arrangements of active neurons in a complex network. This involves splitting a system into all possible arrangements, and characterising the complexity and connectivity of the system by a single value, Φ (the Greek letter "phi"). However, like any theory attempting to detect the positive **presence** of consciousness, the problem arises from the sheer number of different possible states of the network.

In his book *Consciousness*, Christof Koch considers the computational requirement of calculating Φ : "Computing Φ is rather demanding because all possible ways the system can be divided have to be considered — that is, every way to cut the network into two parts, all ways to cut it into three parts, and so on until one arrives at the atomic partition, where all units that make up the network are considered in isolation. In combinatorial mathematics, the number of all such partitions is Bell's number. It is large. For the 302 neurons that make up the nervous system of *C. elegans* (a type of roundworm), the number of ways that this network can be cut into parts is the hyperastronomical 10 followed by 467 zeroes. Computing Φ for any nervous system, therefore, is fiendishly difficult and requires heuristics, shortcuts, and approximations."

So computing the **positive presence** of consciousness in a network with high complexity would inevitably be an incredibly computationally-intensive task, maybe beyond our capabilities for decades. But if computing the positive presence of consciousness is incredibly difficult, it would appear from this discussion that computing the **negative absence** of consciousness is really incredibly simple. All that is necessary to test for the absence of consciousness is to test for the absence of a property which would inevitably be produced by any conscious system:

"If it's cold, it's not conscious".

The end of the saga

At so that brings us to the end of this epic tale, the longest and most ambitious chapter I have ever written. We have traversed the full length of scientific history and recorded human knowledge, from the very first scientists of ancient Greece to the present day.

Bringing the saga right up to date, in a 2012 *Nature* article, a team of physicists announced that they had measured the microscopic amount of heat which is produced when a single bit of information is erased.[\[24\]](#) Landauer's principle had been experimentally confirmed for the first time.

This chapter has proceeded in a logical manner from the insights of Aristotle, to George Boole, to McCulloch and Pitts, to Leo Szilard, to Rolf Landauer. Each step builds on the previous step. The final conclusion can be traced back to the very first discoveries of Aristotle, 2,500 years ago. This emphasizes how mathematics and logic are timeless: a theory which was proven true 2,500 years ago remains true forever.

We have a tendency in current society to only value young things, or transient fashion. We would be wise to remember that the most important concepts in the universe are eternal.

IMPLICATIONS OF THE RULE

This is the final chapter of this book.

In this chapter, we will be considering the implications of the simple classification rule: "If it's cold, it's not conscious". We will be seeing how the rule can be used to provide valuable insights into the nature of consciousness.

Later in this chapter, we shall be applying the principle in three fairly mind-bending thought experiments. But first let us return to consider a part of the cortex of the brain which is not believed to be conscious ...

The primary visual cortex revisited

If you remember, back in Chapter Five it was explained how Francis Crick and Christof Koch developed an ingenious technique to determine which parts of the brain were responsible for consciousness. And, conversely, it was explained how the technique can be used to determine if consciousness is **not** to be found in a particular part of the brain.

Bearing that in mind, in Chapter Five it was explained how the technique of Crick and Koch revealed that consciousness is not to be found in the primary visual cortex which lies at the back of the brain. It was explained how visual data is copied from the retina, along the optic nerve, to the primary visual cortex at the back of the brain. The raw data is copied precisely onto the primary visual cortex, which acts like a "cinema screen" on the back of the brain. As this is purely a precise information-copying operation, no information will be lost. It is very easy to see why no information is lost by considering the truth table of the information-copying logic gate:

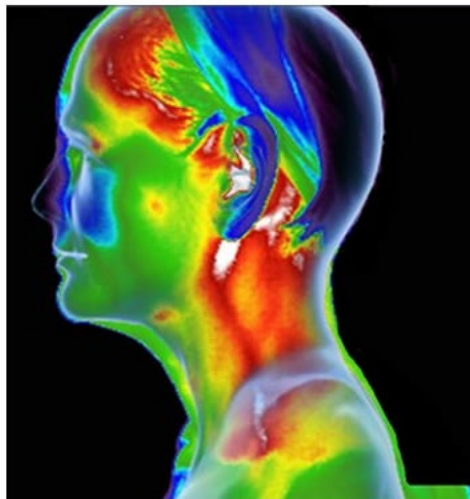
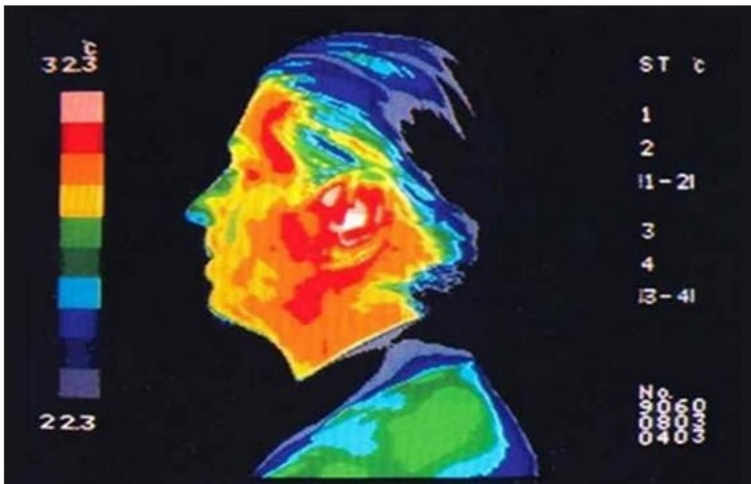
A	B	
0	0	}
1	1	

Output uniquely identifies input.
No information lost.

In the previous truth table, you can see that the input value (A) is simply copied to the output value of the gate (B). Therefore, as you can see from the truth table, there is a unique relationship between the output of the logic gate and its input. That means that if we know the output of the gate, we can therefore "wind back" the gate to find its input. This means that no information has been lost due to the operation of the gate: the gate is reversible.

No information being lost means that there is no logical information processing occurring, and no information being lost also means that there will be no heat produced. We should therefore not be surprised that consciousness is not to be found in the primary visual cortex. Consciousness is associated with logical information processing, information loss, and the production of heat.

This phenomenon can be clearly seen in the following thermal images of a head (*thermographic* imaging). You will see that the back of the head is the cold portion of the brain (denoted by a dark colour on the images). As explained in Chapter Five, this is the location of the primary visual cortex. According to the classification rule, this coldness indicates a lack of consciousness in that area:



This result represents convincing evidence that the classification rule — applied to the primary visual cortex — is correct: "If it's cold, it's not conscious".

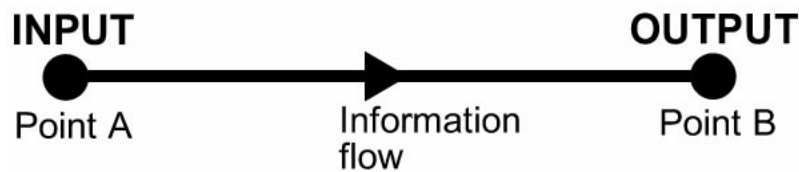
Is a wire conscious?

If we consider the microprocessor at the heart of a computer — the computer's "brain" — we would find several billion miniaturised transistors. Those transistors are linked together to form electronic logic gates, and those logic gates allow the computer to perform logical operations.

The linkages between the transistors are thin, metal connections — which, for the purposes of this discussion, we might think of as "wires". Hence, the billions of transistors are wired together. Similarly, in the brain, the billions of neurons are linked together by biological "wires". In Chapter Four it was explained that neurons in the cortex are linked together by the "wires" which comprise the white matter of the bulk of the brain, which lies beneath the cortex. Psychology professor Frank Amthor has described this white matter by saying: "Most of the volume of the brain is wiring, not cells".

So, assuming it might be possible to one day construct a conscious computer, we might wonder if that consciousness would be found either in the logic gates, or in the wiring which connects those logic gates? Similarly, is the consciousness of the brain to be found in the neurons or in the wiring which connects those neurons?

To answer these questions, we need to realise that a wire actually performs a kind of logical operation. Bits of information (zeroes and ones) are input at one end of the wire, and those bits of information are output at the other end of the wire:



The previous diagram shows a wire, with information entering the wire at one end (Point A), the information flowing down the wire, and the information being output at the other end of the wire at Point B. The logical operation is then clearly a simple copying operation, with the data being precisely copied from A to B. We can therefore describe the operation using the same truth table we used in the previous section to describe the primary visual cortex:

A	B
0	0
1	1

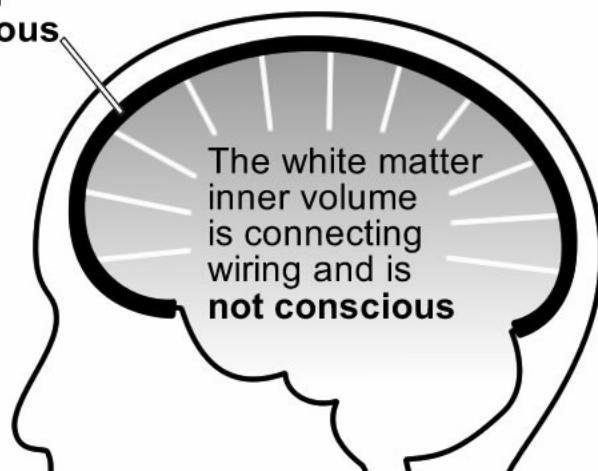
}

Output uniquely identifies input.
No information lost.

Once again, as with the primary visual cortex, no information is lost. Indeed, if the wire in our computer was composed of a superconducting material, it could perform this operation without producing any heat (zero electrical resistance). According to the classification rule, we should therefore consider the wire as not being conscious. Remember: consciousness is associated with information loss and the production of heat.

This, then, explains why consciousness is not found in the white matter of the brain. As was explained in Chapter Four, it is known that consciousness is only found in the thin cortex — the covering of the brain. This is known as the grey matter of the brain. In contrast, consciousness is not found in the white matter of the brain, which makes up the brain's inner volume. This arrangement is shown in the following diagram, which shows the conscious outer cortex, and the unconscious inner white matter:

The thin cortex outer layer is **conscious**



On the basis of the discussion which has just been presented, we should not be surprised that the white matter is not conscious. The white matter is composed of the wiring which connects the neurons of the cortex, and, as has just been explained, wires are not conscious (also, presumably, the temperature of the white matter would be considerably lower than the temperature of the cortex).

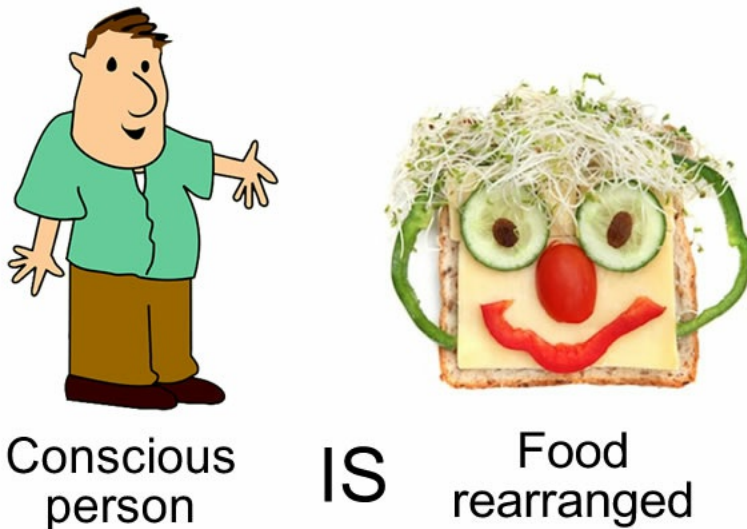
So far in this chapter, the simple classification rule — and the techniques described in this book — have been used to explain that the primary visual cortex and the brain's white matter are not conscious. The fact that it is generally accepted that these regions of the brain are, indeed, not conscious provides a great deal of confirmation that the techniques described in this book are correct.

In the following three sections we will now apply the classification rule to everyday objects. We will be considering three mind-bending thought experiments to see if we can decide whether or not those objects are conscious.

Food rearranged

In a TED talk in 2014 entitled *Consciousness is a Mathematical Pattern* (available on YouTube), the physicist Max Tegmark asked a deep question wondering when does a particular configuration of atoms become conscious: "From my physics perspective, a conscious person is simply food ... rearranged. So why is one arrangement conscious, and not the other? Moreover, from my physics perspective, food is just a bunch of quarks and electrons arranged in a certain way. So why is one arrangement — like your brain — conscious, while another arrangement — like a bunch of carrots — not conscious?"

In his talk, Max Tegmark illustrated this point with a slide which resembled the following diagram:

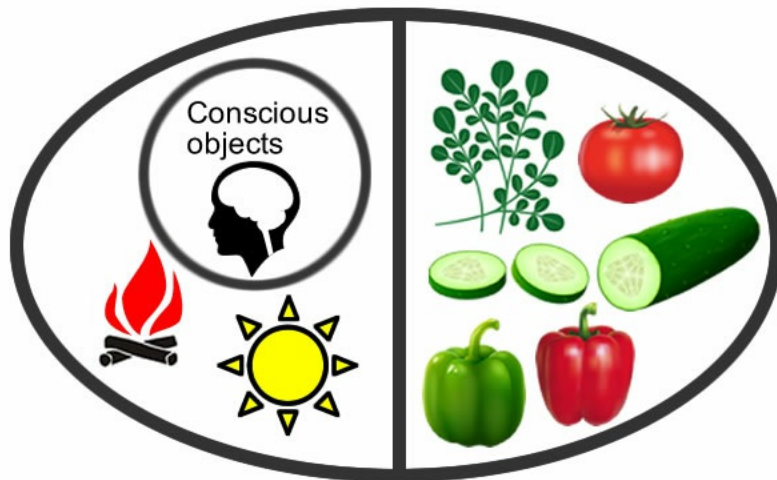


As you can see in the previous diagram, Max Tegmark's physics experience means he is forced to consider a conscious human being (shown on the left) to be nothing more than the equivalent of "rearranged food" (shown on the right). This is because any human at the fundamental level is just a rearrangement of the food that he or she has eaten over their lifetime. So, at the level of fundamental physics, Max Tegmark is surely correct.

But, on that basis, Tegmark then asks "Why is one arrangement — like your brain — conscious, while another arrangement — like a bunch of carrots — not conscious?"

To attempt to answer Tegmark's question, let us consider the items of food which compose that elegantly-presented meal shown in the previous diagram. The face is made of a thin slice of cheese, with watercress hair, cucumber slices and raisins for eyes, slices of green peppers for ears, a tomato for a nose, and a slice of red pepper for a mouth. And, finally, the whole monstrosity is placed on a slice of bread.

Let us now consider each of those food items and place them inside the diagram which was presented earlier:



As before, all classification is performed on the basis of whether or not the object is generating significant internal heat. Obviously, none of these food items generate heat internally (hence the phrase "cool as a cucumber"), so all of the food items are classified as belonging to the right-hand side of the diagram — the side that represents "not conscious" (remember, "if it's cold, it's not conscious").

So here, then, is an answer to Max Tegmark's question. In order for "rearranged food" to become conscious, it needs to cross from the right-hand side of the diagram to the left-hand side. Therefore, the rearrangement of atoms must be quite specific, in order to produce an object capable of logical information processing. The inevitable production of heat from that logical processing will mean that the object will be then be reclassified into the left-hand grouping.

When the food becomes a conscious brain, it also becomes a warm object. [25]

Who would have thought that carrots, tomatoes, and cucumbers could be used to gain insights into the nature of consciousness? It would also appear that this vegetable-oriented example also has implications for the theory of consciousness which is known as *panpsychism*.

Panpsychism is the theory that everything — even elementary particles — contains a "little bit of consciousness". The philosopher David Chalmers described panpsychism during his 2014 TED talk entitled *How do you explain consciousness?* (available on YouTube): "I think that we may need one or two ideas that initially seem crazy before we can come to grips with consciousness scientifically. There are a few candidates for what those crazy ideas might be. One crazy idea is that consciousness might be universal: every system might have some degree of consciousness. This view is sometimes called panpsychism. Every system is conscious — not just humans, dogs, mice, flies, but even microbes, elementary particles. Even a photon has some degree of consciousness. This panpsychist view has the potential to transfigure our relationship to Nature, and it may have some serious social and ethical consequences. **I used to think I shouldn't eat anything which is conscious, so therefore I should be vegetarian. Now, if you are a panpsychist, and you take that view, you're going to go very hungry.**

It sounds like a humorous conclusion: we should not eat vegetables if panpsychism is correct. David Chalmers' panpsychist views would make him feel uneasy about eating a cucumber or a tomato because of the belief that vegetables can be conscious. Although it sounds like a crazy, humorous conclusion, it is the inevitable conclusion of panpsychism. Read into that what you will.

However, if the conclusion of this book about Max Tegmark's "Food Rearranged" thought experiment is correct, then David Chalmers can tuck-in with confidence.

As has just been discussed, a cucumber or a tomato does not generate internal heat, and we should remember: "if it's cold, it's not conscious". These objects — like Ray Kurzweil's rock — are not performing logical information processing. They are not performing any recognisable computation, and are therefore surely not conscious.

For this reason, I do not believe panpsychism is correct. I believe it is a mistake to believe all objects contain "a

little bit of consciousness" which is always present in all circumstances. Instead, as we shall be seeing in the next few sections, consciousness is not "contained" within anything, and consciousness is not "made of" anything. Instead, consciousness appears to be an emergent effect which only emerges in very particular circumstances.

Let us continue to the next thought experiment ...

The frozen head of Walt Disney

Nowadays, the name of Walt Disney is probably exclusively associated with animated movies: Mickey Mouse and Donald Duck. What is perhaps not so well known is Walt Disney's fascination with science and technology, his drive to promote science to the public, and his pursuit of technological solutions to the world's problems.

If you read my eighth book about building an atomic bomb, you will know that Walt Disney had a fascination with the potential of nuclear power, featuring a nuclear submarine in the live-action movie *Twenty Thousand Leagues Under The Sea*, and even building Disney's own "Atomic Energy Lab". In the 1960s, Walt Disney started planning for the Experimental Prototype Community of Tomorrow (EPCOT), a futuristic town which he hoped would provide a blueprint for urban planning. The EPCOT Center educational theme park opened in 1982.

Here is a photograph of Spaceship Earth — a geodesic sphere which lies at the heart of EPCOT:



It might be said that Walt Disney was the Elon Musk of his day.

So, considering Walt Disney's love of technological solutions, it is perhaps not surprising that a bizarre rumour started circulating when Walt Disney died in 1966.

A popular 1964 book by Robert Ettinger called *The Prospect of Immortality* had raised the possibility of a seemingly bizarre new technology. Ettinger suggested the possibility of freezing a dead human body at extremely low temperature, in the hope that sometime in the future there would be sufficient technological advances that the body could be taken out of refrigeration and revived. Ettinger is now considered to be the godfather of the science of *cryonics*. The first documented cryonic freezing of a dead body took place in 1967.

It is likely that Walt Disney read Ettinger's book, and the possibility of technology overcoming mortality would surely have appealed to Disney. According to Robert Mosley's 1986 biography of Disney: "Disney's growing preoccupation with his own mortality also led him to explore the science of cryonics, the freezing of an aging or ill person until such time as the human body can be revived and restored to health. Disney often mused to Roy about the notion of perhaps having himself frozen, an idea which received indulgent nods from his brother."

When Walt Disney died of lung cancer in 1966, a rumour started circulating that he had arranged for his dead body to be frozen in liquid nitrogen. The rumour spread, and the rumour mutated. The latest version of the rumour is that the metal tank containing Walt Disney's frozen body is buried in Disneyland in Anaheim, California — in the precise location currently being occupied by the *Pirates of the Caribbean* thrill ride.

So ... is the king of animation waiting to be reanimated?

Well, it's a great story — but it's not true. Walt Disney was cremated and buried at the Forest Lawn Memorial

Park in Glendale, California. The truth — as far as we will ever know — appears to be that Disney wanted to be frozen, but his family refused to go along with it.

The cryonics industry is currently thriving in America, with several companies offering the service for a fee of around a hundred thousand dollars. There are currently approximately 250 bodies in cryopreservation in the United States. Following his death in 2004, Baseball legend Ted Williams became the highest-profile celebrity to be placed in cryostasis.

Contrary to popular belief, the freezing process would not cause cells to burst due to the formation of ice, and we already possess the technology to freeze a dead body indefinitely with no deterioration. So the freezing technology is not so crazy: cells, tissues, and small organs have all been successfully cryopreserved and returned to working order. The big problem would be curing the person from the disease which caused them to die in the first place.

But that "big problem" is not going to be a big problem for our purposes. Firstly, it is not going to be a problem because we are performing a thought experiment, and thought experiments can deal with idealised hypothetical situations — with no regard for practical limitations. And secondly, the "big problem" of curing the deadly disease is not going to be a problem for us because we are not going to be using a dead body. Instead, we are going to imagine placing a healthy, conscious person into cryostasis. In science fiction movies such as *Alien* and *Interstellar*, this is the technique used to place healthy astronauts into cryostasis for decades-long space journeys.

The questions that arise are, firstly, would the person be conscious during the period while they were in a state of cryostasis? And, secondly, what would the person feel after being thawed-out? Would the person have a recollection of the period during which they were frozen?

The answer to the first question is surely rather clear: a person in cryostasis would surely not be conscious — it would be like the deepest sleep imaginable. And, just like being in deep sleep, the person would surely have no recollection of the time during which they were in cryostasis. In fact, if our idealised cryonic procedure was truly perfect, we might imagine a person being instantly frozen, and then waking up twenty years later feeling as though no time had passed. It would be as if they had instantly jumped twenty years forward in time.

This all might sound intuitively obvious, but I would suggest that it reveals some deep fundamental truths about the nature of consciousness. For our hypothetical and idealised thought experiment, let us imagine a technologically-advanced truly perfect process of cryostasis which perfectly preserves every aspect of the brain. In this science-fiction example of cryostasis, every atom and every molecule in every neuron in the brain is preserved in exactly the same position as it was before freezing. The only effect of cryostasis would be to make those atoms and molecules motionless — it would be as if the brain was frozen in time.

If that was the case, then it is clear that the information contained within the brain in cryostasis would be exactly identical to the information before the brain was placed in cryostasis — the information in the brain would not be altered in any way. However, before the brain was frozen, the person was conscious, and after the brain is frozen the person is unconscious. This seems obvious. But if consciousness is purely due to the arrangement of information in the brain, how can it be the case that the same arrangement of information can lead to both consciousness and unconsciousness? The arrangement of information in the brain is identical after freezing as it was before freezing, and yet consciousness has been lost.

So it appears that the connection between the arrangement of information and consciousness is rather more complex than might have been assumed. The effect of cryostasis is simply to make all atoms and molecules in the brain motionless. The brain is effectively frozen in time, and the result is that the information contained within the brain no longer leads to consciousness. It is therefore clear that **static information does not lead to consciousness**, no matter how that information is arranged in the brain. Organization of information is not sufficient to produce consciousness — there has to be time-based processing of information for consciousness to emerge.

On the basis of this discussion, I feel this principle is fairly inarguable, so that is surely an important conclusion.

It is another reason why a cucumber, or a tomato is not conscious. These objects contain information, yes, but that information is static — it is not being processed. As in the case of Ray Kurzweil's rock, nothing is being computed in these objects.

And if no information is being processed, then no heat will be generated. Remember, "If it's cold, it's not conscious".

A similar scenario would arise with a conscious computer (if such a device could ever exist). It is possible to place a computer in *sleep mode* in order to save power. Sleep mode acts to pause the computer: the processor clock stops, so the processor stops executing instructions. It is as if time has been eliminated. However, the entire state of the computer remains unchanged — the contents held in RAM remain unchanged. So the arrangement of information within the computer is unaltered.

As the processor stops the logical processing of information, there is no inevitable heat generation and the computer goes cold (remember: "If it's cold, it's not conscious"). Surely the conscious computer would not be

conscious for the period it was in sleep mode. However, when the computer is brought out of sleep mode, processing would start again from the precise moment when it entered sleep mode. The conscious computer would feel as though it had jumped forward in time.

As the arrangement of the information of the computer is unchanged during sleep mode (the information stored in RAM is unchanged), this represents another example of how static information does not lead to consciousness.

Now let us consider the third and final mind-bending thought experiment ...

A conversation with Einstein's brain

Douglas Hofstadter is the author of the dazzling book about computing and the mind entitled *Gödel, Escher, Bach*, which was considered in my previous book on consciousness. In 1981, Hofstadter presented a thought experiment which he called *A Conversation with Einstein's Brain*.^[26] In that thought experiment, Hofstadter imagined a huge book which contained a complete detailed description of the state of Albert Einstein's brain which was captured just a fraction of a second after he died.

Hofstadter describes the book of Einstein's brain: "Each page of this book — and there are around a hundred billion numbered pages in it — corresponds to one neuron and contains numbers recording such aspects relevant to that neuron such as what other neurons its axons lead to, what its threshold current is for firing, and so on."

If you had a question which you wanted to ask Einstein, you could leaf through the book and follow the instructions on each page. Eventually, you would receive a calculated response which would be exactly the same answer as the real Einstein would have given. Hofstadter then suggests that, as the book is performing the same sequence of instructions as the brain of Einstein would perform, then surely the book is completely equivalent to the mind of Einstein — though the book's "thought processes" would be considerably slowed-down.

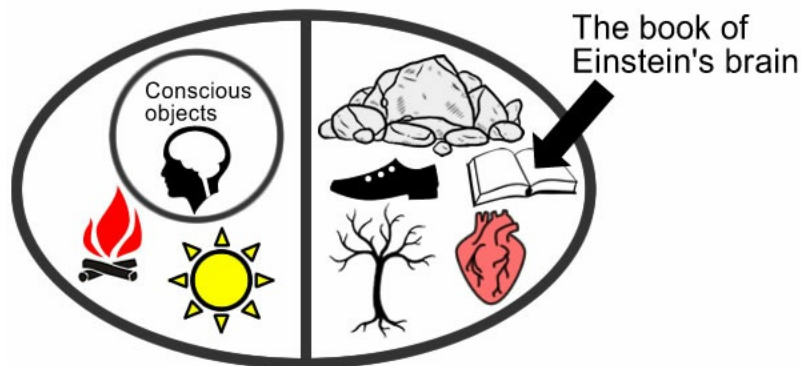
Imagine, then, if we told the book that it (Einstein) had just died, and that his thought processes had been captured in a book. Surely the book would have responded in horror: "Oh no, I'm dead!" In other words, it appears that the book "felt" horrified. But can a book can have feelings?

The physicist Roger Penrose considered this thought experiment in his book *The Emperor's New Mind*. Penrose was not impressed by the conclusion that the book has feelings, and he also considered some additional complications: "But now a new difficulty presents itself. The book might never be opened, or it might be continually pored over by innumerable students and searchers after truth. How would the book 'know' the difference? Perhaps the book would not need to be opened, its information being retrieved by means of X-ray tomography, or some other technological wizardry. Would Einstein's awareness be enacted only when the book is being so examined? Would he be aware twice over if two people chose to ask the book the same question at two completely different times? Would the book remain completely self-aware even if it were never examined or disturbed by anyone or anything?"

The book contains a list of instructions, and therefore represents an algorithm. According to Penrose, the crux of the matter is "What does it mean to **activate** an algorithm?"

Can the simple classification rule — "If it's cold, it's not conscious" — cast a light on this problem?

Let us consider the first classification diagram which was presented earlier. On that diagram, you can see that a book does not generate heat and so was classified as belonging to the right-hand side of the diagram, which is the non-conscious side. We therefore conclude that the book — being left by itself, sitting on a shelf — is not conscious. As explained by the previous Disney thought experiment, static information — such as information contained within a book — is not conscious. At this stage, Roger Penrose would say that the algorithm has not been "activated":



So the classification rule provides an answer to Roger Penrose's question: "Would the book remain completely self-aware even if it were never examined?" No, on its own, it would not be conscious.

Now let us imagine that the book is opened and is being read. This represents an act of information-copying: the information contained within the book is precisely copied into the brain of the reader. The classification rule now clearly distinguishes the two situations. When the information is in the book, the book is cold, and is therefore not conscious. However, when the same information is copied into the brain of the reader and processed, it is subjected to logical information processing: each instruction in the book describes the operation of a neuron, and calculating the output of a neuron is a logical operation requiring logical information processing. It does not even have to be a human reader: a computer could perform the same logical information processing.

According to Landauer's principle, the inevitable result of this logical information processing is that heat will be produced. The composite object — book plus brain, or book plus computer — would therefore no longer be classified into the right-hand side of the diagram, the non-conscious side. Instead, the book would move to the left-hand side of the diagram: the algorithm has been activated.

Does this mean that Einstein has become conscious? Can Einstein now think and feel? The classification rule does not specify if that is the case: not all of the objects on the left-hand side of the diagram are necessarily conscious. Remember, it is a far more difficult task to detect the presence of consciousness than it is to detect the absence of consciousness. But there is now at least the possibility that Einstein has become conscious — which was not the case before the book was read.

Conclusion

In this final chapter, we have considered three mind-bending thought experiments, and used those thought experiments to try to identify the implications of the classification rule "If it's cold, it's not conscious".

The three thought experiments which have been considered were:

- Max Tegmark's *Food Rearranged*.
- A brain in cryostasis.
- Douglas Hofstadter's *Conversation with Einstein's Brain*.

These three thought experiments have a lot in common. All three cases deal with objects that are not performing internal logical information processing. In Max Tegmark's experiment, we considered carrots and tomatoes. In the example of the brain in cryostasis, we considered a brain in which the particles had been rendered motionless. And in *A Conversation with Einstein's Brain* we considered the static information in a book. Because none of these objects were performing internal logical information processing, none of the three objects produced any heat. It was therefore a simple matter to use the simple classification rule "if it's cold, it's not conscious" to classify them as not conscious.

However, when the carrots and tomatoes were rearranged into a brain, the material contained within those vegetables was transformed into a logical information processing device — which started to generate heat. Likewise the brain in cryostasis if it was thawed, or the book describing the neurons in Einstein's brain if that book was read and processed by a human or computer. In all three cases, the transition was observed when a cold, unconscious

object becomes a warm, conscious object.

In my previous book on consciousness, I emphasised the importance of information in consciousness, and suggested that information might be considered as being the "stuff" — the raw material — of consciousness. On the basis of this latest book, however, I now believe that viewpoint needs modification.

At the end of Chapter Five, the chapter at the end of the first part of this book which described the emergence of consciousness, it was explained how consciousness emerges over space just as it emerges over time. It was therefore explained that consciousness should be viewed as a **process**. With that in mind, it appears that consciousness is not "made" of anything. Yes, information plays a central role, but consciousness is not "made" of information. Instead, consciousness emerges from the processing of information. It is the **processing** of information over time that results in consciousness. If that processing stops, consciousness disappears.

And the type of information processing is also crucial. In order for an object to be conscious — in order for any useful goal to be achieved — it must be performing **logical** information processing. In other words, it must be performing **computation**. And, as Rolf Landauer showed, all computation inevitably involves the production of heat. A conscious object can therefore be identified as an object which is performing logical information processing which must necessarily produce a significant amount of heat: a minimum of 15 watts of heat for a human-level consciousness.

To sum up, we cannot yet tell if a computer is conscious, but we can be fairly certain that a banana is not.

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Appendix: Using Landauer's Principle to calculate the total heat output of the brain

In Chapter Six of this book, an attempt was made to use Landauer's principle to calculate the total heat output of the brain. The rather complex details of that calculation are presented here.

The calculation requires the values for two properties of the brain. The first required value is the total number of synapses in the brain. If you remember, a synapse is the connection between a neuron and a previous neuron: it is one of the inputs to a neuron. So, comparing it with a Boolean logic gate, each synapse represents one bit of information which will inevitably be lost during the operation of the neuron (as the neuron only has one bit of output).

The number of synapses in the adult human brain is well-documented and freely available. A common range for the number is between 100 trillion to 500 trillion synapses — a truly astronomical number. A published figure is 150 trillion, and it is that value which will be used in the calculation. [\[27\]](#)

The second required value is the rate of neuron firing. Every time a neuron fires, that represents the completion of a logical operation, and so information is lost. Once again, a range of values is given in the literature, with neurons in the cortex supposedly firing between one time and 100 times a second. A published paper by Laughlin *et al.* gives a value of 55 firings of a neuron per second, and that value will be used in the calculation. [\[28\]](#)

That is all the information which is needed. As described in Chapter Six, according to Landauer's principle the minimum amount of heat produced by the loss of a single bit of information is equal to:

$$kT \ln(2)$$

Therefore, the total minimum heat output of the brain in a single second is the amount of heat produced by the loss of a single bit, multiplied by the number of synapses, multiplied by the number of neurons firing in a single second. The calculation which has to be performed is therefore:

$$kT \ln(2) \times (150 \times 10^{12}) \times 55$$

Assuming room temperature (20°C, or 293.15K), you might want to perform the previous calculation yourself to find that Landauer's principle predicts a minimum heat output of the brain of 23 microwatts.

This is clearly a very small amount of heat. However, this value assumes perfect efficiency of each of the neurons, which is unrealistic. So how efficient are neurons?

In 1998, an experiment was performed by Laughlin *et al.* (described in the previously-referenced paper) to calculate the energy requirement of a single synapse in a blowfly:



Inside every neuron, there are ion pumps whose job it is to restore the electrochemical balance inside a neuron after it has fired (effectively attempting to reverse the effects of an irreversible process). These ion pumps require the largest proportion of the neuron's energy budget. The pumps are powered by the breakdown of molecules of adenosine triphosphate (ATP). ATP is the universal fuel which is used by all cells in the body to power their activities.

According to Laughlin *et al.*, it takes the breakdown of between 2×10^4 and 6×10^4 molecules of ATP to transmit a single bit of information at a chemical synapse, and the breakdown of a single molecule of ATP releases $25kT$ joules of energy. Multiplying 2×10^4 and 25 together means that the transmission of a single bit at a synapse has an energy cost of $5 \times 10^5 kT$ joules.

In comparison, we know that the Landauer limit says that $kT\ln(2)$ joules of energy are required to delete a single bit. The natural logarithm of 2 is 0.69. This means that a real neuron needs 7.2×10^5 more energy to delete a bit of information than the minimum amount of energy predicted by Landauer's principle. This is a similar level of efficiency to a Boolean logic gate in a modern computer. [\[29\]](#)

So let us take this efficiency figure into account. We calculated earlier that Landauer's principle predicts a minimum heat output of the brain of 23 microwatts. If the inefficiency of neurons raises that amount by a factor of 7.2×10^5 then that means the total heat output of the brain is predicted to be 16.5 watts, which compares very well to the actual heat output of the brain of 20 watts.

The origin of the brain's remarkable heat output is therefore clear: it arises from the astronomical number of synapses contained within the brain. As each synapse represents the loss of a single bit of information, Landauer's principle reveals we should not be surprised at the amount of heat produced: the production of a significant amount of heat is inevitable.

The brain is so hot because it is a logical information processor, with information being lost in each neuron.

NOTES

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- [6] Anthony Marcel, *Conscious and Preconscious Recognition of Polysemous Words*, Attention and Performance 8, 1980.
- [7] Frank Amthor, *Neuroscience for Dummies*.
- [8] Based on a diagram from *The Student's Guide to Cognitive Neuroscience* by Jamie Ward.
- [9] C.D. Frith et al., *Willed Action and the Prefrontal Cortex*, Proceedings of the Royal Society, 1991.
- [10] Elizabeth Landau, *Where is self-control in the brain?*, <http://tinyurl.com/brainselfcontrol>
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- [12] Unfortunately, I have had to reconstruct the sloped Parthenon roof in the previous diagram as the actual roof was destroyed by an explosion in 1687 when the Parthenon was used to store gunpowder.
- [13] Alayna R. Cobb, *Euclid*, <http://tinyurl.com/euclidarticle>
- [14] In physics, the famous *black hole information loss paradox* presents the clearest example of this connection between "something being lost" and "irreversibility". According to quantum mechanics, all quantum operations must be reversible, with the result that no information about a particle can ever be lost. However, when a particle enters a black hole, the current theory of general relativity states that all information about that particle is lost for ever. This represents a paradox. See my second book for more details — and a potential solution.
- [15] Simon Colton, *Making Deductive Inferences*, <http://tinyurl.com/irreversiblelogic>
- [16] McCulloch's multi-disciplinary approach made it difficult to obtain funding. However, in the 1930s, McCulloch was able to obtain funding from the Rockefeller Foundation's *Science Of Man* patronage scheme, a program directed toward "the improvement of mankind". This is an example of how a patronage scheme — supporting unconventional thinkers and unorthodox methods — can provide a valuable service which is beyond the capabilities of rigid academia.
- [17] Amanda Geffer, *The Man Who Tried to Redeem the World with Logic*. <http://tinyurl.com/walterpitts>
- [18] For a review, see: Sterling Street, *Neurobiology as Information Physics*, Frontiers in Systems Neuroscience, 2016.
- [19] Sometimes you might read that "information is the same as entropy" — not inversely related. This is because of confusing terminology introduced by information theory pioneer Claude Shannon. Shannon took what we generally think of as information and called it "information entropy", a term which is only used in information theory — not physics. Apparently people told Shannon he should never have called it entropy because entropy is disorganization, but he did not seem to care.
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- [21] Rolf Landauer, *Irreversibility and Heat Generation in the Computing Process*, IBM Journal of Research and Development, 1961. <http://tinyurl.com/informationloss>
- [22] Aristotle had something of a reputation for making bad calls. He once announced that women had fewer teeth than men — without actually looking into his wife's mouth to check. This pronouncement of Aristotle was taken as fact for 2,000 years.
- [23] The only possible way to circumvent Landauer's principle would be via highly-theoretical reversible computing. As heat is produced when information is lost (resulting in an irreversible system), reversible computing attempts to avoid information loss. Creating a reversible computer represents a huge technical challenge. The quantum computer is the only form of reversible computer which has yet been constructed (see my previous book for details).
- [24] Antoine Bérut et al., *Experimental verification of Landauer's principle linking information and thermodynamics*, Nature, 2012. <http://arxiv.org/abs/1503.06537>
- [25] It has been suggested that a plant is conscious but its information processing is stretched over a longer

timescale so its consciousness cannot be detected. Plants in general only produce a negligible amount of heat, and would therefore be classified as not conscious. However, it would be interesting to calculate the total heat output of a plant over an extended timescale.

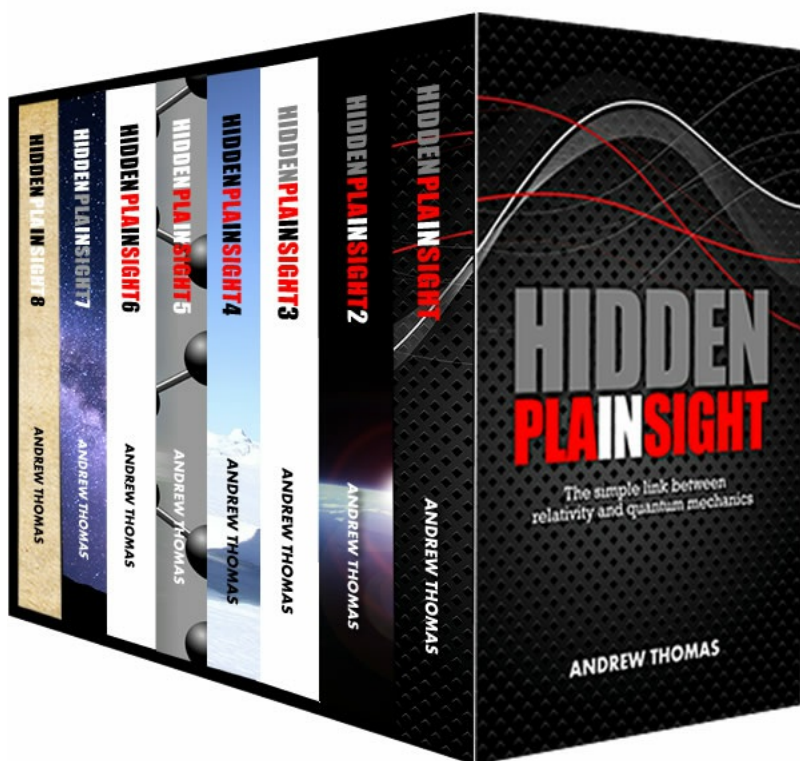
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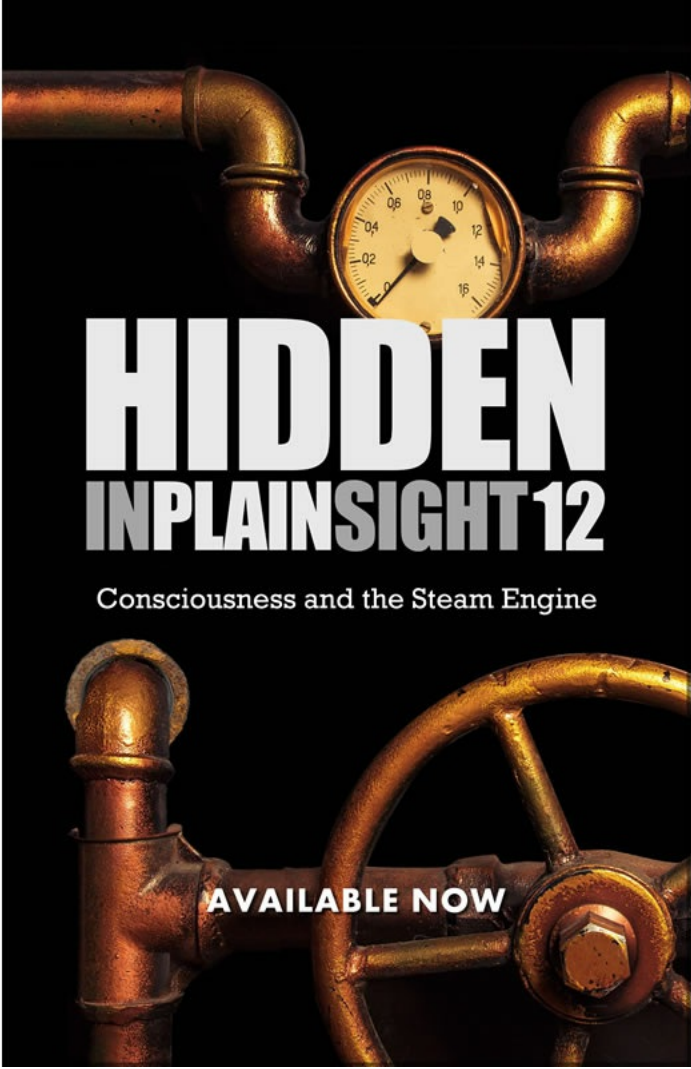
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Andrew Thomas studied physics in the James Clerk Maxwell Building in Edinburgh University, and received his doctorate from Swansea University in 1992.

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CONTENTS

PREFACE

1) THE INDUSTRIAL REVOLUTION

[James Watt and the cooking pot](#)
[The cycle](#)
[The first steam engine](#)
[The fiery monster](#)

2) THE MOTIVE POWER OF FIRE

[The humiliation of Sadi Carnot](#)
[The revenge of Sadi Carnot](#)
[Historic theories of heat](#)
[The waterwheel of heat](#)
[Heat engines](#)

3) REVERSIBILITY

[Reversibility in the movies](#)
[Reversibility and efficiency](#)
[The Carnot cycle](#)
[A musical interlude](#)

4) HEAT, TEMPERATURE, AND ATOMS

[The rings of Saturn](#)
[The kinetic theory of gases](#)
[Heat](#)
[Temperature](#)
[The bridge between the human world and the atomic world](#)
[Consciousness and physics](#)

5) ENTROPY

[An example calculation of entropy](#)
[The atoms of Ludwig Boltzmann](#)
[Order and disorder](#)

6) MAXWELL'S DEMON

[Inside the mind of the demon](#)

[Information, entropy, and bits](#)
[Back inside the mind of the demon](#)

7) LOGIC

[Truth table](#)
[The electrical circuits of Claude Shannon](#)
[Electronic logic gates](#)
[The structure of a neuron](#)

8) LANDAUER'S PRINCIPLE

[The irreversibility of logic](#)
[The inevitable production of heat](#)
[Side effects](#)

9) THE MAKING OF A THEORY OF CONSCIOUSNESS

[An imaginary survey of physicists](#)
[The fifth side effect](#)

10) DOES THE PRIMARY VISUAL CORTEX GENERATE CONSCIOUSNESS?

[A simple test for consciousness](#)
[Applying the test](#)
[Copying information does not generate consciousness](#)

11) IS A THERMOSTAT CONSCIOUS?

[Applying the test](#)
[A solid lump of metal](#)
[The human thermostat](#)

12) THE SUSPENDED ANIMATION ARGUMENT

[Suspended animation](#)
[Motion at the atomic scale](#)

13) IS CONSCIOUSNESS A FORM OF HEAT?

[A proposed unification](#)
[Chaos and complexity at the nanoscale](#)
[Quantum mechanics and consciousness](#)

14) DOES A NEURON GENERATE CONSCIOUSNESS?

[Applying the test](#)

[Information loss in neurons](#)
[The neuron and the steam engine](#)
[The "reset" operation](#)
[Neurons vs. electronic logic gates](#)

PREFACE

In the *Hidden in Plain Sight* series of books, this is my third book dedicated to the subject of consciousness.

In my first book on the subject, it was explained how information is likely to play a central role in the emergence of consciousness. Then, in my second book on the subject, it was suggested that the physics of thermodynamics might hold the key to unlocking the problem. This third book on the subject of consciousness builds on the conclusions of those previous two books (information and thermodynamics).

This book represents the culmination of my three years working on this problem. I am pleased to say that in this third book I now feel confident to present an original, scientific theory of consciousness. The theory is being presented in this book for the first time.

As you will see, the theory is very simple. It attempts to describe the basic principles of consciousness, explaining why some devices are capable of generating consciousness, whereas other devices do not possess that special quality. Unusually for this subject, the theory is firmly based in mainstream, orthodox physics.

I believe the theory is correct.

Of course, I am totally biased in favour of my own theory! But by the time you finish this book, I hope you will agree with me.

Andrew Thomas
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Swansea, UK
2021

*“All our actions,
from digestion to artistic creation,
are at heart captured by the essence
of the operation of a steam engine.”*

- PROF. PETER ATKINS

“Four Laws that Drive the Universe”

1

THE INDUSTRIAL REVOLUTION

The eighty-year period from 1760 to 1840 was a time of great change in Britain. It was a period of rapid technological innovation, and the emergence — for the first time in human history — of a modern industrial economy. In this chapter we will be examining how a small, rain-soaked island in the North Atlantic became the world's dominant industrial power, and the richest nation on Earth. It is the story of the Industrial Revolution.

The Industrial Revolution was based on a series of inventions. The inventors tended to be based in the North of England rather than the more genteel South. These men were not scientists: hardly any of them had received a university education. They had no interest in knowledge for knowledge's sake. No, they were practical men, often with an engineering background, who could recognise problems which urgently required solutions. Usually, their motivation for inventing was purely financial.

Roger Osborne considered the impact of these inventors in his book about the Industrial Revolution, *Iron, Steam & Money*: "The Industrial Revolution came about because of inventors and their innovations. So, having survived a few decades in the wings of history, the great inventors — Watt, Newcomen, Hargreaves, Arkwright, Trevithick — are once again centre stage as the great movers in this historical drama. It was a single generation of British artisans who made possible Britain's transition to industrialisation and transformed the prospects of humanity."

Let us start by considering the invention which Roger Osborne called "one of the greatest inventions in human history". It is also the invention which — as we shall see later in this book — potentially holds the key to unlocking the mystery of consciousness.

It is the invention of the steam engine.

James Watt and the cooking pot

Every British schoolchild knows the legend of how James Watt invented the steam engine. Indeed, it was the story I was taught in my history lessons in school. If you do not already know the story, allow me to tell you the legend of James Watt and the cooking pot.

The various forms of the legend revolve around a young James Watt watching a cooking pot which belonged to his mother. As the water in the pot boiled, it turned into steam. The only way the water could escape from the pot was by lifting the metal lid which was on top of the pot. As we can imagine, the escaping steam caused the lid of the pot to rapidly jump up and down. According to legend, it was at this moment that James realised that there was "power in steam".

The following drawing shows an older James Watt watching the moving lid of the legendary cooking pot (from an original engraving by Jacob Abbott, 1854):

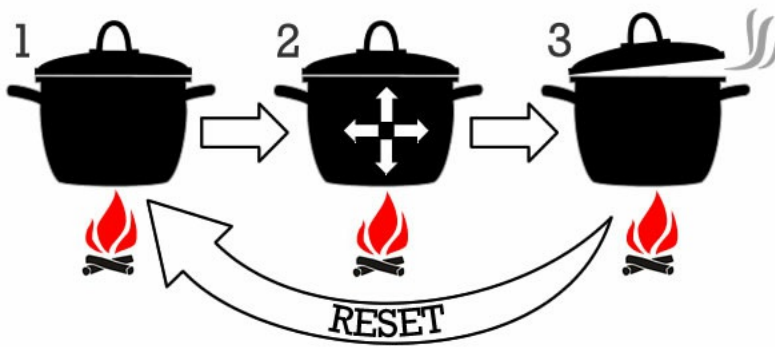


We will now examine the "jumping" of the cooking pot lid in more detail. In doing so, we will discover how it is possible to convert the intermittent lifting of the cooking pot lid into a continuous form of motion. The method will involve a linked sequence of steps, a sequence which lies at the heart of all steam engines.

The sequence is known as a *cycle*.

The cycle

Let us consider the jumping of the cooking pot lid in more detail. The three steps are shown in the following diagram:



Step One of the previous diagram shows the cooking pot above the fire, with the lid lying on top of the pot. At this stage, the pressure of the steam in the pot is the same as the atmospheric pressure outside the pot.

Step Two shows pressure building inside the pot as the water is heated, creating steam.

Step Three shows the cooking pot lid flying up off the pot. This is caused by the pressure of the steam inside the pot becoming sufficiently large to lift the lid. However, once the lid lifts off the pot, the pressure inside the pot is equalised with the atmospheric pressure outside the pot, so the lid drops down again. The system is therefore returned to its initial state.

This last step is vital. It acts as a "reset" operation (drawn as a curved arrow on the diagram). The result of the reset operation is to perfectly restore the state of the system back to its initial state (in this case, equalising the pressure inside the pot with the atmospheric pressure). Because of the reset operation, and the restoration of the system back to its initial state, it is possible for the entire sequence of steps to immediately repeat.

The sequence of steps then returns to Step One again, and the sequence repeats with pressure building inside the pot again. This sequence of steps therefore forms a cycle. A cycle is defined as being a sequence of steps performed by a system before the system returns to its initial state. The cycle then repeats continuously, creating continuous motion.

A repeated cycle plays a central role in the operation of a steam engine, with the motion of a piston moving in and out of a cylinder representing one cycle. As we shall see, one particular cycle will play an important role towards the end of this book when we come to consider human consciousness.

The story of James Watt and the cooking pot is a great story, but it is just a legend. James Watt made tremendous contributions to the development of the steam engine, but he was not responsible for its invention. So let us now consider the true story of the invention of the steam engine.

The first steam engine

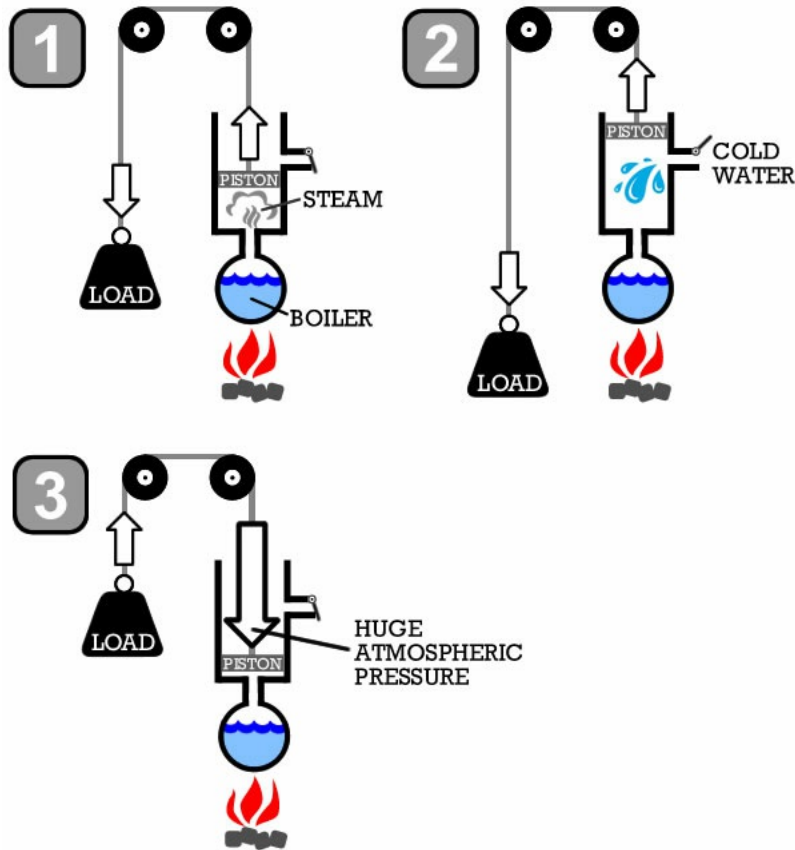
Britain in the 1700s found itself in the midst of an energy crisis, a crisis which threatened to stop the Industrial Revolution before it had even begun. The problem was that, up to that point, vast forests had provided a plentiful supply of wood which could be burnt as fuel. With the expanding population, however, the demand for wood had increased to such an extent that Britain had become largely deforested. The country was rich in coal, which could potentially be used as an alternative source of energy. However, to extract coal from deeper underground involved digging mines which rapidly filled with water. Some method had to be found for pumping the water out of deep mines.

The solution was found by Thomas Newcomen. Newcomen lived in Cornwall, which is a mineral-rich county in the far south west of England. It was Newcomen who invented the world's first steam engine, and it was used to pump water out of mines in Cornwall.

In the previous section, it was considered how pressurised steam might be used to power a steam engine. The idea seems intuitively obvious, so it is surprising that Newcomen's first steam engine was powered by a completely

different principle. In fact, it might be said that Newcomen's engine worked by the reverse principle, exploiting the power of low pressure (a partial vacuum) rather than using pressurised steam.

The three stages in the cycle of a Newcomen steam engine are shown in the following diagram:



The previous diagram shows a round boiler containing water being heated by burning coal. In Stage One of the cycle, it can be seen that the load is allowed to drop, and this lifts a piston which is in a cylinder. As the piston rises, it draws steam from the boiler into the cylinder. Note that the steam engine is not performing work at this stage of the cycle as the load is being allowed to drop (i.e., the engine is not lifting the load).

In Stage Two of the cycle, it can be seen that cold water is injected into the cylinder. This causes the steam to condense into water (just as your breath condenses into water on a cold pane of glass). When steam condenses and turns into water, the volume of water created is 1,800 times smaller than the volume of the steam. Therefore, a partial vacuum is created in the cylinder.

In Stage Three of the cycle, the exterior atmospheric pressure plays the central role. Air has weight, and the pressure pushing the piston down into the vacuum generates a tremendous force (indeed, in Newcomen's first experiment the force was so great that the piston broke the chain it was attached to and crushed the bottom of the cylinder). **Crucially, it is only on this powerful downward stroke that the Newcomen steam engine performs work.** As you can see in Stage Three of the previous diagram, it is this powerful downward stroke that lifts the heavy load (such as lifting a load of coal out of a mine, or operating a water pump to raise water from the bottom of a deep mine).

Steam engines such as this which only perform work on either the up or down stroke — but not both — are called *single-acting* engines. The internal combustion engine in your car or motorcycle is another example of a single-acting engine, with a piston only performing work on the down-stroke when the spark plug above the piston fires.

The three-stage cycle of the Newcomen engine then repeats. However, unlike James Watt's jumping cooking pot lid, this was most certainly not a rapid repeat: a Newcomen steam engine could only perform about twelve strokes per minute.

So that is how the world's first steam engine operated. Roger Osborne describes Thomas Newcomen's achievement in his book *Iron, Steam & Money*: "It deserves a place among the greatest inventions in human history.

This was the first machine that replaced human, animal, and water power; its effect on the world could hardly have been greater."

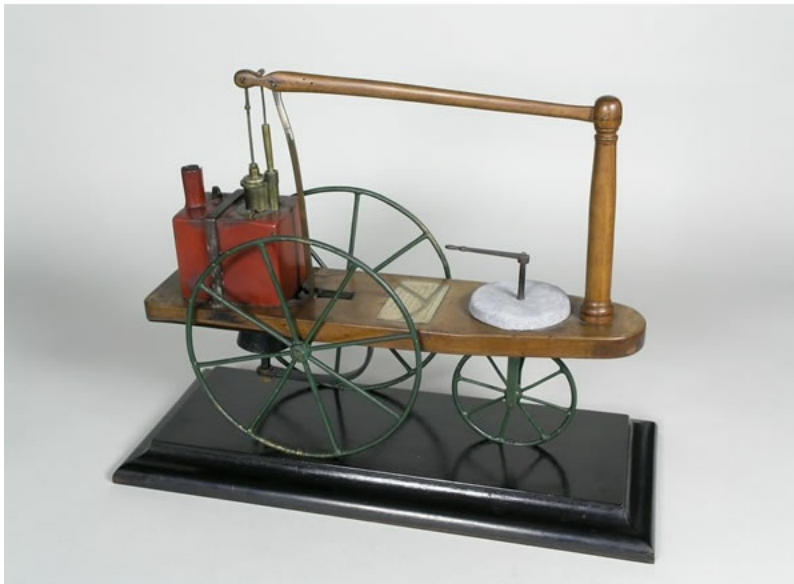
The fiery monster

Before the invention of the steam engine, the power for factories was mainly produced by waterwheels. One advantage of a steam engine as compared to a waterwheel is that a steam engine is mobile. It was realised that it might be possible to take advantage of the mobility of a steam engine to put a steam engine on wheels — thereby creating a steam locomotive. A big problem, however, was the huge size and weight of the Newcomen engine. If steam engines were to be used for locomotion, they had to be made smaller and lighter.

As explained in the previous section, the Newcomen engine used a vacuum and atmospheric pressure to produce power. Because of its use of a vacuum, it might be called a low pressure engine. However, it was realised that steam at high pressure could also be used to move a piston (in the same way that steam moved the lid of James Watt's legendary cooking pot).

James Watt was, by now, a successful inventor who had made significant improvements to Newcomen's engine. However, Watt was reluctant to make the change to using high pressure steam because of safety concerns: there had been several cases in which the boilers of high-pressure engines had exploded, causing several fatalities.

James Watt's assistant was an enterprising young engineer named William Murdoch. Ignoring Watt's concerns about its safety, Murdoch became interested in the possibilities of high pressure steam. To test its feasibility, Murdoch built a small working model of a steam locomotive. The resultant model had three wheels, and was about a foot in height. The model has survived to this day, and is shown in the following photograph:



Murdoch was living in Redruth in Cornwall at the time, and he found the perfect track on which to test his vehicle. The path which led from the church had steep banks on either side, which would act to keep his vehicle on track. Murdoch started the engine, and ran alongside it as it powered its way towards the church. In his book *Energy and the Unexpected*, Keith Laidler described what happened next: "When he made his first trial, at night, the engine moved so fast that it out-distanced him and almost ran down the rector of the church who happened to be walking along the road. As he ran away in terror, the rector assumed the fiery monster to be the embodiment of the devil."

All initial experiments with steam-powered locomotion proved unsuccessful due to the poor quality of the roads, and William Murdoch did not pursue the idea. However, Murdoch had a neighbour in Redruth named Richard Trevithick who was also an engineer. Murdoch showed his working model to Trevithick who was intrigued, and Trevithick decided to build his own steam locomotive.

Trevithick realised that a solution to the problem of rough road surfaces would be to put the locomotive on the metal rails which were being used in the coal and iron industry. As a result, on 21st February 1804, Trevithick

demonstrated the first steam locomotive running on the rails of the Penydarren Ironworks in Merthyr Tydfil in South Wales. It travelled a distance of 9.75 miles carrying ten tons of iron and seventy people, travelling at an average speed of 2.4 miles per hour. As to why the average speed was so slow, Trevithick himself described the journey: "We carry'd ten tons of iron, five waggons, and 70 men riding on them the whole of the journey. It's above nine miles which we perform'd in 4 hours and 5 mins, but we had to cut down some trees and remove some large rocks out of the road. The engine, while working, went nearly 5 miles per hour."

At this point, I must declare a personal interest as Merthyr Tydfil is the town in which I grew up. It is a remarkable town, with a rich industrial heritage. The achievement of Richard Trevithick has not been forgotten and a monument was erected in the town centre. A model of Trevithick's locomotive sits proudly atop the monument:



The inscription on the monument reads: "Richard Trevithick, 1771-1833. Pioneer of high pressure steam built the first steam locomotive to run on rails. On February 21st 1804 it traversed the spot on which this monument stands on its way to Abercynon."

I no longer live in Merthyr, having moved to the town of Swansea which is thirty miles from Merthyr. However, in the National Waterfront Museum in Swansea, a full-size completely operational replica of Trevithick's locomotive has been built. In the following video taken by Matt Slade, you can see the locomotive in action, running on the rails outside the museum in Swansea:

<http://tinyurl.com/steamtrainvideo>

That first journey of Trevithick's locomotive was a truly monumental event, not just for Britain but for the world. According to Roger Osborne in *Iron, Steam & Money*: "The Penydarren locomotive had most of the essential features of steam locomotives that would transform the world over the next 150 years."

From a physics viewpoint, Trevithick's locomotive showed it was possible to convert heat into motion, the heat in the boiler being converted into the motion of the locomotive. Therefore, in the 1800s, what was needed was a new science which was able to describe the connection between heat and motion. That science was the science of *thermodynamics*. It is that new science of thermodynamics which we shall consider in the next chapter.

2

THE MOTIVE POWER OF FIRE

Our attention now turns across the English Channel to Britain's neighbour, France.

During the period of the Industrial Revolution, Britain was involved in a series of lengthy wars with France. The leader of France at that time was the ambitious and charismatic Napoleon Bonaparte. Napoleon was a brilliant military commander who developed novel military strategies which laid the foundations of modern warfare. Instead of the traditional head-on approach to battle, Napoleon's armies were fast and mobile, capable of outflanking the opposing forces.

Napoleon was famously a man of short stature, and it has been suggested that he overcompensated for his lack of height by presenting himself as a figure of great grandeur (in psychology, this has even been given the term the *Napoleon complex*). Indeed, by 1804, Napoleon had awarded himself the title of first Emperor of France. The following painting by Jacques-Louis David titled *Napoleon Crossing the Alps* shows Napoleon in a typically grandiose pose (Napoleon actually crossed the Alps seated on a mule):



Napoleon enjoyed astounding military success in a series of famous battles, most notably the defeat of the much larger Russian and Austrian armies at the Battle of Austerlitz in 1805. At its height, the French Empire under Napoleon extended from Portugal to Moscow.

Napoleon's progress across Europe appeared unstoppable. However, on the 18th June 1815 in the fields of

Belgium, the forces of Napoleon met the forces of his greatest enemy, the British army led by the Duke of Wellington. The battle is now known by the name of a nearby village: Waterloo.

The night before the battle saw a thunderstorm of biblical proportions. The torrential rain made the ground soft and boggy. As a result, the French forces were unable to get their cannons into position until late in the morning. Also, because of the soft ground, the recoil from the cannons caused them bury themselves into the ground after firing. A huge effort then had to be made to haul the cannons back into position, which greatly reduced the rate of firing. Unable to rely on his artillery to devastate the British forces from a distance, Napoleon's forces had to engage the British infantry in close quarters fighting. After a brutal day of hand-to-hand fighting, Napoleon's forces were narrowly defeated by the British army.

The Battle of Waterloo was to be Napoleon's final defeat. He was deposed as Emperor, and exiled to the small, damp island of St. Helena in the South Atlantic — one of the most remote islands in the world — where he could pose no more threat. Napoleon died on St. Helena six years later, supposedly from boredom.

The humiliation of Sadi Carnot

In 1800, soon after rising to power in France, Napoleon appointed Lazare Carnot to be his Minister of War. Carnot was trained as a military engineer, and was known for his analytical mind. Throughout his leadership of France, Napoleon came to rely on the strategic advice of Carnot. It was Carnot who developed the modern principles of lightning pace combined with an outflanking strategy (*pincer movement*) which Napoleon employed with great success.

Perhaps we should not be surprised that Carnot had such a strategic and technical mind as he was also a highly-talented physicist. When he was not involved in military activities, Carnot continued to develop his ideas about physics, and he published several books about physics in his spare time.

Lazare Carnot had a son whose name was Sadi. Carnot had often taken the young Sadi to meet Napoleon. It is recorded that a four-year-old Sadi once ran up to Napoleon shaking his fist and reprimanding the continent-conquering Emperor for his rude treatment of women. Luckily, Napoleon roared with laughter.

When the time came to choose a college for Sadi, with his family background in physics and the military, there was an obvious choice. An establishment had been created precisely for the purpose of fostering the scientific talents of young French men. The French had realised that British military superiority had been founded on their technological superiority gained during the Industrial Revolution. It was therefore decided that French engineers and scientists needed the best training. As a result, in 1794, Lazare Carnot co-founded the École Polytechnique in the Latin Quarter of Paris as the premier training school for young scientists.

Here is a painting of Sadi Carnot in 1813 at the age of seventeen, wearing the traditional uniform of a student at the École Polytechnique (painting by Léopold Boilly):



The École Polytechnique became the first great scientific school of the modern world. The roll call of those associated with the school now reads like a list of the early giants of mathematical physics, including Fourier, Lagrange, Laplace, and Ampère. The terms "Fourier analysis", "Lagrangian", and "Laplace transform" are now well known to every physics student.

The name of Sadi Carnot was added to that illustrious list of names when he enrolled at the École Polytechnique in 1812 at the age of sixteen. However, by the time Sadi had finished his studies in 1814, Napoleon was in full retreat and Paris was besieged. The students of the college — including Sadi Carnot — fought bravely to defend the outskirts of the city, but were forced to retreat under sustained artillery fire.

The final defeat of France by the British at Waterloo in 1815 had a devastating impact on Sadi Carnot. Remember, Sadi Carnot's father had been Napoleon's Minister of War, and he had become one of Napoleon's finest generals. Sadi Carnot became determined to avenge the defeat of his father — and his country.

The revenge of Sadi Carnot

When Sadi Carnot saw a steam engine for the first time, he became obsessed with the question of understanding how it worked. The problem was that the operation of a steam engine was not fully understood. Isaac Newton had presented his laws of mechanics a century earlier, but Newton had no understanding of energy, or heat. With no theory to guide them, steam engine designers had proceeded on the basis of trial-and-error: build a different engine design, and see if it produced more power. A theory of steam engines was therefore desperately needed.

In 2012, the BBC made a two-part documentary series about thermodynamics called *Order and Disorder*. The series was written and presented by Prof. Jim Al-Khalili. Here is a link to a video of episode one on YouTube:

<http://tinyurl.com/videoheat>

The video is excellent and is well worth watching.

At the 12-minute mark of the video, Jim Al-Khalili considers Sadi Carnot's reaction to the French military defeat: "The humiliation he felt personally would drive him and motivate him to uncover a profound insight into how all engines work. Carnot came from a highly-respected military family. After the French defeat, he became determined to reclaim French pride."

Jim Al-Khalili then proceeds to describe how Sadi Carnot realised the true basis for the British military advantage: "What really bothered Carnot was the technological superiority that France's enemies seemed to possess. And Britain, in particular, had this huge advantage both militarily and economically because of its mastery of steam power. So Carnot vowed to try and understand how steam engines work, and use that knowledge for the benefit of France."

In the video, Prof. Simon Schaffer then describes how Sadi Carnot realised a method to gain revenge over Britain: "He says absolutely explicitly that if you could take away steam engines from Britain then the British Empire would collapse."

Sadi Carnot became determined to exact revenge on Britain, and the way he would do it would be to design a better steam engine ... for France.

Historic theories of heat

The problem faced by Sadi Carnot was that the operation of a steam engine was based on heat, and nobody actually knew what heat was. The ancient Greeks believed that everything was composed of four fundamental elements: earth, air, fire, and water. Fire was thus thought of as a substance.

This model of the elements survived through the Middle Ages and into the Renaissance. However, in 1678, the German alchemist Johann Becher proposed a new theory called the *phlogiston* theory. According to Becher, all inflammable substances contained the material known as phlogiston. When the material burnt, the phlogiston was released, which gave the appearance of a flame. The material which was left (the ash) was then considered to be "dephlogisticated". Hence, the ash was considered to be the true essence of the material. Growing plants then absorbed the phlogiston from the air, which explained why they burned so well.

The phlogiston theory was generally accepted for 100 years, but flaws in the theory started to emerge. Firstly, the theory predicted that materials should lose weight as they burned and the phlogiston was released. However, some metals actually increased in weight when they burned (we now understand that this is due to the metal combining with oxygen from the air). Secondly, the theory had no explanation of why heat should flow in only one direction: from a hot object to a cold object. An improved theory was required.

As a result, in 1783 the great French chemist Antoine Lavoisier introduced the *caloric* theory of heat. The theory proposed that heat consisted of a weightless substance called caloric. According to the theory, caloric was a material substance (a fluid) and the amount of caloric in the universe was constant: caloric could be neither created nor destroyed. It was also proposed that caloric was self-repellent. The self-repellent nature of caloric provided an explanation as to why heat travels only from hot objects to cold objects: caloric would naturally move from regions in which it was highly concentrated (hot) to regions in which it was more sparsely concentrated (cold).

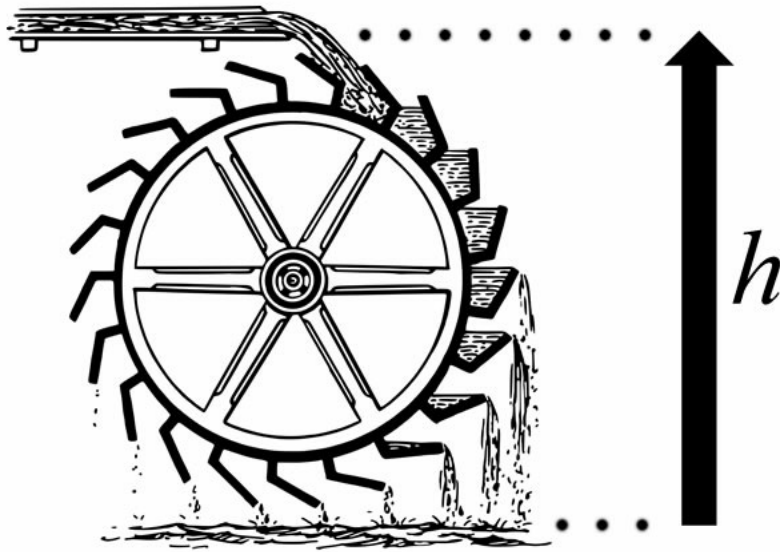
Although we now know the caloric theory to be incorrect, it gave Sadi Carnot the idea he needed to be able to analyse steam engines, as we shall now see ...

The waterwheel of heat

Sadi Carnot wondered if there was a limit to the amount of power which could be produced by a steam engine. Assuming that there was a limit to the efficiency of a steam engine, then what was the formula for that efficiency?

Carnot's analysis of steam engine efficiency was heavily influenced by waterwheels. Before the widespread adoption of the steam engine, factories had generated their power from waterwheels. Waterwheels provided a constant, smooth rotary action, ideal for driving the mill machinery used for spinning cotton in the Industrial Revolution. The use of waterwheels might sound primitive, but we still use waterwheels today — though we call them hydroelectric plants. Hydroelectricity currently provides sixteen percent of the world's electricity, and the world's largest power plants are hydroelectric plants.

Let us analyse how power can be produced by a waterwheel. The following diagram shows how water flows from a height, h , with the flow of water powering the wheel:



You may remember from physics lessons in school that an object which is at a height contains *potential energy* due to that height. That means that the water at the top of the waterwheel will have more energy than the water when it drops to the bottom of the waterwheel. But, according to the law of conservation of energy, energy cannot just vanish — it must have gone somewhere. So if the energy of the water is less at the bottom of the waterwheel than it was at the top, then where has the energy gone?

To answer that question, we need to consider what we mean by "work". "Work" has a very specific meaning in physics. In physics, work means the application of a force to move an object. So, for instance, if a pump lifts water out of a deep mine, then that pump has performed work.

Now let us consider the definition of energy. What is energy? Energy is defined as the ability of a system to do work. If a system has more energy, it can do more work. Exactly the same principle applies to human beings: if you are feeling more energetic, you can do more work. If you have more energy, you can do the gardening, or lift some heavy rocks.

So, as the energy of the water is less at the bottom of the waterwheel than it was at the top, we can now understand where the missing energy has gone. The missing energy from the waterwheel is used to perform work inside the factory. That work might involve moving machinery such as a cotton weaving loom, for example.

At this point, Sadi Carnot realised that this model of a waterwheel could also be applied to analyse steam engines. The breakthrough came when he used the caloric model of heat. If you remember, the caloric theory said that heat was a substance (a fluid), which always moved in one direction: from high temperature to low temperature. Carnot realised that the behaviour of water in a waterwheel was identical: water was a substance which always moved from a high level to a low level. Therefore, the passage of heat through a steam engine was the same in principle as the passage of water through a waterwheel.

Carnot realised he could describe any steam engine in abstract form as a form of "waterwheel" with the caloric fluid of heat "falling" from a high temperature to a cold temperature. The high temperature would be the temperature of the hot boiler, and the low temperature would be the temperature of the external environment.

How, then, could Carnot use this model to analyse the efficiency of a particular steam engine? Well, as has just been described, the potential energy of a waterwheel is dependent on the height difference of the water in the two reservoirs. Carnot applied similar logic to his analysis of the steam engine. In the case of the steam engine, the available energy would be dependent on the difference in temperatures.

In that case, Carnot realised that the available energy which could be produced by the steam engine would depend on the difference in temperatures:

$$T_H - T_L$$

where T_H is the high input temperature, and T_L is the lower output temperature. This formula might be considered

as representing the height of the "waterwheel of heat".

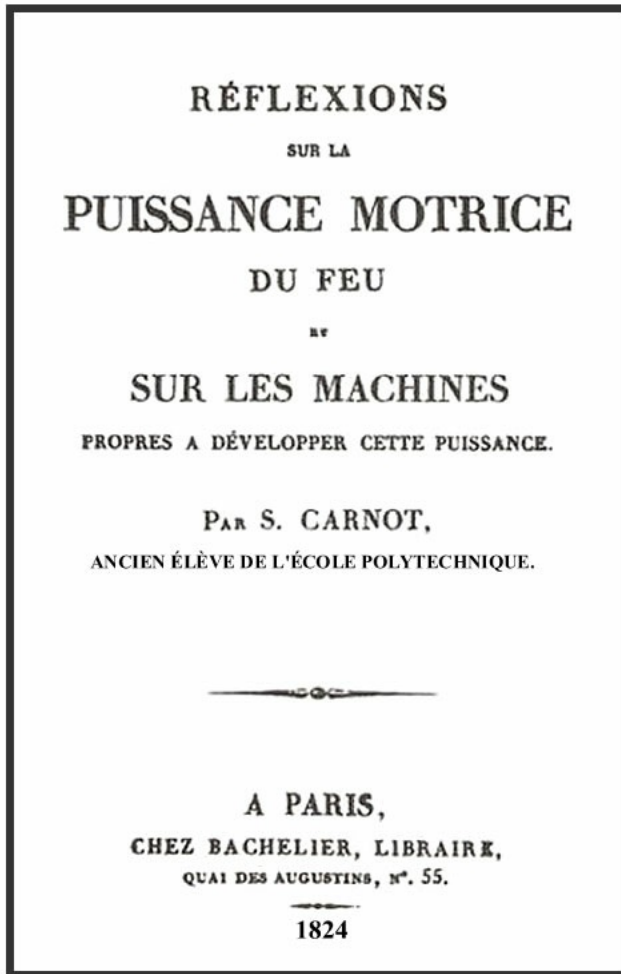
Does this value then represent the efficiency of the steam engine? Not quite. To get to the final form of the formula, let us consider what we mean by "efficiency". Efficiency is the proportion of the energy which is input to the system which is converted into work. We have just seen that the energy which is converted into work is proportional to $T_H - T_L$, so to get the efficiency we have to divide that value by the amount of energy which was input to the system which would be the total height of the waterfall, T_H . The final formula for the efficiency of a steam engine is then:

$$\frac{T_H - T_L}{T_H}$$

Even though Carnot was using the caloric model of heat — which we now know is incorrect — it is amazing that this formula remains the correct formula for the efficiency of a steam engine.

In 1824, Sadi Carnot published his results about the efficiency of steam engines in a book titled *Reflections on the Motive Power of Fire*. This classic book is now considered to have created the science of thermodynamics, the science of heat ("thermo") and motion ("dynamics").

Here is the cover of Sadi Carnot's legendary book. You can see that Carnot described himself as an "Ancien élève de l'École Polytechnique", which translates to "Former pupil of the École Polytechnique":



Heat engines

What does Carnot's formula tell us about how to improve the efficiency of a steam engine? First, allow me to remind you of Carnot's formula:

$$\frac{T_H - T_L}{T_H}$$

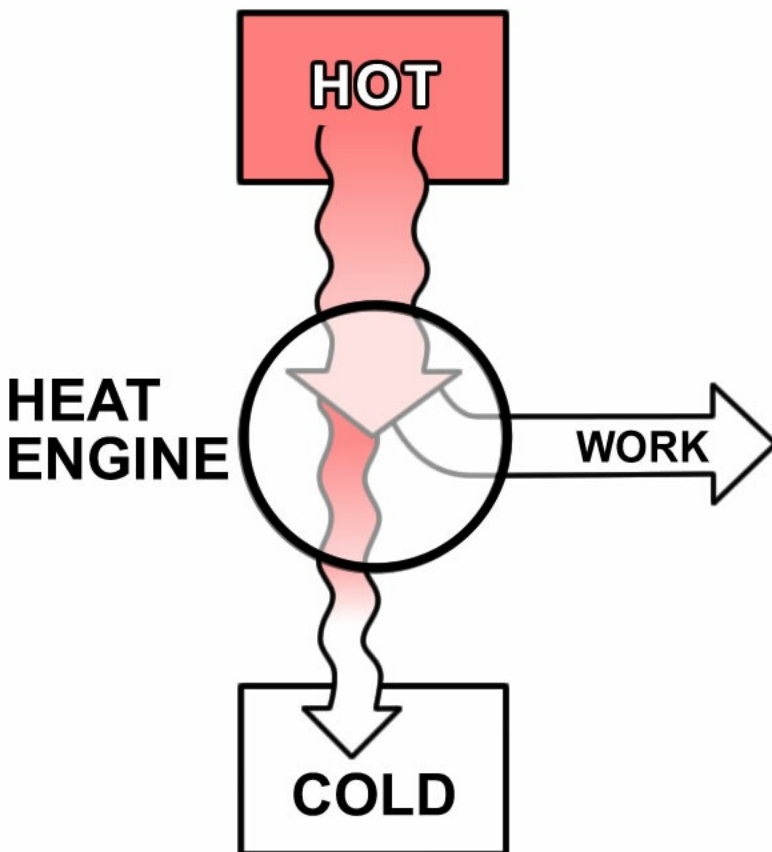
Now let us put some numbers into the formula. Let us imagine a steam engine which has a boiler full of boiling water (which is 100 degrees Celsius, equal to 373 degrees Kelvin). Let us also imagine that the external temperature is freezing (which is 0 degrees Celsius, equal to 273 degrees Kelvin). Putting those numbers into the formula gives a value for the efficiency of that steam engine:

$$\frac{373 - 273}{373} = 0.27$$

So the efficiency of that steam engine is 0.27, or 27%. If you think that sounds inefficient, well, you would be correct. But, considering the formula, how could the efficiency be improved? Before Carnot's result, it had been thought that engine efficiency could be improved by using different materials, such as boiling alcohol instead of water. However, Carnot's formula revealed that the important factor was the working temperature — not the materials used. In order to improve the efficiency of this steam engine, we need to increase its working temperature, T_H .

Prof. Jim Al-Khalili considers this strategy at the 17-minute mark of the excellent BBC thermodynamics video (a link was provided earlier in this chapter). According to Jim Al-Khalili: "Carnot's crucial insight was to show that to make any heat engine more efficient, all you had to do was to increase the difference in temperature between the heat source and the cooler surroundings. Ultimately, a car engine is more efficient than a steam engine because it runs at a much hotter temperature."

Note the use of the term "heat engine" in the previous quote by Jim Al-Khalili. The term "heat engine" is the generic term for any engine which exploits the passage of heat from hot to cold, with the difference in heat energy being used to perform mechanical work:



A heat engine is powered by the movement of heat from hot to cold. For example, in a steam engine that would be the movement of heat from a hot boiler, through the steam engine, and then expelled as exhaust steam.

A steam engine is just one example of a heat engine. Many other types of heat engine exist, all working on the same principle. For this book, I have created an entertaining video showing some other types of heat engine (you

may be surprised!).

Here is a link to the video:

<http://tinyurl.com/hotpower>

I hope you enjoy the video!

3

REVERSIBILITY

In his 1687 masterwork, the *Principia*, Isaac Newton had presented his laws of mechanics. These were the laws of masses, forces, and accelerations. Newtonian mechanics provided the theoretical tools needed by the engineers who created the Industrial Revolution. Just as importantly, Newton's discoveries generated a new excitement in the general population about the possibilities of science, and this encouraged engineers and entrepreneurs such as James Watt and Richard Trevithick to devise their world-changing inventions. It was largely because of Isaac Newton that Britain became the world's leading technological nation.

As a result, Newton became an almost godlike figure in Britain. The insights of Newton, which had been captured in the *Principia*, were treated with almost the same reverence as the Bible.

When Newton died, the English poet Alexander Pope wrote the following famous epitaph which reflected the almost divine status of Newton: "Nature, and nature's laws lay hid in night; God said 'Let Newton be' and all was light."

The esteem in which Newton was held is clearly displayed in his magnificent tomb at Westminster Abbey:



On the tomb, you can see the reclining Newton resting on four of his books, including the *Principia*. At the top of

the tomb can be seen the celestial globe onto which is drawn the path of Newton's Comet of 1680.

It was Newton who had shown that the same force which holds the planets in their orbits was also responsible for pulling an apple down from a tree. Previously, these two phenomena were considered to be completely unrelated. By showing that they were two different aspects of the same force of gravity, Newton had achieved one of the first *unifications* in physics.

Beneath the sculpture of Newton on his tomb, the heliocentric model of the Solar System is drawn showing the Sun at its centre and the known planets orbiting around the Sun — according to Newton's law of gravitation. By unlocking the mystery of the motion of the planets and the heavenly bodies, it finally seemed as though mankind had completely unlocked the secrets of the universe.

So when the steam engine appeared in the 1800s, it might have been expected that it would be no problem for Newton's laws to explain the behaviour of the steam engine. After all, the laws which described the motion of planets and comets could surely explain the operation of a lump of iron filled with water and heated by coal.

What is more, in the previous chapter we have seen how the operation of a steam engine is really quite simple. Like all heat engines, it is based of the one-way flow of heat energy, always from hot to cold, and never in the opposite direction.

But there was only one problem. The laws of Isaac Newton were not one-way at all.

The laws of Isaac Newton were completely reversible.

Reversibility in the movies

Newton's three laws of motion form the basis of Newtonian mechanics (*classical mechanics*). The three laws are as follows:

1) An object remains at rest or continues at constant velocity unless it is acted on by a force. This is sometimes called the *law of inertia*.

2) A force will cause an acceleration of an object. The acceleration will be proportional to the magnitude of the force, and inversely proportional to the mass of the object.

3) Every action (force) will produce an equal and opposite reaction.

The three laws are clearly very simple, but they govern the motion of all objects. Part of the simplicity of the laws arises because they include no mention of any particular direction of time. The laws do not specify that they only apply in the forward time direction. In other words, there is nothing in the laws to indicate that they would not apply in a system in which all the objects suddenly reversed their direction of motion and started running backwards — as if time had been reversed. It is therefore said that Newton's laws are *time-reversal invariant*.

There is one simple way to demonstrate the reversibility of Newton's laws, and that is because it is possible for us to generate an artificial form of "time reversal". And the way we can achieve that time reversal is by making a movie.

The British movie director Christopher Nolan has gained a reputation for making innovative, unconventional movies which consider deep themes about the nature of time, space, and reality. His movies often incorporate ideas from science, particularly physics. Nolan's desire for scientific accuracy was most clearly demonstrated in his movie *Interstellar* which relied on technical advice from the Nobel prize-winning theoretical physicist Kip Thorne.

Nolan first showed an interest in the phenomenon of time reversibility in his movie *Memento*. This brilliant movie told the story of a man with amnesia trying to find the murderer of his wife. But what made the movie so remarkable is that the screenplay unfolded in reverse, starting with the final scene, and ending with the first scene. In other words, the events in the movie unfolded in time-reversed order (though Nolan still manages to surprise us at the end of the movie — or should I say the start?).

But it was in a later movie that Christopher Nolan's interest in time reversal was to play a central role. That movie was *Tenet*, released in the late summer of 2020.

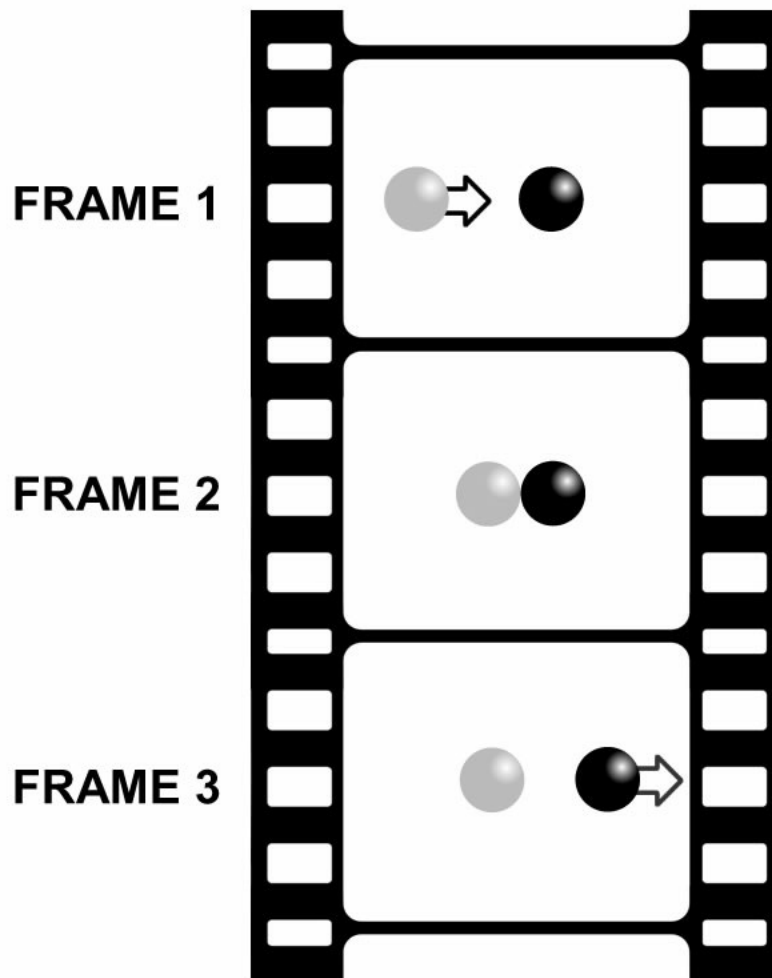
Unfortunately, the coronavirus pandemic, and the resultant closure of cinemas, meant that the release date of *Tenet* was delayed several times. However, the movie was finally released in the UK at the end of August. And so it was that I found myself in a virtually empty cinema with just four other socially-distanced people.

The central premise of *Tenet* is that there exists a technologically-advanced device (called a "turnstile") which can reverse the direction of the flow of time for objects. This idea resulted in some spectacular and inventive time-

reversed scenes. As was stated earlier in this section, time reversal would involve objects in a system reversing their direction of motion. Hence, as an example, one time-reversed scene in *Tenet* shows bullets leaving a target and following a reversed trajectory back into the barrel of a gun.

These time-reversed motions shown in movies such as *Tenet* are the best way to demonstrate the reversibility of Newton's laws. All we need to do is make a movie of the movements and interactions between a group of objects, and then play that movie backwards. If it can be seen that Newton's laws still apply to the reversed sequence of events, then that means that Newton's laws are reversible in time. As the physicist Paul Davies says in his book *The Physics of Time Asymmetry*: "Time reversal may be imagined as taking a movie film of the original motion, and then playing it backwards."

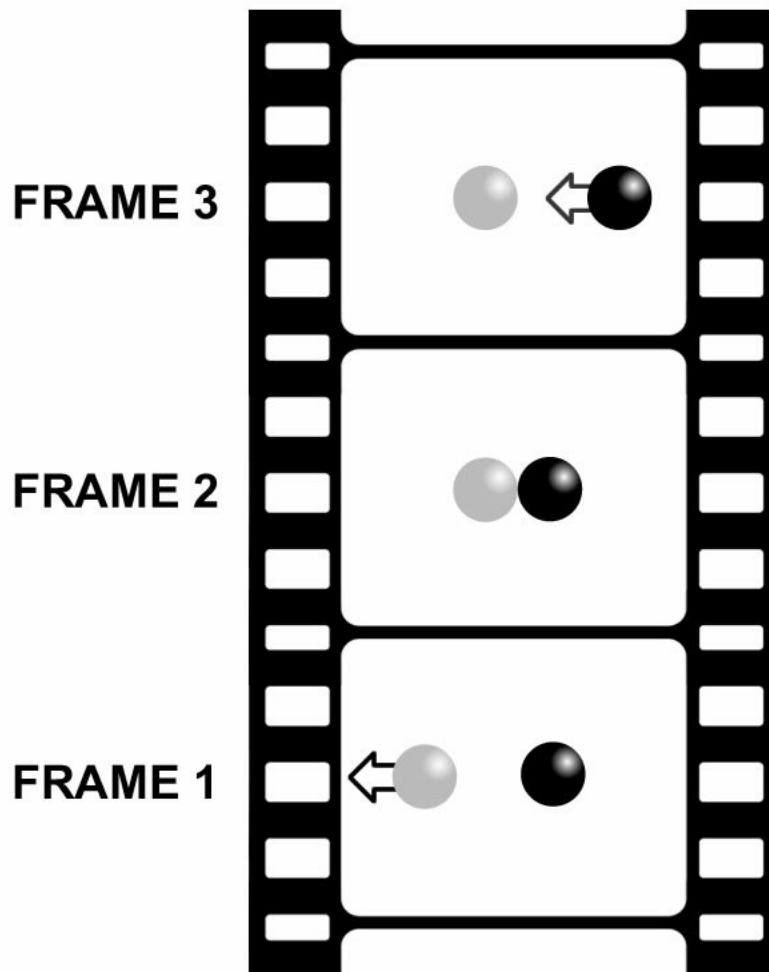
The following diagram shows three frames of a short movie. The movie is of a game of snooker (or pool). The first frame shows a stationary black ball in the middle of the frame, and a moving white ball coming in from the left of the frame. The second frame shows the white ball colliding with the black ball. The third frame shows the result of the collision: the white ball becomes stationary, while the black ball moves off at speed:



Simple motions of balls, and collisions (forces) between those balls, are described by Newton's laws of motion. So let us reverse this short movie and see if it still makes sense, i.e., do Newton's laws still apply to the time-reversed motions?

To answer that question, let us consider the sequence of frames in the reverse order, so that the last frame becomes the first frame, and the first frame becomes the last frame.

Here is the new sequence of frames, now numbered from Frame 3 to Frame 1:



As you can see, the first frame now shows the white ball stationary in the middle of the frame, and the black ball moving in from the right of the frame. The second frame shows the collision between the two balls. And the new final frame (the old first frame) shows the black ball stationary in the middle of the frame, while the white ball moves out of the frame to the left.

So this new time-reversed sequence of events seems reasonable, perfectly in accordance with Newton's laws of motion. This tells us that Newton's laws are reversible in time.

However, the situation would have been different if our movie had involved the passage of heat, rather than the motions of snooker balls. Imagine a movie of a hot object in a cold room. As the movie is filmed, heat leaves the object, and passes into the colder environment. Now let us imagine we play that movie in reverse. In reverse, we would see heat passing from the cold environment to heat the warmer object, thereby raising its temperature. This behaviour is something we would never encounter in reality: heat only ever travels from a hot object to a cold object — never from a cold object to a hot object. So this tells us that the laws of physics which govern the behaviour of heat cannot be time-reversible. It also tells us that Newton's laws cannot describe the behaviour of heat, because — as we have just seen — Newton's laws are time-reversible.

As described earlier, Isaac Newton was perceived as almost a divine being in Britain during the Industrial Revolution. So it must have been a shock to discover that Newton's supposedly infallible laws — the laws which were treated with almost the same reverence as the Bible — were incapable of describing the behaviour of the new steam engines which were having such a great impact at that time.

The failure of Newton's laws to describe the behaviour of heat explains why there was such urgency in the early 1800s to develop a new science which was capable of describing the functioning of steam engines.

So let us now rejoin our story in France ...

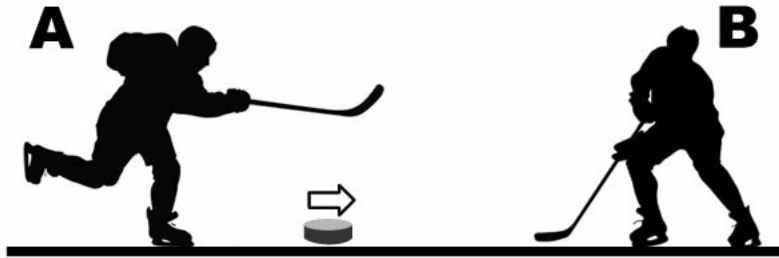
Reversibility and efficiency

Let us now return to consider the story of Sadi Carnot. If you remember, Carnot was obsessed with a desire to overcome the English technological superiority. To achieve his goal, Carnot aimed to improve the efficiency of French steam engines.

When we last left Carnot in the year 1824, Carnot had just published his book *Reflections on the Motive Power of Fire*. As described in the previous chapter, this was the book which launched the new science of thermodynamics — the science of heat and motion. And thermodynamics — unlike the laws of Newton — was the branch of physics which **was** capable of describing the behaviour of steam engines.

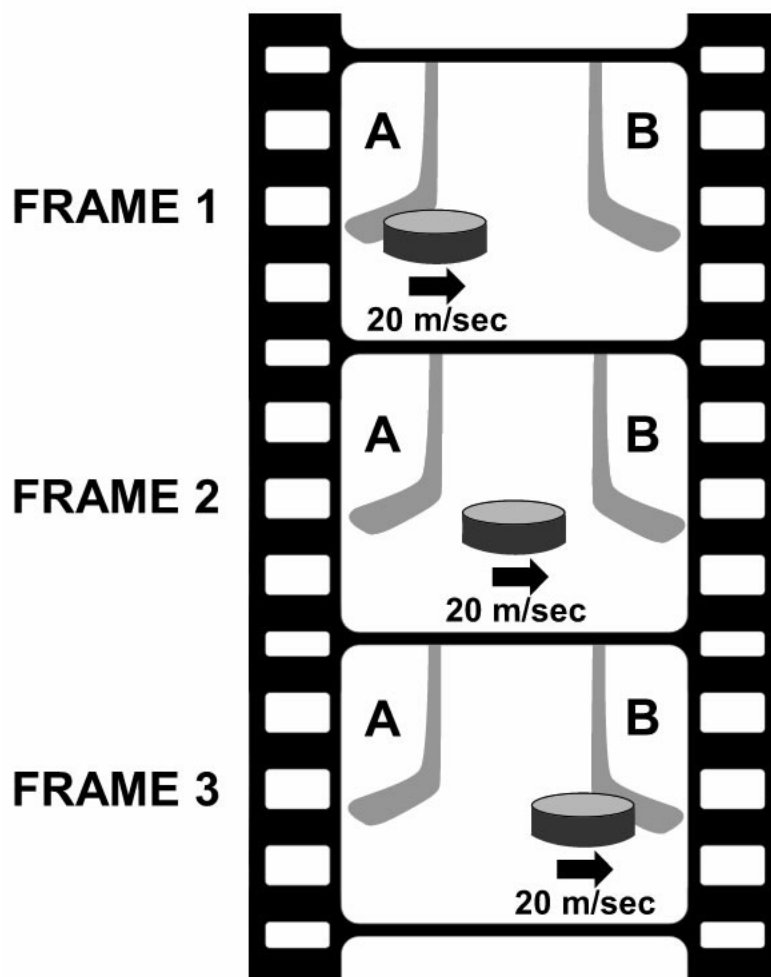
Also in his book, Carnot described how the principle of *reversibility* played a central role in determining the efficiency of a steam engine — or any machine. Why should reversibility be so important?

To understand why this is the case, consider the following thought experiment. Two ice hockey players are on a perfectly smooth surface of ice. As you can see in the following diagram, the player on the left (Player A) is hitting the puck to the player on the right (Player B):



Let us imagine that Player A strikes the puck at a speed of 20 metres/sec towards player B. Let us also imagine that the ice is perfectly smooth and frictionless, so that the puck loses no speed on its journey. As a result, the puck arrives at Player B travelling at the same speed of 20 metres/sec.

Now let us imagine we make a movie of the sequence of events, just as we earlier made a movie of the snooker ball collisions. Here are three frames of the short movie which just shows the movement of the puck:

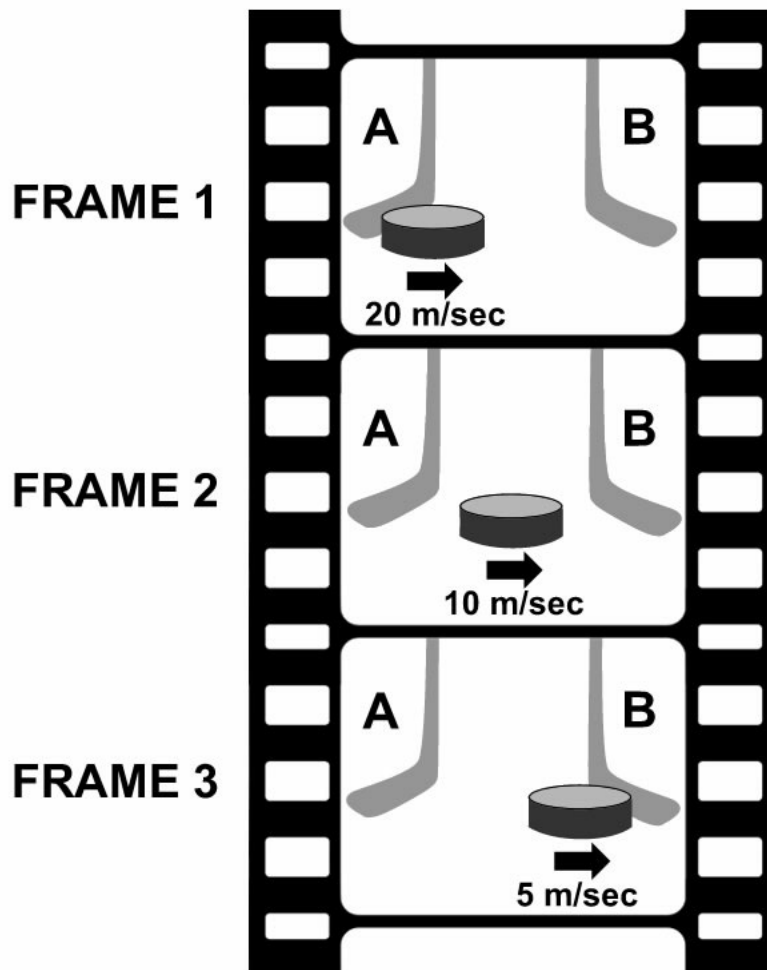


In the first frame of the movie, you can see the puck being struck by the hockey stick of Player A on the left, which results in the puck moving at a speed of 20 m/sec. Because the ice is perfectly smooth and frictionless, there is no reduction in the speed of the puck in the second frame as it continues its journey across the ice. Finally, in the third frame, we see the puck hit the hockey stick of Player B — still travelling at a constant speed of 20 m/sec.

It is easy to see that if this movie was reversed, this sequence of events would still make sense. All that would change is that the direction of motion of the puck would be reversed, so the movie would show the puck moving in the opposite direction — at the same constant speed of 20 m/sec. For that reason, it is clear that this is a time-reversible situation.

Now let us consider the situation in which the playing surface of perfectly smooth ice is changed to be a surface of rough sandpaper. This would introduce the effect of friction on the motion of the puck. This would act to slow the puck on its journey across the ice. Although the puck would start its journey at the same speed of 20 m/sec, it might now slow down to a speed of just 5 m/sec by the time it reaches player B.

Here is the movie of this new situation. It can be seen that the puck loses speed as it moves across the sandpaper:



What has happened is that the puck has lost energy as it has passed across the ice. The energy associated with moving objects is *kinetic energy*, so the puck has lost kinetic energy as it moves across the sandpaper, due to the effect of friction.

Now let us imagine watching this new movie in reverse. In this new time-reversed movie, we would see the puck initially travelling at a speed of 5 m/sec as it leaves Player B, but speeding up as it moves across the sandpaper until it reaches a speed of 20 m/sec at Player A. This would, of course, never happen in reality: objects do not speed up as they travel across rough surfaces — they lose energy and slow down. So, because this time-reversed situation could never happen in reality, we can say that this has become an irreversible system.

So why has the previously reversible system now become an irreversible system? The cause of this irreversibility is the puck losing kinetic energy due to friction as it moved across the sandpaper. But the law of conservation of energy says that energy cannot be created or destroyed — it can only change its form. So the energy must have gone somewhere. But where did it go?

The answer is revealed when we realise that friction produces heat, a feeling we experience when we rub our hands together and feel them getting warm. Heat is a form of energy, so the kinetic energy lost by the puck is converted into heat energy by friction from the rough sandpaper. And that heat energy then transfers from the puck into the general cooler environment.

So the root cause of the irreversibility comes from the heat released by friction. Any friction in a system will introduce irreversibility.

This connection between irreversibility and the production of heat will play a central role later in this book when we come to consider consciousness.

The Carnot cycle

Sadi Carnot realised that any system which was losing energy due to friction would exhibit irreversible behaviour. And that energy loss would have the effect of reducing the efficiency of an engine. Therefore, in his book, *Reflections on the Motive Power of Fire*, Sadi Carnot explained that an engine with the greatest possible efficiency would be perfectly reversible. We now call this perfectly reversible engine a *Carnot engine*.

In order to achieve maximum efficiency, each individual step in the cycle performed by the engine must also be reversible. The complete sequence of reversible steps which is performed by the engine is called the *Carnot cycle*. In theory, the cycle could be interrupted at any point and the engine could then be operated in reverse.

So Sadi Carnot had finally achieved his goal of specifying how a perfect steam engine could be made: it should be reversible, or as near reversible as possible.

However, in reality, it can never be possible to make a perfectly reversible engine as it can never be possible to remove all loss-making factors such as friction. But, even for modern engineers, the goal of perfect reversibility is used to guide the process of efficient engine design.

A musical interlude

We have now come to the end of this chapter on reversibility. In the later chapters of this book, we will be returning to consider irreversibility. It will be seen that irreversibility potentially plays a key role in the emergence of consciousness.

However, right now, I think you deserve a reward. So I have specially written and recorded a song and music video based on the theme of this chapter.

The song is called *Turn Back Time*, and it is about irreversibility. The music video includes several examples of irreversibility including a collapsing house of cards, a breaking wine glass, and me getting wet (or, more accurately, me getting dry). Here is a link to the music video:

<http://tinyurl.com/irreversibility>

The song and video were influenced by the time-reversal movie *Tenet*.

Hopefully the song will have the effect of emphasizing the central role which irreversibility will be playing in this book.

I hope you enjoy the video!

4

HEAT, TEMPERATURE, AND ATOMS

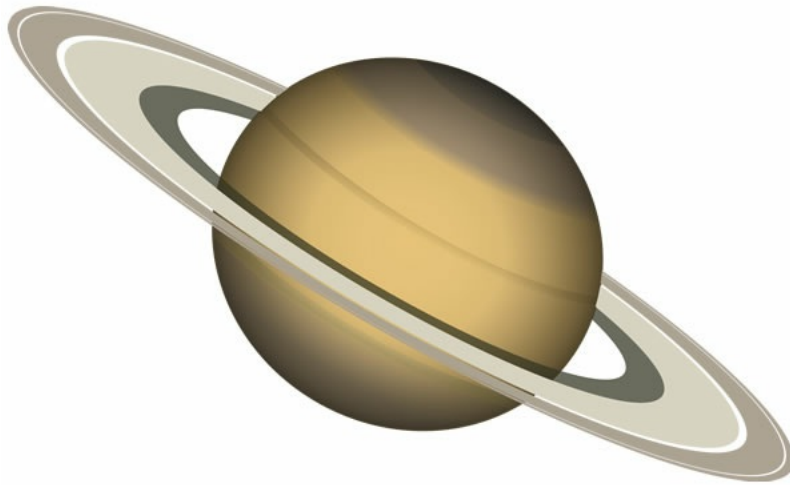
As we have just seen, Sadi Carnot made great advances in understanding the behaviour of steam engines. However, Sadi Carnot still did not understand the true nature of heat. As explained in Chapter Two, Carnot still believed in the caloric theory of heat which proposed that heat was an actual substance. Carnot was fortunate that this mistaken theory of heat did not prevent his progress in understanding the steam engine. As Ingo Müller says in his book *A History of Thermodynamics*: "It was quite irrelevant whether he knew what heat was — and he didn't!"

A deeper understanding of heat was desperately required. In this chapter, we will see how that accurate, deeper understanding of heat was obtained. We will see how an entirely new theory had to be developed, a theory which relied on a completely new model of reality at its smallest scales.

At the end of this chapter we will also see that the theory of heat has implications for a theory of consciousness.

The rings of Saturn

The planet Saturn is the second-largest of the eight planets in the Solar System, almost a hundred times larger than Earth. The planet is mostly made of hydrogen and helium, with a total density less than water. But, of course, Saturn is most famous for its spectacular system of rings:



The rings around Saturn were first observed by Galileo Galilei in 1610 using his telescope. However, because of the low magnification of Galileo's telescope, the internal structure of the rings was unobservable. The true nature of the rings remained unknown. Were they connected to the planet, or separate? Were they solid, or made of small rocks, or even a fluid?

In 1857, in the hope of finally solving the problem, St. John's College in Cambridge announced a competition. A prize would be awarded to anyone who could solve the problem of the composition of the rings. The competition attracted the attention of 25-year-old James Clerk Maxwell, a highly-skilled mathematician who was a professor at Aberdeen University.

In 1859, after studying the problem for two years, Maxwell proposed his solution. In his essay *On the Stability of the Motion of Saturn's Rings*, Maxwell was able to show that if the rings were completely solid then the internal stresses would break the rings into smaller pieces as they orbited the planet. The same result would occur if the rings were made from a fluid: tidal waves would be created of such a monstrous size that the rings would eventually be torn apart.

Maxwell announced that the rings must be composed of a swarm of smaller objects, such as small rocks or lumps

of ice. Occasionally, Maxwell realised, those rocks would collide with each other. This prediction was eventually confirmed by the images sent back from the Voyager spacecraft in 1980. The images showed that the rings are made of lumps of ice ranging in size from a radius of one centimetre to ten metres.

The Astronomer Royal described Maxwell's work as "One of the most remarkable applications of mathematics to physics that I have ever seen." James Clerk Maxwell won the £130 prize, and the physics community became aware of his name as a new rising star in the field.

Maxwell realised that his work on the rings of Saturn had wider applicability. Maxwell was one of a growing number of physicists who believed that all materials were made of smaller particles which were called atoms. Just as Maxwell had shown that the rings of Saturn were made from a huge number of smaller lumps colliding with each other, could he now use similar techniques to explain the properties of gases made of trillions of microscopic swarming atoms?

The kinetic theory of gases

If a gas really was made of trillions of atoms, then the challenge was to explain how the large-scale properties of a gas — such as its temperature and pressure — could be explained in terms of the interactions of the microscopic atoms in that gas. The solution was developed by Maxwell, together with the German physicist Rudolf Clausius and the Austrian physicist Ludwig Boltzmann. Together, those three giants of 19th century physics created what we now know as the *kinetic theory of gases*.

The kinetic theory of gases models the atoms of a gas as microscopically small balls. Those balls move at high speeds, and, because of the vast number of atoms in a gas, collisions are extremely frequent. When these balls collide, the kinetic theory proposes that the balls bounce off each other perfectly elastically. As a result of these collisions, the motion of the atoms is completely random.

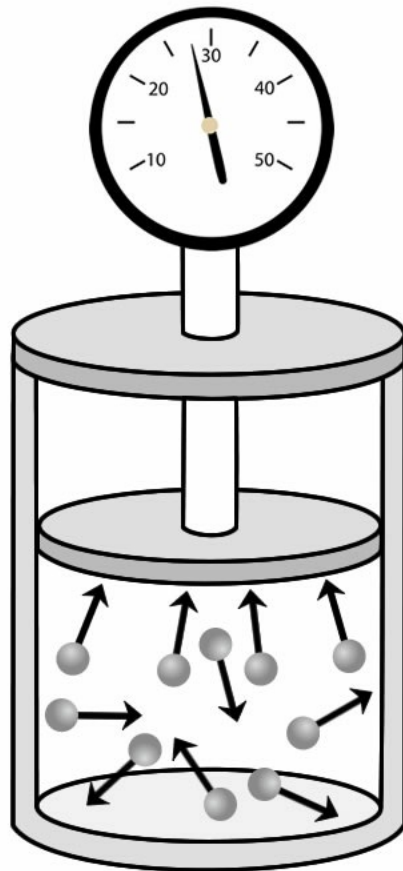
To provide some actual numerical values, the theory can be used to calculate that one molecule of oxygen in a room full of oxygen gas will be moving on average at the astonishingly high speed of 461 metres per second. When this result was announced, it raised some objections to the theory. As an example, consider the situation in which you are standing at one end of a room and someone wearing heavy perfume enters the other end of the room. With gas molecules predicted by the theory to travel at several hundred metres per second, it might be imagined that you would smell the perfume as soon as you see the person. But this is obviously not what happens — it takes several seconds for the scent to drift across the room.

The answer to this objection is that the atoms of the scent do not fly in straight lines. Instead, those atoms collide with other gas atoms as they zigzag across the room — just as the lumps of ice in the rings of Saturn collide with each other as they orbit the planet. This is the reason why the smell of the perfume takes several seconds to cross the room.

The kinetic theory of gases reveals that these collisions are occurring with extraordinary frequency. At room temperature, one oxygen molecule can travel an average distance of only 67 nanometres before it collides with another oxygen molecule, a distance which is 1,500 times smaller than the width of a human hair. Remembering that molecules are travelling at great speed, that means that a molecule will collide with another molecule 6.8 billion times per second. It is clear that the microscopic world is a world of extreme dynamism and constant, violent collisions.

The kinetic theory of gases provides an explanation of how large scale, measurable properties of a gas are produced by the interactions of the microscopic atoms in the gases. One such example is an explanation of how the pressure of a gas results from the forces applied by its atoms.

To see how this occurs, we might consider a sample of gas which is trapped in a cylinder, as shown in the following diagram. The atoms of the gas are drawn as small balls, bouncing off each other at high speed. The motions of the atoms are indicated by the small arrows. It can be seen that the cylinder contains a piston which is pushing down on the gas:



As has just been explained, the atoms of the gas are travelling at tremendous speed. Those atoms would strike the piston extremely fast, and this would result in a force being applied to the piston — like tennis balls striking a tennis racket. Because there are so many atoms in the gas, and they strike the piston with such high frequency, this would have the effect of exerting a constant outward force onto the piston. We would interpret this force as the pressure of the gas, and we could measure that pressure using a gauge (as shown in the previous diagram).

Hence it can be seen how the kinetic theory of gases can explain how a large scale, measurable property of the gas (such as pressure) can arise from the interactions of the microscopic atoms within that gas. The field of physics which considers how measurable properties arise from the interactions of microscopic particles is called *statistical mechanics*.

Heat

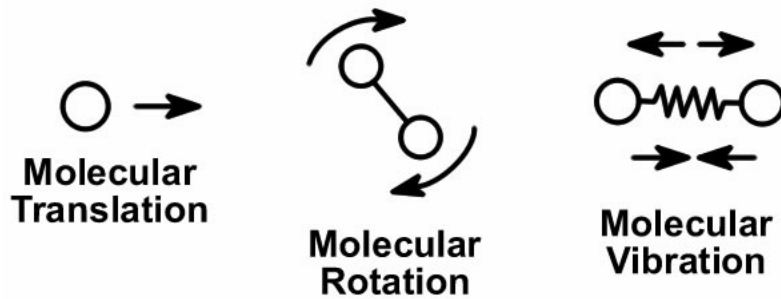
We might wonder how the kinetic theory of gases can explain the heat and temperature of a gas. Heat and temperature are closely related, but they are different properties. Let us consider heat first.

It was explained in Chapter Two that it was originally believed that heat was a substance, named either "phlogiston" or "caloric". It was suggested that caloric was a fluid, and caloric could be neither created nor destroyed. However, the main flaw in this theory is fairly obvious: if you create heat by friction — by rubbing two surfaces together — then you can create an endless source of heat. It was clear that heat could not be a substance which was limited in amount.

In his 1857 paper *On the Nature of the Motion which we call Heat*, Rudolf Clausius rejected the caloric theory of heat. Instead, Clausius suggested that heat was motion: the motion of atoms in an object. This makes a lot of sense, after all, when you rub your hands together they get hot. In that case, the motion of your hands is causing the atoms of your hands to move, which generates heat.

Clausius realised that each of those moving atoms would possess an amount of kinetic energy, the energy

associated with movement. Let us consider how atoms and molecules can move. In a gas, three types of molecular motion are possible, as shown in the following diagram:



As the previous diagram shows, the three possible types of molecular motion are translation (movement in a straight line), rotation, and vibration. Each different way in which the molecule can move is called a *degree of freedom*. There is some kinetic energy — the energy of motion — associated with each degree of freedom. In other words, each different way in which the molecule can move adds an amount of energy to the total energy of the molecule. If we then add up the total energy of all the molecules we get the total thermal energy (the heat) of the gas.

Heat, therefore, is the energy associated with the random motion of atoms and molecules in an object.

Temperature

So the total amount of thermal energy in an object is the heat in that object. Let us now move on to consider temperature — which is different from heat.

We can measure temperature using a thermometer — or even our bare hands. In terms of physics, the temperature is the **average** kinetic energy of the atoms in an object. The word "average" is crucial here. A very large object might contain a great amount of heat energy in total, but — because of the size of the object — the average temperature might be surprisingly low. An example of this is the temperature of the sea. The sea contains a huge amount of heat energy in total, but, because of its size, the temperature of the sea when we put our hand in the water — the **average** amount of energy in a small sample — can be chilly!

The ocean has absorbed more than 90% of the heat caused by human activity. John Abraham, a professor of thermal sciences at the University of St. Thomas in Minnesota has explained how much heat energy is absorbed by the ocean: "It's about five Hiroshima bombs of heat, every second, day and night, 365 days a year". This reveals the vital role of the oceans in absorbing heat in the battle against global warming.

So the heat energy contained within the ocean is huge — but if you dip your toe into the sea, the water will feel cold! This is an example of the difference between temperature and heat.

The bridge between the human world and the atomic world

Let us now consider in more detail the connection between temperature and the properties of individual atoms.

The kinetic theory of gases can be used to calculate the amount of kinetic energy of a single molecule of a gas. That kinetic energy can be found from the following formula:

$$\text{Kinetic energy of molecule} = \frac{3}{2} kT$$

where T is the temperature of the gas and k is a constant value known as *Boltzmann's constant*.

But where does the $3/2$ factor come from? Well, as explained earlier in this chapter, gas molecules have various degrees of freedom, which means they have various directions in which they are free to move. Each degree of

freedom adds an amount of kinetic energy to the molecule which is equal to:

$$\frac{1}{2}kT$$

With three dimensions of space in which the molecule is free to move (three degrees of freedom), that means that this amount of energy gets added three times to the total energy of the molecule, thereby resulting in the 3/2 factor shown earlier.

Now let us consider how we measure temperature. If I want to measure temperature, I would use a thermometer. A thermometer is a fairly large instrument which I can hold in my hand. A thermometer is definitely part of the human-scale world. Because of its size, we would say that a thermometer is a *macroscopic* object (a human-scale object).

In contrast, I cannot see an atom because of its incredibly small size: it is unobservable. I cannot hold a single atom in my hand, or use a single atom as a tool. An atom is not part of my human world. Because of its small size, we would say that an atom is a *microscopic* object (as opposed to macroscopic).

But the analysis which has just been described managed to connect temperature with the kinetic energy of an individual molecule. How was that magic achieved? Let us again consider the previous formula for the kinetic energy of a molecule:

$$\text{Kinetic energy of molecule} = \frac{3}{2}kT$$

We can see that the factor which links temperature of a gas with the energy of one of its molecules is Boltzmann's constant, k . For this reason, it is often stated that Boltzmann's constant represents "the bridge between the microscopic and macroscopic world". For an example, see the following page on the Boltzmann.com website:

<http://tinyurl.com/boltzmannconstant>

As that webpage states: "Boltzmann's constant bridges macroscopic physics (temperature, entropy) with microscopic physics (average energy of particles/atoms/molecules)."

Consciousness is part of the human experience, part of the human world. So consciousness is a *macroscopic* phenomenon. Whereas the motion of particles in our brains — out of which consciousness emerges — is a *microscopic* phenomenon.

This point was made by the physicist Carlo Rovelli in a recent YouTube video (<http://tinyurl.com/rovellivideo>). In the video, Rovelli attempts to understand consciousness within the known laws of physics, and emphasises the macroscopic nature of consciousness. According to Rovelli: "Consciousness is a macroscopic phenomenon. Subjective experience ... is a macroscopic phenomenon."

The challenge for physicists is to explain how consciousness emerges from the trillions of interacting particles in our brains. How can we link microscopic activity to a macroscopic phenomenon? For this reason, I would suggest that Boltzmann's constant will likely play a central role in any final theory of consciousness. The theory of consciousness presented later in this book will have a central role for Boltzmann's constant.

Consciousness and physics

This line of reasoning, I would suggest, provides us with the first indication of why thermodynamics is the branch of physics which is best suited for studying the phenomenon of consciousness.

When we consider a brain, we observe a staggeringly complex swarming of microscopic particles. Somehow, our consciousness emerges as a macroscopic phenomenon from the interactions of these particles in the same way that the temperature or pressure of a gas arises from interactions between the atoms of that gas. Consciousness is,

therefore, a phenomenon which needs explaining in terms of the activity of its microscopic constituents, in the same way that explanations were found for temperature and pressure in terms of microscopic atoms — as this chapter has explained.

Although, historically, there has been little interest in consciousness from physicists, several high-profile physicists now appear to be taking the problem seriously. And, I am pleased to say, I detect a general focus on thermodynamics as a likely solution.

This trend towards considering thermodynamics as a solution was clearly shown in the 15th February 2020 cover story of *New Scientist* magazine. The article was called *Finding Our Place in the Universe* and was written by Richard Webb. In the article, Webb interviewed several prominent physicists including Sean Carroll and Carlo Rovelli. In the following extended extract from the article, the possible explanation for consciousness in terms of thermodynamics is explored, with particular reference to the kinetic theory of gases: "For Carroll and many others, the answer lies not in mysticism, but in emergence. This is the idea that behaviours and properties that are inscrutable when you look at single components of a complex system pop into existence when you view things as a whole. There are plenty of precedents. The temperature or density of a gas, for example, doesn't mean much at the level of single molecules. Look at all the molecules of the gas together, however, and they are measurable quantities that explain physical change: how temperature differences cause heat flows, for example, or how a gas pushes a piston when compressed. The catch is that human brains are phenomenally complex. A fully grown one contains nearly 100 billion interconnected neurons, and we are still far from establishing how they produce the felt states of our conscious world, let alone how those states interface with the wider world: "It's one thing to say I can explain the temperature and density of the air by hypothesising that it is made of molecules bumping into one another" says Carroll. "It seems quite a more dramatic project to say I can explain mind and choices and consciousness as emerging out of atoms and molecules bumping into one another."

For physicists, the challenge is clear. An explanation of the macroscopic phenomenon of consciousness in terms of microscopic atoms is required — just as explanations were found for temperature and pressure.

With that in mind, let us continue our story ...

5

ENTROPY

When we last left Sadi Carnot it was the year 1824, and Carnot had just published *Reflections on the Motive Power of Fire*. The principles which Carnot described in that book still influence engineers to this day. Unfortunately, Carnot did not live to see the widespread adoption of his ideas as he tragically died in Paris during a cholera epidemic in 1832 at the age of just 36.

Carnot's work remained largely unnoticed for almost twenty years after his death before it was rediscovered by a few notable scientists. That small group included the German physicist and mathematician Rudolf Clausius.

It was Clausius who, in the 1850s and 1860s, analysed the work of Carnot and placed it on a stronger theoretical foundation. Clausius proceeded to make a series of theoretical breakthroughs, in the process becoming one of the key founders of the science of thermodynamics.

Despite Carnot's advances, one great mystery remained about the behaviour of heat. That mystery was the tendency of heat to travel in only one direction: from hot to cold. As explained in Chapter Three, this was a mystery because Newton's laws — and the fundamental laws of physics in general — are all reversible in time. It was Clausius who provided the breakthrough in solving the problem when he introduced the concept of *entropy*.

In developing the concept of entropy, Clausius carefully analysed the writings of Sadi Carnot about steam engine efficiency. Clausius considered a system which had heat energy added to it. Clausius then defined the increase in the entropy of that system as follows:

$$\text{Entropy change} = \frac{\text{Heat}}{\text{Temperature}}$$

Crucially, Clausius also combined this definition of entropy with a rule to describe its behaviour:

The entropy of a closed system always increases in time.

This rule is called the *second law of thermodynamics*, and it is considered to be one of the most important and unbreakable rules in physics.

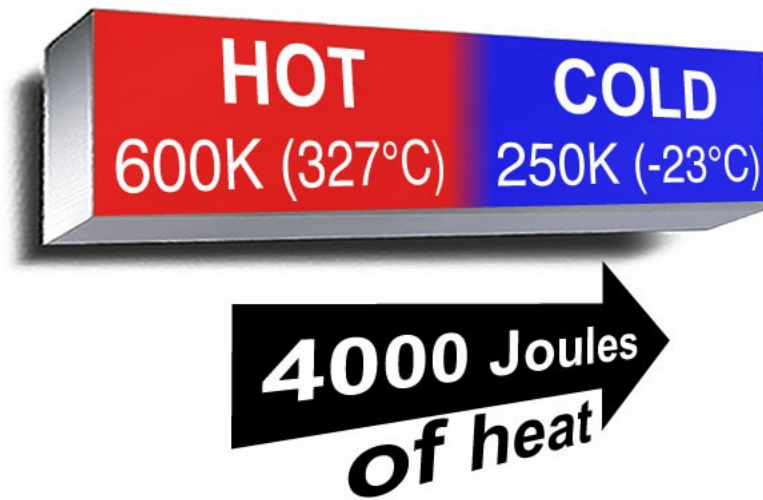
It can immediately be seen that there is a crucial difference between this law and the laws of Newton. While the laws of Newton do not specify any particular direction of time, it can be seen that the second law of thermodynamics says that entropy always increases in the forward direction of time — never in the reverse direction of time. So, unlike the laws of Newton, **a direction of time is explicitly stated within this law**. It is clear that we are moving away from the laws of Newton and into a new world of physics.

An example calculation of entropy

Let us now consider an example calculation of entropy, according to Clausius's definition. The following example is from the excellent free online physics textbook provided by OpenStax. Here is a link to the relevant page in the book:

<http://tinyurl.com/entropybook>

The example described in the book considers the following scenario. Imagine a metal bar. The left half of the bar is at a very high temperature of 600 Kelvin (327 degrees Celsius), while the right half of the bar is at a low temperature of 250 Kelvin (-23 degrees Celsius). This arrangement is shown in the following diagram, with one half of the metal bar being hot, and the other half being cold:



If we leave the bar for a period of time, we will find that heat energy naturally flows from the hot end of the bar to the cold end of the bar (heat naturally flows from hot to cold). Let us consider the situation in which 4000 Joules of heat energy flows from hot to cold (shown by the arrow in the previous diagram). We then ask the question: what is the overall change in the entropy of the entire system?

Firstly, let us remind ourselves of Clausius's definition of the change in entropy:

$$\text{Entropy change} = \frac{\text{Heat}}{\text{Temperature}}$$

Now let us calculate the entropy change in the hot, left half of the metal rod:

$$\begin{aligned} \text{Entropy change} &= \frac{-4000}{600} \\ &= -6.67 \text{ J/K} \end{aligned}$$

Note that this is a negative value, representing a decrease in entropy. But that is strange as it was just explained that entropy always increases. So what is going on?

All becomes clear when we consider the cold, right half of the metal rod:

$$\text{Entropy change} = \frac{4000}{250} = 16 \text{ J/K}$$

This time the result is positive, representing a large increase in entropy. If we then consider the total entropy change in both halves of the metal rod, we get the following value:

$$\text{Total entropy change} = \\ 16 \text{ J/K} - 6.67 \text{ J/K} = 9.33 \text{ J/K}$$

which is a positive value. So the total change in entropy of the rod is a positive value. In other words, the total entropy has increased — in agreement with the second law of thermodynamics.

This calculation has revealed how the second law of thermodynamics — the rule that entropy always increases — can describe the flow of heat from hot to cold.

However, for many years after Clausius's discovery, no one actually knew what entropy was. Why should there be this strange property which was always increasing?

The answer was provided by an Austrian physicist, and it was an answer which changed our view of reality ...

The atoms of Ludwig Boltzmann

Ludwig Boltzmann was born in Vienna in 1844. In 1866 he obtained his doctorate from the University of Vienna, and by 1869 he had become a professor of mathematical physics at the University of Graz.

It was when he was a student at the University of Vienna that Boltzmann performed his first important work. That work was on the kinetic theory of gases, which was considered in the previous chapter. If you remember, the kinetic theory of gases revealed how the temperature of a gas represented the average kinetic energy of a single molecule of that gas. It was explained how the factor which links the overall temperature of the gas to the energy of a single molecule is now called Boltzmann's constant, named in recognition of Ludwig Boltzmann's pioneering work.

Here is a photograph of Ludwig Boltzmann:



It was clear, then, that Ludwig Boltzmann believed in the reality of atoms, that a gas was composed of trillions of atoms moving around with considerable kinetic energy. What is more, Boltzmann realised that if a gas was, indeed, made of atoms then a simple explanation for entropy emerged. Remember, the second law of thermodynamics stated that entropy had to always increase. Boltzmann realised that this made sense if entropy represented the amount of

disorder of the atoms in a gas. If that was the case, then entropy would naturally tend to increase — in the same way that a set of playing cards would tend to become more disordered when it was shuffled.

It really is quite a simple idea. But, as we shall now see, this simple idea was capable of explaining the flow of heat from hot to cold.

Let us imagine the metal rod which was described in the previous section. The left half of the rod is hot, while the right half of the rod is cold. We might consider this arrangement as representing a type of "ordering" of the atoms in the rod: the faster-moving atoms (hotter) have been ordered so that they are in the left half of the rod, while the slower-moving atoms (colder) have been ordered so that they are in the right half of the rod.

Over time, as the atoms in the two halves of the rod interact with each other, this ordering would tend to disappear. As the atoms in the two halves randomly collide with each other, some of the atoms in the left half of the rod would slow down, while some of the atoms in the right half of the rod would speed up.

Eventually, an equilibrium position would be reached in which the atoms in both halves of the rod have the same average velocity. At this point, the entire rod is at the same temperature. All of the initial ordering of the atoms would have disappeared. This would be the point of maximum disorder: maximum entropy.

But how would we interpret this increase of disorder? We would observe the cold half of the rod getting warmer, while the hot half of the rod becomes colder. So we would interpret the increase of entropy as a flow of heat from hot to cold. This atomic model of Boltzmann could therefore explain how an increase in entropy would lead to a flow of heat from hot to cold — but never in the reverse direction.

We now know that Boltzmann's theory was correct, and his explanation of entropy is accepted as one of the great achievements of 19th century physics. However, the theory received a great deal of opposition at the time. All of Boltzmann's work depended on the existence of atoms. However, when Boltzmann proposed his theory, the existence of atoms was by no means certain. Indeed, many German scientists believed that atoms did not exist, and they were openly critical of Boltzmann's idea. Influential critics such as the Austrian physicist Ernst Mach subscribed to the positivist school of thought which believed that physics should only consider things which can be directly observed — and atoms are, of course, too small to be directly observed.

Throughout his life, Ludwig Boltzmann had suffered from manic depression. This continued rejection of his ideas contributed to the slow decline in Boltzmann's mental state.

In September 1906, Boltzmann took a vacation to the coastal village of Duino, near Trieste, with his wife and daughter. The trip was specifically intended to improve his state of mind. Indeed, by the end of the holiday his health seemed much improved. About six o'clock in the evening of September 5th, Boltzmann's wife and daughter went to the beach for a swim, and Boltzmann assured them he would join them shortly. But Boltzmann never arrived. Tragically, Ludwig Boltzmann had hanged himself from a window in his hotel room.

Order and disorder

The interpretation of entropy as a form of disorder provides an intuitive notion of the nature of entropy. However, it also introduces a problem. Just saying that one arrangement of particles is "ordered" while a different arrangement is "disordered" appears to be a matter of personal taste. Who gets to decide what is an ordered state and what is a disordered state?

As an example, if we look into the bedroom of a teenager, it might look to be in a disordered state — a complete mess. Take a look at the following image, for example. You might think it looks completely disordered. But maybe the teenager would insist that all of the items are positioned just where he or she wants those items to be, and so, according to the teenager, the room is perfectly ordered.

So what is the answer? Does the following image show an ordered room or a disordered room? Hence, is it low in entropy or high in entropy?



Ordered or disordered?

It is clear that if we want to use the model of entropy as disorder then we need to find an unambiguous definition of the difference between order and disorder. In order to solve that problem, we first need to introduce the concepts of *microstates* and *macrostates*.

Firstly, remember from the discussion in the previous chapter that the prefix "micro" refers to very small objects, usually atoms, while the prefix "macro" refers to the large human-scale world. So the term "microstate" refers to the state of a system at the smallest level: the positions and velocities of its atoms. However, humans cannot see atoms, so the term "macrostate" refers to the state of a system as recognisable by a human.

A classic example of a macrostate is the temperature of a system. Temperature is a macrostate as it can be measured by a human-scale device: a thermometer. If an object is at a certain temperature, that means that the atoms of the object are moving randomly, possessing a certain kinetic energy. If the atoms then move to different positions, that would mean that the system is then in a different microstate as the microscopic positions of the atoms would have changed. However, the temperature of the system might well be the same as before. So the temperature macrostate of an object is associated with a large number of different microstates (different arrangements of atoms).

Let us consider the example of the teenager's room again. If the room is in a state of "order", then there are not many associated microstates. The reason why that is the case is described by Peter Hoffman in his book *Life's Ratchet*: "There are only a few arrangements (microstates) compatible with a tidy room: clothes in the closet, grouped by long-sleeve shirts, short-sleeve shirts, slacks, jeans, and so on; books on the shelves, sorted alphabetically by author; and so forth."

So when a room is in an ordered state, there are not many different possible arrangements of the objects in that room — not many microstates. However, when a room is in a disordered state, there are a vast number of possible different arrangements. As Peter Hoffman again describes: "There are almost unlimited ways the room could be messy: jeans on top of the computer, books on the floor, shirts strewn over the bed."

So this provides us with a way of distinguishing between ordered and disordered states. A disordered state will have many more microstates associated with it than an ordered state will have. A disordered room has many more ways that it can be disordered. This allows us to categorically state — for the reason described by Peter Hoffman — that the teenager's room in the previous diagram is in a state of disorder!

And, as entropy is defined as being the amount of disorder in a system, this allows us to create a formula for the amount of entropy in a system. The amount of entropy of a system will be proportional to the number of microstates associated with the current macrostate of that system: more microstates means more entropy. This allowed Ludwig Boltzmann to develop a formula for the entropy of a system.

Here is Boltzmann's formula:

$$\text{Entropy} = k \ln W$$

where W represents the number of microstates associated with the current macrostate of the system, k represents Boltzmann's constant (introduced in the previous chapter), and "ln" represents the natural logarithm function. The units of entropy are joules per kelvin.

Put simply, we see that the formula tells us that the greater the number of microstates associated with the current macrostate, the greater will be the entropy of that macrostate.

Boltzmann's formula for entropy was such a tremendous achievement that you can see the formula engraved near the top of Boltzmann's magnificent tombstone in Vienna:



6

MAXWELL'S DEMON

James Clerk Maxwell was born in Edinburgh, Scotland, in 1831. Maxwell was born into a wealthy and eccentric family. As an example of the adventurous and eccentric nature of the family, Maxwell's Scottish grandfather, James Clerk, was a captain in the East India Navy. Unfortunately, his ship was wrecked in the River Ganges. James Clerk managed to avoid drowning by floating to shore on his inflated bagpipes. When he reached the shore, he played the bagpipes to scare away some predatory tigers.

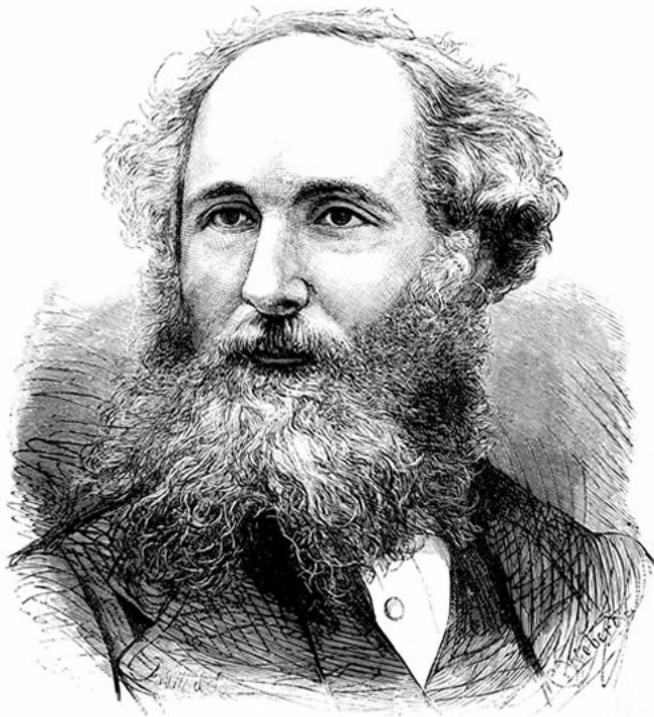
James Clerk Maxwell inherited his grandfather's adventurous and curious nature. As a young boy, he would often ask questions about the operation of the devices he found in the house. In his Scottish accent he would ask: "What's the go o' that?". If he did not find the answer to his question to be satisfactory, he would then ask: "But what's the *particular* go o' that?"

Maxwell's talents as a superb mathematician became clear when he studied as an undergraduate at the University of Edinburgh and Cambridge University. It was while he was in Cambridge that he started his work on analysing the composition of Saturn's rings. As described in Chapter Four of this book, Maxwell realised that the rings had to be composed of many smaller rocks which would frequently collide with each other. Also as described in Chapter Four, this work on the interactions of rocks in the rings of Saturn would lead to James Clerk Maxwell becoming one of the most important contributors to the kinetic theory of gases.

However, Maxwell's work on the kinetic theory of gases is not the work for which James Clerk Maxwell is most famous. After securing a professorship at Kings College in London, Maxwell started to analyse the connection between the electric force and the magnetic force. In his 1865 paper *A Dynamical Theory of the Electromagnetic Field*, Maxwell unified electricity and magnetism, showing that they were two aspects of a single electromagnetic force. As a result of that unification, Maxwell had the historic insight that light must be an electromagnetic wave.

Mainly for his achievement in electromagnetism, Maxwell is now regarded as one of the most important physicists of all time. When *Physics World* magazine conducted a poll of 100 leading physicists to discover who was considered to be the greatest physicist of all time, James Clerk Maxwell came third, only behind Albert Einstein and Isaac Newton.

Here is a drawing of James Clerk Maxwell:



Maxwell enjoyed a lifelong correspondence with his good friend Peter Tait. Tait was an outstanding Scottish physicist and an expert on thermodynamics. They would send letters to each other, often containing humorous stories, or observations about science.

In December 1867, Maxwell had an idea which he found deeply puzzling, so he described the idea in a letter to Tait. The idea contained in Maxwell's letter was so startling that it is still having ramifications to this day. Let us consider Maxwell's remarkable idea.

As has been described, Maxwell was a major contributor to the kinetic theory of gases, and he was well aware of the latest developments in thermodynamics. In his letter to Tait, Maxwell described a thought experiment which apparently broke the "unbreakable" second law of thermodynamics.

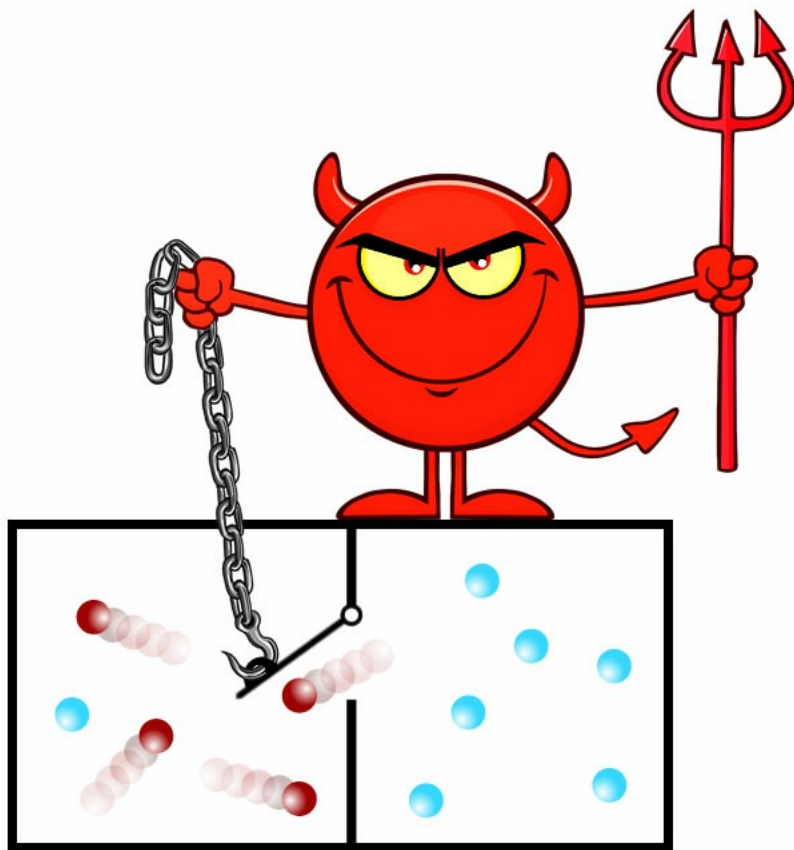
If you remember from the previous chapter, the second law of thermodynamics states that the entropy of a closed system will always increase over time. If we consider entropy to be the amount of disorder in a system, then this makes intuitive sense: ordered systems tend to become more disordered over time.

However, in his letter to Peter Tait, James Clerk Maxwell described the following scenario. Imagine a sealed box which contains a gas. The box is divided into two compartments by a solid partition in the middle of the box. The gas is initially at the same temperature in both compartments.

There is a small trapdoor in the partition which can be opened and closed to allow individual atoms of the gas to pass from one compartment to the other.

Maxwell then asked us to imagine a so-called "demon" who was in charge of opening and closing the trapdoor. The demon is in charge of performing the following operation. If the demon sees a fast-moving atom of gas approaching the trapdoor from the right-hand compartment, the demon opens the trapdoor to allow the atom to cross to the left-hand compartment. And, vice versa, if the demon sees a slow-moving atom of gas approaching the door from the left-hand compartment, the demon opens the trapdoor to allow the atom to cross to the right-hand compartment.

The following diagram shows the demon opening the trapdoor to allow a fast-moving atom of gas to cross from the right-hand compartment to the left-hand compartment:



We see that, over time, the effect of the demon's actions will be that the left-hand compartment contains faster-moving atoms than the right-hand compartment. As heat is nothing more than the movement of atoms, that means that the left-hand compartment will become hotter than the right-hand compartment.

And so this is where the puzzle emerges. As described in Chapter Two of this book, a heat engine operates on the basis of a temperature difference: a "waterfall of heat". So we could connect a heat engine in between the two compartments and use that temperature difference to perform work. In theory, this could continue forever as the demon continues to order the gas atoms according to their speed. It appears we have found a form of perpetual motion machine, which is, of course, impossible.

But the puzzle which really concerned James Clerk Maxwell is that the demon appears to have broken the second law of thermodynamics. The second law states that entropy — disorder — of a system will always tend to increase. But the demon has ordered the gas molecules according to their speed, so the demon has ordered the atoms. As an ordered system has lower entropy, this has had the effect of reducing the entropy of the system. It would appear that the second law of thermodynamics has been broken.

This mystifying thought experiment is now called *Maxwell's Demon*.

In 2012, the BBC made an excellent two-part documentary series about thermodynamics called *Order and Disorder*, presented by Prof. Jim Al-Khalili. A link to the first episode was presented earlier in Chapter Two of this book. The second episode considered Maxwell's Demon. Here is a link to the second episode on YouTube:

<http://tinyurl.com/videomaxwell>

The whole video is excellent. The discussion of Maxwell's Demon is at the 23-minute mark of the video.

The physicist Paul Davies has recently written a book about information in biological systems. The book is titled *The Demon in the Machine*, and it contains a chapter on Maxwell's Demon. In that chapter, Paul Davies explains that the problem of how Maxwell's Demon could seemingly break the second law of thermodynamics remained unsolved for over sixty years. According to Paul Davies: "For many decades, it lay like an inconvenient truth at the core of physics, an ugly paradox that most scientists chose to ignore."

To find the solution, physicists had to look in a very dark and surprising place ...

Inside the mind of the demon

In 1929, the Hungarian physicist Leo Szilard believed he had found a solution to Maxwell's Demon. Szilard considered the second law of thermodynamics, which says that the entropy of a system will always tend to increase. Szilard realised that, in the case of Maxwell's Demon, **the whole system also included the demon** — not just the gas in the box. If the entropy of the demon was increasing by a greater amount than the entropy of the gas in the box was decreasing, then the entropy of the system **as a whole** would be increasing. In that case, the second law of thermodynamics would not be violated after all.

But this posed a second mystery. Why should the entropy of the demon be increasing? At first glance, it appeared the demon was not doing very much at all — just opening and shutting the trapdoor. That surely did not require much expenditure of energy. It was even possible to imagine that the trapdoor was completely frictionless — in which case the demon would be performing no physical work at all!

But, of course, the demon was actually exerting a huge amount of effort — but it was not physical work. No, all the work was in the demon's mind. The demon was having to perform a superhuman feat in his mind, measuring the velocity of every single atom of the gas, and then calculating whether or not the trapdoor should be opened. When the vast number of atoms in the gas is considered, Szilard realised that the increased entropy generated by the superhuman mental processes of the demon could hold the key to solving the mystery.

In 1929, Szilard published this proposed solution to Maxwell's Demon in his paper *On Entropy Reduction in a Thermodynamic System by Interference by Intelligent Subjects*.

The use of the word "intelligent" in the paper's title is remarkable. Up to that point, physicists had only talked about simple, clear properties such as velocities and forces, properties which could be easily measured. But now, for the first time, Szilard was bringing "intelligence" within the domain of the laws of physics.

Physicists had always avoided the concept of intelligence because it was something internal to the human mind — it was not something that could be measured, or studied objectively. After all, we cannot see inside a mind.

But Leo Szilard had managed to see inside the mind of the demon.

Information, entropy, and bits

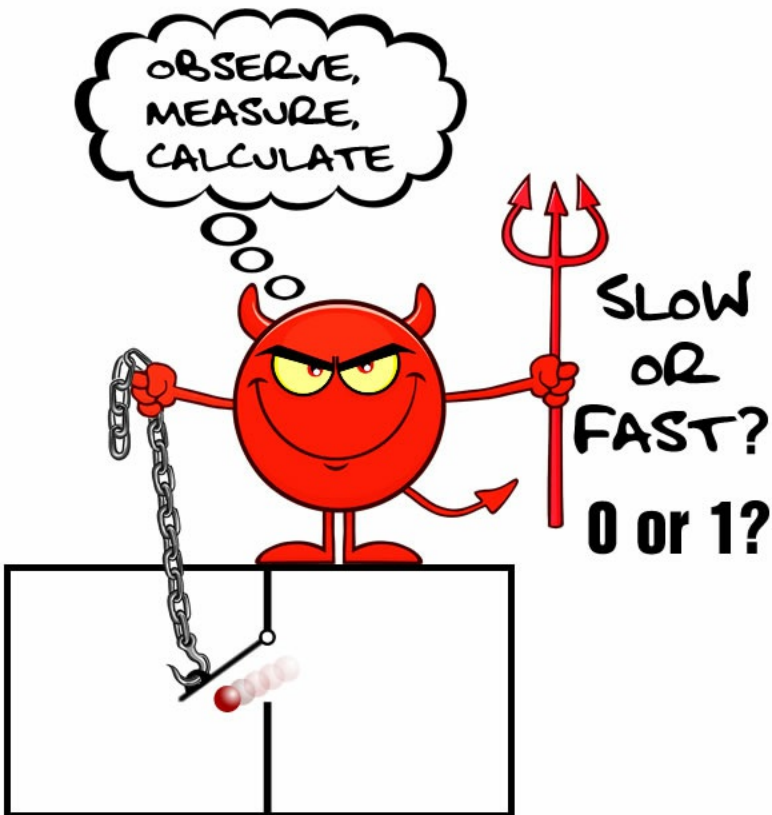
In the remainder of this chapter, let us consider Leo Szilard's solution of Maxwell's Demon in more detail, based on the argument which Szilard presented in his original paper.

The first step taken by Szilard was to simplify the problem. In order to do that, he considered a box which was filled with very little gas. In fact, he considered a box containing just a single atom of gas.

Initially, before the demon has had a chance to do his ordering job, we would consider the gas (at least, the single atom of the gas) to be in a "disordered" state. At that point, the single atom of the gas is flying around the entire box randomly, and at any particular moment in time it could be in one of two positions: either in the left-hand side of the box, or in the right-hand side of the box. The task of the demon is then to "order" the gas, which means using the trapdoor to trap the single atom in either the left-hand compartment or the right-hand compartment — depending on the speed of the atom.

So, in which side of the box should the demon trap the atom? In order to calculate that, the demon must first observe the atom, and measure its velocity. The demon must then use its mind to perform a simple comparison operation to determine if the particle is either slow or fast. On the basis of the result of that operation, the demon then either opens the trapdoor, or leaves the trapdoor closed.

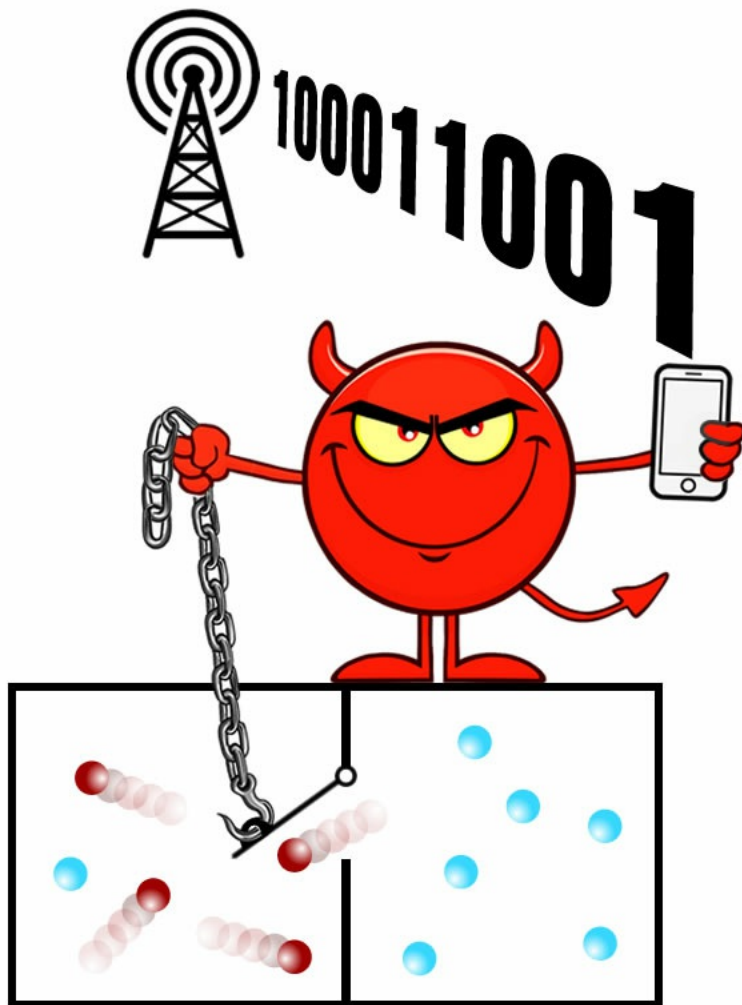
We can therefore see that the end result of all the processing in the demon's mind (observing, measuring, calculating) is to produce just a single piece of **information**, and that single piece of information can take one of only two values: "slow" or "fast". The following diagram shows Leo Szilard's demon, with only a single atom of gas in the box, and the demon having to use its mind to calculate if the atom is "slow" or "fast":



A piece of information which can only take one of two possible values (in this case, "slow" or "fast") is called a *bit*. "Bit" is short for "binary digit". By convention, a bit can only take the value 0 or 1. We might therefore represent a slow atom by a bit with the value 0, and represent a fast atom by a bit with the value 1. The task which the demon must perform in its mind then becomes clearer:

With one atom in the box, the demon must generate one bit of information.

Of course, the demon does not have to calculate the information himself in his own mind. Instead, the calculation could be performed elsewhere by some third party, and then that information could be transmitted to the demon who could then use that information to decrease the entropy of the gas. This situation is shown in the following diagram. In this case, all the atoms of the gas are now in the box. The demon therefore needs a large number of bits of information — one bit per atom of gas. This information is calculated elsewhere, and is then transmitted to the demon as a long string of bits:



You can see in the previous diagram that the demon is now holding a smartphone. The demon receives the transmitted string of bits (zeroes and ones) on his smartphone, and then by reading the information one bit at a time he knows whether to open the trapdoor or leave it closed. Hence, the demon can use the transmitted information to lower the entropy of the entire gas.

So here we have revealed a very important principle: information is the inverse of entropy. If relevant information is available, then that information can be used to lower the entropy of a system. As Paul Davies states in his book *The Demon in the Machine*: "Information is, in some sense, the opposite of entropy."

And, vice versa, if information is lost, then the entropy of the system will increase. We will see that this second point will have major implications later in this book: if information is lost, then entropy will increase.

Back inside the mind of the demon

Let us now return to consider the situation in which the demon processes the information in his own mind. It is in this case that Leo Szilard had his moment of brilliant inspiration. As described earlier, Szilard realised that if the demon reduced the entropy of the gas, then the second law of thermodynamics would then require the entropy inside the demon's brain to increase by at least an equivalent amount.

This was a remarkable discovery. The brain is an incredibly complicated system, containing approximately 86 billion neurons, wired in an almost inconceivably complex manner. Similarly, the range of various thoughts which might be passing through the demon's mind might appear to be uncountably huge in number: "Do I open the trapdoor? Yes or no? It is a fast-moving particle so, yes, I will open the trapdoor."

It might appear impossible that our current knowledge of physics could ever be used to analyse such a complicated system. But, via an indirect technique using the second law of thermodynamics, Szilard had shown how it could be done — at least in the Maxwell's Demon example. Szilard had shown that if we use our minds to process information and make a decision about whether or not to open the trapdoor, the entropy of our brain has to increase by a certain, fixed amount. In this example at least, Leo Szilard had brought the human brain and the workings of the human mind into the domain of exact physics.

So by how much, exactly, would the entropy of the brain have to increase? To answer that question, we have to use the formula of Ludwig Boltzmann which was described at the end of the previous chapter. If you remember, Boltzmann's formula for the entropy of a system was given as:

$$\text{Entropy} = k \ln W$$

where W represents the number of microstates associated with the current macrostate of the system, and k is Boltzmann's constant.

With that in mind, let us once again consider the situation in which there is only a single atom of gas in the box. In this situation, before the demon has performed his ordering operation, we might consider the gas to be in a "disordered" macrostate. The atom is flying around the entire box randomly, and at any particular moment in time it could be in one of two positions: either in the left-hand side of the box, or in the right-hand side of the box. Hence, this "disordered" macrostate is associated with two microstates (remember: microstates deal with the positions of individual particles, individual atoms).

If we then substitute the value of W equal to 2 in the previous equation, we then get the value for the entropy of the initial disordered system as:

$$\text{Entropy} = k \ln(2)$$

And this is therefore the amount by which the entropy of the gas is reduced when the demon performs his ordering operation on the single atom of the gas.

So, even though the brain is an inconceivably complex structure, we have arrived at a very precise result. The entropy of the demon's brain would have to increase by an amount equal to $k \ln 2$. Leo Szilard really had brought the operation of the brain and mind into the domain of exact physics.

But this result raises another question. What is the underlying reason for this precise value of entropy increase in the brain? Where does this value of $k \ln 2$ originate in the processing of information in the brain? In the next two chapters, we will discover the solution to that question.

And we will see that the explanation is entirely logical ...

7

LOGIC

The development of logic dates back to antiquity. In ancient Greece, philosophers such as Aristotle and Plato would often spend their days having arguments about mathematics and philosophy. These arguments would sometimes extend for many days, or remain permanently unresolved. Aristotle believed that it should be possible to develop a clear method for resolving these arguments. How could the truth or falsity of an argument be unambiguously established?

The methods of logic were developed for precisely this reason of settling arguments. It was Aristotle who suggested the first method for determining whether a claim or statement made by one of his fellow philosophers was true or false. With a clear method in place, the philosophers on both sides of the argument would be forced to accept the conclusion.

To understand the basis of Aristotle's approach, it must first be explained that at the core of logic lies statements — or claims — which can be either true or false. No other value is possible. These statements are called *propositions*.

As an example, "The cat is on the mat" is a proposition as it is a statement which can be either true or false. The following image shows how the proposition "The cat is on the mat" could be evaluated to one of two different values:



At this point, you might recognise the similarity between a proposition and a "bit" of information (considered in the previous chapter), as a bit is also restricted to taking only one of two possible values: 0 or 1. We will shortly be returning to consider this similarity.

Aristotle's method of logic was based on stating some initial assumptions, called *premises*. Those premises would be simple propositions which everybody could agree were true. For example, "Socrates is a man" is an example of a premise — a simple statement which everyone can agree is true.

In order to create a convincing *argument*, those initial premises would then be connected to produce a single *conclusion*. Here is a famous example of one of Aristotle's arguments which consists of two premises (the first two lines) and a single conclusion (the last line):

Socrates is a man.
All men are mortal.
Therefore, Socrates is mortal.

It can be seen in this example that the conclusion ("Socrates is mortal") logically follows from the two premises (the previous two lines).

It is important to note that there may be a large number of premises, but **there is only ever one single conclusion**. This crucial point is emphasized by Dr. Siu-Fan Lee in his book *Logic: A Complete Introduction*: "An argument contains one and only one conclusion. If we want to make more than one conclusion, then there must be more than one argument."

Truth tables

The example of Aristotle's argument included two premises ("Socrates is a man" and "All men are mortal"). However, there is no upper limit on the number of premises. Multiple premises can be connected by using *logical operators*.

Logical operators such as AND and OR operate in a similar manner to how they operate in the English language. The following example shows two premises connected by the AND operator:

IF
I have a knife
AND
I have a fork
THEN
I can eat the meal

In this example, the conclusion ("I can eat the meal") is only true if both the first premise **AND** the second premise are true, and is false otherwise. The premises are therefore connected by the AND logical operator. The use of logical operators plays a central role in *Boolean logic*.

Boolean logic is a branch of logic which resembles mathematical arithmetic. In Boolean logic, the logical value TRUE is replaced by the number 1, and the logical value FALSE is replaced by the number 0. In that case, if a premise is true then it is given the value 1, and if it is false then it is given the value 0.

In arithmetic, numbers are connected using operators such as addition and multiplication. A similar principle applies in Boolean logic, except the operators are the logical operators such as AND and OR.

The functioning of those logical operators can then be illustrated by the use of a *truth table*. As an example, the truth table for the AND operator in Boolean logic is:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

In the previous truth table, the two inputs, A and B, are listed in the two left-hand columns. The output of the AND operation is listed in the right-hand column. As you can see, the result of this operation is only equal to 1 when **both** of the inputs, A **and** B, are equal to 1.

Similarly, the truth table for the OR operator in Boolean logic is:

A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1

As you can see, the result of this operation is equal to 1 when **either** of the inputs, A **or** B, is equal to 1.

The simplest Boolean operation is the NOT operator. This simply acts to invert the input value, as shown in the following truth table:

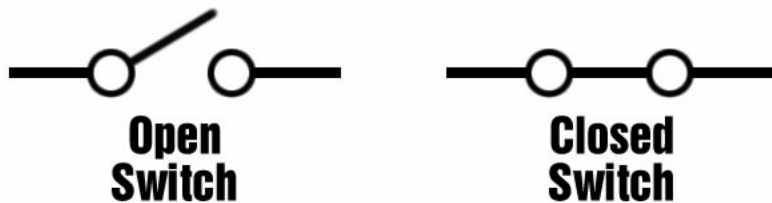
A	NOT A
0	1
1	0

As you can see from the previous truth table, the result of a NOT operation will be 1 if the input is 0, and it will be 0 if the input is equal to 1.

The electrical circuits of Claude Shannon

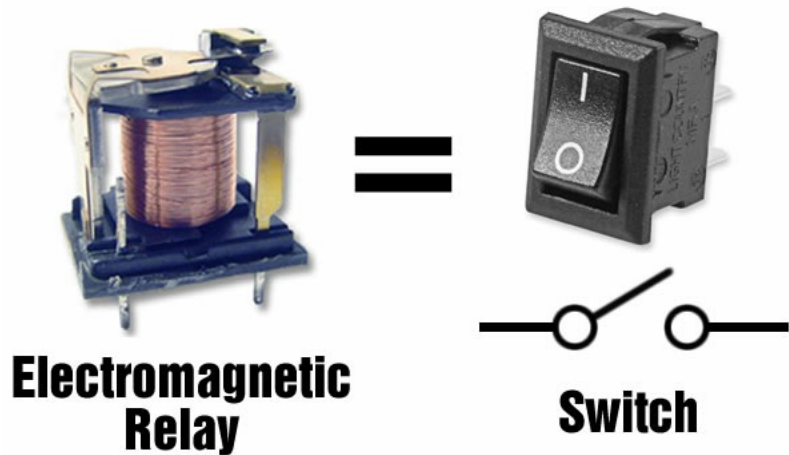
Boolean logic, developed in the mid-1800s, might well have vanished as nothing more than a footnote in history had it not been resurrected in America in 1938 by the mathematician Claude Shannon. At the time, Shannon was a 21-year-old master's degree student at MIT, studying electrical engineering.

To understand Shannon's breakthrough, it must be realised that Shannon — as a student of electrical engineering — was well-acquainted with electromechanical *relays*. A relay is a type of switch. We all know how a switch works, just like the switch that turns the light on and off in your room. A switch is a mechanical device which you can move with your finger to open or close an electrical circuit. When a switch is *open*, there is no direct path for current to flow through the switch, but when the switch is *closed*, current can flow between the two terminals:



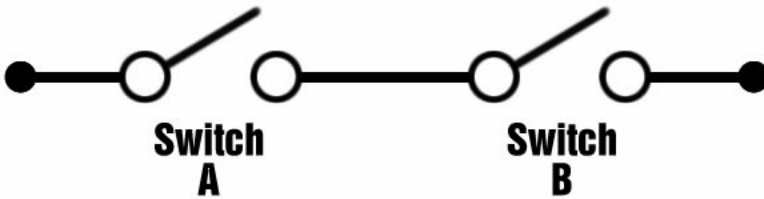
A relay operates in the same way as a mechanical switch, except that the mechanical movement to open and close the switch is caused by an electromagnet attracting a piece of metal. In this way, an electric current can cause the switch to be closed — instead of your finger doing the job.

The following diagram shows how an electromagnetic relay is a form of switch:



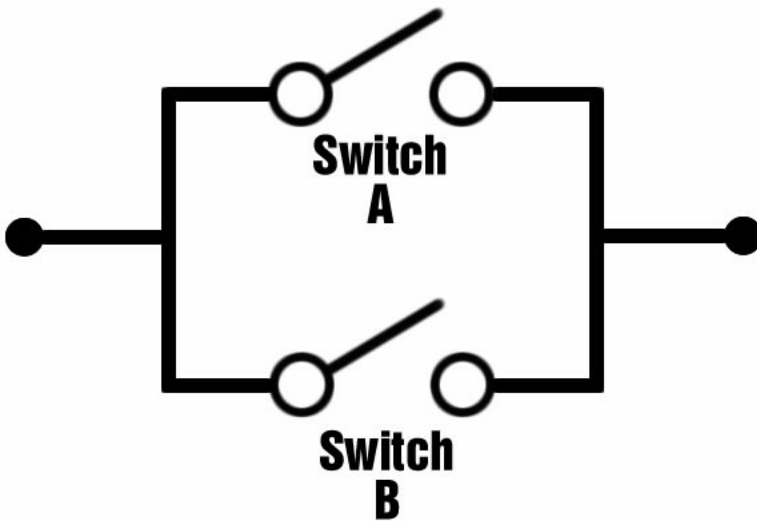
Note that the mechanical switch on the right-hand side of the diagram has been labelled with the two values 0 and 1. This immediately reveals that a switch is a perfect device for processing Boolean logic. In the mechanical switch, the value 1 is being used to signify a closed circuit (current can flow, so the device would be turned on), and the value 0 is being used to signify an open circuit (no current can flow, so the device would be turned off).

Even though Claude Shannon was studying electrical engineering, he had studied Boolean logic in an undergraduate philosophy course, and this is where his breadth of knowledge proved invaluable (Shannon said later "It just happened that no one else was familiar with both fields at the same time"). Shannon realised that it would be possible to create Boolean logic operations using these relay switches. The idea was simple — brilliantly simple. As an example, Shannon realised that it would be possible to implement an AND operation simply by connecting two switches in *serial* ("serial" means connected in sequence, on the same wire):



As you can see on the previous diagram, when two relay switches are connected in serial, then there will only be a connection along the total length of the wire when **both** switch A **and** switch B are closed. Therefore, this forms a simple implementation of a Boolean AND operation.

Similarly, two switches connected in *parallel* ("parallel" means they are connected side-by-side) would implement a Boolean OR operation:



As you can see on the previous diagram, when two relay switches are connected in parallel, then there will be a connection along the total length of the wire when **either** switch A **or** switch B is closed. Therefore, this forms a Boolean OR operation.

The biographer Walter Isaacson has written a book about the pioneers of computing titled *The Innovators*. In *The Innovators*, Isaacson describes how Shannon brought Boolean logic to electrical circuit design: "Shannon figured out that electrical circuits could execute these logical operations using an arrangement of on-off switches. To perform a AND function, for example, two switches could be put in sequence, so that both had to be on for electricity to flow. To perform an OR function, the switches could be in parallel so that electricity would flow if either of them was on. In other words, you could design a circuit containing a lot of relays that could perform, step-by-step, a sequence of logical tasks."

Shannon had shown how electrical circuits could be designed to perform any logical function. According to the computer scientist Herman Goldstine, Shannon's work "helped to change digital circuit design from an art to a science". In his book *The Innovators*, Walter Isaacson describes Shannon's 1938 master's thesis as "the most influential master's thesis of all time". (Do not confuse this work of Shannon with his later groundbreaking work on information theory, which was described in my ninth book. The two different achievements are completely separate.)

As Walter Isaacson states at the end of his previous quote, Shannon had shown how to "design a circuit containing a lot of relays that could perform, step-by-step, a sequence of logical tasks". A device which can perform, step-by-step, a sequence of logical tasks is a computer. So Shannon had shown how a computer could be constructed using mechanical relays. Indeed, in 1941, the German engineer Konrad Zuse used 2,600 relays to build the Z3 computer. The Z3 was the world's first programmable digital computer (just to be clear, the Colossus computer which was made in Britain in 1944 — and was featured in my seventh book — was the world's first programmable **electronic** computer).

Here is a photograph of a replica of the Z3 computer on display at the Deutsches Museum in Munich. You can see the relays in the cabinet:



But the Z3 had a problem, a problem shared by all electromechanical computers. The root of the problem is that mechanical relays have moving parts, and moving parts are slow. As a result, the Z3 could only perform five to ten logical operations per second. We might compare this to a modern digital computer which can perform several billion instructions per second.

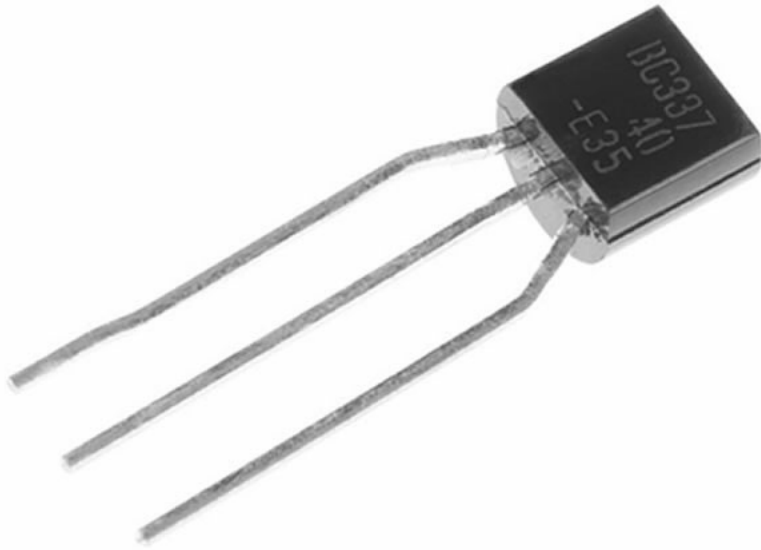
So where did the massive increase in speed come from? It came from a miniature device which was invented in 1947, as we shall now see ...

Electronic logic gates

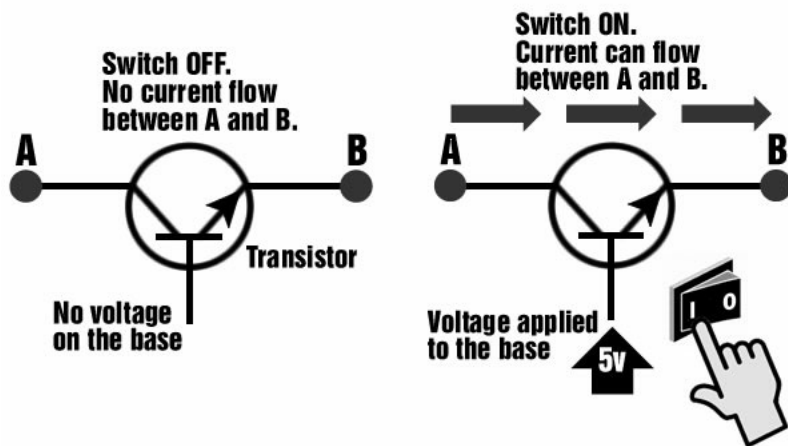
As has just been explained, mechanical relays could perform logical operations, but they were slow. The problem was that mechanical devices have moving parts. If a fast, practical computer was ever going to be developed, it needed a device which could perform logical operations without involving moving parts.

The solution arrived with the invention of the *transistor* in 1947. A transistor is a switch — just like a relay — but a transistor has no moving parts. Instead of the switching being achieved by the movement of a mechanical switch (by your finger, for example), a transistor is switched on and off by the application of a voltage to one of its three legs (the leg which is known as the *base*).

Here is a photo of a transistor (its actual size would be only about two centimetres long in total). Note the three legs:

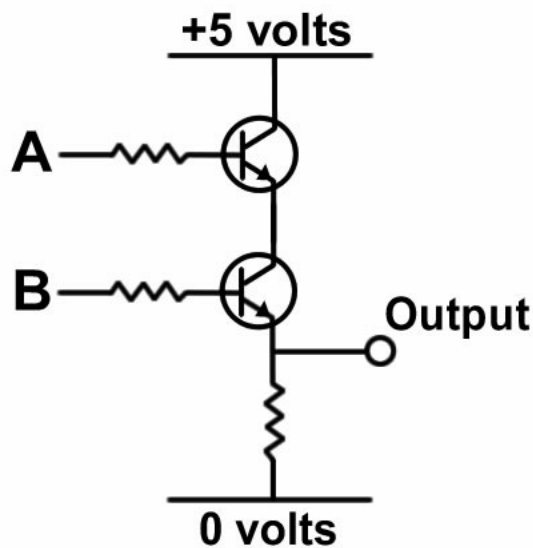


The following diagram shows a transistor being switched on and off by the application of a voltage (effectively equivalent to a mechanical switch being switched on and off by a finger). The large black circle with the three black wires coming out of it is the standard representation of a transistor in circuit diagrams:



Just as Claude Shannon had shown it was possible to use mechanical switches to perform Boolean logical operations, so it was possible to use transistors as switches and arrange them into electronic circuits which could perform Boolean logic. Extremely fast computers could then be constructed.

These simple electronic circuits which can perform logical operations are called *logic gates*. The following diagram shows an actual circuit diagram which uses two transistors to implement an AND logic gate:



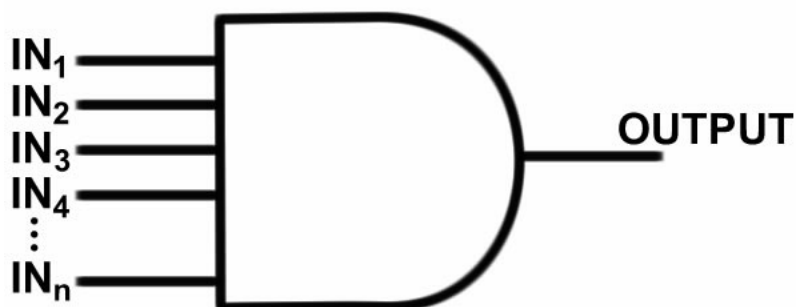
Remember from the previous section on Claude Shannon's electrical circuits that an AND logic function can be implemented by two switches in series. Well, that is precisely what we see in the previous diagram. You can see in the diagram that the two transistors are connected in series along the vertical wire. That immediately tells us that this is an AND gate. Let us now consider how this logic gate works.

If either input A or input B are at zero volts, then one or other of the transistors (switches) will be turned off, breaking the circuit along the vertical wire. In that case, you can see that the output will only be connected to the zero volt line (i.e., the output will be zero). This is the behaviour we would expect from an AND gate: if either one of the inputs is 0, then the output will be 0. However, if both of the inputs are 1, then both of the transistors (switches) will be turned on, and the output will be directly connected to the five volt line (i.e., the output will be 1). Again, this is the behaviour we would expect from an AND gate: if both of the inputs are 1, then the output should also be equal to 1.

In circuit diagrams, an AND gate is denoted by the following symbol:



However, there is no reason why a logic gate should be restricted to having just two inputs. An AND gate with multiple inputs would look like this:



In the multiple input AND gate shown in the previous diagram, the output would be 1 only when **all** of the inputs are equal to 1, and would be 0 otherwise.

Note that — although there is no upper limit on the number of inputs to a logic gate — there is only ever one single output from a logic gate. The structure of a logic gate therefore mirrors the structure of an argument in logic. As described earlier, there is no upper limit on the number of premises in a logical argument, **but there is only ever one conclusion**. This principle is shown in the following argument which connects multiple premises using a multiple input AND operator. Note there is only a single conclusion:

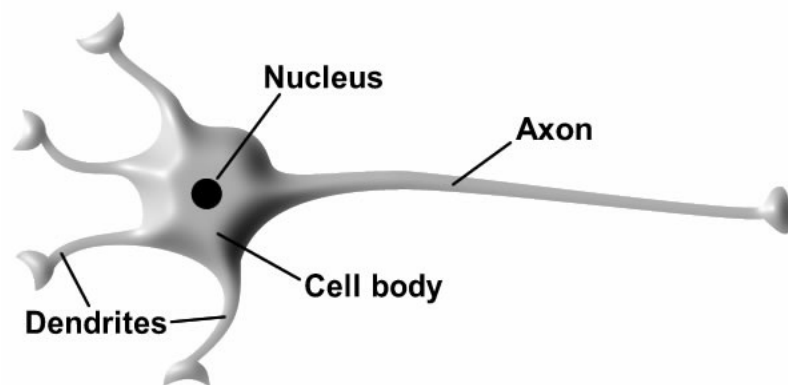
IF
 I have a knife
AND
 I have a fork
AND
 I have a plate
AND
 I have some food
THEN
 I can eat the meal

And when we start to consider this structure of a multiple input logic gate, we find an uncanny similarity with the structure of another type of information processing unit ...

The structure of a neuron

The brain is composed of an incredibly complex network of approximately 86 billion cells which are called *neurons*. In that sense, we might think of neurons as the "building blocks" of the brain. It is these neurons which transmit information throughout the brain, and allow information processing to take place. Somehow, it is the processing of information by these neurons which gives rise to consciousness.

The following diagram shows the structure of a neuron. As with all cells, a neuron has a cell body which contains a nucleus at its centre. Information enters the neuron via *dendrites*, which are branches which emerge from the cell body (shown on the following diagram). These dendrites receive input signals from previous neurons in the network. There may be in the region of a hundred dendrites on a single neuron. However, a neuron only ever has a single output, which is called an *axon*. Here is a simplified diagram of a neuron, only showing the features which are essential for this discussion:



Inside the brain, the length of a neuron's axon might be as little as a millimetre. However, the axon which transmits information from a motor neuron in the spinal cord to the foot (telling a foot to move) can be a metre in length. This makes it clear that what we call "nerves" are, in fact, the axons of neurons (which are themselves "nerve cells"). To put it simply, all information in the body is transmitted by neurons.

Information is transmitted along an axon by a series of rapid spikes of electrical charge. These spikes can travel at a speed of over 100 metres per second. The mechanism which produces these spikes will be considered later in this

book.

So, to sum up the structure of a neuron:

- Dendrites (inputs) bring information to the neuron, and there can be many dendrites on a single neuron.
- The axon (output) carries information out of the neuron, and **there is only ever one axon (output) on a neuron.**

The similarity with the logical structures we have considered so far in this chapter is clear. Truth tables, arguments in logic, and multi-input logic gates all have multiple inputs (no upper limit on their number) **but only one conclusion (output)**. This is precisely the structure we see in neurons, with a large number of dendrites (inputs) but only ever one axon (output). It is as if logic is inscribed into the structure of each and every neuron.

But why should the structure of neurons necessarily take this logical form? It is because if you want to do anything useful with information processing, to solve some problem or puzzle, or to achieve some goal, or to come to some conclusion, then **you have to use logic**.

To illustrate this point, we might consider an example in which an early ancestor of *homo sapiens* might have been walking across the African savannah many millennia ago. Suddenly, he spots a lion on the horizon. He has to think of a way to escape from the hungry lion. In that case, he would have to use logic in order to devise a suitable escape strategy. His logical thought process might then be as follows:

IF

I can reach the lake before the lion

AND

I can swim faster than the lion

THEN

I will escape from the lion.

So logic is required for any form of mental activity in which reasoning is required in order to do something useful, such as solve a puzzle, or build a house, or grow crops successfully, or escape a hungry lion. So, as an evolutionary necessity, **the human brain emerged as a device for processing logic**.

The reason for the logical structure of neurons then becomes clear.

Many great names in the history of science — including Alan Turing, George Boole, and Gottfried Leibniz — have believed that an understanding of logic is the key to understanding the working of the human mind. In the book *Introducing Logic*, we find the thoughts of the great German mathematician Gottfried Leibniz: "Logic is no longer a tool for convincing arguments but rather a system of rules of thought, so that even God's thought is necessarily logical. Even He could not create a world where a contradiction is true."

In this chapter, we have seen how the human mind (and the mind of God) would necessarily have to follow the laws of logic. Presumably, even a demon would have to use the laws of logic. Might this, then, provide the clue we need to finally unlocking the mystery of Maxwell's Demon ...

8

LANDAUER'S PRINCIPLE

The green and leafy town of Yorktown Heights is located in upstate New York, about forty five miles from New York City. The peaceful nature of the town — coupled with its proximity to New York — has made it a desirable location for commuters, being just a fifty minute train ride from Grand Central Station.

Yorktown Heights is also where the research division of the giant computer corporation IBM has been located since 1961. Named after IBM's founder, the Thomas J. Watson Research Center has been responsible for some of the most important breakthroughs in computing, including the invention of dynamic random access memory (DRAM), the FORTRAN programming language, and the discovery of fractals (by Benoit Mandelbrot, while he was working for IBM at Yorktown Heights).

The period of the early 1960s was the start of the computer revolution. The research center at Yorktown Heights had been established with the aim of discovering the fundamental laws of computing.

One of the research scientists in the IBM facility was Rolf Landauer. As part of the programme to determine the limits of computing, Landauer was charged with exploring ways of reducing the amount of heat produced by a computer.

Here is a photograph of Rolf Landauer during his time at IBM:



Landauer successfully analysed the reason underlying the heat production of a computer. But his work also revealed a surprising side effect. It was to be that side effect which finally solved the problem of Maxwell's Demon. And, as we shall now see, Landauer's solution had logic at its very core ...

The irreversibility of logic

In order to analyse the production of heat by computers, Landauer considered how computers process information

using logical operators. As we have seen in the previous chapter, electronic logic gates such as AND and OR form the core of information processing in a computer. Landauer noted something interesting about all of these logic gates. To understand what Landauer noticed, let us once again consider the truth table of an AND gate:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

} Same outputs

Landauer realised that this truth table is irreversible. It is irreversible in the sense that once the logic gate has processed its inputs to calculate the output, you cannot then operate the logic gate in reverse to regenerate the inputs. We can see why this is the case from the previous truth table for the AND gate. If the output of the gate is 0, you can see that we cannot be certain if the input pairing had been 0 and 0, or 0 and 1, or 1 and 0 (on the previous truth table, you can see that those three conditions are grouped under the label "Same outputs"). So the logic gate cannot be operated in reverse as it is simply impossible to know what the inputs had been if you only know the output.

In his landmark 1961 paper, Landauer referred to this type of irreversibility as *logical irreversibility*. As Landauer said in his paper: "We shall call a device logically irreversible if the output of a device does not uniquely define the inputs. We believe that devices exhibiting logical irreversibility are essential to computing." [1]

In this quote, Landauer is defining logical irreversibility as the situation in which "the output of a device does not uniquely define the inputs". This is precisely the situation we have been considering with the AND gate in which knowledge of the output does not allow you to determine the particular values of the inputs.

The second part of Landauer's quote is also interesting. By saying that "We believe that devices exhibiting logical irreversibility are essential to computing" he is essentially making the same point which was made in the previous chapter of this book. In that chapter, it was explained that if you want to do anything useful with information processing, then **you have to use logic**. In his belief that logical irreversibility is "essential to computing", Landauer is making the same point that logic is essential to computing.

In computing, you simply cannot avoid logic, and you therefore cannot avoid irreversibility.

The inevitable production of heat

In his attempt to reduce the heat output of computers, Rolf Landauer realised that there would be a remarkable side effect of this logical irreversibility. To understand what Landauer realised, we need to return to consider Maxwell's Demon.

If you remember, the demon was able to reduce the entropy of the gas if he obtained **information** about the position and velocity of the atoms in the gas. Hence, it was explained that there is an inverse relationship between information and entropy. If information increases, then entropy decreases. And, vice versa, as stated in Chapter Six, "if information is lost, then entropy will increase".

So when Rolf Landauer examined these irreversible logic truth tables, he realised that information was, indeed, being lost in a logic gate. For example, a two-input AND gate takes two bits as input, and produces a single output bit. If you only have access to that output bit, you cannot then tell with certainty what the two inputs of the gate had been. This is due to the logical irreversibility of the gate. Before the operation of the logic gate, you knew the value of both of the inputs, but after the operation of the logic gate, you no longer know the value of both of the inputs. Hence, you do not know as much after the application of the gate as you did before the application of the gate. So some information would have been lost.

Another simple way of understanding that information must be lost in a logic gate is due to a logic gate having, for example, two input bits but only ever one output bit. Hence, one bit of information is lost. It is as simple as that.

This point was made by Francis Crick in his book about consciousness titled *The Astonishing Hypothesis*. In the following quote from that book, Francis Crick compares the operation of neurons to logic gates, and realises that information must be lost: "One characteristic of a neuron is already fairly clear. A single neuron can fire at different rates and, to some extent, in different styles. Even so, in any period of time it can only send out limited information. Yet during that time the potential information coming into it, through its many synapses, is very large. In this process — going from its input to its output — **there must be a loss of information.**"

As a result of this information loss, Landauer realised that entropy would increase (due to the inverse relationship between information and entropy). What form would this increase of entropy take? Well, it was explained in Chapter Five how Rudolf Clausius discovered the close connection between entropy and heat. Entropy is a measure of disorder, and disorder at the atomic scale is heat. So the increase of entropy would take the form of the production of an amount of heat.

How much heat would be produced? To answer that question we need to return to the result of Rudolf Clausius in Chapter Five. If you remember, Clausius defined the increase in the entropy of a system as:

$$\text{Entropy change} = \frac{\text{Heat}}{\text{Temperature}}$$

By reorganising this equation we get:

$$\text{Heat} = \text{Entropy change} \times \text{temperature}$$

So, to calculate the amount of heat produced, we simply need to multiply the increase of entropy by the ambient temperature. In Chapter Six it was explained that the amount of entropy associated with a single bit is $k \ln 2$. So, for every single bit of information lost in a logic gate, Landauer realised that $kT \ln 2$ joules of heat would be produced (where T is the ambient temperature).

This was a remarkable discovery, and it is called *Landauer's principle*. Computing pioneer Charles Bennett has said that Landauer's principle is "often regarded as the basic principle of the thermodynamics of information processing". [\[2\]](#)

I am convinced that the implications of Landauer's principle are not generally realised. Landauer had shown that any attempt to completely eliminate the heat produced by a computer would be doomed to failure — it is completely impossible. We might listen to the cooling fan spinning on our laptop computer and imagine that — given better technology or better design — the heat produced by the computer could be completely eliminated and so the fan would be unnecessary. However, that is not the case. Landauer had shown that whenever you have the logical processing of information, **heat must be produced.**

Rolf Landauer refers to this fact in his original 1961 paper, referring to the dissipation of heat in a computer: "The relevant point, however, is that the dissipation has a real function, and is not just an unnecessary nuisance."

So heat must be produced by a computer. In fact, heat must be produced by any system which processes information in a logical manner, be it an iPad, or a digital watch — or a brain. In a nutshell, **logical information processing must produce heat.**

This production of heat is very noticeable in the human brain. The average power consumption of a human at rest is 100 watts. The brain has a power consumption of approximately 20 watts, which means that a fifth of the entire power consumption of a human is being used by the brain — and almost all of the energy used by the brain is converted into heat. Twenty watts represents a lot of heat (compare to a sixty watts incandescent light bulb — it is very hot).

In fact, if you were not aware of the true function of the brain, the production of heat would be its outstanding feature, and you might well imagine that was its main purpose. As an example, the philosopher Aristotle believed that the main function of the brain was for cooling the blood, with the brain acting as a radiator.

And this discussion about Landauer's principle and its implications (such as the production of heat) represents the final answer to the mystery of Maxwell's Demon. The entropy of the demon increases because of the processing of information in the demon's brain. The entropy increase would manifest itself as the production of heat from the brain of the demon. The entropy (disorder and randomness) of the heat produced by the brain of the demon would be more

than enough to outweigh the reduction of entropy caused by the demon ordering the atoms of the gas.

The second episode of the excellent BBC documentary series *Order and Disorder* presented by Prof. Jim Al Khalili considers Landauer's principle as a solution to Maxwell's Demon. Here is a link to a video on YouTube:

<http://tinyurl.com/videmaxwell>

The discussion of Maxwell's Demon and Landauer's principle is at the 52-minute mark.

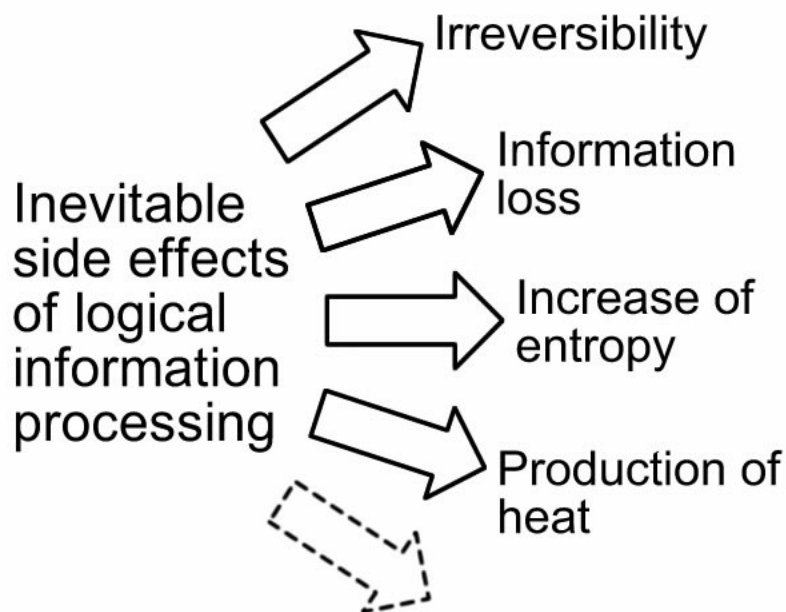
The video considers the slightly different situation in which the information is not immediately lost in the logic gates. Instead, the demon stores that information in memory rather than deleting it. But, as the video explains, eventually the demon runs out of memory and has to delete the information after all — so the end result is the same.

Side effects

This discussion of Landauer's principle has revealed that there are four side effects associated with the logical processing of information.

Firstly, when we studied the truth tables of logical operators, we found that they were irreversible. Secondly, we have seen that this logical irreversibility leads to the loss of information across the gate. Thirdly, because of the inverse relationship between information and entropy, the loss of information leads to an increase of entropy. Finally, that increase of entropy would manifest itself as the production of heat from the gate.

The following diagram shows these four inevitable side effects of logical information processing:



Note that a blank position has been included at the end of the diagram. Might there be a fifth side effect of logical information processing?

We will find out in the next chapter ...

9

THE MAKING OF A THEORY OF CONSCIOUSNESS

What do we mean by a "theory"?

Firstly, a scientific theory should be able to predict the outcome of experiments and observations with accuracy. As an example, one of the central theories in physics is the theory of general relativity, which is a theory of gravity. The theory can be used to predict the motions of the planets around the Sun with great accuracy. So a theory makes predictions.

This introduces another important property of a scientific theory: it can be falsified. For example, if I was to suggest a different theory of gravity, but my theory failed to correctly predict the motion of the planets (which general relativity predicts with great accuracy), then my theory would have been falsified. In that case, general relativity would have successfully repelled the challenge from my theory.

These aspects of a theory would apply to any potential theory of consciousness. The theory would need to make predictions about whether or not a system is conscious. That system might be a biological system (a brain) or an electronic or mechanical system.

But a theory should be more than just a generator of predictions. A theory should also provide an *explanation*. An explanation requires a deep understanding of **why** a particular phenomena occurs.

This point is made by the physicist David Deutsch in his book *The Fabric of Reality*. The first chapter of that book is devoted to describing why a theory is an explanation. According to Deutsch: "Our best theories embody deep explanations as well as accurate predictions."

I would also suggest that, to be an explanation which would satisfy a physicist, the explanation would ideally be phrased in terms of the behaviour of low-level, fundamental entities, such as particles, or fields, or space or time. A scientific explanation needs to be deep, referring to some low-level of reality.

Bearing all of this in mind, in the remaining chapters of this book, an original theory of consciousness will be presented. It will be based on the material we have covered so far in this book, in other words, it will have a firm basis in mainstream, orthodox physics. It will attempt to connect to reality at a deep level (the atomic level). It will be seen that the theory largely agrees with our intuitive notions about consciousness.

Perhaps, best of all, it is a simple theory.

OK, let's go ...

An imaginary survey of physicists

I think it would be fascinating to organise a survey.

This survey would require the assistance of 100 of the leading theoretical physicists in the world today. Each physicist would be asked for his or her opinion as to what is the most likely solution to the mystery of consciousness. Theoretical physicists are a bright bunch of people, so you would think that they would know the answer, or at least the likeliest answer.

As far as I am aware, no such survey has ever been conducted, so we will have to use our imagination. Fortunately, I think I have a fair idea of the outcome.

Firstly, I suspect a large proportion of the physicists would refuse to answer the question, stating that they regard the subject of consciousness to be subjective and unscientific.

Secondly, I suspect a small percentage of the physicists would state that they agree with the controversial theory of consciousness presented by the physicist Sir Roger Penrose. Penrose's theory was first presented in his book *The Emperor's New Mind* in 1989. In his book, Penrose suggested that quantum mechanics plays the central role in generating consciousness (see my ninth book for details). Everybody loves Roger Penrose, but, unfortunately, I think it is fair to say that very few physicists agree with his idea. The small percentage who might agree with it in the survey would probably only be saying that because Sir Roger's theory is the only theory of consciousness that they know.

So, regarding my survey, up to this point it seems to be a case of "so far, so bad". The physicists do not seem to agree, and candidate theories — those theories which would be known by physicists — are few and far between, and suspected to be wrong.

But all is not lost.

Out of the physicists who provide an answer, who are prepared to suggest a likely solution, I am convinced one solution would have a huge lead in popularity over all the other proposed solutions. And it would simply be this:

Consciousness is an emergent phenomenon which arises from information processing.

You will notice the two key points in this sentence being the words "emergent" and "information processing". The word "emergent" simply refers to the idea that consciousness is a macroscopic effect — a human-scale effect arising from the interaction of trillions of microscopic particles. This was covered back in Chapter Four, so let us concentrate on the idea that consciousness arises from information processing.

Let us consider some of the high-profile physicists who would likely suggest this solution. In his book *Life 3.0*, Max Tegmark — a physicist at MIT — includes a chapter on consciousness. In that chapter, Tegmark states: "I'd been arguing for decades that consciousness is the way information feels when being processed in certain complex ways."

So here is one example of a physicist suggesting that consciousness arises from information processing.

As another example, in a post on her popular blog *Backreaction* (in the post "Electrons Don't Think"), the outspoken physicist Sabine Hossenfelder is dismissive of any alternative explanation of consciousness: "Consciousness is an act of information processing. I don't understand why some people think there's something mysterious about it."

So, as I suggested, a survey of 100 physicists would probably result in the majority view that consciousness arises from information processing. The reason why they should come to this conclusion is described by the physicist Paul Davies in his book *The Demon in the Machine*: "One thing isn't contentious: the brain processes information. It is therefore tempting to seek 'the source of consciousness' in the patterns of information swirling inside our heads."

As Paul Davies says, the brain is an information processor, and our consciousness is certainly produced by the brain. It would therefore appear to be logical to imagine consciousness arising from the processing of information — maybe as a side effect.

In fact, that conclusion can seem to be so logical as to be almost beyond doubt. As James Stone says in his book *Principles of Neural Information Theory*: "Neurons communicate information, **and that is pretty much all they do.**"

On the basis of that quote, the proposed solution of the physicists can seem like the obvious conclusion:

- 1) There are 86 billion neurons in the brain.
- 2) All they do is process information.
- 3) Consciousness arises as a result.
- 4) Therefore, the logical conclusion is that consciousness arises from the processing of information in the brain.

Expressed in this way, it is clear why, I would suspect, this would be the most popular solution among physicists.

However, those physicists who suggest this solution would not necessarily know the details as to **how** consciousness arises from information processing. And that is the challenge for anyone with a physics background who is attempting to try to solve the mystery of consciousness. That is the challenge which we will attempt to solve in the remainder of this book.

And, as a first step towards that solution, we should take special notice of this idea that consciousness is a **side effect** of information processing. That would appear to be a crucial clue, as, in the previous chapter of this book, we have already encountered several side effects of information processing ...

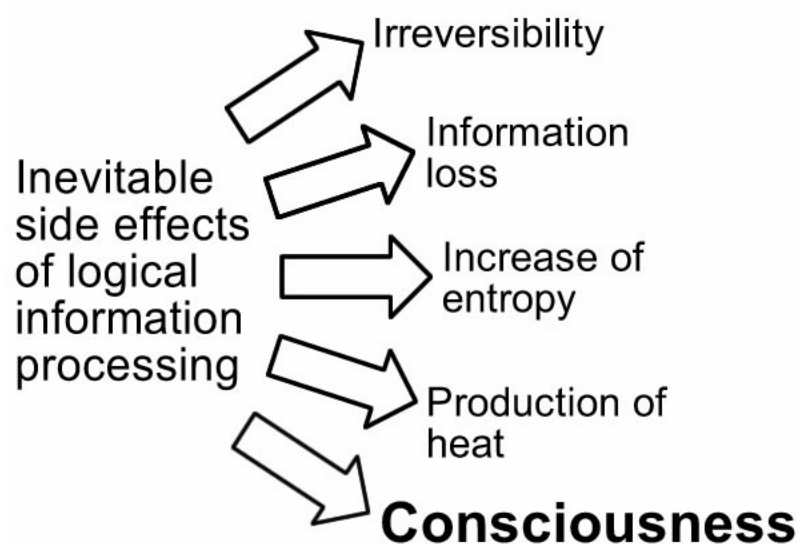
The fifth side effect

I would suggest that there is a very important point which must be appreciated in the attempt to understand the link between information processing and consciousness. The point is that the information processing which is performed in the brain is not of some arbitrary nature. It must be, as described in Chapter Seven, **logical** information processing.

Once it is realised that the brain must perform logical information processing, then I think that is the first step towards a solution to this mystery. This is because — as explained in the previous chapter — any logical information processing system necessarily introduces Landauer's principle. The system would inevitably lose information in its logic gates (or neurons) and so it would be necessary to use Landauer's principle to fully describe the behaviour of the system. In that case, it might be said that the system *invokes* Landauer's principle.

And, as described in the previous chapter, if a system invokes Landauer's principle then side effects will inevitably be introduced. Those side effects would include irreversibility and heat production (a diagram of the four side effects was included in the previous chapter). And the idea of side effects appearing in an information processing system should make our ears prick up and set alarm bells ringing, because — as has just been explained — **many physicists suggest that consciousness is also a side effect of information processing.**

On that basis, it is a relatively small leap to suggest that consciousness is a fifth inevitable side effect of logical information processing, as shown in the following diagram:



This idea forms the crux of the theory of consciousness described in this book. The idea is as follows:

Consciousness is an inevitable fifth side effect of logical information processing, as described by Landauer's principle.

Well, I told you it would be a simple theory!

Now, even though at the start of this chapter I stated that a theory should include an **explanation** of a phenomenon at a deep level, I am not going to include an explanation of the theory at this stage of this book. The proposed explanation will come later in this book. For now, this idea is being suggested as a tentative hypothesis which we will examine in the chapters to come.

In the following chapters, this idea will be used to test for the generation of consciousness in various systems.

DOES THE PRIMARY VISUAL CORTEX GENERATE CONSCIOUSNESS?

In 1952, the structure of the DNA molecule was discovered by Francis Crick and James Watson, who were working at the legendary Cavendish Laboratory in Cambridge, England. They were both awarded the Nobel Prize in 1962 for their discovery. However, it is not so well known that Francis Crick had an interest in solving another great mystery of biology. Crick was fascinated by the mystery of consciousness. And so it was that, in 1976, at the age of sixty, Francis Crick left Cambridge for California and started to pursue his interest in consciousness.

Crick started a collaboration with a young German-American neuroscientist named Christof Koch who was based at the California Institute of Technology (Caltech). It was to be a close and fruitful relationship which would continue until Crick's death in 2004. Together, Crick and Koch were determined to show the wider community that consciousness could be studied scientifically.

Crick and Koch wanted nothing to do with the endless philosophical discussions which had dogged the subject for centuries. Instead, they were only interested in developing **scientific** experiments which had the potential to shed light on consciousness. They chose to specialise on experiments which involved the human visual system.

One of the main reasons they chose to focus on vision was because it is easy to create optical illusions which provide insights into consciousness. In particular, it is possible to create optical illusions in which the consciously-perceived image can randomly switch between two different shapes.

As an example of this phenomenon, we might observe the following image of a vase, known as Rubin's vase:



As you stare at the vase, the image might suddenly switch so that you instead become consciously aware of the two faces staring at each other (the two faces on the side of the vase). Then, after a short period of time, the consciously-perceived image might switch so that you see the vase again.

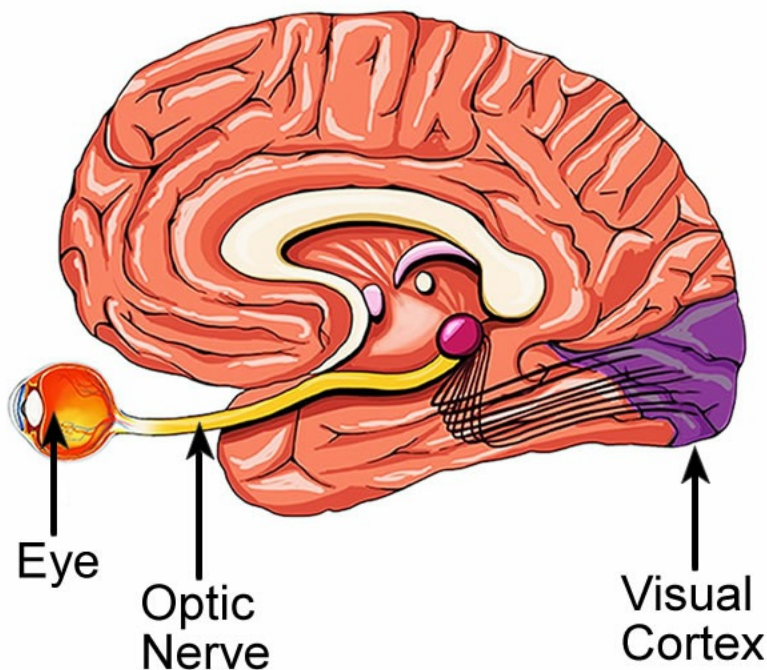
But throughout all of this switching process, **the raw data presented to your eyes does not vary**. So the

switching in your conscious perception must be entirely due to some switching in the activity of the neurons in your brain. Crick and Koch realised that if those switching neurons could be identified, then that would provide an insight into which parts of the brain were responsible for generating consciousness.

Francis Crick describes this approach in his 1995 book about consciousness titled *The Astonishing Hypothesis* (in the following quote, the "percept" means the perceived image): "Can we find neurons whose behaviour always correlates with the relevant visual percept? One way to do this would be to set up situations in which the visual information coming into the eyes remains the same but the percept changes. Which neurons change their firing, or style of firing, when the percept changes?"

It would appear that this approach could be used to identify the regions of the brain which are responsible for consciousness. Conversely, any region of the brain in which the neurons were **not** switching could then be deduced to be **not** playing a role in generating consciousness. And that resulted in Crick and Koch paying particular attention to the *primary visual cortex*.

The primary visual cortex is located at the back of the brain, and it is the first region of the brain to receive the raw visual data from the retina of the eye. The following diagram shows how the data is copied from the retina, along the optic nerve, to the primary visual cortex:



If we consider the Rubin's vase experiment again, we can see that the neurons in the retina contain the raw visual data from the image. Therefore, the activity of those neurons would not be switching as your conscious perception of the vase is switching.

The data in the primary visual cortex is just a copy of that data in the retinal neurons (copied along the optic nerve). Therefore, the activity of those neurons in the primary visual cortex would also not be switching as your conscious perception is switching. It would therefore appear logical to conclude that the primary visual cortex of the brain is not responsible for generating consciousness.

This conclusion of Crick and Koch is described by the physicist Max Tegmark in his book *Life 3.0*: "This same research controversially suggests that the primary visual cortex at the very back of the head is as unconscious as your eyeballs and your retinas."

Therefore, according to the reasoning of Crick and Koch, the primary visual cortex is a region of the brain that does not generate consciousness. Let us now apply the simple theory of consciousness described in the previous chapter to see if it comes to the same conclusion.

A simple test for consciousness

Allow me to remind you of the theory of consciousness described in the previous chapter. The theory says that consciousness is an inevitable side effect of logical information processing — as long as that information processing invokes Landauer's principle.

So the central question we need to answer is: "Is Landauer's principle invoked by the information processing?" One way to answer that question is by examining the inputs and outputs of the system which are captured in the form of a truth table. The truth table is then examined to determine whether or not it is irreversible. As was described in Chapter Eight, irreversibility in a truth table is a sure sign of information loss — which leads to an increase of entropy, the production of heat, and the invocation of Landauer's principle.

The following rule is then applied:

- If the truth table is **reversible**, then the system is declared to be **NOT** consciousness-generating.
- If the truth table is **irreversible**, then the system **IS** declared to be consciousness-generating.

It is hard to imagine a simpler test for the generation of consciousness!

The whole of Chapter Three (and a song!) was devoted to this subject of irreversibility. Hopefully it is now becoming clearer how irreversibility could potentially play a central role in detecting the generation of consciousness.

Let us now apply this simple consciousness test to see if it predicts that the primary visual cortex is conscious or not conscious.

Applying the test

As we are initially stating that the retina and eyeball are not conscious (this is not controversial), the question we need to consider is whether the information processing which occurs when the information is copied from the retina to the primary visual cortex is the type of information processing which will generate consciousness. As has just been explained, we will answer this question by describing the inputs and outputs of the information processing operation in the form of a truth table.

A simple information copying operation applied to, say, one bit of information would have one bit of input and one bit of output. It turns out that there are two Boolean logic operations which have one bit of input and one bit of output, and they are the NOT gate and the Buffer gate. The NOT gate was considered in Chapter Seven. To remind you, the NOT operator simply acts to invert the input value, as shown in the following truth table:

A	NOT A
0	1
1	0

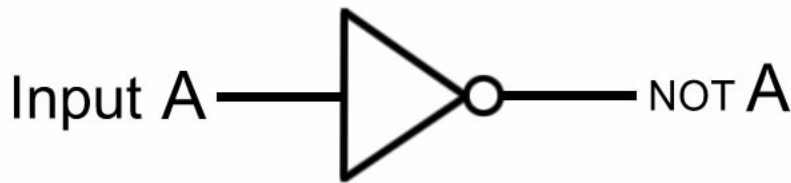
As you can see from the previous truth table, the result of a NOT operation will be 1 if the input is 0, and it will be 0 if the input is 1. Crucially, this truth table is **reversible**, meaning that if we know the value of the output then we know what the value of the input was. This is described in an entry in the online *Stanford Encyclopedia of Philosophy* by Owen Maroney (in an article which considers reversibility and irreversibility in logic gates): "The NOT operation, for example, is a logically reversible operation. If the output is logical state one, then the input must have been logical state zero, and vice versa." [3]

The other logic gate which has a single input and a single output is the Buffer gate. The Buffer gate simply takes the input value and copies it to the output, as described by the following truth table:

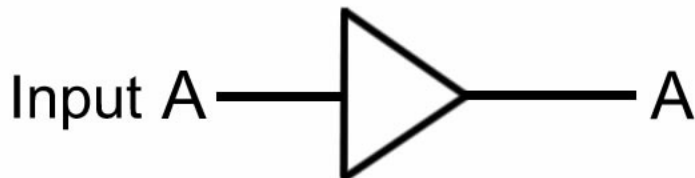
A	B
0	0
1	1

As you can see from the previous truth table, the result of the Buffer gate will be 0 if the input is 0, and 1 if the input is 1. So, as is the case with the NOT gate, this truth table is also reversible because if we know the value of the output then we immediately know what the value of the input was. So both the NOT gate and the Buffer gate are reversible.

The following diagram shows the symbols for both the NOT gate and the Buffer gate:



The NOT gate



The Buffer gate

As you can see, the symbols are the same except that the Buffer gate does not have the small circle on the output of the gate (the small circle means that the output is inverted).

Let us now return to consider the primary visual cortex.

It has been explained that the information from the unconscious retina is copied to the primary visual cortex. A simple information copying operation would be represented by a Buffer logic gate. According to the consciousness test described earlier in this chapter, if the truth table describing a system is reversible, then the system is declared to be **not** consciousness-generating. As we have just seen that the truth table for the Buffer logic gate is reversible, we therefore declare that the information copying operation (from the retina to the primary visual cortex) has not generated consciousness. As a result, the primary visual cortex is declared to be unconscious — in agreement with the theory of Crick and Koch.

Copying information does not generate consciousness

As a general principle, this example has shown that the theory presented in this book predicts that simple copying of information from one point in space to another point in space (down a wire, for example) does not generate consciousness.^[4] Clearly, as long as the information copying is error-free then the process is completely reversible: the output data could be sent back to the input, thereby perfectly restoring the initial input data. And, according to

the theory, reversible operations do not generate consciousness.

Put simply, according to the theory, copying information does not generate consciousness.

IS A THERMOSTAT CONSCIOUS?

I suspect the thermostat has been responsible for more arguments at home and at work than any other device ever invented. Certainly, that was my experience of office work. Just when everyone is feeling too hot, the thermostat decides to turn the heating on, and when everyone is feeling too cold, the thermostat decides to turn the heating off. It is as if a thermostat has a mind of its own.

And this idea — that a thermostat has a "mind of its own" — was given serious consideration by John McCarthy, a professor at Stanford University. McCarthy was one of the pioneers of artificial intelligence (AI). In 1959, McCarthy invented the LISP programming language for developing AI applications (the language is still widely used today). McCarthy was even responsible for coining the term "artificial intelligence" in 1956.

In 1979, McCarthy wrote a paper titled *Ascribing Mental Qualities to Machines*. In that paper, he wrote: "Machines as simple as thermostats can be said to have beliefs, and having beliefs seems to be a characteristic of most machines capable of problem-solving performance."

In his paper, McCarthy presented a real example from his house which had two thermostats: an upstairs thermostat and a downstairs thermostat. McCarthy imagined that his thermostats had "beliefs" as to the temperature of the house. In the example, it is clear that McCarthy had been having the usual thermostat-related problems: "Recently, it was too hot upstairs, and the question arose as to whether the upstairs thermostat mistakenly **believed** it was too cold upstairs."

The idea that a thermostat has beliefs and, therefore, consciousness has also been taken seriously by the leading consciousness philosopher David Chalmers. Chalmers considered the thermostat in Chapter Eight of his 1997 book *The Conscious Mind*. In that chapter, Chalmers followed a similar line of reasoning to McCarthy, suggesting that — because a thermostat can be considered as being an information-processing device (a device which can make decisions) — then it is not unreasonable to suggest it has consciousness. To justify his view, Chalmers considered moving down the animal kingdom, starting from humans: "To make the view seem less crazy, we can think about what might happen to experience as we move down the scale of complexity. We start with the familiar cases of humans, in which very complex information processing gives rise to our familiar complex experiences. Moving to less complex systems, there does not seem much reason to doubt that dogs are conscious, or even that mice are. Moving down the scale through lizards and fish to slugs, similar considerations apply. As we move along the scale from fish and slugs through simple neural networks all the way to thermostats, where should consciousness wink out?"

I believe the theory of consciousness presented in this book can provide an answer to David Chalmers' question. In fact, I believe a simple thermostat is a perfect example for revealing the point at which consciousness "winks out", as Chalmers describes it. In this chapter we will see how the application of the simple consciousness test can provide a clear-cut decision as to whether or not a thermostat is different from a slug.

So let us apply the simple test and see whether or not a thermostat possesses that vital property essential for consciousness.



Applying the test

Let us now apply the simple truth-table based test for the generation of consciousness which was described in the previous chapter. Firstly, let us consider the behaviour of a thermostat.

A thermostat is a device capable of controlling the heating of a room. If the room is too cold, the thermostat turns the heating on, and if the room is too warm, the thermostat turns the heating off. A thermostat is therefore a device with a single input: the temperature of the room, and the thermostat has two possible output values: ON or OFF.^[5] On the basis of the room temperature, the thermostat has to make a simple decision: "Should the heating be on, or should it be off?"

So let us construct the truth table which captures the behaviour of the thermostat. We can then apply the simple test described in the previous chapter to analyse the truth table to determine if the thermostat is consciousness-generating or not.

For the purpose of capturing the functionality of the thermostat in a truth table, first let us consider the input values. Let us assign the value 0 with the room being cold, and the value 1 with the room being hot (we could assign these values the other way round as it would make no difference to the eventual conclusion — as will be explained in the final paragraph of this section). Then, considering the output of the truth table, let us assign the value 0 with the heating being OFF, and the value 1 with the heating being ON (again, these values could be the other way round). The truth table then becomes:

Room temp. (input)	Thermostat output
Cold 0	1 ON
Hot 1	0 OFF

We can see that what we have here is a logical NOT gate. When the input is 0 the output is 1, and when the input is 1 the output is 0. So the output is the inverse of the input. As explained in the previous chapter, a NOT operation is reversible because it is possible to "wind back" a NOT gate from the output to the input because if you know the

output value then you instantly know the input value (it will be the inverse of the output value). So a NOT gate is reversible.

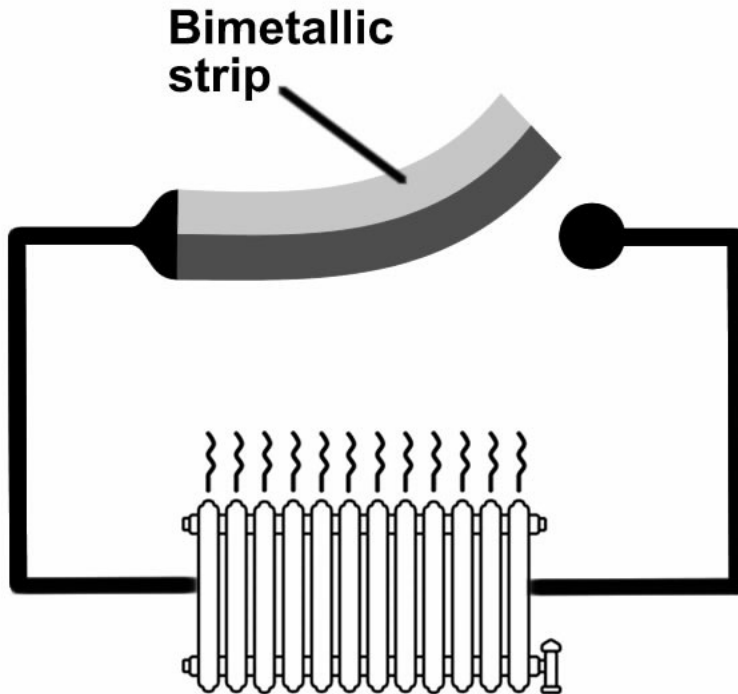
Finally, according to the simple test, a reversible truth-table implies that a thermostat is **not** consciousness-generating.

In other words, a thermostat is not conscious.

Note that if we had assigned the truth values the other way round when forming the truth table, then we would have been left with a Buffer gate rather than a NOT gate. As explained in the previous chapter, both of these types of logical operation are reversible, so the consciousness test would still have declared the thermostat to be unconscious.

A solid lump of metal

Perhaps this result can be best understood when it is realised that the job of a thermostat can be performed by a solid lump of metal. A thermostat can be constructed from two strips of different types of metal which have different expansion coefficients (a *bimetallic strip*). As the strip becomes warmer, the difference in the expansions of the two metals will result in the strip bending. If the strip is used in an electrical circuit, this can break the circuit and turn the heating off — as shown in the following diagram:



While we cannot be certain that a lump of solid metal is not conscious, this result certainly ties in with our intuition about consciousness: we don't generally believe that a lump of solid metal is conscious.

Another way of realising that this is a prediction of the theory is to appreciate that a lump of metal produces no internal heat. Heat production is one of the four side effects of Landauer's principle, and so, according to the theory, a system which is producing no heat from internal information processing is not consciousness-generating. This would eliminate all systems made of cold, solid material — such as statues and rocks — from being conscious. Again, this agrees with our intuition: we don't generally imagine that statues and rocks are conscious.

The test for consciousness described in this book therefore concludes that a thermostat — which might well be nothing more than a solid lump of metal — is not conscious.

The human thermostat

I would like to end this chapter with a rather technical — though important — point.

In this book, a simple test for the generation of consciousness has been presented. As we have seen, the test is based on the analysis of truth tables. However, we have to be careful of a potential pitfall when applying the test. Allow me to explain.

A truth table has several columns which represent the inputs to a system, and one column representing the output of a system. So when we analyse a truth table we are analysing the inputs and outputs of a system. In effect, we are treating the system like a "black box", with no regard for its internal functioning. Can it really be possible to detect consciousness purely on that basis?

It was the English mathematician Alan Turing who, in 1950, first considered the possibility of examining an information processing system purely on the basis of its inputs and outputs. He devised a famous test which we now call the *Turing test*.

In the Turing test, your task is to ask questions to two different information processing systems: a computer and a human. The computer and the human are hidden behind a screen so you do not know which responses are coming from the computer and which responses are coming from the human. The task of the computer is to imitate a human in its responses, and to fool you into thinking that it is a human.

At the end of the question-and-answer session, you are asked which is the human and which is the computer. So you have to make a decision purely on the basis of the answers you have received. If you mistakenly reply that the computer is actually the human, then the computer has achieved its goal of fooling you, and the computer is said to have passed the Turing test. According to Alan Turing, the computer could then be said to possess intelligence.

So, clearly, what we have here is an attempt to analyse an information processing system purely on the basis of the inputs and outputs of that system.

Now, we could surely imagine a highly-advanced computer which is capable of fooling you by producing identical responses to the human. In that case, the responses could have come from the computer, or they could have come from the human — we would have absolutely no way of distinguishing between the two different systems. This results in an important conclusion: **it is clearly not possible to uniquely define a complex information processing system purely on the basis of its inputs and outputs.**

Does this pose a serious problem for the simple consciousness test we have been using in this book? After all, that test is based on the analysis of truth tables, and truth tables just show the relationships between the inputs and outputs of a system. If the same truth table can describe two wildly different systems, then how can the method ever be used to reliably detect consciousness?

Fortunately, this is a problem we can overcome. The secret is that we have an advantage over a "black box" test such as the Turing test. Our advantage is that **we can open the black box and look inside.** In other words, we have the ability to examine the internal information processing of the system — something we are prohibited from doing in the Turing test because we are not allowed to look behind the screen.

Our task then is to ensure that the truth table accurately represents the information processing which is being performed by the system. In particular, we have to be careful that the system is not a complex, conscious system which is just pretending to be a dumb, unconscious system.

As an extreme example of this, we might consider the hypothetical example of a "human thermostat". The human thermostat is a human who sits inside a big black box in your living room. The human has the simple job of turning the heating on and off when the room gets too hot or too cold (I would imagine job satisfaction would be rather low).

Purely on the basis of the inputs and outputs of that human-based system, we might construct the truth table for that system. The truth table would be the usual truth table for a thermostat which — as we have just seen — would be reversible. On that basis, the consciousness test would conclude that the system is not conscious, effectively deducing that the box contains nothing more than a lump of solid metal (a bimetallic strip) and is therefore not conscious. However, that would be an incorrect conclusion as the "human thermostat" is most certainly a conscious system!

So, as in the Turing test, we have to be careful when applying the consciousness test to check we are not being deceived. We have to "look inside the box" to ensure that the truth table is an accurate representation of the system.

That brings us to the end of this chapter.

In the last two chapters, we have applied the consciousness test to two very different information processing systems — the primary visual cortex, and a thermostat — and the test has returned a negative result in both cases. Before we consider the next example (which will provide us with our first positive result), there is something I must do.

At the start of Chapter Nine, it was explained how a scientific theory needs to do more than just make accurate predictions. The theory should also provide an *explanation*, it should explain **why** a particular phenomena occurs. Ideally, a scientific explanation should explain the phenomena in terms of low-level fundamental entities, such as particles, or fields, or space or time.

So, what is the explanation for the theory of consciousness which has been presented in this book? What is the connection between logical information processing and consciousness? Why is irreversibility so important?

I did not provide you with an explanation earlier, stating that an explanation would be provided later in the book. So I owe you an explanation, and — in the next two chapters — I will present an explanation.

Let me start by presenting what I feel is a very strong argument which provides a valuable insight into the nature and cause of consciousness ...

THE SUSPENDED ANIMATION ARGUMENT

I am a huge fan of classic science fiction movies. I can remember going to the local cinema in the 1970s with my father — another sci-fi aficionado — to watch a stream of classic movies from *Planet of the Apes* to *Close Encounters of the Third Kind*. It was a golden age for intelligent sci-fi.

But there is always a problem with presenting science fiction in a movie in a way which is scientifically accurate, certainly a problem if you want to portray space travel. The problem arises simply because everywhere interesting in space is such a long distance away — and you cannot travel faster than light. If you have read my third book then you will appreciate that if there is one law of physics which we will almost certainly never be able to break it is our inability to travel faster than light.

As an example of the great distances involved in space travel, the star which is nearest to the Sun is Proxima Centauri. Proxima Centauri is orbited by two exoplanets which have the potential to support life (see my seventh book for details), so this would certainly be an interesting place to visit. Unfortunately, Proxima Centauri — the nearest interesting place outside our Solar System — is 4.2 light years away from us. So even if we could make a spaceship which travelled at the speed of light, it would still take a minimum of 4.2 years to get there. Considering more realistic speeds of travel, it would take longer than a human lifetime to get there.

So this raises a problem for any science fiction movie attempting to present a realistic portrayal of space travel. Put simply, it would take too long to get anywhere interesting in the galaxy. Film makers then have two choices. Firstly, they could ignore the speed of light limitation and employ fictional faster-than-light travel as in movies such as *Star Wars* ("hyperdrive") or *Star Trek* ("warp drive").

Or, alternatively, they could use the realistic solution ...

Suspended animation

In February 2015, in the Pennsylvania town of Tresckow, 25-year-old Justin Smith went out for the night drinking with some friends. The temperature was twenty degrees Celsius below freezing, and there was snow on the ground.

At 9:30, Justin left the bar to walk home. At some point, it appears Justin blacked out and fell head first into a snowdrift. His body was not discovered until twelve hours later, frozen solid. There was no sign of a heartbeat. The paramedic on the scene reported back in a phone call and was recorded as saying "All signs lead us to believe that he has been dead for a considerable amount of time".

The state police arrived to investigate the death, and the body was transported to the local hospital. The team there were unable to pronounce Justin to be dead at that stage as the body was completely frozen.

However, almost working on a hunch, the hospital decided to try giving Justin a blood transfusion using warmed blood. After receiving the transfusion, early in the evening Justin's heart started to beat again.

Doctors were amazed to discover that Justin had suffered no brain damage, though some fingers and toes had to be amputated. To all intents and purposes, Justin Smith had come back from the dead.

The important factor in surviving being frozen appears to be the speed at which the body is frozen: not too fast (so that tissue is not damaged), and not too slow (so that the patient does not die from exposure before being frozen). If the speed of freezing is just right, then being frozen solid can actually save your life as it protects the body from the other harmful effects of exposure.

It is vital that the heart keeps beating — supplying the brain with oxygen — until the brain freezes. The brain is easily damaged by lack of oxygen, but if the brain is placed in suspended animation without being starved of oxygen at any stage of the process, then the brain will be undamaged. The patient can then be defrosted at a later stage without brain damage.

Fortunately, this is precisely what happened to Anna Bagenholm in Norway in 1999 when she was out skiing with friends. I can remember Anna's story making the international news reports at the time. Anna fell while skiing and plummeted head first through the ice covering a lake. Anna was trapped under the ice in the freezing water for a total of eighty minutes. Apparently her heart stopped beating after forty minutes, but that forty minutes in which the heart was supplying oxygen to the brain as it froze was crucial.

When Anna was eventually pulled out of the ice, she had no pulse, no breathing, and her pupils were dilated and unresponsive. She was clinically dead.

However, the Norwegians have a saying: "Nobody is dead until they are warm and dead". So Anna's blood was removed, warmed, and returned to her body. At 10pm that evening, Anna's heart started beating again. She has since made a full recovery.

These extraordinary stories provide a solution as to how to achieve long space journeys within the lifetime of an astronaut. The astronaut could be placed in a state of suspended animation at the start of the journey, and be revived many decades later when the destination is reached. This technique has been featured in many sci-fi movies including *Planet of the Apes*, *Alien*, and *Interstellar*. (Incidentally, *Interstellar* is the third Christopher Nolan movie to be mentioned in this book. Nolan certainly likes to get his science right.)

The following image is from the 1960s television series *Lost in Space* showing the Robinson Family being placed in suspended animation before a space flight:



NASA is seriously considering the possibility of using suspended animation for long space journeys. As part of its Innovative Advanced Concepts Program, research is being conducted to determine if astronauts could be successfully placed in a state of suspended animation for a journey to Mars.

Motion at the atomic scale

So, what are we actually doing when we place someone in a state of suspended animation? The real-life examples of Justin Smith and Anna Bagenholm which we have just considered have both involved extremely low temperatures. So what is it about low temperature that causes a subject to enter a state of suspended animation?

The physics behind heat and temperature was considered in Chapter Four. It was described how Rudolf Clausius, in 1857, was the first to realise that heat is nothing more than the motion of atoms in an object. If you rub your hands together, you cause the atoms in your hands to move, and your hands get warm as a result. Heat is nothing more than motion at the atomic scale.

So what we are actually doing when we freeze someone to place that person into suspended animation is to remove all motion from the atoms in their body — including their brain. So try not to think about hot and cold — this argument at its core is all about motion.

Now, here is an interesting question. When a person is in a state of suspended animation, with all of the atoms in their body motionless, do you think the person would be conscious? Surely not — it would be like the deepest sleep possible. So there appears to be a deep connection between motion at the atomic scale and consciousness: if motion is removed from atoms, consciousness is lost.

A similar argument was presented in 2017 by Romain Brette, a research director in theoretical and computational neuroscience at the Vision Institute in Paris.^[6] Brette used the 1960s TV series *Bewitched* to illustrate the point. Brette considered a stoppage in the flow of time rather than a stoppage of the motion of atoms: "In the TV series *Bewitched*, Samantha the housewife twitches her nose and everyone freezes except her. Then she twitches her nose and everyone unfreezes, without noticing that anything happened. For them, time has effectively stopped. The question is: was anyone experiencing anything during that time? To me, it is clear that no one can experience anything if time is frozen."

So, if motion is removed from atoms, it seems clear that consciousness is lost. The only possible counter-argument I can see would be the argument that a person whose atoms in their brain are stationary can still be conscious. In other words, a person with no brain activity can be conscious. Well, that's simply not the case, is it.

Let us perform a thought experiment to reveal the implication of this result.

Let us start by considering a conscious person. We are going to make a **single change** to this person, keeping all other variables unchanged. All we are going to do is use some advanced technology to render every atom in that person stationary (remember, this is a thought experiment so we can consider hypothetical situations even if we do not yet possess the suitable technology). No other change is made: the positions of the atoms are not altered, so no physical damage is caused to the person. Only the velocity of all the atoms which make up the person is stopped. At that point, according to the argument which has just been presented, the subject would no longer be conscious. So removal of motion at the atomic scale has resulted in a loss of consciousness.

We then make the second, single change. We restore the original motion to the atoms in the person. Again, no other change whatsoever is made — only atomic motion is added. As the state of the person has been restored to his or her original state, the person is now conscious again.

Logically, I can see only one conclusion. If you disagree with the following conclusion then you have to find a fault in the argument, and I can find no fault in the argument.

We have seen an unconscious, inert, unfeeling object become conscious when absolutely no other change is made apart from the addition of motion at the atomic scale. In other words, the addition of atomic motion has endowed inert, unfeeling matter with the gift of consciousness.

Therefore, it would appear that there can be only one logical conclusion:

Consciousness is caused by the motion of atoms.

I believe this is a hugely important result. I can see no logical weakness in this argument. I think it is watertight. Insights into the nature of consciousness which are fairly indisputable are few and far between.

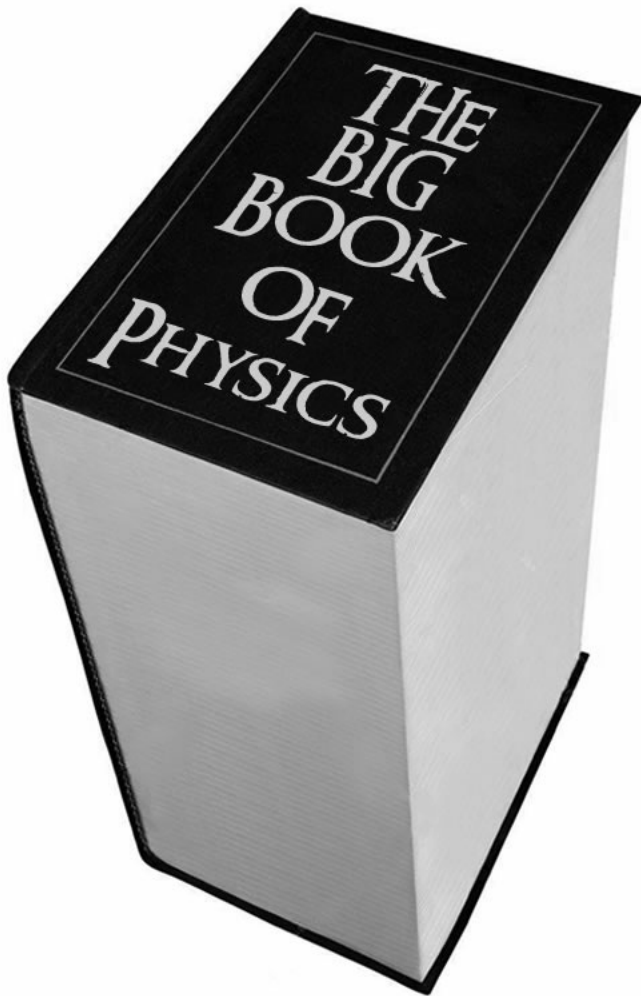
It would appear that no arrangement of static, unmoving atoms can ever be used to create a conscious object. Consciousness is only generated when atomic motion is added to that object.

The result suggests that atomic motion is the essential ingredient for consciousness. It also suggests that if we want to discover the "stuff" of consciousness then we should look for a substance whose atoms are in continuous motion ...

IS CONSCIOUSNESS A FORM OF HEAT?

As research for this series of books, I have been reading various books on the philosophy of consciousness. One common theme in those books is the suggestion by some philosophers that physics is unable to describe consciousness. After all, say the philosophers, there seems to be nothing in our knowledge of physics which resembles consciousness. As an example, David Chalmers devotes the third chapter of his book *The Conscious Mind* to "arguing that consciousness is not entailed by the physics of our world".

It would appear that these philosophers have a point. For example, if we look at the Standard Model of particle physics — our best model of fundamental reality — consciousness does not feature as a particle, or a property of any particle. As another example, we might imagine the construction of an enormous textbook containing our entire knowledge of physics. This hypothetical book might be called "The Big Book of Physics". The following image shows a copy of the Big Book:



If you then did a search for the word "consciousness" in the Big Book of Physics you would find nothing. So, on that basis, the philosophers would appear to be correct.

But what if there was another possibility. What if consciousness **was** included in the Big Book, but it simply did

not appear in our word search.

Because it was called something else ...

A proposed unification

In physics, progress in our knowledge has frequently been made by achieving *unifications*. A unification occurs when two phenomena — which previously were considered to be completely unrelated — are shown to be two different aspects of the same phenomena.

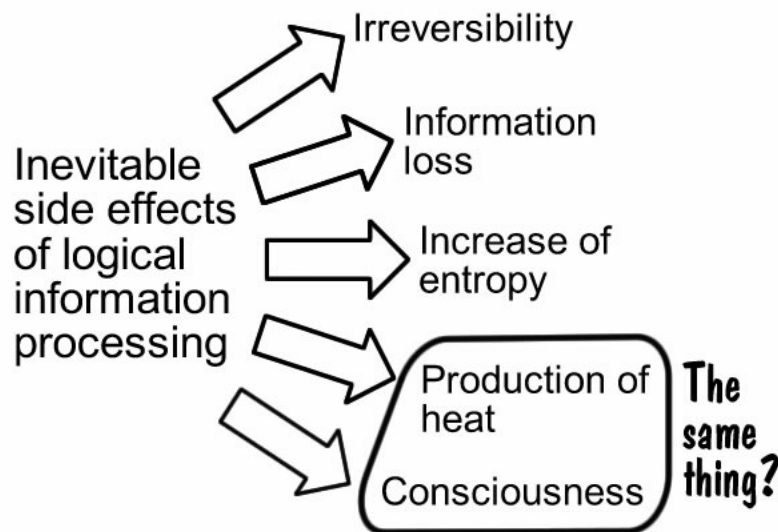
In Chapter Three, one of the first unifications in physics was described. It was Newton who had shown that the force which holds the planets in their orbits is the same force which pulls an apple down from a tree. These two phenomena had previously been considered to be completely unrelated. Hence, by showing that they were two different applications of the force of gravity, Newton had achieved a unification. Another unification — briefly described in Chapter Six — was James Clerk Maxwell's unification of electricity and magnetism, showing that they were two aspects of the single electromagnetic force.

Unifications greatly advance our knowledge, while also simplifying our view of the universe. In a unification, two different theories are combined into a single, unified theory, which is usually simpler and clearer than the two theories which it replaced. Also, the unified theory describes reality at a deeper, more fundamental level than the previous two theories, and that can clarify our understanding of the universe.

Not all proposed unifications turn out to be correct. In his book *The Trouble With Physics*, Lee Smolin presented a history of unifications in physics. One of the proposed unifications involved the proposal for phlogiston in 1678, which was considered in Chapter Two of his book. As Lee Smolin describes: "Not all proposals for unification turn out to be true. At one time, chemists proposed that heat was a substance, like matter. It was called phlogiston. This concept unified heat and matter. But it was wrong. The right proposal for the unification of heat and matter is that heat is the energy in random motion of atoms."

Let us now return to consider the four inevitable side effects of logical information processing, as predicted by Landauer's principle (as was described in Chapter Eight). If you remember, those four side effects were irreversibility, information loss, increase of entropy, and the production of heat. Then, in Chapter Nine, a theory of consciousness was presented which proposed that consciousness was a fifth side effect of logical information processing.

So let us redraw the diagram showing the five side effects of information processing — but this time you will notice an addition to the diagram:



You will notice on the previous diagram that a loop has been drawn around two items: the "Production of heat" and "Consciousness". The reason for this is because I am suggesting a unification, a unification between heat and consciousness. Even though the production of heat appears to be a totally different phenomena from consciousness, I am suggesting that they are two different aspects of the same phenomena. In other words, they are the same thing.

This is a bold step which requires justification. Five reasons will now be presented why consciousness and heat are the same thing. I believe the last two reasons are particularly important.

Firstly, there are several qualitative similarities between our consciousness and heat. Our conscious experience feels complex, random, chaotic, ever-changing and unceasing — which is what you would expect if consciousness was the result of the complex, random, chaotic, ever-changing and unceasing interactions of trillions of atoms (which forms heat).

Secondly, as was explained at the end of Chapter Four, consciousness is a *macroscopic* property, meaning it is large, a part of the human experience, a part of the human world. Somehow, this macroscopic property emerges from the motion of *microscopic* particles in our brains. So, if we want to try to find consciousness in the "Big Book of Physics" — with the understanding that it might well be called something else — we should filter our search by only looking for macroscopic properties.

When we do that, we find that there are several macroscopic properties described in the Big Book. For example, if we have a sample of gas in a container, then that gas will have a certain pressure, temperature and volume. Each of those three properties is a macroscopic quantity. That is because each of those properties is a part of our human-scale world (we can measure the value of those quantities using our human-scale thermometers and pressure gauges). But each of those macroscopic properties would depend on the behaviour of the microscopic atoms which make up the sample of gas. So macroscopic quantities depend on the behaviour of their microscopic constituents.

These macroscopic properties are said to be "emergent" in that they only appear when a large number of particles are considered together. Individually, for example, it makes no sense to talk about the temperature or entropy of a single particle. Temperature and entropy are examples of properties which only appear when a vast number of particles are involved. The physicist Carlo Rovelli makes this point in his book *Reality Is Not What it Seems*. As Rovelli explains, 'hot' and 'cold' are macroscopic concepts which only emerge when a large number of particles are considered: "There are no 'hot' or 'cold' things at a microscopic level but, when we put together a large number of microscopic constituents and describe them in terms of averages, then the notion of 'heat' appears."

So heat is a macroscopic property — just like consciousness. So at this early stage of our search, heat has passed our filter test as it is one of the macroscopic properties described in the Big Book of Physics. Heat has become a contender to be the "stuff" of our consciousness.

The third reason why consciousness might be a form of heat is because consciousness is an **irreversible** phenomenon. In Chapter Three it was explained how the fundamental laws of physics — and certainly the laws of Newton — are reversible in time. That means if we made a movie of the phenomenon, and then played that movie in reverse, the phenomenon would still appear to be correct. However, that is not the case for heat. Heat only ever flows in one direction, from hot to cold, so a movie of heat flow would not look correct if it was played in reverse. Similarly, our conscious experience has directionality in time: we feel as though we are moving from the past into the future, never vice versa. Also, we can remember the past but we cannot remember the future. If we somehow made a movie of our conscious experience, and played that movie in reverse, it would not appear to be correct (as the movie would show us remembering the future).

So heat and consciousness are both irreversible phenomena. This is surprising in a universe in which the fundamental laws of physics are reversible.

In a YouTube video, Carlo Rovelli has emphasized the irreversibility of consciousness:

<http://tinyurl.com/rovellivideo>

According to Carlo Rovelli: "Consciousness is a process — it is something that happens. It definitely happens in time, and in a time-oriented way. It's an extremely **irreversible** process. Where does this time orientation come from? The ability to make decisions about the future, but not to make decisions about the past? Why do we have memories about the past and not the future? The only answer is because of entropy."

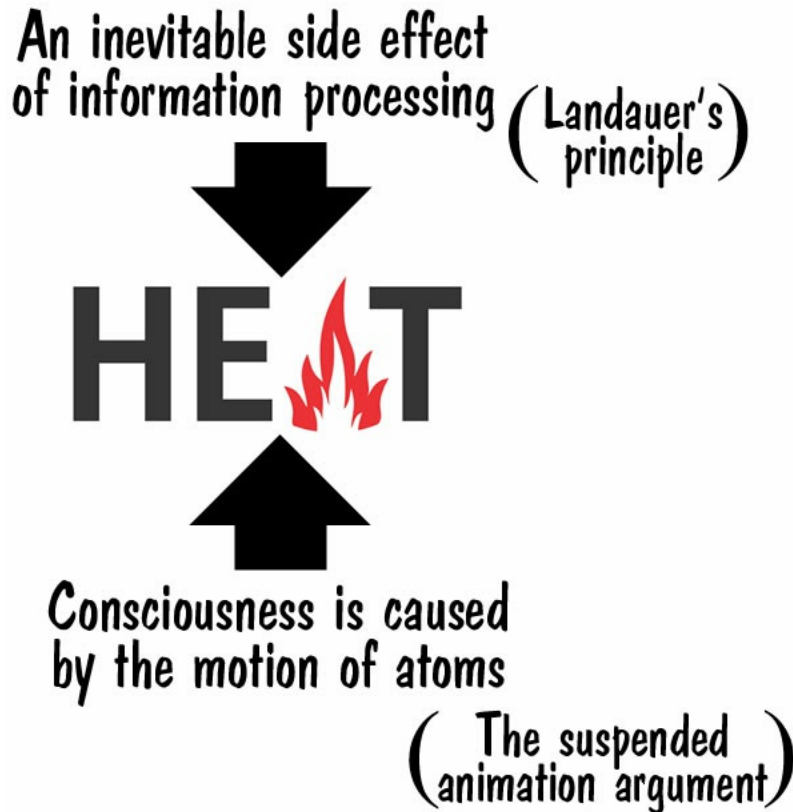
Let us now consider the fourth reason why consciousness might be a form of heat. As described in Chapter Eight, Landauer's principle reveals that heat is an inevitable side effect of logical information processing. If it is true that heat is consciousness, then that would provide a wonderfully simple explanation as to why consciousness emerges in our brains. Consciousness would be an inevitable side effect of thinking, because heat is an inevitable side effect of thinking. It would provide an elegant solution to the question of why consciousness is produced by the information processing in our brains.

Now let us move on to the fifth reason why heat might be consciousness, and that reason is provided by the suspended animation argument presented in the previous chapter. As I described, I feel it is a very strong argument, possibly watertight. If you remember, the conclusion of the argument was simple and impactful: consciousness is caused by the movement of atoms. And what is the movement of atoms? Well, of course, as described in Chapter Four, heat is nothing more than the movement of atoms. For example, if you rub your hands together then you will make the atoms in your hands move, and your hands will get warm as a result. So the idea of consciousness being a

form of heat ties in very nicely with the conclusion of the suspended animation argument.

So these last two reasons have provided two entirely separate arguments coming to the conclusion that consciousness is a form of heat. We have an argument based on Landauer's principle, and we have the suspended animation argument.

The following diagram shows the two arguments both pointing to the same conclusion:



I would suggest that having two entirely independent paths leading to the same conclusion means that this theory of consciousness as a form of heat is a compelling theory. It suggests that the word "consciousness" **IS** included in the Big Book of Physics ...

... but it is spelt "H-E-A-T".

Chaos and complexity at the nanoscale

To be clear, the type of "heat" being considered here is not truly heat at all — not in the generally-accepted meaning of the word. Heat, as defined in physics, is the truly random motion of atoms. The randomness is a crucial element. I am certainly not suggesting that truly random heat is a form of consciousness. No, the random heat we feel from the Sun or a campfire, for example, is surely not conscious.

However, the "heat" which is being considered in this chapter is the product of a very particular process: logical information processing. As such, the motion of the atoms would not be truly random. The particle motions would still retain correlations of the original information processing. Once the heat leaves the brain and interacts with the random motion of air particles, then those delicate correlations would be lost and at that stage it would truly become random disordered heat leaving our brains.

But while that heat is protected in our brains, the motion of the atoms would retain traces of the information processing which originally produced that heat. In other words, **it would retain traces of our thoughts**. It would be a special type of heat.

In Chapter Four, it was revealed how the atomic level is an extraordinarily fast-moving and violent environment. It was explained that one molecule of oxygen in a room full of oxygen gas will be moving on average at the speed of

461 metres per second, with molecular collisions occurring 6.8 billion times per second. All of this chaos is hidden from our eyes. It is easy to see how we might well overlook this churning, constant activity as being a potential cause of consciousness.

Perhaps we might speculate that microscopic transient structures might appear: order out of chaos. Maybe these structures might be formed by turbulence in the same way that tornadoes and hurricanes appear in the atmosphere. There is some interesting research in this area.

For example, in 2012, the physicist Peter Hoffman wrote a book titled *Life's Ratchet* which explores how biological systems exploit what Hoffman calls the "molecular storm" at the atomic scale. The use of the term "storm" seems to imply the possibility of the emergence of miniature "weather-related" structures such as microscopic tornadoes and hurricanes. Interestingly, Hoffman notes that the ancient Greek philosopher Democritus associated the human soul (consciousness?) with turbulence at the atomic level: "Democritus imagined the soul as a fire consisting of myriads of jostling particles, which Democritus called atoms."

The similarity between Democritus' view and the theory described in this book is quite remarkable. Democritus' description of a "fire" as describing the soul is also interesting, making an early connection between consciousness and heat.

George Ellis, a professor of complex systems at Cape Town University, is also exploring the importance of molecular chaos in our thought processes. According to Ellis, the randomness of molecular chaos in neurons might lead to a way in which the apparent free will of our consciousness can be accommodated in physics. The concept of free will is notoriously difficult to explain using physics which describes the universe in a predictable, deterministic way. Maybe the chaos of swirling molecules provides an answer? George Ellis has described his theory in an online essay titled *From Chaos to Free Will*. [\[7\]](#)

Whatever is the case, according to the theory of consciousness described in this book, it appears that "messiness" at the atomic and molecular scale is required for consciousness: smoothness and order simply will not do the trick. This idea of the importance of atomic "messiness" will be explored in the example in the final chapter of this book.

But now, before we leave this chapter, it is interesting to note that this proposed close connection between consciousness and heat provides an instant, simple answer to one of the great scientific mysteries about consciousness ...

Quantum mechanics and consciousness

When Erwin Schrödinger and Werner Heisenberg developed the theory of quantum mechanics in the mid 1920s, it launched one of the greatest revolutions in the history of physics. Applications of quantum mechanics include transistors, computers, and smartphones. It is the theory which has made our modern world.

However, when the theory was discovered, it quickly became clear that the role of the observer was particularly important. In 1927, the *Heisenberg uncertainty principle* revealed that the observer should not be regarded as being completely isolated from the system being observed. Instead, the act of observing inevitably affects the system. As an analogy from classical physics, when the air pressure in a tyre is measured, it is impossible to perform the measurement without extracting a small amount of air from the tyre. Therefore, the act of observation inevitably affects the system being observed.

In quantum mechanics, before a system is observed, that system can be in a remarkable state called a *superposition* state. For example, while it is in a superposition state, a particle can appear to be in two places at once (as revealed in the famous *double-slit experiment*).

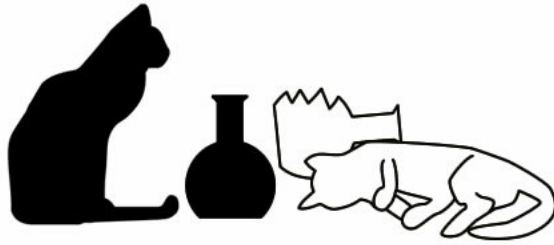
It might sound bizarre, but this ability for a particle to be in two states at the same time is currently being used to make quantum computers. Quantum computers use particles in superposition states to perform multiple mathematical operations at the same time (for more details on quantum computing, see my tenth book).

So before a particle is observed, it can be in a superposition state. This superposition state can only be represented by a purely mathematical description called the *wavefunction*. However, the moment the system is observed, the system will no longer be in a superposition state. As an example, once it is observed, a particle will only ever be found at one particular point in space — not in two places at once. As a result, after observation there is said to be a *collapse of the wavefunction*.

This peculiar phenomenon forms the basis for the famous Schrödinger's Cat thought experiment. In the experiment, Schrödinger's cat is placed inside a sealed box. There is also a sealed glass jar of poison gas in the box, together with a small piece of radioactive material. If an atom of the radioactive material decays, the glass jar is broken, the poison is released, and the cat dies. Conversely, if an atom does not decay, the cat lives.

However, according to quantum mechanics, before the atom is observed we must consider the atom to be in a

superposition state of both "decayed" and "not decayed". It appears we must therefore treat the cat as being both dead and alive at the same time!



It is certainly true that if a human opens the box to observe the cat, the cat will be found to be either alive or dead — not in a strange mixture of both states. So there has been a "collapse of the wavefunction" caused by observation. The question was therefore raised, is there something special about observation by a conscious human being? Why do conscious beings never observe systems in superposition states? Why do conscious beings never observe cats which are both dead and alive? This has been one of the great scientific mysteries about consciousness.

Schrödinger's Cat remained a mystery for many years after it was first proposed. However, over the last fifty years, we have obtained a much greater understanding of the physical processes which occur during the so-called "collapse of the wavefunction". It is no longer so much of a mystery.

It appears that a particle which is in a superposition state is very rapidly reduced to a single, well-defined state when that particle interacts with a noisy, messy, random environment, full of fast-moving particles. This process is called *decoherence*. And what do we call the state when particles are moving in a random, fast-moving manner? That is heat. Heat is the random motion of particles. So a warm environment acts to collapse the wavefunction.

This is the reason why a quantum computer must operate at an incredibly low temperature. The temperature of the interior of a quantum computer is the lowest temperature in the entire universe, lower than the temperature of deep space. A quantum computer has to be kept at this low temperature to avoid the collapse of the wavefunction, which would take its particles out of their superposition state — ending the calculation.

And so this reveals why the theory presented in this book provides a simple solution of how consciousness will always act to collapse the quantum wavefunction. As has been explained in this chapter, the theory suggests a very close connection between consciousness and heat — even suggesting that heat is the "stuff" from which consciousness is made. That heat would therefore act to take any system out of its superposition state, very rapidly collapsing the wavefunction of that system.

In fact, according to the theory, it would be literally impossible for a conscious system to **not** collapse the wavefunction of a system it was observing. According to the theory, no conscious system could ever see a cat alive and dead at the same time.

The theory therefore provides a very simple solution as to how a conscious system will always collapse the quantum wavefunction.

That brings us to the end of this chapter. The next chapter is the final chapter of this book, and it contains another example of the simple consciousness test in action. It is also an important chapter.

Because the next chapter examines the big question ...

DOES A NEURON GENERATE CONSCIOUSNESS?

The human brain is composed of approximately 86 billion neurons. Somehow, by connecting a large number of these relatively simple devices together, consciousness is created. On that basis, surely it would appear that the answer to the mystery of consciousness must be found in a neuron.

Why are neurons capable of generating consciousness? Why, for example, does Nature not make a brain out of 86 billion miniature solid metal cubes? What property does a neuron have that a solid metal cube does not have? If you can answer that question, I would suggest you would have solved the mystery of consciousness.

In this final chapter, an attempt will be made to answer that question.

We will discover some truly remarkable conclusions ...

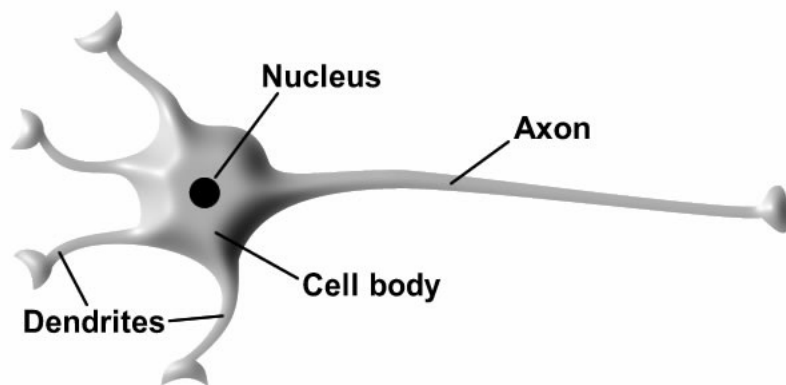
Applying the test

Let us start by applying the simple consciousness test to a neuron to see if it is predicted to be "consciousness-generating".

Of course, we already know what the outcome of this analysis should be. A neuron is certainly consciousness-generating. We know this because we know that if you have 86 billion neurons then you can make a brain (I am using this as the definition of what it means to be "consciousness-generating"). So let us apply the test and see if it comes to the correct conclusion.

Let me first remind you of the structure of a neuron.

A simplified diagram of a neuron was presented at the end of Chapter Seven, but it is presented again here. As you will remember, information enters the neuron via multiple *dendrites*. However, a neuron only ever has a single output, which is called an *axon*. Here is the simplified diagram of a neuron, showing the dendrites and the axon:



A neuron therefore operates like a logic gate, with the usual multiple inputs and single output of a logic gate (just as a truth table has multiple input columns and a single output column). This similarity between the functioning of neurons and logic gates has been noted by the physicist Paul Davies in his recent book *The Demon in the Machine*: "Because converging incoming signals from many neurons can be amalgamated, **the system acts rather like a logic circuit**, with the neuron being either on (firing) or off (quiescent), according to the state of combination of the incoming signals."

As a neuron acts like a logic gate, we can create a truth table of its inputs and outputs and apply the simple test for consciousness-generation described in this book. We might, for example, consider a multiple-input neuron which is performing an AND logical operation:

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

}

Same
outputs

As described in Chapter Eight, we can see from the previous truth table that this is an irreversible operation. As you can see from the truth table, if the output of the gate is 0, then we cannot be certain if the input pairing had been 0 and 0, or 0 and 1, or 1 and 0. So this logic gate could not be operated in reverse as it is impossible to know what the input values had been if you only know the output value.

The consciousness test predicts that an irreversible truth table is a sign of consciousness-generation. Therefore, the test correctly predicts that a neuron is consciousness-generating.

If the consciousness test had predicted a negative result — that a neuron cannot generate consciousness — then the theory could have been rejected as being wrong. That is the advantage of a scientific theory of consciousness which makes clear, testable predictions.

Information loss in neurons

The irreversibility of the information processing in a neuron inevitably leads to the loss of information. Another simple way of realising that information must be lost in a neuron is due to the fact that a neuron has multiple inputs but only a single output. This point was made by Francis Crick in a quotation which was presented in Chapter Eight: "One characteristic of a neuron is already fairly clear. A single neuron can fire at different rates and, to some extent, in different styles. Even so, in any period of time it can only send out limited information. Yet during that time the potential information coming into it, through its many synapses, is very large. In this process — going from its input to its output — **there must be a loss of information.**"

Each "bit" of information lost in a neuron would produce an amount of heat equal to $kT \ln 2$ joules of heat, according to Landauer's principle. The suggestion is that it is that heat which would be the "stuff" of consciousness.

You will note that Boltzmann's constant, k , is included in the value. At the end of Chapter Four, it was explained that Boltzmann's constant is "the bridge between the microscopic and macroscopic world". For this reason, it was suggested that any final theory of consciousness would likely include Boltzmann's constant as a means of explaining how the macroscopic experience of consciousness can emerge from the microscopic movement of particles. So the presence of Boltzmann's constant here is an encouraging sign for the theory of consciousness described in this book.

In the previous chapter it was suggested that this production of heat — this "molecular chaos" — is the essential ingredient of consciousness. In contrast, a system which is sterile and cold, and which lacks that "messiness" at the atomic level, can never be conscious.

So let us now leave neurons behind and consider a solid metal cube instead. When we consider a cold, sterile object — such as a solid metal cube — we find none of that essential molecular chaos. We have already considered a solid lump of metal back in Chapter Eleven when we considered the question of whether or not a thermostat is conscious. It was explained that the function of a thermostat can be performed by a strip of solid metal (a bimetallic strip). It was also explained how the resultant truth table for that thermostat would be reversible — and therefore predicted to be **not** consciousness-generating.

So lumps of solid metal do not produce consciousness — they are simply too cold and sterile, with none of the essential "messiness" at the atomic level. Whereas the information processing in a neuron is irreversible and therefore inevitably produces heat — that essential atomic "messiness". And this is how the theory provides an explanation as to why Nature can make a conscious system out of 86 billion neurons — but not out of 86 billion solid metal cubes.

The neuron and the steam engine

At this point, I could quite happily finish this chapter. The consciousness test applied to a neuron has made the correct prediction, and the associated explanation appears credible. However, when we start to dig deeper into the functioning of a neuron, we discover some truly remarkable conclusions.

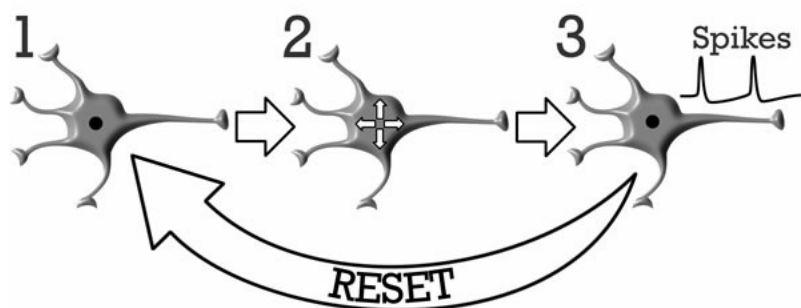
So let us dig a bit deeper.

Let us start by considering the steps which result in the so-called "firing" of a neuron, in which a neuron transmits its electrical signal to the next neuron in the network.

Earlier in this chapter, it was explained that the input signals enter a neuron through the neuron's dendrites. The voltages from the various inputs are then summed inside the neuron. If the total voltage exceeds a certain threshold (the *threshold potential*), the neuron is said to *fire*. At that point, the neuron sends a burst of electrical voltage down its single output (axon).

After the neuron has fired, the voltage inside the neuron body is reset to its initial value (the *resting potential*). The process then starts again, with voltage building inside the neuron. As a result, firing is a rapid and repetitive process.

The following diagram shows this sequence of steps during the firing of a neuron:



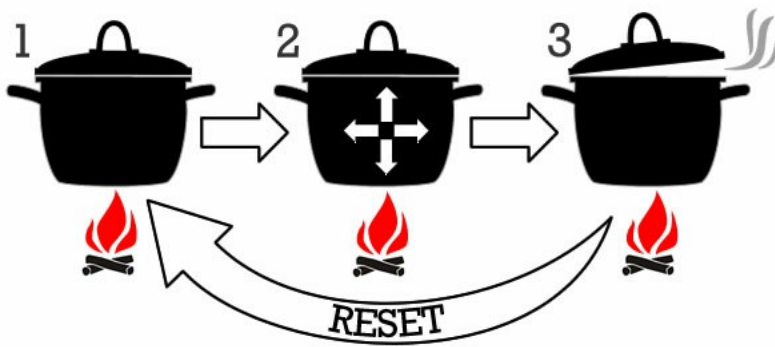
In the previous diagram, Step One shows the neuron in its initial state, with its internal voltage at its resting potential. Step Two shows the increase of internal voltage as electrical signals are received on the neuron's dendrites. Step Three shows the neuron firing, with a series of rapid voltage "spikes" being sent down the neuron's axon. Then the final stage is the reset operation which restores the neuron to its original state.

Because the sequence of steps ends in a reset operation, it is possible for the sequence to quickly repeat, and this is, indeed, what happens. A neuron will typically fire fifty times a second, with spikes of voltage being sent down the axon of a neuron like bullets from a machine gun.

So what we have here is a **cycle**. If you remember, we have already encountered cycles back at the start of Chapter One when we considered steam engines. A cycle was defined to be a sequence of linked steps ending with a reset operation. The reset operation is crucial as it allows the cycle to be rapidly repeated.

This definition of a cycle is described in the *Thermodynamics* textbook by Cengel and Boles: "A system is said to have undergone a **cycle** if it returns to its initial state at the end of the process. That is, for a cycle the initial and final states are identical."

In particular, I would suggest that there is a remarkable similarity between the cycle of a neuron firing and the cycle which occurs during the jumping of the lid on young James Watt's cooking pot boiling on his mother's fire. To remind you, here again is the diagram of the jumping lid of James Watt's cooking pot:



Initially, the pressure of the steam in the cooking pot is the same as the atmospheric pressure outside the pot. But as more heat energy enters the pot, the pressure of the steam in the pot increases (just as the voltage in a neuron increases). When the pressure of the steam in the pot exceeds a certain threshold value, it blows the lid of the pot up (just as the voltage inside a neuron has to exceed a certain threshold to initiate the spike). The whole process ends with a reset operation in which the pressure in the pot is equalised with the atmospheric pressure outside the pot (just as the voltage in a neuron is reset to its resting potential). Because of this reset operation, the lid of the pot drops back down again, and the cycle can rapidly repeat (just as a neuron firing can repeat fifty times a second).

In his recent book *Until the End of Time*, The physicist Brian Greene describes the importance of the reset operation in a steam engine: "The steam engine relies on a cyclical process: a piston is thrust forward by expanding steam and is then **reset** to its original position, where it awaits the next thrust. The steam, too, reverts to its original volume, temperature, and pressure, as must all of the engine's vital parts, readying the engine to heat back up and thrust the piston once again."

So it appears that there are clear similarities between the firing of a neuron and the operation of a steam engine. And I would suggest that these similarities raise some interesting questions about neurons and consciousness.

Firstly, a steam engine does not produce a constant motive force throughout its entire cycle. Considering James Watt's cooking pot, we could only extract power from the movement of the lid at the point where the steam pushes the lid upwards. No force is generated as the lid drops down again. This is typical of all single-acting steam engines. This explains why, in a steam engine, it is essential that the cycle is rapidly repeated. As the thermodynamics textbook, *Concepts in Thermal Physics*, explains: "It has to be cyclic so that it can be continuously operated, producing a steady power."

As a steam engine does not produce continuous power during its cycle, we might feel justified in asking a similar question about neurons: does a neuron generate consciousness continually? Or does a neuron only generate consciousness during a particular part of its cycle?

To answer that question, we must remember the reason why the consciousness test predicts that a neuron is consciousness-generating. The reason is because there is inevitable information loss in a neuron (not all of the multiple inputs can be passed to the single output). The point at which a neuron loses information is the point at which it fires. It is at that point that the voltage in the neuron is reset to its resting potential, with all internal information being erased. The spike of electric voltage down the axon would be matched by a burst of heat output (according to Landauer's Principle) and, according to the theory, a burst of consciousness.

Therefore, it is proposed that a neuron only generates consciousness at the point at which it fires.

Because consciousness is only generated at the point of firing, it would then be necessary for a neuron to fire repeatedly and rapidly in order to produce a continual experience of consciousness — just as a steam engine needs to cycle repeatedly and rapidly to produce continual motion. With neurons firing fifty times a second, the successive bursts of consciousness would generate a continuous impression of consciousness — just as frames in a movie played at fifty frames per second generate an impression of continuous motion.

The "reset" operation

There is another way to realise the potential importance of the firing process in generating consciousness.

When a neuron fires, its internal voltage is always reset to exactly the same original resting potential. This, therefore, acts as a "reset" operation. Rolf Landauer refers to a "reset" (or "restore") operation many times in his

original 1961 paper, the paper which first introduced what we now call Landauer's principle.

In that paper, Landauer describes the reset operation as follows: "We start with each bit in one of two states and end up with a well-defined state."

So, as Landauer explains, we have to create a truth table in which the inputs are in "one of two states" — 0 or 1 — but both inputs lead to the same single, "well-defined" output state. As an example, in the case of the following truth table for a reset function, both input values lead to a 0 output value (both inputs are reset to the same output value):

Input	Output
0	0
1	0

Applying the usual consciousness test, we now examine the truth table to see if it is reversible or irreversible. It can be seen that the truth table is irreversible (if we know the output is 0, we cannot be sure of the value of the input). The test predicts that an irreversible truth table is a sign of consciousness-generation. This is, therefore, another indicator that a neuron generates consciousness during its reset operation — the point at which it fires.

In his book about molecular biology, *Life's Ratchet*, the physicist Peter Hoffman considers several examples of "molecular machines". These incredible microscopic devices — only a few molecules in size — operate within the cells in our body. They are constantly in action, carrying nutrients around our cells, expelling waste, and repairing damage. But what is particularly interesting is that in Chapter Six of his book, it is explained how these molecular machines use cycles and reset operations to achieve their motion. In other words, this is conclusive evidence that the cells in our body — including our neurons — do, indeed, use the physics of James Watt's cooking pot.

Another example considered by Hoffman is the Maxwell's Demon thought experiment. Hoffman considers the situation in which the demon wants to process billions of particles — opening and shutting the trapdoor each time. As Hoffman explains, that represents a repeated operation: a cycle. In that case, there must be a reset operation in the demon's mind. As Hoffman explains: "In the case of the demon, erasing information restores or 'resets' the system to its original state, allowing a new measurement cycle to begin. The same applies to machines. To make a small machine perform repeated motions, a reset step is needed, as the machine needs to be returned to its original state before it can begin a new cycle. **And it is this reset step that leads to an inevitable increase in entropy.**"

Hoffman identifies the reset step as the point of increasing entropy — and therefore the point at which heat is produced. It is therefore the reset step that is potentially the point at which consciousness is generated in a neuron.

Neurons vs. electronic logic gates

Several times in this book, it has been stated that a neuron is a form of logic gate, performing the same function as an electronic logic gate in a computer. This is a well-accepted view, and it is largely correct. However, when we look more closely at the functioning of neurons and logic gates, we find there is one very big difference between them. And, based on the discussion in this chapter, it is a difference which might very well hold the key as to whether or not an electronic logic gate is capable of generating consciousness.

Let us first consider a neuron.

The firing mechanism of a neuron was considered earlier in this chapter. It was explained how the voltage in a neuron will keep increasing until the neuron fires — with the voltage inside the neuron being reset to the resting potential at that point. It is important to realise that this process in which the voltage continually builds will continue even if the inputs to the neuron are held steady and unchanging.

This important point is described in the textbook *Neuroscience: Exploring the Brain*.^[8] In that book, a wonderful analogy to the process is presented. The firing mechanism of a neuron is compared to the motorised drive of a fashion photographer's expensive camera: "We likened the generation of an action potential to taking a photograph by pressing the shutter button on a camera. But what if the camera is one of those fancy motor-driven models that fashion and sports photographers use? In that case, continued pressure on the shutter button beyond threshold would cause the camera to shoot frame after frame. The same thing is true for a neuron. If, for example, we pass continuous

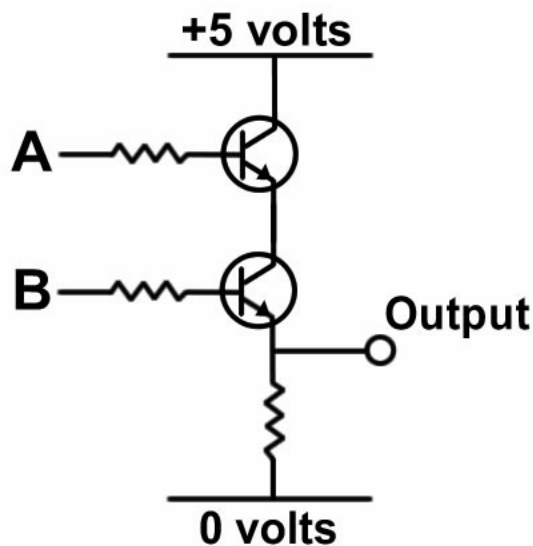
current into a neuron through a microelectrode, we will generate not one, but many action potentials in succession."



So, if the photographer keeps his or her finger depressed on the button, the camera will take a stream of rapid photographs. Similarly, if the inputs to a neuron are kept constant and unchanging, the neuron will still be an extremely active and dynamic object, continuing to send a stream of spikes down its axon at a rate of around fifty spikes per second (50 Hz).

In this sense, we see a neuron is more than just a logic gate. Instead, a neuron is a logic gate ... **with an additional rapid firing mechanism attached.**

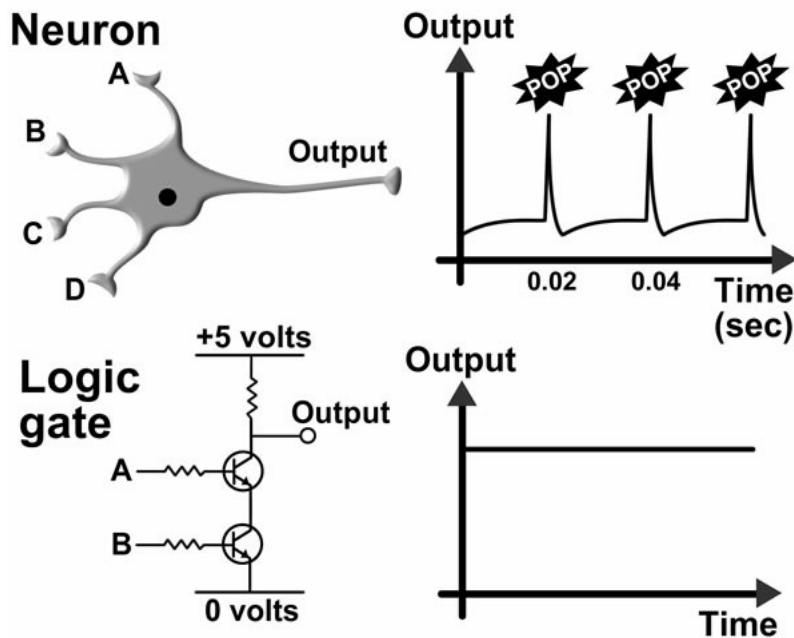
However, when we consider an electronic logic gate, we discover a very different situation. A typical circuit diagram of an electronic logic gate was presented in Chapter Seven:



It can be seen from the diagram that this AND gate consists of just five electronic components: two transistors and three resistors. It is a very simple device, and this is typically the case for all electronic logic gates. Crucially, then, **an electronic logic gate does not possess the in-built rapid firing mechanism which a neuron possesses.**

As has been explained, if the inputs to a neuron are held at constant values, the neuron will continue its 50 Hz firing mechanism. In contrast, if the inputs to an electronic logic gate are held constant, then the output of the logic gate will be a continuous constant value.

This difference in behaviour between neurons and electronic logic gates is shown in the following diagram. In the neuron, it can be seen that the output will "pop" fifty times a second when the neuron fires: "pop, pop, pop, ..." (I have used the terms "pop, pop" rather than "fire" to emphasize that this is a quick, repetitive action). Each of those "pops" will be accompanied by a loss of information, a burst of heat, and — according to the theory — a burst of consciousness. In contrast, the output of the electronic logic gate can be seen to be a constant value — with no "pops" of consciousness and heat:



A neuron is simply a far more dynamic device than an electronic logic gate. As the suspended animation argument (in Chapter Twelve) suggests, movement is essential for consciousness. It would appear that dynamism is essential for consciousness.

Neurons are constantly dynamic, continuously losing information in rapid bursts. According to the theory, that results in a continuous experience of consciousness. In contrast, information is not lost in an electronic logic gate with static inputs: it would not generate consciousness.

In fact, it appears that neurons are the optimal consciousness-generating devices, almost as if they have been specifically selected for their ability to generate a continuous experience of consciousness. Why should that be the case? Is consciousness important? I have no answer to that question.

But I find that to be an absolutely fascinating conclusion.

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NOTES

[1] Rolf Landauer, *Irreversibility and Heat Generation in the Computing Process*, IBM Journal of Research and Development, 1961. <http://tinyurl.com/informationloss>

[2] Charles Bennett, *Notes on Landauer's Principle, Reversible Computation, and Maxwell's Demon*, 2003. <http://arxiv.org/abs/physics/0210005>

[3] Owen Maroney, *Information processing and thermodynamic entropy*, The Stanford Encyclopedia of Philosophy, <http://tinyurl.com/stanfordwebpage>

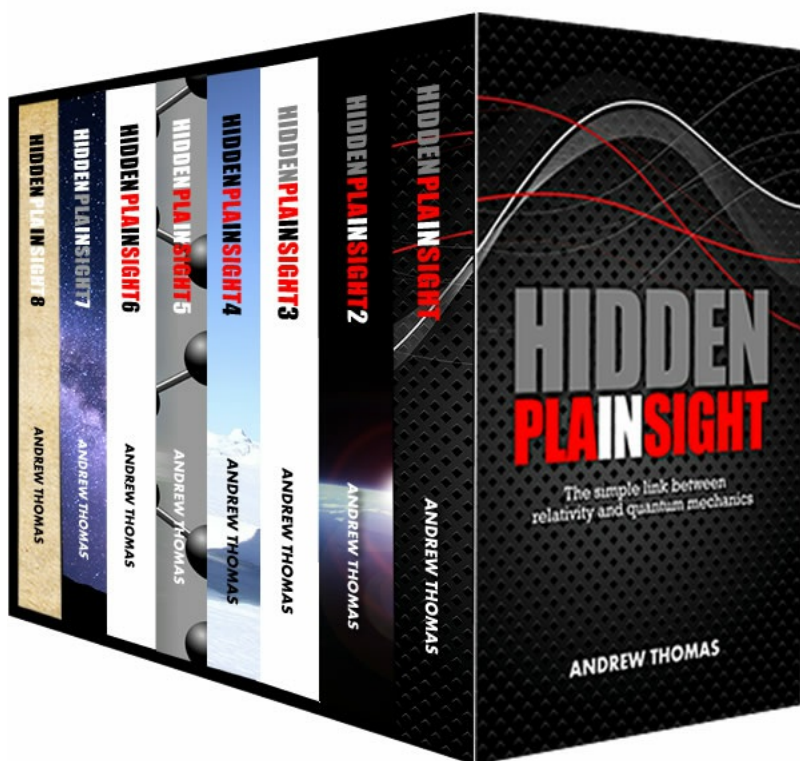
[4] I found a *Physics Today* webpage which makes it clear that the copying of information does not invoke Landauer's Principle: "Gaining, or writing, information is akin to copying information from one place to another. Such one-to-one mapping can be realized, in principle, without dissipating any heat.", *Information: From Maxwell's Demon to Landauer's Eraser*, <http://tinyurl.com/copyinginformation>

[5] In his book, David Chalmers considers a thermostat with three possible states corresponding to the room being too hot, the room being too cold, or the room temperature being OK. This implies that it is a more complex thermostat which is able to control the air conditioning to cool the room, as well as turn the heating on or off. This would require the setting of two temperatures to form an acceptable range. This would require two truth-tables: one to control the heating, and one to control the air-conditioning. But each individual truth-table would still be reversible.

[6] *Is a thermostat conscious?* Romain Brette, <http://tinyurl.com/bewitchedbrain>

[7] George Ellis, *From Chaos to Free Will*, <http://tinyurl.com/fromchaos>

[8] *Neuroscience: Exploring the Brain*, Third Edition, 2007, Mark Bear, Barry Connors, and Michael Paradiso.

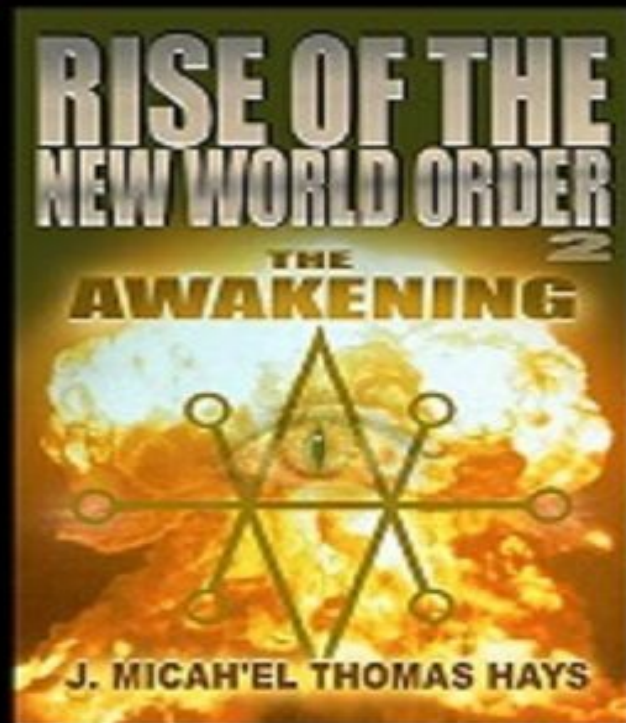
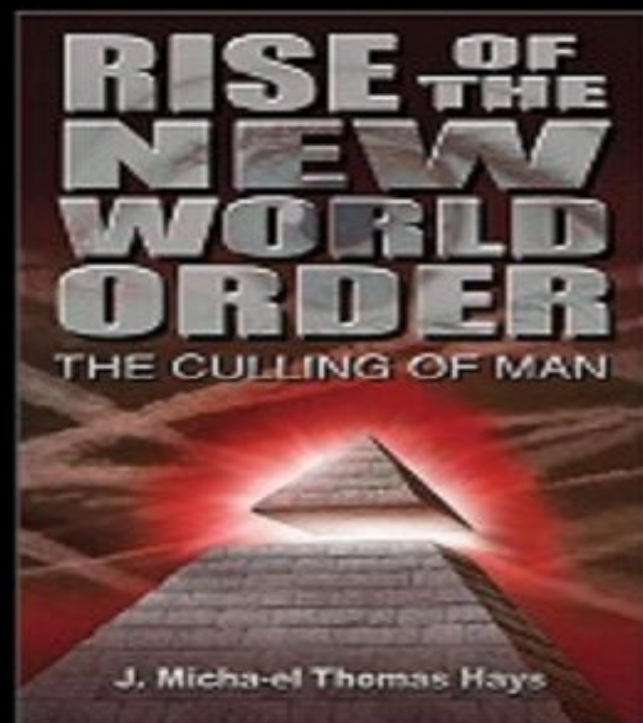


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**Book Series Update and
Urgent Status Report
March 26, 2020 Vol. 1**

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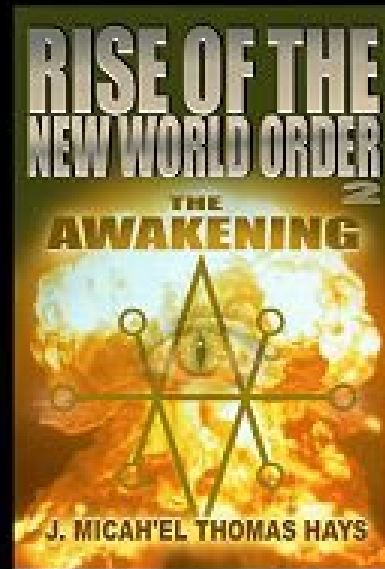
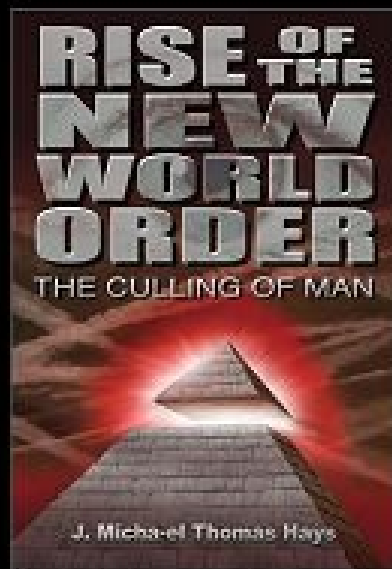


J. Michael Thomas Hays

RISE OF THE NEW WORLD ORDER:

**Book Series Update and
Urgent Status Report**

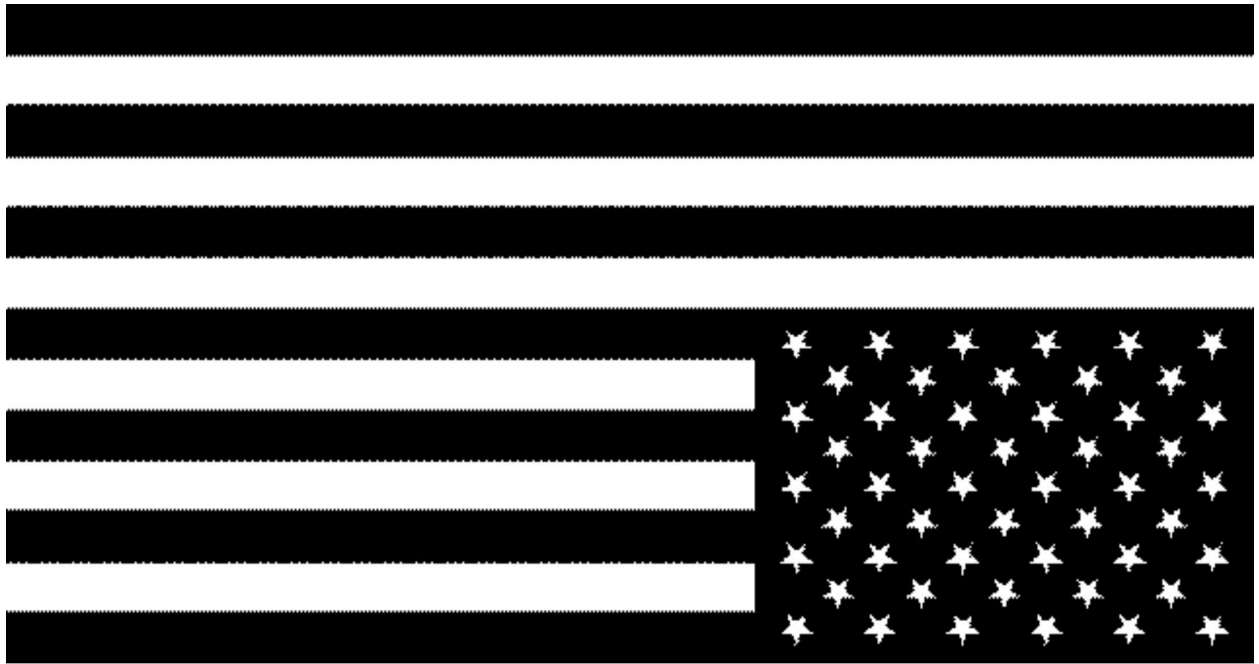
March 26, 2020 Vol. 1



J. Michael Thomas Hays

Rise of the New World Order:
Book Series Update and Urgent Status Report Vol. 1

March 26, 2020



J. Michael Thomas Hays

Well, friend.... this is not how I wanted for us to meet again. I thought we had more time but things are moving quickly now. As we descend into chaos I'm going to try and turn these 'reports' out as often as possible...as often as justified. Please look for me on Facebook, I've got two pages going now as I'm bounced in and out of Facebook jail because I'm trying to wake people up and keep them updated. These are largely NWO-themed meme and news pages but I post links for pertinent other stuff also.

Search for 'Samaritan Sentinel' and 'Rise of the New World Order: The Culling of Man's Meme Machine'. If I'm not actively posting there that means I'm in FB jail...or worse.

I just feel like I needed to say something about the current events to the people who read my books and woke up. This is the best way to reach a ton of people as hopefully Amazon will alert you to my update here. I put this out on Amazon's Kindle for as cheap as they would let me = 2.99. Hopefully Amazon will contact you about this update, you've got to prepare for the financial implosion that will be blamed on this 'pandemic', but it's really a 'plannedemic'.

I'll also try to put this out on my Facebook pages, but it's pretty long for a FB post. I'll definitely try though.

I certainly do appreciate people purchasing my books and spreading them around to support me and my family right now as always. Thank you in advance for your continued support!!!! There is no other book I know of that covers all the bases of the NWO like my first one.

The following should be taken under advisement **as my opinion only** and it is up to you to do your own due diligence in looking into and tracking everything I'm going to say.

I don't know for sure what's going to happen, but we just took a financial gut-shot from the alleged "pandemic" and effectively bankrupted the entire United States and even global travel industries of airlines, hotels, restaurants, etc.

These businesses might never come back. Why would they? To go broke next year over the next plannedemic? This is a gaping hole in our economy with millions now immediately on the unemployment ranks with not much future getting back into the same line of work because all those businesses are folding as you read this. You are witnessing the controlled demolition of our economy, and our country, the United States, right now, right before your eyes while we are all detained in 'soft' martial law for our own good against a virus that will kill less people than the flu. No, you don't want to catch this virus, I've heard nothing good about the illness, but what has been foisted upon the world is a false flag of epic proportions.

I will repeat this as I did for my first two books: Don't ever believe what I say without doing your own research and then coming to your own conclusions.

I am speaking on the authority of the amount of research I've done and continue to do, tips from others, and of course praying my heart out that I will know what to say when the time comes for people to look to me for guidance. I've woke up many thousands or more with my books and I'm not done yet speaking about what has happened and what I can see happening.

So...with all that said....

We've had the NWO/Illuminati/Deep Staters boxed in a corner now for a little while. All their pedophilia was uncontrollably spilling out in the public arena. Pizzagate, Jeffrey Epstein, Jimmy Seville, the Royal Family and tons more are horrible monsters to the point and degree it cannot be hidden any more.

All the names on Epstein's 'Lolita Express' flight manifests read like a who's-who of Hollywood elite, politicians, and European royalty. The cat was out of the bag and they were forced to act and act now or we would be coming for them with torches and pitchforks.

The globalist proponents of the Great Plan and their agenda for global enslavement were being threatened by a ton of people who are now awake thanks to you, me and others spilling the truth about the Federal Reserve, 9/11, Bilderberg, and the like.

We are on to them and they had to act and act fast as they were losing the information war and badly. I have literally spent tens of thousands of hours at this point researching and passing on information to others in my books and on

Facebook...I live and breathe this stuff because that is what I was put here to do. When I woke up in 2007, I jumped right in the fight.

Unfortunately for us, they now use Artificial Intelligence to map out the NWO agenda these days, and apparently it called for releasing an engineered bioweapon against humanity to keep the Great Plan from being derailed.

They are probably going to pull it off with this plannedemic. There is the highest probability that this is the beginning of the End Game I'm afraid. It was always my intention to slow it down but it is moving full steam ahead.

You probably haven't heard this as this type of info is highly suppressed by the NWO-owned-and-controlled mainstream media, but the author of the U.S. Biowarfare Act has gone public stating he believes COVID-19 to be a BIOWEAPON that either escaped or was intentionally released. I believe the latter to be the truth. Watch this video interview on YouTube...as long as it is still up: https://youtu.be/F_TPjbu4FAE

They are not going to run us through this false flag and have millions more people wake up to the NWO, start looking for the truth about what is happening, start prepping, awakening others, etc. They are moving to quash the United States and humanity right now with this false flag called COVID-19.

We are in a bad way in terms of losing our country, and things are going to get way worse fast. This is a **'Red Alert'** status update, we've got a very rough road ahead of us. We've got an intentionally-released manmade bioweapon on one side and the empowered FEMA to "deal" with it, and the diabolical proponents of the New World Order who released the bioweapon on the other side and there is no where to run unless you have a rocket ship to Mars so buckle up.

Throw in an already-collapsed oil market, a soon-to-collapse stock market, and a dollar crisis not far behind and this is going to make for a truly interesting year. Oh yeah, we're supposed to hold an election or something also.... almost the entire Federal Government is up for grabs this November.

Now it came out that some of the Congressmen and women sold their stock in hotels, etc. because they had beforehand knowledge of exactly what was going to happen. This whole thing is a gigantic false flag to protect the Deep State/Illuminati/New World Order crowd.

Why didn't they warn the hotels/restaurants/hair dressers/etc. that this financial storm was coming when they clearly knew it? Because they didn't want to cause panic. They are still doing this right now with Trump saying that he can't wait to get back to business in America. You can tell he is quite uncomfortable jerking us off like this because he too knows what's coming: FEMA martial law and the end of the USA.

So now we've got all the **MILLIONS** of hotel workers, restaurant workers, airlines people, etc. all unemployed and largely going on the government payroll via unemployment...they are now dependent on the state to survive going forward because those jobs aren't needed in the New World Order. That type of excess is coming to an end, slaves.

This is not good at all, we are headed straight into tyrannical fascism. The definition of fascism is when the state takes over all corporations. It also works the other way and this is why we are falling: the corporations have already taken over the government via lobbyists. Term limits and anti-lobbying laws could have prevented this but you know...everyone has their price. The entire federal government is bought and paid for by the Federal Reserve crowd!!!!

I don't believe that we will pull out of the current financial nosedive we are in right now. This is probably going to be the big crash I talk about in my first book. This is why the Federal Reserve and Trump/Congress are all over this thing...throwing \$2 Trillion dollars at it just to start with. Mortgage companies letting people slide for a year on their mortgages, SBA emergency loans available, etc. They know the shitstorm is right on the horizon. You can expect a roller coaster ride on Wall Street going forward...it will be one step forward, two steps back all the way down...possibly to ZERO.

I knew that the next crash after the 2008 one was going to be the big one, they just barely staved it off last time but this time it will be too big of an issue.

After what they did to stop the big crash in 2008 by using all their silver-bullets of interest rate reductions, this Greatest Depression is going to hit HARD.

They already ran the interest rates so low they can't really go lower without them paying you to borrow money...

negative interest rates. Trump has publicly called for them himself!

The Fed right now is injecting money into the economy by buying “mortgage-backed securities”. This is a fancy way of saying they are entering numbers on a computer screen to create hundreds of billions of dollars out of thin air and purchasing the rights to your house when they foreclose on it after this Greatest Depression gets rolling. Your house. Your neighbor’s house. Your grandma’s house. My house. All by printing money out of thin air for a small handful of globalist, satanic pedophiles.

Getting mad yet? I am....I am PISSED, pardon my French!!!

Some people were barely making it before this happened...I’m one of them! I’m not sure what I’m going to do but if enough people pass this report around, I’d move a few books and get some kind of plan together for my family’s financial situation. I spent way too much time over the years working on waking people up instead of looking for work...my bad.

The lumber store down the street from my house is only open for ‘takeout’....?????. Look I’m a construction worker. You just don’t have a takeout/curbside lumber store...it just doesn’t work like that. I’m a lifelong carpenter, I’m going to be hand-selecting the best lumber there is to make my work look as good as possible!!!

This isn’t going to last long before everyone goes under like dominos and the whole thing crashes right to the ground....the whole pyramid scheme under the Federal Reserve is to thank for the coming financial woes.

Funny, that’s why it was expressly stated in the Constitution to NOT EVER ALLOW AN ENTITY LIKE THE PRIVATELY-OWNED, FOR-PROFIT FEDERAL RESERVE TO EVER EXIST. And we let it in and gave the country’s control to the evilest people on the planet: the Satanic pedophile murderous Illuminati banking families. You know exactly who they are from my first book!!!

You already know everything I’m talking about I hope...if you read my first book, I’m preaching to the choir here. It’s just unfolding now before our eyes and it’s like watching a horrific train wreck happen in slow motion, in real time.

And then when people are wondering what to do with the ‘cash’ they have in the bank after they barely sold their stock for pennies on the dollar...their ‘cash’ being literally numbers on a computer screen and not gold in their pocket...you know...real money? They are going to implode the dollar either during or after the stock market meltdown and the dollar will then be worthless also.

The 2020 coronavirus plannedemic will be the scapegoat for the illegal, not-so-Federal Reserve’s economy coming apart at the seams. This is an intentional, controlled demolition of our economy, just like the WTC on 9/11.

You know what’s funny? The goberment ran drills for this exact scenario last Fall!! The stock market will go to zero, then the dollar crisis will wipe out what is left. I wouldn’t be surprised to see UN troops on the ground here before the end of the year. This is about a right time to get right with God if you haven’t lately, because you might be going to see Him soon.

I fully am expecting riots to begin in the cities this year, either from people getting cabin fever or if the food starts to run out in the next few weeks/months, or whatever. People are broke right now, imagine not working at all for weeks or even months. This thing could drag on as long as they need it to in order to finish us off.

I also expect that we will be kicked when we’re down. I’m fully anticipating a major earthquake in the United States and soon, I would say this year. With the HAARP technology available to the NWO they could easily trigger the Cascadia Subduction Zone earthquake right in my backyard in Seattle!!!

This would essentially destroy about every city up and down the West coast, coast of Japan, etc. This will be a HUGE quake with massive damage and massive loss of life. They were just running drills about it out here a couple years ago so that should tell you all you need to get your guard up!!

Now, going forward from today, Trump will eventually be blamed for the economic meltdown and the handling of the COVID-19 ‘plannedemic’. All voting this Fall will probably be electronic/mail-in and there will be no exit polls to police this election because I believe we may still be in quarantine later this year!

This elimination of exit polls will open the door to the proponents of the Great Plan to rig the election and install

good ol' Hillary Clinton. Yes, I believe Hillary is going to be Biden's running mate, he will bow out or be removed, and Hillary will be in the driver's seat. Have you seen Hillary lately? She just got a bunch of plastic surgery in anticipation of her big day in the limelight as the "savior" of the U.S.....*gag*. She would love to be the one to put the knife right the heart of the good ol' USA.

The Illuminati need their Jezebel in the driver's seat to put out the flames of all the pedophilia and general corruption we all know that they're up to.

Forced vaccinations are probably coming later this year and will be accompanied by attempted gun confiscation in the USA. I don't know if this will ignite a Civil War, but the death from the force-injected bioweapon they will label a 'vaccine' will arguably be worse than being shot with a gun so take your pick when the time comes. You will know what to do.

Going forward after this plannedemic blows over, 'Pandemic' will be the new invisible boogeyman to terrorize humanity. It was terrorism but that wasn't good enough. You can expect a mandatory annual 'pandemic' shot against whatever it is they cook up that year to go along with your flu shots, etc. No. Thank. You.

I doubt I'll be around that long anyways to be quite honest, I'm not very popular with what I've already done in the infowar against the NWO. I won't be taking any vaccine either. Nope.

They will introduce the new digital global currency, which of course they will issue and control....and legally mandate you use. The mainstream media is already quacking about the paper money and coin transmitting the virus. They want to go to a cashless society so they can track everything and it is unfolding right this second!!

The same people who set up the central bank pyramid scheme are the same ones who are setting up the global currency system. We're going digital people. RFID chipping of the population is right around the corner and actually has been practiced for many years at this point already. Soon it will be mandatory...arguably the Mark of the Beast.

I see Bitcoin being outlawed for the 'good of humanity' after the dust settles. Can't have any rogue currencies running around competing with the Satanists for control of the money supply and therefore humanity.

I also see gold confiscation coming, again, just like during the Great Depression. They want it all. Every last bit of it. For a dozen or so Satanic families pulling the strings of our reality.

Hey, it's Satan's world, says so right in the Bible. That's what my second book is all about, how we are in the clutches of Satan and his minions and always have been, that's how it was designed. They just do his bidding and have for thousands of years...and reap the rewards.

Now the game is coming to an end. Just as the Baby Boomers start checking out in large numbers, possible thanks to this coming plague called COVID-19, Gen X, the Millennials, Gen Z and beyond are all going to be left here to go through a literal Hell on Earth.

Even though we are staring down the oncoming crisis, it is still our duty to tell people what is really going on. To educate them with the truth of everything in my first book. What I learned by researching and writing my first book transformed me from an unbelieving atheist to a born-again Christian. The entire New World Order conspiracy is in the Bible if you have eyes to see and ears to hear the truth, this cannot be disputed if you've read my books.

I do believe I was always a saved man...I just didn't know it. Something had to trigger it and that something was knowing what was really going on in our world. There are still thousands and millions to wake up to this truth so they can claim their rightful place in the Book of Life. If they are saved, their names are in the Book of Life from the beginning of the world. I think that's somewhere in Revelation lol. They just need to be triggered...in a good way!

So many people have no idea what is happening that there almost needs to be a 'group awakening' or something. Unfortunately, only a very small percentage of people listen to what I'm saying and a HUGE percentage of people listen to useless talking heads on mainstream media...literally paid actors! None of them investigate ANYTHING or I wouldn't be writing these books!

I will tell you this, if I only were to wake up one person with my first book it would have been worth it, but I've woke up many more simply because I jumped in the batter's box and swung for the fence for humanity.

You yourself can get just as active and fast. Throw together a blog. Start doing videos. Start posting on message boards. These are what I was doing at the start before I had the motivation to go full throttle and write a book outlining all the pertinent stuff going on.

And that reminds me....the third book...*big sigh*

I'm so sorry it has taken this long....it's going to take a little while longer now. I was on track to get it done and out by the end of this year but I don't know what's going to happen now that we are heading into dire straits...hence this 'report'. This may be the last you hear from me! I'll sure try and get it done and out though.

I can let you know that the third book is way more like the first book in that I'm giving out a bunch of different topics and showing how they tie to the first book and the Great Plan for global enslavement.

The second book of the series, the Awakening, was more of a one-off but is super-pertinent information. I wish I would have had the second book as a separate, stand-alone book but what are you gonna do? That's what I get for doing everything myself right? Right. Author. Editor. Publisher. Advertiser. Promoter. I don't really know what I'm doing, I'm just making it up as I go!

Obviously, I'm getting help from above with all of this, because if you knew me personally, I'm a lifelong construction worker to the core. I'm pretty rough around the edges in other words. I'm still a beer-drinking, cussing, gun-totin' rock-and-rollin' patriotic guy and nobody, and I mean NOBODY needed to be woken up more than me back in 2007.

That spun my head right off when I woke up to the NWO and I went crashing to the ground as an unwashed atheist with no hope knowing about the NWO and that it was real.

Only a couple years into my research and Jesus spun my head back on straight, picked me up and dusted me off, and sent me off to write that first book.

And here we are now 7 years after releasing my first book and it's all coming true. I would be lying if I told you I wasn't a little scared, but I'm also a little excited. I really can't wait to shed this worn, physical body and get a one-way ticket outta Satan's world and into the loving arms of Jesus. We've all gotta die sometime, that's a fact, so no reason to be scared of it knowing your place is secure after the fact.

Never in our history...since the days of Nimrod's Babylon, has the world been so gripped by evil. Think about it. We have the most decadent society in the history of mankind. With the technology came great evil. Online porn. Tinder for random sexual hookups. Gay marriage. Trans kids...? WTH is that? We are in BIG TROUBLE.

So...I haven't worked on the third book for about three or four weeks now, just too much going on to get my head into it. But this mini-book you are reading now suddenly came together in just the last few days...I was suddenly moved to get something out there.

I just went and read the preface to the third book and got sick to my stomach as to how drastically things can change in life, and quickly.

Here is the preface for the third book as it was intended to be released later this year:

Preface of “Rise of the New World Order 3:Resonance”

Well I can hardly believe I've reached another milestone in my crazy life and managed to get my third book out but here we are. The world still hasn't ended and I'm still working my construction jobs and working on these books as I've got time available.

I've been doing a lot of 'memelording' since getting onto social media at the start of 2013 and I HIGHLY encourage you to join me and millions of others globally in this very effective campaign against the NWO. A picture says a thousand words. If you combine a powerful, thought-provoking picture or image, coupled with witty, biting, factual smarm, you have created a powerful propaganda tool and the NWO knows this.

*You would be amazed at how many people are awake around the world to the Great Plan. It doesn't matter if you are black, white, Latino, Asian, gay, straight, Christian, Hindu or whatever, the people running the planet want to cull the global population way down for easier control and **EVERYONE** is on the chopping block.*

There is an old saying, the enemy of my enemy is my friend. The enemy to humanity are the proponents of the New World Order, this makes all of humanity to be friends against the foe, the NWO. I don't care who you are, if you are awake and against the NWO agenda for global enslavement I've got your back, friend.

If you're already awake and have been doing research of your own, you may know some or all and even more than what I'm going to talk about here. Great. Awesome. Love it. Thank you from the bottom of my heart for taking a keen interest in our future. But if you are just waking up and recently coming off my last two books, you will find this a continuation in your crash-course about how the NWO operates.

In fact, part of the reason for this book 3 is if someone were to sit down and wake up for the first time, they would be able to read all three of my books straight through and have a better understanding of the NWO than 99.99% of the rest of the population. Another part of the reason for this book is hopefully I am bringing to even seasoned researchers some new information. And lastly, part of the reason for this book is to put into writing the facts of what is going on before they are censored from the internet by Google, Bing, YouTube, and the rest whose owners and controllers have been sucked into the Illuminati and now regularly attend Bilderberg meetings, Bohemian Grove campouts, attend CFR meetings and are on the Trilateral Commission, etc.

As with all of my books, as a whole they should be considered to be my opinion. Don't believe what I write as Gospel, research about what I write, but don't disbelieve out of hand as you read it either. I make my books as fact-based as possible to stand up to the naysayers.

Again, as with my first book, each chapter and subchapter in this book could have multiple books written about it and have been. I'm just bringing to your attention everything I think you should be made aware of at this point in time, just like my first book. I put everything in that book that I thought you needed to know to get at least a basic understanding of the New World Order. Now I have many new topics for you to look into and add to your arsenal of knowledge about what's really going on in our world.

People have no idea how good we have it today compared to 100 years ago in terms of creature comforts. At the same time, we also have it worse today because all of those things can be instantly taken away by our advanced technology.

For example, a single nuclear device detonated 250 miles above Kansas would cause an EMP that would knock out the national power grid and anything that needs electrical components to operate...which is about everything. This would instantly send us back to the 1800s. The cities' sewers would shut down and immediately begin to spill into the streets, rampant disease would immediately follow. Rape, robbery and murder would immediately commence upon those in the cities, especially if the guns are managed to be taken from the law-abiding.

This is a fact and there have even been Congressional hearings and public warnings generated about this so it's not a matter of if but when stuff like this is going to happen. They even tell you to have two weeks of survival supplies on

hand. If you've read and followed my first book, you should actually have way more!

Look at how far we've fallen since the publication of my first book in January of 2013. Full-blown socialists occupying seats of our government at all levels. You should know by now that the New World Order is a socialist, anti-God/Jesus and pro-Satanic agenda run by the 'do as we say, not as we do' global elites.

"Bad men cannot make good citizens. It is impossible that a nation of infidels or idolaters should be a nation of freemen. It is when a people forget God that tyrants forge their chains. A vitiated state of morals, a corrupted public conscience, is incompatible with freedom"

-Patrick Henry, one of the Founding Fathers

The United States in particular is on the NWO's chopping block. A strong United States that the UN has no power over cannot be for much longer if things are to progress according to plan. We are the modern-day Babylon and we are slated to crash and burn...one way or another.

On June 26, 2015 the US Supreme Court legalized gay marriage nationwide. Gay marriage was just the beginning down the road to good ol' Sodom and Gomorrah. Now we've got 'trans kids' running around and we are expected to accept that that is the new societal norm. Now they are pushing for kids who aren't even old enough to decide their bedtime to decide if they want to undergo gender reassignment surgery...complete madness.

As an active member of the Truth Community I am pushing back against the lies and propaganda with everything I've got on social media as are others...and have paid the price being censored heavily, even banned for speaking my mind.

In particular, any opinion against the radical LGBT agenda is censored as 'hate speech'. If you are against pedophile drag queens hanging out in public libraries with unassuming parents with young, impressionable kids then you are a homophobe and not welcome on the liberal platforms of Facebook, Twitter, etc. We have fallen quite a way since I first woke up in 2007.

Since the publication of my last book in 2015 the banks and other major globalist corporations have installed RFID chips in all their debit/credit cards. These chips constantly track your location, buying habits, etc. and this information is collected and sold among the globalist entities. The next step from this is human implants, something that has already been happening for years now and is only increasing in usage.

Cancer rates are 100x what they were 100 years ago. As you know, we are under attack by land, sea and air.

Our GMO food is laced with biotoxins, pesticides and cancerous chemicals. It's not even food, it's a science experiment.

Fluoridated water is still the norm in the USSA, while being outlawed in about every other country on Earth.

The chemtrails/geoengineering are ramping up filling the air we breath with aluminum, barium, and who-knows-what-else.

We are exposed to millions of times more electromagnetic radiation than our grandparents were thanks to the proliferation of personal wireless devices: phones, tablets and laptops. The generally safe 'wired' desktop computer's numbers are declining as rapidly as the unsafe, radiation-spewing wireless devices are expanding. We're literally bathed in radiation these days and the closer you get to the city the worse it gets...another good reason to get out if you can.

The globalist drums are beating loudly for gun confiscation here in the United States thanks to a series of sloppy false flags that were picked apart by the Truthers.

Forced childhood vaccinations are now making their way through various local governments, again, largely pushed by government-worshipping statist.

Keep in mind that I'm not a Republican, a member of the 'alt right' or any kind of ridiculousness like that. I am a Libertarian believing in less government and more freedom, something neither the left or right is behind. No matter who is the President, the globalist, one-world agenda marches forward.

Remember from my first book about the global warming hoax/scare? The United Nations propaganda machine has been rolling tough as of late to scare everyone into thinking that 'Climate Change' is going to doom us all if we don't turn over all aspects of human society to UN control. Just look where we're at with 'climate change' being shoved down our throats at every mainstream media propagandized moment. Greta Thunberg anyone?

This engineered storm of 'climate change' is purely to stampede humanity into the UN's waiting clutches. This physically involves using Tesla's various amazing technologies to affect the global weather and cause events that the UN is pinning on 'Climate Change'.

Just about all the hurricanes, fires and floods that are going on these days are not necessarily all caused by Tesla technology, but all can either be created, made worse or alleviated completely with said technology and I'm going to show you how in this book.

Not only can they affect the weather through 'geoengineering', they can affect us personally using Tesla's technology via radio frequency (rf) waves...including being able to literally insert voices in our heads! This is a fact that I will prove using the various patents on file stating they can do exactly this!

There are pressing things for you to be aware of and/or watch out for going forward. A lot of people are sensing the dangers around them but less are actually 'waking up' to the Great Plan for global enslavement.

If you are awake and know others that aren't you need to step up your game in sounding the alarm that things aren't right. I talk to people constantly about what's going on in the world I come into contact with when I'm out and about.

Pretty much everyone I personally know I've impressed upon them the information about the Federal Reserve being privately owned and controlling our economy and by default our country. Everyone is interested and concerned about money so this is always a good 'in' to get a conversation going about how the Fed, 9/11, the CFR, etc. are all connected through the ancient money powers headed by the Rothschild Banking Dynasty and buttressed by the Rockefellers and others to maintain a death grip over humanity.

So...This is arguably the true sequel to the first book...this is largely information I didn't know about at the time of the publication of my first book, and it took a few years of researching and just living as an awake soul to take it all in and see what else was out there that needed to be put into writing so the facts may live after information like this is struck from the internet like a hatchet against 'domestic terrorism'.

You mark my words because it's coming. Only the paper copies of my books will withstand the test of time. Files and notes on computers will easily one day be able to be remotely scrubbed of information. If you don't think the FBI, NSA, CIA and the rest aren't intimately involved with the development side of companies like Microsoft, Google, Amazon, etc. you haven't been paying attention.

People like Bill Gates and the founders of Google are all-in for the NWO, attending Bilderberg meetings, etc. Remember, money is power. Gates and Bezos have billions. The families who run the Great Plan are worth in the hundreds of trillions.

The people who run the Great Plan have been drawing interest on monopoly money for hundreds of years at this point. They constantly add to the amount of money in circulation (inflation) which they own to start with by printing out of thin air, then they loan it out to governments AT INTEREST remember. They are stacking coin left and right and we pay for it all!

"Compound interest is the eighth wonder of the world. He who understands it, earns it; he who doesn't, pays it."

-Albert Einstein

If you've made it this far and have read my first two books, I commend you for wanting to know as much as me. I want to know exactly, factually what is happening no matter how ugly the truth is.

I've never said that I know it all when it comes to the New World Order, but I want to. I want to know everything about what's happened with the Great Plan and what's going to happen.... most don't. Most can't handle knowing what we've learned so far and we're not done yet.

Now, my second book was and is extremely important information that I felt at the time was needed to lay the ground work for going forward. I'm not so sure now (lol). That book is vastly ahead of its time, even now, as there were no books on Saturn worship to be found on Amazon or the whole of the internet when I wrote that book and believe you me I looked because I am a voracious reader and wanted to know everything about ancient Saturn worship.

It is still largely the only book putting all the pieces together of ancient history and how Satan navigated his way through it collecting worship and adoration the whole way. Now that that's out of the way, off my plate, off my back, whatever you want to call it, we're back on track getting into the nuts and bolts operations of the Great Plan....the forward march to totalitarian world government and eventual (re)appearance of King Nimrod, aka the Antichrist.

*A lot of people didn't like my last book, the Awakening, because they felt I gave too much attention to Satan. There is a **BIG** difference between attention and adoration. Hopefully they won't have a problem with me giving too much "attention" to Jesus and our Heavenly Father in this book 3, all entities need to be understood the best we can.*

It's important to me personally since coming around and getting born-again during the research for my first book to try and figure out what He wants from us and why we're even here. I'm always asking myself questions and then trying to figure out the answer.

So what does He want? Adoration. It's actually very simple. Adoration is love, fear and respect all wrapped into one word. And what's Satan's #1 job right now in this world? To block that adoration by misleading us from all angles in order to transfer adoration to himself or his 'son' King Nimrod.

Look at what all the celebrities are doing flashing the occult signs, saying they are in the Illuminati, etc....it's because they really ARE Illuminati foot soldiers!!! Sure Jay-Z and the like are worth millions but their masters are worth TRILLIONS. All of this pedophile stuff coming out of Hollywood, Jeffrey Epstein, etc. is just the tip of the iceberg. The Satanic Great Plan is slowly but surely coming out into the open arena for all to see because we are ever near the End.

(End of Book 3 Preface)

So, friend, what do we do right now besides worry, fret, cower and let them run roughshod over us, our friends, family and way of life? You gotta get MAD and stand the up with me and millions of others and say NO!!! You CANNOT force-inject us. You CANNOT have our guns. You CANNOT force us to use an illegal digital currency issued by an illegal entity called the Federal Reserve! All of the preceding are illegal according to the Constitution.... HELP! HELP! HELP!!!!

This whole pandemic is a false flag 'plannedemic'. Things you need to look into immediately about it include the following highly important issues:

-Event 201

-ID 2020

-CDC loses autism case

Quarantining the population will not stop this pandemic. When everyone comes out of their home detention there will be another wave of plannedemic. Only their vaccine will "stop it" so life can get back to normal...that's where the mandatory injections come in.

The CDC just lost badly in federal court and you probably never heard a peep about it. They lost a case to a non-profit who sued them over their statement that 'vaccines don't cause autism'. **The CDC could provide no proof of their statement so they lost in Federal court! This was completely whitewashed by the mainstream media.** Just another reason that this false flag is meant to take us down...we're on to them.

You've got time off now in 'quarantine'? **Get ACTIVE!!**

If nothing else help **ME** to get more active against the NWO! I've been trying to get on the Coast-to-Coast radio show for years and they won't even return my calls or email. Same with Alex Jones and others. I need **YOU** to email C2C, Alex Jones, and anyone else you can think of to get me on the air. My email is at the end of this report for a contact.

Nothing more I'd love than to be a monkey wrench in the gears of the NWO tyranny machine one last time but I need your help!!!! **I'M NOT AFRAID OF THEM** so saddle my horse, hand me my lance and watch me go right at them armed with faith and truth.

“But an hour is coming, and now is, when the true worshipers will worship the Father in spirit and *truth*; for such people the Father seeks to be His worshipers. God is spirit, and those who worship Him must worship in spirit and *truth*.”

-John 4:23-24

Thanks for backing me up all these years and thanks for your support!!! Tell everyone you know about my first book and we'll see what happens. You never know, I pray that we can pull this current situation out of the fire but it's looking ominous, hence this report.

One last note before I sign off here, the artist for my book covers, and my friend, David Dees, has been diagnosed with stage IV cancer and is on the ropes. He's the original motivation for me to jump fearlessly into the fracas....thanks again David Dees, good luck on your recovery. He's forgoing traditional treatments like chemo and radiation and going the natural route. Please pray for him...we need him more than ever.

I pray for you daily my friends and allies, and hopefully you for me...I'm going to need it!!

Pray for the best but prepare for the worst.

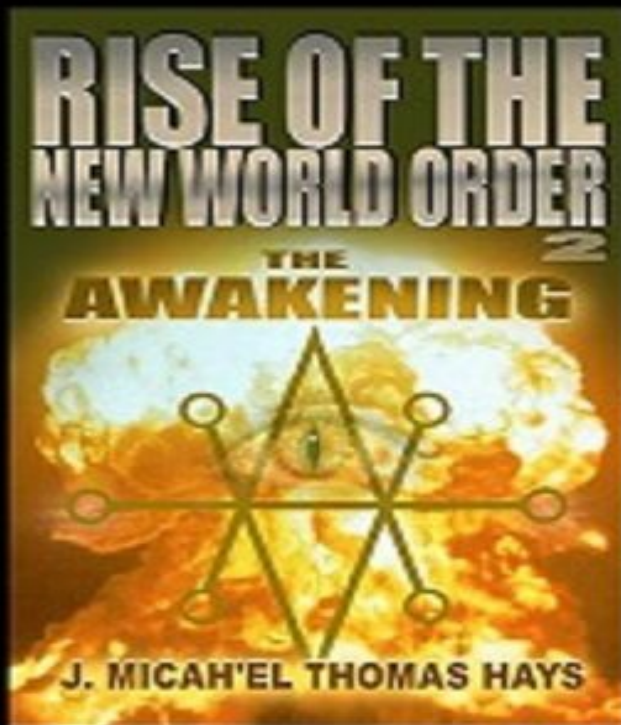
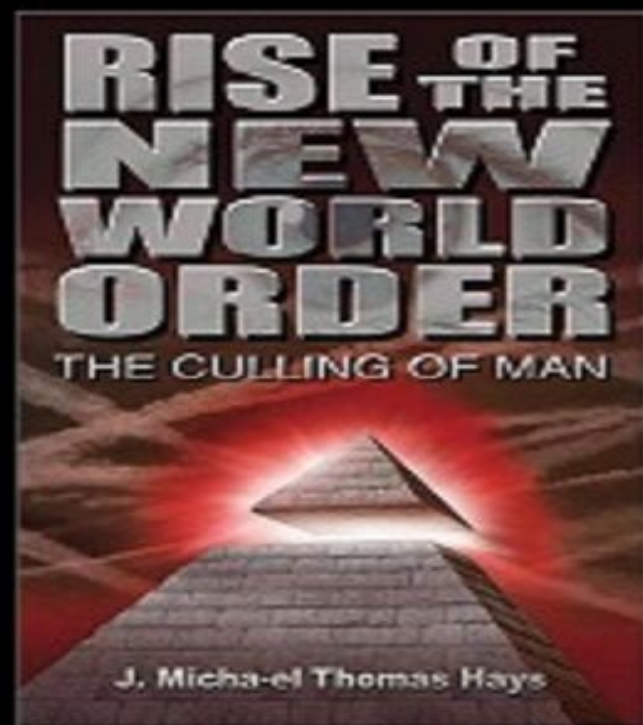
In His service,

-J. Michael Thomas Hays (Sentinel)

RISE OF THE NEW WORLD ORDER:

**Book Series Update and
Urgent Status Report
May 18, 2020 Vol. 2**

2

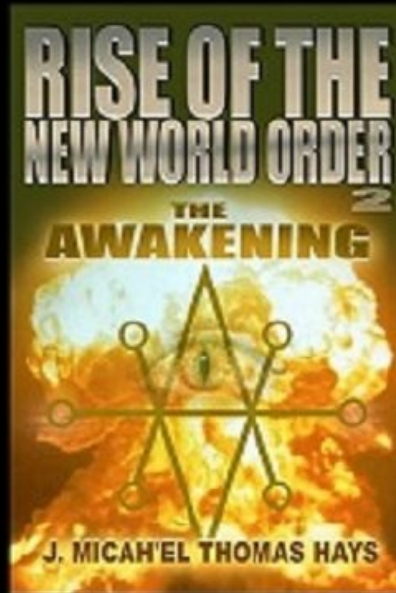
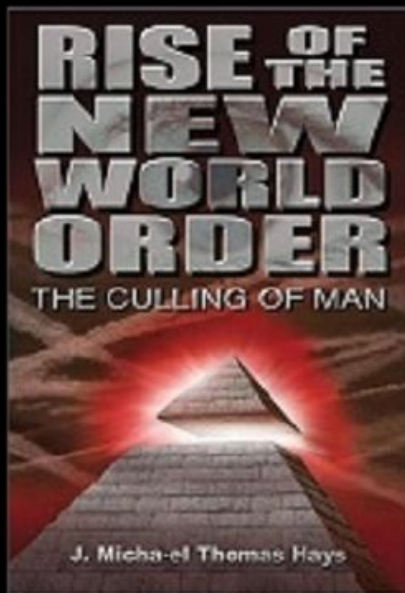


J. Michael Thomas Hays

RISE OF THE NEW WORLD ORDER:

**Book Series Update and
Urgent Status Report**

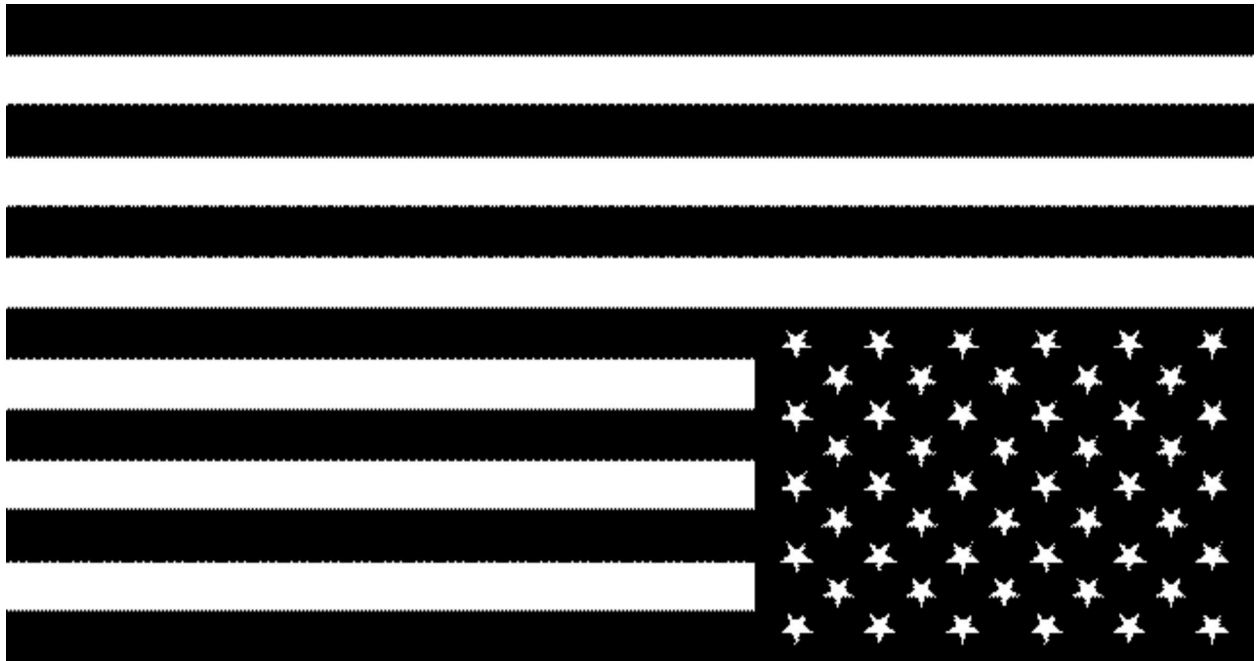
MAY 18, 2020 Vol. 2



J. Michael Thomas Hays

Rise of the New World Order:
Book Series Update and Urgent Status Report Vol. 2

May 18, 2020



J. Michael Thomas Hays

Table of Contents

Table of Contents: Page 3

Intro: Page 4

“Slow Kill Bill” Gates: Page 16

Event 201: A Global Pandemic Exercise: Page 28

The ID2020 Alliance: Page 31

Predictive Planning 101: Page 38

The Shutdown: Page 48

The Covid-19 Mandatory Vaccine: Page 53

Conclusion: Page 58

Intro

“Nearly every American citizen is suspect under the Patriot Act. Cameras are everywhere if you take the time to look around and notice them, tracking everything you do. Just look up at the traffic signals the next time you are in any decent-sized town. A good deal if not all of these cameras are equipped with facial-recognition and license plate-reading software.

These are not only monitoring but recording everything that comes into the lens and stored, just in case they need it. It costs next to nothing to store information these days, and they are storing as much information as possible.

We are constantly pushed to stop using cash or checks and to go with “automatic debit” to pay our bills, and on the other end “automatic credit” for our paychecks, whereby we don’t even hold in our hand the money we earned from working an honest day’s labor—it’s just numbers on a computer screen, all tracked by “big brother”.

Virtually your entire life has been recorded and is on computer records somewhere, and if you are suspected to be a combatant against the New World Order agenda, these records will be assembled together in some Homeland Security office, and your case will be assigned to one of the HS lackeys to “keep an eye on you”.

This means this person will be constantly reviewing everything you do, everything you buy, what websites you go to, where you drive your car and what places you visit, looking for anything to build a case against you as a domestic terrorist.

If they feel they have enough “evidence” that you are a threat to the Great Plan agenda, and if you haven’t fallen into one of their pitfalls, they will just flat out arrest you with no reason needed or given, and send you to a FEMA camp, or worse to Guantanamo, probably never to be heard from again and all “legal” under the NDAA signed by Fuhrer Obama at the end of 2011.

We are also headed for a national ID card system complete with RFID location-tracking chips. Once that is implemented and accepted by the sheeple, they will take it to the next level: Personal RFID microchipping, either

by implantable chip or RFID tattoo, with both of these options in existence right now.

RFID stands for Radio Frequency Identification, and allows you to be tracked by GPS anywhere on the planet. I'm not talking about injecting a small chip under your skin either, they can in fact do it now with an RFID tattoo, and if you don't believe this you better Google it, because that is a fact. Be vigilant for false flag events concerning information security that could make RFID chipping mandatory by law.

There are about 900 drone (unmanned) airplanes flying over the U.S. at the beginning of 2013, and that number is projected to skyrocket to 30,000 within 10 years. Why so many drones over the U.S.? It's part of the Homeland Security police state they are implementing. And they are all already equipped with facial recognition software and.....maybe assassination implements for the most patriotic dissenters in the future? That's what they are doing right now in Afghanistan: assassinating the "troublemakers", and any men, women, and children who happen to be in the immediate vicinity.

Look for this to start happening in the U.S. at some point in the future, literally "Death from above".

The way they are going to excuse quickly bringing in this tyrannical behavior is through declaring martial law in the United States.

There are a handful of scenarios laid out in the FEMA guidelines that allows the federal government to declare martial law and suspend the Constitution. This will be accomplished with one of many different false flag scenarios that we already know are in the works due to vigilant people researching these kinds of things.

Remember what a false flag is: an orchestrated event to get the people to capitulate to what the Great Plan needs to advance, but otherwise wouldn't go along with it. An orchestrated event like the coming economic collapse most likely, but time will in fact tell.

It was actually made public in the Mainstream Media recently that Homeland Security had purchased 2 billion rounds of 9-millimeter and .40 caliber hollow-point bullets specifically to arm their employees with and also to distribute to other federal agencies across the country.

Hollow-point bullets are made to do one thing: inflict maximum tissue damage to a human in the hopes of a single shot being a kill shot. Now why would they be doing this? Is something going to happen that the feds know about that hasn't been put out in the Mainstream Media to alert the public? They wouldn't keep us in the dark, would they? You already know the answer to that question.

2 billion bullets are enough to pump 6 rounds into every man, woman, and child in America. What are they planning on doing with all of this ammo except to use it and soon.

Let's go over some of the potential scenarios that I feel are possible, or probable, so that when the next false flag event happens, you will know the truth of what is really going on.

We already went over the economic crash that's coming, the likes of which has never been seen before. The dollar is currently the reserve currency of the world and won't be in the near future. This spells disaster for the citizens and country of the United States of America.

As the derivatives pyramid comes crashing down, the Federal Reserve will begin to "print" money en masse to try and contain the fire. This will not work, hyperinflation will ensue, and the dollar will crash. This means that the dollar will become worthless, and if you have your wealth in the form of United States dollars, you will be financially ruined.

The economic conditions that gave rise to Hitler are coming again x 100. The reason for the crash will be blamed on the Federal Reserve and the other central banks. The Federal Reserve and the rest of the individual nations' central banks will implode or be abolished. This will pave the way for the introduction of the ultimate one world central bank, of course owned by the Illuminati families.

Again, when this massive economic crash happens, you will know that it was coming, who did it, how it happened, and why they did it.

As the worldwide central-bank pyramid scheme falls like a house of cards, bringing worldwide economic and societal collapse, expect pestilence and disease to go off the chart as the power grids break down, sewers quit

operating, drinkable water quits flowing into the cities and countries, and generally unsanitary conditions explode.

This would probably be a good time for the operators of the Great Plan to introduce a worldwide flu pandemic.....or worse.

Another way, all by itself, to introduce martial law is through a massive pandemic. Military scientists exist whose sole job purpose is to create deadly bioweaponry for the New Babylon's military use.

This is where that anthrax came from immediately after the attacks on 9/11. If you research what our military is in possession of in terms of weaponized biological agents intended to be used against human beings, it is truly frightening.

A massive outbreak of an engineered, highly contagious, highly deadly virus would not only excuse martial law to "limit the spread of the disease", it would eliminate millions, if not ultimately billions of humans from the planet.

Remember, the elimination of 90% of the Earth's population is one of the goals of the Great Plan.... the Culling of Man.

Don't worry though, I'm sure the Illuminati and their families will have the needed vaccines to be able to live and carry on for us all.

The military, under the direction of the proponents of the Great Plan who run the government, have built massive underground cities for the elites to go and hide out in just in case something like a massively deadly and contagious pandemic breaks out. There are over 100 of these multi-billion dollar "hideouts" in existence in the U.S., called DUMBS or Deep Underground Military Bases. Just something else to Google and research for yourself...."

*-From my first book, "Rise of the New World Order 1: The Culling of Man", released January of 2013, **Chapter 12/B: What's Going to Happen***

Well...hello again my friend...long time no talk!

I've decided that we're going to go down with the ship together, I plan on releasing these reports every few weeks now as our situation continues to deteriorate. I'm researching as we go, filtering and fact-checking everything as best as possible. Censorship on Google of pertinent information is getting worse by the day at this point. I'm glad I've got my first two books done and out, a permanent record of the truth.

Obviously and as always, what I present in my books should be taken as my educated opinion and not as gospel. All of my books are my **opinion**, based on **facts**. Due diligence is up to you to research everything I talk about and come to your own conclusions. I'm just telling you what I believe and why.

I was always taught growing up if someone was doing you wrong you speak up and call that right out to the point of physical altercation if it comes down to it to stand up for yourself.

I am vastly too disgusted, bewildered and angry to sit on my hands while Bill Gates walks around like a humanitarian in the public eye when he's anything but...truly an agent of the global pedo-Satanists.

This psychotic Bill "Baal" Gates started our country on fire and then shows up in a fire truck...with hoses full of poisonous vaccines.

Time is too short to keep my powder dry...our country in the jaws of the NWO Beast as I speak. Please print up this report if you're able and pass out!!!

Print these reports up on hard paper to share with others as things go right to hell. If you are able, get the paperback of my first book, you can read it aloud to family and neighbors after all electronic traces of the Truth Movement are

eliminated...which includes all digital forms of my book. We are right there, folks.

People have to know what Gates & co. are up to and it's all in this second report.

Hmmm...well the official narrative as of the publishing of this update is that COVID-19 came from a bat in the Chinese wet market in Wuhan.

In the days leading up to the publishing of this report there is scuttlebutt coming out of the White House that mounting evidence suggests that COVID-19 came out of the biological lab in Wuhan, China.

Fauci is still insisting it came from a bat, while the evidence is mounting that it is what I and a ton of others have been saying, it's an engineered bioweapon.

If it can be PROVEN UNEQUIVOCALLY that it was made in a lab their little plan of releasing a 'mutated' version of it here in the next couple of months might be too risky and they would be called out by the independent medical community more so like they are right now...humanity is on to them.

The heat is starting to come upon Bill Gates, Dr. Fauci and others...as well as Trump. This is going to get very interesting, not that it hasn't been a shitshow up to this point...geez what a nightmare, particularly for the vulnerable citizens of our country, the old, young, handicapped...this is terrible...I want some payback and right now dammit. Pass me my torch and pitchfork, please.

Whether it came out of that Wuhan lab or not, I do believe that it is real and is a bioweapon that was intentionally released in Wuhan, knowing it could be used to cripple the global economy and the United States in particular. It is a weapon of the NWO against humanity to destroy life as we know it and usher in the New World Order. It is not even as dangerous as the flu from what I can ascertain, at least for now.

We are almost out of time to slow or stop them. This update report contains a blistering accounting of Bill Gates' cumulative actions and his henchman Fauci, and will now be a chapter in the upcoming Rise of the New World Order 3: Harmageddon.

Another HIGHLY CREDIBLE person has come forth since the publication of my last book also stating that this is a man-made virus and didn't come out of a 'wet market in Wuhan'. This man's testimony has been completely whitewashed by the mainstream media. There are plenty of people calling BS on the "naturally occurring bat-origin of COVID-19" at this point.

There was talk in the online Truth community in March of COVID-19 being a 3-part bioagent: one-part HIV, one-part malaria, and one-part coronavirus.

The one-part malaria would explain why the drug hydroxychloroquine works so well because it's an anti-malaria drug! Trump was lambasted for promoting this early on but it really does work effectively against COVID-19... imagine that.

Now check **THIS** out...

Luc Montagnier, the French virologist and **Nobel Prize winner** for his work on HIV, said the SARS-CoV-2 virus (COVID-19) was created in a laboratory by inserting genes from HIV, the AIDS virus, into a coronavirus!!!

"We have concluded that this virus was created," said the French scientist, during an interview with the French channel CNews.

In 2008 Montagnier won the Nobel Prize in Medicine for his part in research that led to the discovery of HIV, so this guy isn't some dummy!

"There has been a manipulation of the virus: at least part of it, not all of it. There is one model, which is the classic virus, which comes mainly from bats, but to which HIV sequences have been added, in any case, it's not natural. It's the work of professionals, of molecular biologists. Very meticulous work. For what purpose? I don't know. One hypothesis is that they wanted to create an AIDS vaccine"

Montagnier went on to cite a study by a group of researchers at the Indian Institute of Technology in New Delhi, which found "an uncanny resemblance" and "little chance of coincidence" in the amino acid sequences of a SARS-CoV-2 and HIV-1 protein.

Montagnier also predicted COVID-19 should be going away soon, its artificial origin would be weakening it.

“One can do anything with nature, but if you make an artificial construction, it is unlikely to survive. Nature loves harmonious things; what is alien, like a virus coming from another virus, for example, is not well tolerated. So what we’re seeing is that in the western United States, in Seattle, the sequences are destroyed, virtually non-existent. So, if the pathogenic power of the coronavirus is linked to the insertion of these sequences, we can think that it’s going to disappear.”

I agree. It’s going to disappear. Then it’s going to come back, ‘mutated’, and will be more contagious and dangerous. Gates, Fauci, the WHO, the corrupt CDC and all the rest of the ‘experts’ have all stated another wave of pandemic is coming.

Again, Fauci has gone public in the last few days to state that COVID-19 is a NATURALLY OCCURRING VIRUS and at this point we all know that is just a flat out LIE and he knows it!!

Most people are buying into thinking Gates is an ‘expert’ on viruses and vaccines purely because he is rich and famous. They aren’t even batting an eye about his agenda because ‘he’s the richest man in the world’.

Ummm....if you look into it he didn’t get rich by being a nice guy but by being a completely diabolical JERK!

This is the same Bill Gates who has said on one hand that **we need to cull back the global population using vaccines**, and on the other is **claiming to be the savior of humanity with his vaccine** that will keep the population from being decimated by COVID-19.....he’s a lying snake. He’s a true Rothschild/Rockefeller puppet. You’ve seen him smiling smugly on the teevee with his sweater, trying to appear to be meek and harmless.

Nothing could be further from the truth!!! Gates is a cutthroat corporate kingpin who got to the top by stealing ideas and ruthlessly eviscerating his competition until Microsoft stood alone at the top of the personal computer world. His ideals come from his father, a hardcore eugenicist!!!

He’s also a do-as-I-say-not-as-I-do elitist, which ALL of the upper echelon of the NWO are.

Besides corporate piracy and vaccines, Gates is also a ‘climate change’ activist. That’s funny, he just bought a multi-million-dollar mansion on the coast somewhere a few weeks ago...won’t it be flooded when all the glaciers melt from climate change? These people are saying one thing and doing another!

Sure, Gates is way up the financial ladder but remember, Gates’ billions **PALE IN COMPARISON TO THE TRILLIONS CONTROLLED BY THE PROPONENTS OF THE NEW WORLD ORDER.**

Gates is a PIKER. A PUPPET. Why do you think he was caught photographed with Jeffrey Epstein? To compromise him to the NWO puppet masters.

You’ve never seen a Rothschild or Rockefeller with Epstein or in any of his ‘Lolita Express’ jet airplane flight manifests, right? Right. But they got Gates’ hands dirty with Epstein and arguably even before that.

In fact, Gates seems to have been helped along his entire career to get to this point...No, that’s the stuff of conspiracy theories....*rolls eyes*

If you really dig into how Microsoft came into being, you’ll see exactly what I’m talking about. At the least, they have pedo-dirt on Gates and if he doesn’t do exactly as they say they will ruin him in the public eye....or worse. He knows their power, as do we.

The Satanic Rothschild/Rockefeller/Royal Family are the pinnacle of the global Satanic network. Notice how Prince Andrew got tangled up with Epstein and walked away a free man even with victim eyewitness testimony against him IN PUBLIC...he was never meant to be compromised like Gates or others as he was born into the BIG CLUB.

Now, puppet-boy Gates has ‘his’ vaccine that is coming...hooo boy. ☹

This vaccine was created years ago when they were planning this whole thing out and is intended to either maim or kill you outright eventually and bring you under full NWO-dependence...we’ll have to wait and see.

No matter what happens with the vaccine, remember, whoever supplies it won’t be held accountable thanks to the **1986 Vaccine Injury Act!!!!** You’ve got to wake others up to this **FACT!!!!**

Either way, I'm not taking it, or my family, or any of my friends, or ANYONE I've talked to about this....everyone is waking up, and that's why they will hit us hard in the 'second wave'. It will be contagious and far more deadly. They need it to be in order to stampede the sheeple into wanting the vaccine that is coming.

Gates' Instagram, Facebook and other pages are now under constant crushing attack by the Truth Movement...
YAY!!!!!!!!!!!!!!!!!!!!!!!!!!!!

I've been party to this myself, opening up an Instagram account purely to get at Gates and others and I HIGHLY ENCOURAGE you to do so also.

Here is a sampling of what was posted on Gates' Instagram before he pulled this particular post:

“Go to HELL. We're on to your secret societies”

“Are you even human? How could you be OK with what you're doing to the world?”

“Quit pushing your garbage vaccine. We don't want it”

***“Operation ‘Bill Gates Wants To Depopulate The Planet’ is underway. First comes the plandemic, next comes the microchip vaccine that will kill more than the virus. WE DO NOT CONSENT TO YOUR POISON!!!!
#billgatesisevil***

“SAY NO TO VACCINE”

“#killbill2020”

“I love that he (Gates) is being dragged. So many awake”

“If you think Gates is a Satanist, give me a like” (This was the number one comment in terms of upvoting...!!!)

Exercise your Constitutional rights while you can because they will soon be gone if you don't...ALL HANDS ON DECK SENTINELS!!!

The powers-that-be, aka the CDC/FDA/NIH crime bosses, have publicly stated to little fanfare that they are allowing this 'new' vaccine to be rushed through without even animal testing because this is ***‘such an emergency...the economy and society won't recover unless we eradicate COVID-19 like smallpox’*** or whatever BS-excuse they will spit out.

‘Rushing it through’ for the *‘good of humanity’* will be the excuse for not discovering the ‘side effect’ of extreme injury and/or DEATH that will start to show up months or YEARS after this injection. The culling of man is at hand!!! This is not a drill.

Again, the **Vaccine Injury Act of 1986** is still in place so no matter what happens with the rushed vaccine the manufacturer won't be held liable...especially Baal Gates!!!!

You want to talk about a Zombie Apocalypse....everyone that gets the vaccine....OMG....good night. Stop the world, I want off...this is complete madness. A literal nightmare scenario is coming right up folks.

With that said, I'm going to release my long-overdue Book 3, “Harmageddon”, in pieces through Amazon's

Kindle program.

I'm not a big fan of globalist Bezos, but they are the only game in town for a self-published, go-it-alone author-activist to reach people like I have and do. No big publisher would dare touch what I've got to say about the facts of our situation!! I'll eventually have all the parts together later this year to put them together in a true book 3 that I can submit for paperback production. In the meantime, KDP/Amazon are what I'm working with.

I certainly do appreciate your financial support, when you purchase my books it helps me to be able to keep researching, writing and releasing my books and update reports like this one. I also SUPER-APPRECIATE reviews you leave on Amazon...those really do help me out also...if you WANT to help, I'll sure accept it. I need everything you can back me up with now or never...Thank you!!!!!!!!!!!!!!

If you've read my first update through Amazon, I've set this up as a series so I'm hoping they will just straight up notify anyone who's read part 1 that part 2 just went live.

Of course, we might not even talk after this report! If not, thanks for joining me on this wild ride of finding out what's really going on, truly terrifying but spiritually enlightening to the max!

I'm glad I know the **FACTS** I do; I hate wondering about stuff...drives me crazy. Tell me the ugly truth over a beautiful lie any day. At least I can make hugely important, life-altering decisions that way based on facts instead of deceptions and lies.

This particular report is obviously my take on current events as I write and edit this report, but I've decided it's highly important for both you and me to know about "Slow Kill Bill" Gates. He's been on my radar for a while now, he's had quite a reputation as chief of Microsoft.

In fact, let's figure Bill out right now and then we'll get to the rest of the update.

I've decided there will be a chapter on Gates in Book 3, what you will read in this report. It will be worded slightly different and maybe more info, but this is basically what you need to know about eugenicist Bill and his urgent agenda to vaccinate and track the entire global population...anything for his masters.

'Slow Kill Bill' Gates

The recent public narrative about Gates has not been the old 'usual' of the ruthless head of the Evil Empire itself, Microsoft.

Now he's depicted in the media as a mild-mannered, caring, concerned, sweater-wearing, constantly-smiling billionaire philanthropist throwing billions of dollars of his own money around to make the world a safer place.

Gates pursues his ambitions by bankrolling the World Health Organization---an arm of the UN---and the CDC---an arm of Big Pharma--- and by working with these organizations and others he donates billions to in order to facilitate vaccine development and technology in general that will help bring the third worlders up out of poverty.

What a load of BS!!!

Gates and co. have no intention of bringing the third world standard of living up to the first world standard. They are seeking to do the opposite actually. The citizens of the USA, Europe and other 'advanced' nations are soon to know what it feels like to starve to death. The proponents of the NWO are going to flip the script!

"First, we've got population. The world today has 6.8 billion people. That's headed up to about nine billion. Now, if we do a really great job on new vaccines, health care, reproductive health services, we could lower that by, perhaps, 10 or 15 percent ..."

-Bill Gates, 2010 'TED talk'

When Gates says "reproductive health services" he means that his people are actively sterilizing and euthanizing Africans and Asians via vaccines, birth control and abortions!

Bill Gates' ideals, motivations and moral compass come from his father, eugenicist Bill Gates Sr.

Here is a portion of a transcript of an interview between Bill Moyers and Bill Gates in 2003:

GATES: *Certainly, I'll never be able to put myself in the situation that people growing up in the less developed countries are in. I've gotten a bit of a sense of it by being out there and meeting people and talking with them. And one of the gentlemen I met with AIDS talked about how he'd been kicked out of where he'd lived and how he felt awful he'd given it to his wife and their struggle to make sure their child didn't have it, and the whole stigma thing, which, you know, that's hard to appreciate. In this country when you get sick people generally reach out, you know, that's the time to help other people and yet some of these diseases it's quite the opposite.*

So, what I was thinking about was where my resources that I'm the steward of be able to make an impact, I thought "okay, what's the greatest inequity left?" And to me, and the more I learned about health and the unbelievable inequity, it kind of stunned me, it shocked me, every step of the way.

MOYERS: *You could have chosen any field, any subject, any issue and poured billions into it and been celebrated.*

How did you come to this one? To global health?

GATES: *The two areas that are changing in this amazing way are information technology and medical technology. Those are the things that the world will be very different 20 years from now than it is today.*

I'm so excited about those advances. And they actually feed off of each other. The medical world uses the information tools to do their work. And so when you have those advances you think will they be available to everyone. Will they not just be for the rich world or even just the rich people and the rich world? Will they be for the world at large?

The one issue that really grabbed me as urgent were issues related to population... reproductive health.

And maybe the most interesting thing I learned is this thing that's still surprising when I tell other people which is that, as you improve health in a society, population growth goes down.

You know I thought it was...before I learned about it, I thought it was paradoxical. Well if you improve health, aren't you just dooming people to deal with such a lack of resources where they won't be educated or they won't have enough food? You know, sort of a Malthusian view of what would take place.

And the fact that health leads parents to decide, "okay, we don't need to have as many children because the chance of having the less children being able to survive to be adults and take care of us, means we don't have to have 7 or 8 children." Now that was amazing.

MOYERS: *But did you come to reproductive issues as an intellectual, philosophical pursuit? Or was there something that happened? Did come up on... was there a revelation?*

GATES: *When I was growing up, my parents were always involved in various volunteer things. My dad was head of Planned Parenthood. And it was very controversial to be involved with that. And so it's fascinating. At the dinner table my parents are very good at sharing the things that they were doing. And almost treating us like adults, talking about that.*

Yes, what Gates said in this interview is apparently true, otherwise why would he have said it, but I cannot find anything about it online: Bill Gates Sr. was head of the national abortion mill called Planned Parenthood.

It only says online that he was on the board of Planned Parenthood at some point, but I believe Billy Junior was telling the truth in the interview.

Now that sonny-boy 'Slow Kill Bill' has moved to the top of the global financial food chain, Bill Sr.'s ambitions have now been empowered. The Bill and Melinda Gates Foundation is at the pinnacle of the globalist eugenicist ambitions of the NWO masters. Gates Sr. sits on the board of the Bill and Melinda Gates Foundation and is a co-chair and ultimately, it's director, since all this eugenics crap was his baby to start with. Bill jr. is just picking up the torch for his father.

It should be noted that Bill Sr., Bill Jr. And Melinda are all card-carrying Democrats, all pro-abortion, pro-open borders, pro-globalist, etc. In the 2016 Wikileaks dump it was even revealed that Hillary Clinton had considered Bill Gates as her VP pick!! They would not have even considered that if Gates was a conservative by them. Not that I'm a conservative myself...you know me by now.

The governor of Washington State where I live, Jay Inslee-his daughter works for the Bill and Melinda Gates foundation, so everything is nice and cozy in Washington and Seattle for Gates and co.

Melinda Gates, speaking at the 2019 G7, pushed for digital currency in order to help empower women. Melinda is a known Bilderberg attendee, as is Bill. They are complete NWO-operatives.

Gates was busted associating with notorious pedophile Jeffrey Epstein. Gates' name is in at least one flight manifest on the 'Lolita Express' to Epstein's Pedo-Island in the Caribbean.

Gates knew what he was doing. He vehemently denies ever being on that flight!!! But he was!!!

It is written in stone on the Georgia Guidestones to maintain humanity at 'not more than 500 million' and it looks like they are going to make a run at that with the upcoming economic devastation, food shortages, dangerous vaccines and general chaos that the proponents of the New World Order have managed to kick off with little to no

resistance from society.

Gates seems to be in the driver's seat of all of this chaos, telling people to quarantine and that there will be no 'normal' until the entire world is vaccinated. Who the hell put him in charge? He's a private citizen and not an elected anything so sit down little boy Bill, we don't need your 'help'.

How did this punk Bill Gates get the money and power needed to realize his father's ambitions? He schemed, bullied and pirated his way to the top ala John D. Rockefeller.

Bill Gates Jr. was positioned with \$50,000 from somewhere, probably his daddy, to purchase the program that would become MS-DOS...Gates didn't invent anything!! He then somehow got his foot in the door to license this product to IBM in a hugely shady deal if you look into it.

It was revealed in his co-founder Paul Allen's memoir, "Idea Man", that Allen stated Gates was a ruthless schemer who demeaned his employees and conspired to rip him off personally of his percentage of Microsoft ownership!!

He stated that Gates was after every bit of the company he could get when it came time to issue stock and Allen felt bullied, getting less of a share than he felt he deserved. Allen also stated he overheard Gates and Steve Ballmer conspiring against him to lessen his stake in the company even more!! Gates is truly a jerk that thinks little of humanity like he does his employees! This is documented in co-founder Allen's book!

Gates brutish approach to business and competition that led Microsoft to the top peaked in February of 2000 when he was forced to step down as CEO of Microsoft as part of a deal with US government prosecutors over anti-trust legislation against Microsoft. There is much more to this story, but you get the gist.

Gates bowed out of Microsoft with billions upon billions of dollars' worth of stock.

What's the first thing he did when he 'left' Microsoft? He started his own tax-free foundation of course to squirrel away those billions from the tax man...sound familiar? Then made a big deal about it in public like he was some kind of hero!! What is there NOT to hate about this guy? We're just getting started!

Not wanting to keep all his eggs in one basket, or his fingers in one piece of the NWO-pie as it were, Gates started getting involved in all manners of NWO-related mechanisms.

Let's start with the organized dumbing down of America called 'Common Core'...yes, Gates is primarily responsible for Common Core!!! A dumbed-down America would be much easier to collapse and make dependent on a world government to save them from themselves.

Starting with \$200 million in 2008, Gates bankrolled the program and also the political strings that needed to be pulled in order to institute Common Core nationwide...which they did.

Once Obama got sworn in at the start of 2009, the then-President Obama swiftly worked to implement Gates' Common Core nationwide. Just a couple of good ol' modern day progressive Democrats looking out for the USA...ugh.

10+ years, \$400+ million of Gates Foundation money, and hundreds of billions of taxpayer-education funds after the implementation of Common Core, and we're no more ahead than when we started and are arguably behind. In 2017, Gates finally admitted Common Core was a failure.

Wow. See how much *evil* influence this guy has already had over us and our nation? He never intended to make our kids smarter at all, quite the opposite!!! He is a full-on NWO-puppet boy.

After Gates started his foundation and had access to tax-free money, he started to diversify his holdings....

In 2010 he threw out some pocket change to the tune of \$23 million and bought 500,000 shares of ~~Monsatan~~ Monsanto.

He stated the following on GMOs in a 2016 Wall Street Journal interview:

“What are called GMOs are done by changing the genes of the plant, and it's done in a way where there's a very thorough safety procedure, and it's pretty incredible because it reduces the amount of pesticide you need, raises productivity (and) can help with malnutrition by getting vitamin fortification. And so I think, for Africa, this is going to make a huge difference, particularly as they face climate change ...”

The fact is, Bill, that most GMO crops are intended to be sprayed bathed in toxic Roundup, which contains cancer-causing Glyphosate, the active ingredient in Monsanto's 'Roundup' weed killer.

The plants are genetically altered to be able to withstand the Roundup, but the weed killer kills everything else around it, including the people, and then goes on to contaminate the soil, water, air and everything else.

I've looked extensively into Roundup and glyphosate is just toxic, let alone the other even WORSE chemicals that are put in it that are labeled 'inert ingredients' making them immune from listing on the label!!!

Gates stated that there is a 'very thorough safety procedure' involved in making and testing GMOs.....GIVE ME A BREAK! These GMOs are DESIGNED from the get-go to be bathed in toxic poison!!

I saw that Gates had recently partnered with global AG magnate Cargill to start introducing GMO soy into Africa. So the people there are already starving, let's give them Frankenfood that that have to bathe in toxic chemicals to make it work and poison their land and people. Perfect. Thanks Slow Kill!!

The recently retired head of the Gates Foundation's agricultural research and development team was Rob Horsch, a former decades-long Monsanto employee. Vultures of a feather, flock together.

In 2016 Bayer bought Monsanto, kept their products/name brands, and dropped the Monsanto name. The toxic products are still there, just under the wholesome **Bayer** banner.

This is the same Bayer that, among other things, **kept HIV-infected medicines on the market in third world countries after pulling them in the USA after it was discovered they were contaminated with HIV**....they literally murdered thousands of people intentionally with their tainted medicine for hemophiliacs, most of them children.

Moving on to the next NWO-themed action Gates has inserted himself in....

At the end of 2018, it was publicly announced that Bill Gates would be teaming up with Harvard scientists... meaning he was bankrolling them and they would be answering to him...to do experiments in injecting solid particles into the atmosphere to block the Sun in the hopes of mitigating 'climate change' or 'global warming' or whatever they are calling their climate charade now. Hey Gates! You might want to talk to the military, they have been spraying us like bugs for YEARS and are PROS at blocking out the Sun on any given day.

And go figure: As I was putting this report together, it was announced that Gates was teaming up with Tyson Foods and others to start making artificial meat. This meat would take cultured meat cells and regrow the meat in laboratories. Mmmmmmm.....tasty labmeat....soylent green can't be far behind at this point.

So...on to the Big Kahuna that Gates has taken upon himself: Vaccines

I'm going to do a status update report on vaccines specifically coming right up, certainly will be a chapter in Book 3, so let's just talk about Gates' relation to vaccines in general now instead of the mechanics behind the actual vaccine components.

To start with, the Gates Foundation donations to the WHO are second only to the United States contributions. This is the group who gets to decide--by whose authority I don't know---when a disease 'officially' turns into a global 'pandemic'. They are also the front that Gates uses to inject (!) his influence into third world countries and ultimately the entire planet.

The WHO was founded in the 1940s along with about the rest of the globalist, pro-NWO organizations. WHO = 1948. UN = 1945. World Bank = 1944. Etc....ad nauseum.

The WHO is basically an arm of the United Nations, and from my first book you know who founded and runs the UN even to today: the proponents of the New World Order. Remember, the UN was built right on land donated by the Rockefellers!!

Virtually everyone to do with this plannedemic and the upcoming COVID-19 vaccine are on Gates Foundation payroll: The WHO, CDC, National Institute of Health/NIH, Dr. Fauci, Dr. Birx, all of it....all are in the pocket of Bill Gates and his Deep State masters.

Gates plays dirty pool and has all his life. Now he's got his own puppet, Dr. Fauci, who he's using as a battering ram

against the USA to get us all to quarantine and destroy our own economy, our rights, our morale, our country. This whole quarantine has been an uncalled-for DISASTER for our country.

You better brush up on Fauci too. He is going to be front and center in your life for the next few months or years. He is almost as important to know about as Gates, so let's do this!

Anthony Fauci was born in Brooklyn in 1940, the son of a pharmacist. He was raised in a strict Roman Catholic household, first Communion at 7 and confirmed at 12 years of age.

He was schooled by Jesuits at Regis High School in New York City, and went to College of the Holy Cross, Founded in 1843 by the Society of Jesus (Jesuits) in Worcester, Massachusetts.

Now, you know all about my position on the Unholy Roman Empire and its NWO foot soldiers the Jesuits....'nuff said. Fauci should be regarded as a Jesuit agent on your scorecard, right next to Lady GaGa GaGa.

Well the love of Jesus Christ allegedly wasn't spiritually fulfilling enough for Fauci after he left school and ultimately came to be what is called a 'humanist'...by his own admission.

“Broadly and generically, I'm not a regular church attender. I have evolved into less a Roman Catholic religion person [to] someone who tries to keep a degree of spirituality about them. I look upon myself as a humanist. I have faith in the goodness of mankind.”

-Anthony Fauci (this from an interview with 'the-scientist.com' in May 2003)

What is a 'humanist'? I'll let Encyclopedia Britannica start off:

Humanism, a system of education and mode of inquiry that originated in northern Italy during the 13th and 14th centuries and later spread through continental Europe and England. The term is alternatively applied to a variety of Western beliefs, methods, and philosophies that place central emphasis on the human realm.

Humanism emphasizes humans and human society as the most important thing in life, not the supernatural/God/Jesus.

This is exactly an atheist point of view of the world, and the view that the proponents of the New World Order prefer you had over faith in God. It's a belief that human needs and values are more important than religious beliefs, and should take precedence.

I'm sure shuttering all the churches and the arrests of clergymen and parishioners put a smile on Fauci's face. I've researched Fauci and found not one reference to his belief in, or worship of, Jesus. Plenty of talk about being educated by Jesuits though...**and how they profoundly influenced him.**

I wonder if Fauci has taken the Jesuits' Extreme Oath of Induction? Someone should ask him!!

Humanists are typically of the mantra 'if it feels good do it' or more accurately 'do what thou wilt shall be the whole of the law' ala Aleister Crowley.

They are pro-LGBTQ lifestyle, pro-abortion, pro-transhumanism, pro-genetically modifying anything possible, along those lines. Basically, science and everything it can do for humanity is your god, just as the NWO teaches. After all, science and everything it can do is going to bring their god back to life, King Nimrod, and he's arguably alive right this second but we'll save that for another update.

Here's something with too much detail to get into here and is for you to follow up on: A former colleague of Dr. Fauci who had a falling out with him, Dr. Judy Mikovits, has recently gone public and on record in interviews stating that it is her position that Dr. Fauci quashed evidence she had about the HIV epidemic years ago that resulted in MILLIONS OF DEATHS WORLDWIDE. If what she was saying wasn't true, she could be sued but then all the facts would come out in court and Fauci can't have that, so he slanders and stonewalls her.

Mikovits' character has since been assassinated by the mainstream media and others but if you listen to everything

that happened without blinders you will see that she is telling the TRUTH and has been vilified for it because it paints Fauci in an unfavorable light.

The mainstream media is currently in the process of trying to build Fauci up to be a hero for what's coming with the second wave of COVID-19....the 'mutated' version they will release later this year.

The press right now is calling him 'America's Doctor' and pushing him up the pop-culture ranks by showcasing all the mugs, bobbleheads, etc. referencing this new American hero.....*gag*

I've read up on this Fauci-guy. He was alleged by many to be a tyrant in his department at the NIH, bullying underlings, firing them if they had research he wanted to claim for his own, he owns many vaccine-related patents, etc. If this guy was pro-humanity why is he patenting anything? I've seen that him and Gates stand to make BILLIONS OF DOLLARS off this upcoming COVID-19 vaccine.

So not only are all the Gates' card-carrying socialist globalist liberals, it appears that ol' Tony is too...and now he's in the driver's seat to help this whole thing blow up in Trump's face and excuse his 'losing' the upcoming election.

In emails released by Wikileaks in 2016, there is an email from Anthony Fauci to Cheryl Mills, a top Clinton aide at the time, on the date Hillary Clinton testified about Benghazi, January 23, 2013. Now we all know from looking into it that Hillary is GUILTY of TREASON and directly responsible for the deaths of four United States citizens among other alleged actions that came out of Benghazi...she's a guilty, treasonous piece of crap worthy of a knotted rope!

Fauci had watched the hearing earlier in the day and sent the following email intending his well-wishes to be passed on to Killary:

Cheryl:

Anyone who had any doubts about the Secretary's stamina and capability following her illness had those doubts washed away by today's performance before the Senate and the House. She faced extremely difficult circumstances at the Hearings and still she hit it right out of the park. Please tell her that we all love her and are very proud to know her.

Warm regards,

Tony

This was just the text of the email, all other info from it was removed by yours truly but is online if you look.

Now, Fauci has been head of the NIH's National Institute of Allergy and Infectious Diseases since 1984....36 years!!

I cannot find any evidence or documentation anywhere that shows that Fauci has petitioned the NIH, the WHO, the Congress or any of the handful of Presidents that he served under that we needed to establish some kind of 'pandemic panel' or 'pandemic task force' or anything of the sort. Don't you think as the number 1 guy on the topic that he should have been clamoring for action....**KNOWING THAT A PANDEMIC WAS NOT A MATTER OF IF BUT WHEN?????**

Instead of telling us all to prepare against a coming pandemic, he was busy creating patents for vaccines that could be sold in a pandemic to make him and others money, namely Gates & co.

We've spent TRILLIONS on 'national defense' but not a damn DIME on preparing for a pandemic? They left us

wide open for this false flag to destroy the United States...INTENTIONALLY!!

Even after the United States and the world had bouts with SARS, Ebola, etc. there wasn't a peep from this guy about what to do to prepare.

This whole thing has been long in planning, way pre-Trump. I've read a ton of info on Fauci and he is always adamant that he doesn't involve politics in his actions or thought-processes...BULLSH!T. He sent a memo to support Hillary right from his government-sanctioned office...surely on government time!!! OUR TIME!!

He is a TOTAL PLANT so watch out, especially in light of Event 201 that you should have looked into by now from my last report. Oh, you didn't look into it? That's fine, I got you fam...

Event 201: A Global Pandemic Exercise

That's exactly what it was called folks, "A Global Pandemic Exercise" and it took place on October 18, 2019. This was a simulation of a coronavirus pandemic that would go on for 18 months and go on to kill 65 million people globally.

This was an 18-month simulation crammed into a 3.5 hour presentation that you yourself can watch on YouTube as of the publishing of this update report.

It was orchestrated (of course) and sponsored by (of course again) the Bill and Melinda Gates Foundation, Johns Hopkins University, and the World Economic Forum.

The purpose of this simulation was basically to try and gauge what would happen to the world and society if a pandemic hit being as unprepared as we were. They were essentially testing the water to see if the time was right to pull the trigger on this false flag.

It was.

A mere 10 weeks after this simulation, the first cases of COVID-19 started showing up in force in Wuhan, China. That means the virus would have been released at least 3-4 weeks ahead of it becoming a threat by showing up in noticeable numbers....which means it was released about 6 weeks after Event 201! Not a coincidence in my book!!! This is like 9/11 all over with so many 'coincidences' that the circumstantial evidence is stacking up like cord wood against these bastards.

Now, you've read my first book, you know all about 9/11 and that false flags are what scores the most points in the NWO vs. Humanity fight we're in and always have been. This time they are going for the jugular though, no more messing around. If you've got an OUNCE of FIGHT in you, sentinel, it's going to be now or NEVER to save our country, I will hold out hope until the bitter end for our country and our kids' future.

I'm not even joking here. This is THE EVENT that David Rockefeller spoke of....remember?

"We are on the verge of a global transformation. All we need is the right major crisis and the nations will accept the New World Order."

-David Rockefeller, Statement to the United Nations Business Council, September 23, 1994

Now why do you suppose that Rockefeller uttered those words at a business meeting in particular? And why was 1/3 of the parties involved with Event 201 a globalist business organization that is completely pro-NOW, The World Economic Forum. What do they have to do with a pandemic? Oh that's right, the financial Armageddon and Greatest Depression that would go along with a huge pandemic...which we don't really have just yet, but will soon.

The damage has already been done to the economy. Like I said in the first update book, we took a gut shot and are on a slow bleed-out...wandering through the woods like a hapless, doomed deer....we're going on adrenalin at this point.

The Federal government just keeps borrowing money and throwing it at us and all over the place and the 'recession' hasn't even started yet!!

Now it sounds like they are going to throw trillions more dollars at the population to keep everyone semi-appeased as this thing goes off the rails.

God help us....there is an unbelievable storm coming.

The globalists know our highly-interconnected way of society these days can't take a jolt to the system like it did. You think things are bad now with so many out of work, and we have TP and meat shortages occurring right now, you just wait for what's coming later this year. I'm afraid this is going to get ugly.

I can't emphasize enough to be prepping like mad right now with everything you've got. I'm so sorry to be saying all this downer-crap but dammit I am PISSED OFF!!!! I actually DO give a crap about you and our country, not Gates who wants to help push us under.

They are killing our country right as you are reading this-you've got to help!

You've got to research NOW and speak intelligently to others on what's going on. If we fail, we're DONE. SOMEONE HAS GOT TO STOP BILL GATES AT ALL COSTS. BARRING SOMETHING ILLEGAL WE HAVE SOCIAL MEDIA FOR NOW SO USE IT BEFORE WE LOSE IT!! STRENGTH IN NUMBERS...WAKE PEOPLE UP NOW!!!!!!

Right now, I am in TIME OUT on Facebook where I'm a notorious troublemaker but YOU PROBABLY AREN'T ON THEIR RADAR LIKE ME SO TIME TO THROW DOWN SENTINEL!

GET ON SOCIAL MEDIA AND START CONNECTING TO OTHER TRUTHERS! START YOUR OWN TRUTHER PAGES! WHEN YOU NETWORK WITH OTHER TRUTHERS THERE ARE INDEPENDENT FACTUAL NEWS ARTICLES GALORE AND MEMES YOU CAN SHARE WITH SLEEPING FRIENDS AND FAMILY!

LOOK ON INSTAGRAM, FACEBOOK, MYSPACE SNAPCHAT, WE'RE EVERYWHERE ALL UP IN THE NWO'S GRILLE!!!!!! COME ON!!!!!! ??

Ok...I'm settled now. Geez, what a bunch of crap my friend. I seriously had hoped we had another 20-30 years before this so maybe we did our job too well and their AI told them that if they didn't move now that they would be HUNG from tall trees! I still hold out hope for that actually!!

Anyways, that's Event 201 in a nutshell.

Now about this microchip business.....GRRRRRRRRR!!!!!!!!!!!!!!

ID2020, yet ANOTHER of Bill Gates' babies...another piece of this false flag puzzle we're working out. You're gonna love this.

The ID2020 ALLIANCE

“I’ve got an interesting story to tell you now. There was a man named Aaron Russo, a very patriotic American who has since passed away. Mr. Russo made one of the best documentaries of all time about the New World Order agenda entitled “America: Freedom to Fascism”, and I highly recommend you see it. It is available, for free, on youtube.com as of the printing of this book.

Aaron Russo was an acclaimed Hollywood producer who made the movies “Trading Places” (Eddie Murphy/Dan Akroyd) and “The Rose” (Bette Midler) among other big-name successful movies. He got into a disagreement with the IRS over some issues, which were complete BS on the part of the IRS after I learned the background facts of his story. To vent his anger he made a movie called “Mad as Hell” slamming them. Nicholas Rockefeller, son of current Rockefeller family kingpin and “head” of the American branch of the Illuminati David Rockefeller, found the movie intriguing, and after learning Russo was a big roller in Hollywood, decided he wanted to meet Aaron. The two met and became very close friends very quickly, with the friendship lasting for a few years. During this time, and approximately 11 months before 9/11 happened, Nicholas revealed to Aaron Russo the entire New World Order plan, that they were trying to implement a one world government ran by the banking industry, of which the Rockefellers are intricately part of, as you now know.

Russo, being the truly patriotic American he was, was horrified to learn the details about this, but he knew Rockefeller was telling him the truth. He ended their friendship over this information, and then went public with it after Nicholas’ prophecy about 9/11 came to pass. According to Russo, Rockefeller’s words on 9/11 were something along the lines of “There is going to be an event soon. We’re going to invade Afghanistan and our troops will be looking for terrorists in caves over there, and then we’re going to invade Iraq.” Remember now, Russo says that Rockefeller told him this months in advance of 9/11, and it all came to pass exactly as he had said. You can hear and see Russo speak about this on a handful of clips on youtube.com.

He didn’t tell Russo exactly what the event was, but it is not hard to deduce when he tells of the end result of it. He also foretells of the coming “war on terror” and how it is going to be a farce but the Mainstream Media will convince the people that it is real, and that the coming “event” is going to enable the federal government to take more and more of our liberties and freedom away. Rockefeller also revealed that they were behind the formation of the European Union, and that they were trying to form the North American Union next, by which the United States, Canada and Mexico would form a borderless community. The ultimate goal, according to Rockefeller, was to implant all people of the world with RFID chips, and have all of your money and personal information contained in these chips, which they would control through the banking system that they (Illuminati) owned.”

-From my first book, “Rise of the New World Order 1: The Culling of Man”, released January of 2013, **Chapter 11/J: The 9/11 Truth Movement:**

“**The ID2020 Alliance**”...that’s what they are calling their little sheeple-branding project.

Sounds inviting, doesn’t it? Sounds like something you want to be part of, no?

Probably not, especially after I get done with them here...*cracks knuckles*

To start with, this is a United Nations-founded project. So...the one world government predicted by the Bible is in place, the United Nations, and now they are pushing a global digital ID to track every human on the planet.

Perfect.

I don’t like Wikipedia, but this is good for what we need it for...in fact REALLY good lol...make sure you click on the hyperlink ‘Sustainable Development Goal’ of Agenda 2030 to see what the digital ID is going to try to help them accomplish:

History: In May 2016, at the United Nations Headquarters in New York, the inaugural ID2020 summit brought together over 400 people to discuss how to provide digital identity to all, a defined Sustainable Development Goal including to 1.5bn people living without any form of recognized identification. Experts in blockchain and other cryptographic technology joined with representatives of technical standards bodies to identify how technology and other private sector expertise could achieve the goal.

In 2019, ID2020 started a new digital identity program in collaboration with the government of Bangladesh and vaccine alliance Gavi.

Mission: ID2020 is a public-private consortium in service of the United Nations 2030 Sustainable Development Goal of providing legal identity for *ALL*** people, including the world’s most vulnerable populations.**

United Nations’ Agenda 2030’s Sustainable Development Goal 16.9: *“provide legal identity to all, including birth registration, by 2030”*

This ID system **WILL** be rolled out, in the third world to start with, but once it’s established as the ‘norm’ it will be forced onto the first world countries.

Surprise...surprise...The **Rockefeller Foundation** provided the seed money to get ID2020 going with the UN they contributed the land for, founded and continue to participate in controlling today. The project’s other members include Gavi the Vaccine Alliance (Gates), Microsoft (Gates), Accenture (Microsoft/Gates business partner in other ventures) and IDEO.org (Rockefeller and Gates Foundation partner).

So this ID2020 is full-on Rockefeller inceptioned-and-directed, Gates-implemented, and it IS the one world digital ID that is coming so you better brush up on it even more than what I’m relating here. This is going to be connected to the global digital currency that will come about after the death of the fiat United States dollar and the rest of the nations’ fiat currencies.

This new digital ID is going to come in as a ‘necessary evil’ to track who has had COVID-19, who has been vaccinated and against what ‘mutations’ of COVID-19....this crap is just beginning people, and we’ll watch it all unfold together, right before our eyes.

They are using COVID-19 as a false flag trojan horse to get everyone tracked...by their system. At first the third

world and 'volunteers' were targeted but then after more and more sign on the pressure will begin to get everyone into their system. Now they have an excuse to just go full-bore at humanity with this thanks to the convenience of this plannedemic.

The World Economic Forum is also involved with ID2020...the exact same WEF who participated in Event 201!
Now this from the ID2020 website's home page:

"**We** need to get digital ID right. Identity is vital for political, economic, and social opportunity. But systems of identification are **archaic, insecure, lack adequate privacy protection**, and for over a billion people, inaccessible. Digital identity is being defined now-and **we** need to get it right."

Now, where it says '**we**' they don't mean you and me and them friend, they mean themselves, the globalist NWO cabal pushing this global digital ID.

Notice how they make out their system to be the only logical choice as all other systems are 'archaic, insecure and lack privacy protection'. **You'll surely never be safer than with the ID2020 Alliance...***rolls eyes*

This is from the ID2020 website's 'overview' page:

"ID2020 is coordinating funding for identity and channeling those funds toward high-impact projects, enabling diverse **stakeholders** - UN agencies, NGOs, governments, and enterprises - to pursue a coordinated approach that creates a pathway for efficient and responsible implementation **at scale.**"

Well, surely the **stakeholders** want their owned property to be kept track of.

Don't farmers tag their cattle as soon as they are born? I live in the middle of cattle country and you better believe they do! Now they want to brand their sheep...how thoughtful, they didn't want us to get lost...or more likely they want to know where you are 24/7 to make sure you get all your upcoming vaccines!

I could list quote after quote from the ID2020 website but I'll leave you just one more, from their FAQ page. You yourself should snoop through their site also and often as it's going to be changing as events unfold.

"What is a "good" digital identity?"

A "good" digital identity is one that is truly yours. With a "good" digital identity you can enjoy your rights to privacy, security, and choice...(*insert laugh track **HERE***)

The right to privacy is the right to permission access to your information at a granular level on an ongoing basis. Today, we consent once to give access to our digital identifiers. While it is possible in some digital spaces to revoke consent, revocation mechanisms are often esoteric and hidden behind high barriers to entry. True privacy means that you control access to individual digital identifiers, and that you can revoke (or modify) that access easily, at any time.

The right to security is all about protecting your data from unwanted access. Our certified digital identity systems must adhere to the highest security standards in existence today. And we are constantly evolving our Technical Requirements, which you can view here, in response to a changing landscape.

*Last but not least, the right to choice is essential, and often overlooked in the digital world. Though you certainly have the right to choose among a few providers, and to exchange access to your information for that right, **true choices are few and far between in the digital world; to get philosophical for a moment, what freedom actually exists in a world of prescribed, circumscribed choices? A world that, in most cases, takes a certain kind of digital presence as a given?***

Achieving each of these rights depends on shifting the locus of control away from institutions and towards you.

A "good" digital identity is one that is portable, persistent, privacy-protecting, and personal.

Portability means that your information can be moved seamlessly from one hosting/storage site to another, without duplication, modification, or deletion. Persistence refers to durability; that your digital identity will stay with you for life, and that no individual or institution can duplicate, modify, or delete it. Privacy-protection refers to the safeguards in place to ensure that activities that you do not consent to are strictly forbidden. Personal means that you control your information at a granular level on an ongoing basis.

In short, a “good” digital is yours.

Basically, what I’m gathering from the above, is that the new digital ID they are proposing is mobile, is on or in you at all times, and works in conjunction with your biometrics/fingerprint/retina scanner/whatever. So some type of digital tracker/storage device...like an RFID chip...will work in conjunction with biometrics to confirm it really is you, anywhere on the globe, without an ID like a driver’s license or passport you have to carry around. This will also control the digital global currency that is coming...I wonder if “Baal” Gates is involved with that?

Oh wait, what’s this? Microsoft just applied for a patent for their proposed cryptocurrency (digital currency), patent # wo/2020/060606. Please take special note of the last set of numbers.... If I didn’t know any better (!) I’d say the patent number looks like 06 06 06 ...666...perfect. Thanks Baal Gates, thanks a lot you ol’ devil you.

Let’s cut this ID2020 off here or I’ll go on forever...up to you to look into this further.

So much to know and so little time, that’s why I’m doing what I’m doing for you, friend: Gathering the most pertinent info I can find on the most pressing topics the pedo-Satanists are up to and putting it all together.

Truly nothing is hidden, either deliberately or unintentionally, if you have the will to stomach what you might find. The truth is truly stranger than fiction in today’s world.

Predictive Planning 101

“Vaccines, for Bill Gates, are a strategic philanthropy that feeds his many vaccine-related businesses (including Microsoft’s ambition to control a global vac ID enterprise) and gives him dictatorial control over global health policy—the spear tip of corporate neo-imperialism”

-Robert F. Kennedy Jr. (Bobby’s son!)

Just as uncle JFK had done, RFK Jr. is going up against the NWO/Deep State and needs us!

There are millions of people waking up to the vaccine agenda, including a handful of Hollywood stars, and even some whose kids have been vaccine injured including Robert DeNiro. In fact, DeNiro and Kennedy have teamed up to offer \$100,000 to anyone who could conclusively prove that vaccines are safe!!

This whole forced-vaccine issue is coming so you need to be as informed as possible of the FACTS my friend.

It is a documented FACT that Gates and co. have been beating the drum of an imminent pandemic for about a decade. A global death-pandemic only comes around every 100 years-ish, so how could they have known, hmmmmmmmm???

The warnings issued by those in the know before and after this ongoing “pandemic” tip their hand, they knew this was coming because they had a hand in causing it.

Let's start with Fauci...you tell me how it's even believable that someone could issue an imminent warning for a 'surprise' outbreak of pandemic?

"If there's one message that I want to leave with you today based on my experience, it is that there is no question that there will be a challenge to the coming administration (Trump) in the arena of infectious diseases.... No matter what, history has told us definitively that [outbreaks] will happen," he said. "It is a perpetual challenge. It is not going to go away. The thing we're extraordinarily confident about is that we are going to see this in the next few years.... The mistake that so many people have made ... is a failure to look beyond our own borders in the issue of the globality of health issues, not only things that are there that will come here but surprises that we'll have... We will definitely get surprised in the next few years"

-Dr. Anthony Fauci, speaking in 2017 at the "Pandemic Preparedness in the Next Administration" at the Georgetown University Medical Center just a few days before Trump was sworn in, January 2017.

Now on to Bill Gates...

Gates has been warning the world about a dangerous pandemic since 2010. Has he been hounding the federal government since then to prepare? No. It's been all lip service, just a casual comment here and there about getting prepared so he could say 'I told you so' right about now. If I was Gates, I would have held multiple high-level meetings and pounded the point home that we weren't ready and to get prepared, but no, he instead has spent his billions for after-the-fact treatments, aka vaccines. That's where the money's at, not trying to head off a disaster.

The H1N1 flu strain got a lot of attention in 2009. Most of the headlines made it sound dangerous. Early in the epidemic we thought that a very high percentage of infected people were getting sick, and it was quite scary.

But the real story isn't how bad H1N1 was. The real story is that we are lucky it wasn't worse because we were almost completely unprepared for it.

When an epidemic breaks out, there are four steps to try to contain it. The first is to gather data about the disease—where it is and how it is spreading. Second is to limit the movement of people from place to place—with quarantine a last option. Once a disease is widespread this is very hard to do. Third is to have drugs of some type that reduce how much someone infects others and that reduces the severity of the sickness. Fourth is to make a vaccine that is effective against the disease and give it to anyone who is at risk.

We did a reasonable job of gathering data, partly due to the capacity that had been set up to track avian flu. But for all the other steps, we didn't manage to do anything that would have stopped a serious epidemic. In other words, the modest death toll from this flu epidemic is entirely because we were lucky.

Hopefully this outbreak will serve as a wakeup call to get us to invest in better capabilities, because more epidemics will come in the decades ahead and there is no guarantee we will be lucky next time....

- 'A Better Response to the Next Pandemic', from Gates' personal blog, January 19, 2010

Now this from his 2015 TED speech, titled ***'The Next Outbreak? We're not ready'***:

"...So next time, we might not be so lucky (talking about the Ebola outbreak in 2014). You can have a virus where people feel well enough while they're infectious that they get on a plane or they go to a market. The source of the virus could be a natural epidemic like Ebola, or it could be bioterrorism.

So there are things that would literally make things a thousand times worse...But in fact, we can build a really good response system. We have the benefits of all the science and technology that we talk about here.

We've got cell phones to get information from the public and get information out to them.

We have satellite maps where we can see where people are and where they're moving.

We have advances in biology that should dramatically change the turnaround time to look at a pathogen and be able to make drugs and vaccines that fit for that pathogen...

We need to do simulations, germ games, not war games, so that we see where the holes are. The last time a germ game was done in the United States was back in 2001, and it didn't go so well.

So far the score is germs: 1, people: 0...

Now I don't have an exact budget for what this would cost, but I'm quite sure it's very modest compared to the potential harm.

The World Bank estimates that if we have a worldwide flu epidemic, global wealth will go down by over three trillion dollars and we'd have millions and millions of deaths...

There's no need to panic. We don't have to hoard cans of spaghetti or go down into the basement. But we need to get going, because time is not on our side..."

Now from 2016, the BBC interview with Slow Kill Bill...

"There's a lot of discussion right now about how we respond in an emergency, how we make sure that the regulatory and liability and organizational boundaries don't slow us down there, so I cross my fingers all the time that some epidemic like a big flu doesn't come along in the next 10 years"

This from a CBS news interview in 2017 at the 2017 World Economic Forum in Davos, Switzerland:

"The impact of a huge epidemic, like a flu epidemic, would be phenomenal because all the supply chains would break down. There'd be a lot of panic. Many of our systems would be overloaded, but being ready for epidemics of different sizes, there's a lot more we should do."

Also in 2017 at the Munich Security Conference in Munich, Germany:

"...When I decided 20 years ago to make global health the focus of my philanthropic work, I didn't imagine that I'd be speaking at a conference on international security policy. But I'm here today because I believe our worlds are more tightly linked than most people realize..."

It's also true that the next epidemic could originate on the computer screen of a terrorist intent on using genetic engineering to create a synthetic version of the smallpox virus . . . or a super contagious and deadly strain of the flu.

The point is, we ignore the link between health security and international security at our peril.

Whether it occurs by a quirk of nature or at the hand of a terrorist, epidemiologists say a fast-moving airborne pathogen could kill more than 30 million people in less than a year. And they say there is a reasonable probability the world will experience such an outbreak in the next 10-15 years.

It's hard to get your mind around a catastrophe of that scale, but it happened not that long ago. In 1918, a particularly virulent and deadly strain of flu killed between 50 million and 100 million people.

You might be wondering how likely these doomsday scenarios really are. The fact that a deadly global pandemic has not occurred in recent history shouldn't be mistaken for evidence that a deadly pandemic will not occur in the future.

And even if the next pandemic isn't on the scale of the 1918 flu, we would be wise to consider the social and

economic turmoil that might ensue if something like Ebola made its way into a lot of major urban centers. We were lucky that the last Ebola outbreak was contained before it did.

The good news is that with advances in biotechnology, new vaccines and drugs can help prevent epidemics from spreading out of control. And, most of the things we need to do to protect against a naturally occurring pandemic are the same things we must prepare for an intentional biological attack.

First and most importantly, we have to build an arsenal of new weapons—vaccines, drugs, and diagnostics.

Vaccines can be especially important in containing epidemics. But today, it typically takes up to 10 years to develop and license a new vaccine. To significantly curb deaths from a fast-moving airborne pathogen, we would have to get that down considerably—to 90 days or less.

We took an important step last month with the launch of a new public-private partnership called the Coalition for Epidemic Preparedness Innovations. The hope is that CEPI will enable the world to produce safe, effective vaccines as quickly as new threats emerge.

The really big breakthrough potential is in emerging technology platforms that leverage recent advances in genomics to dramatically reduce the time needed to develop vaccines.

This is important because we can't predict whether the next deadly disease will be one we already know, or something we've never seen before...

Of course, the preventive capacity of a vaccine won't help if a pathogen has already spread out of control. Because epidemics can quickly take root in the places least equipped to fight them, we also need to improve surveillance...

The third thing we need to do is prepare for epidemics the way the military prepares for war. This includes germ games and other preparedness exercises so we can better understand how diseases will spread, how people will respond in a panic, and how to deal with things like overloaded highways and communications systems...

Imagine if I told you that somewhere in this world, there's a weapon that exists—or that could emerge—capable of killing tens of thousands, or millions, of people, bringing economies to a standstill, and throwing nations into chaos.

You would say that we need to do everything possible to gather intelligence and develop effective countermeasures to reduce the threat.

That is the situation we face today with biological threats. We may not know if that weapon is man-made or a product of nature. But one thing we can be almost certain of. A highly lethal global pandemic will occur in our lifetimes.

When I was a kid, there was really only one existential threat the world faced. The threat of a nuclear war.

By the late 1990s, most reasonable people had come to accept that climate change represented another major threat to humankind.

I view the threat of deadly pandemics right up there with nuclear war and climate change. Getting ready for a global pandemic is every bit as important as nuclear deterrence and avoiding a climate catastrophe...

When the next pandemic strikes, it could be another catastrophe in the annals of the human race. Or it could be something else altogether. An extraordinary triumph of human will. A moment when we prove yet again that, together, we are capable of taking on the world's biggest challenges to create a safer, healthier, more stable world."

Now on to 2018, Gates was giving multiple warnings to multiple sources all year, way too many quotes here, but he keeps hounding on the need for 'germ games' like war games to create simulations in anticipation of the real deal, which he did in late 2019 just 6 weeks before the pandemic began we are currently in!

Why in the HELL are Gates & co. running germ games and not our federal government? TRILLIONS spent on 'Homeland Security' since 9/11 and we weren't even prepared for something that was not a matter of if but when,

even without NWO help?? Give me a break!!! We were INTENTIONALLY left wide open to what is happening now.

On February 28, 2020, Gates released an article he penned for the prestigious New England Journal of Medicine that you should read. I'll just give a couple of quotes from Gates here:

“In any crisis, leaders have two equally important responsibilities: solve the immediate problem and keep it from happening again. The Covid-19 pandemic is a case in point... Now we also face an immediate crisis. In the past week, Covid-19 has started behaving a lot like the once-in-a-century pathogen we've been worried about. I hope it's not that bad, but we should assume it will be until we know otherwise....”

So, miraculously they predicted this pandemic, are saying it's the 'big one', have their hands in every piece of the pie to do with it, are at complete odds with nationalist/Republican Trump because the people behind this are globalist-elitist-pedo-Satanists and now they are telling us publicly that we are not done with this pandemic and it is coming back and things are going to be flat-out awful.

MOST viruses DO NOT COME BACK FOR A SECOND WAVE. How do they KNOW that this one is unless they are responsible! There are many things coming out of this pandemic in favor of the New World Order, but the big prize is blaming this whole economic/health disaster on Trump so they can throw the election to the now-party-of-the-NWO...the (D) party. Again, the agenda for global enslavement by the proponents of the New World Order is a leftist, socialist agenda, which is why the battle lines are currently forming between mask-wearing sheep and anti-mask, pro-freedom patriots who know there is an agenda unfolding.

Remember, this current version of COVID-19 is not even as dangerous as the regular flu, the numbers have been completely inflated and there is chaos in all the numbers being reported...intentionally. Wait until the chaos hits of the second wave this Fall/Winter. When this laboratory-created 'mutation' hits, you will know who to go after with torches and pitchforks:

“There's a possibility that the assault of the virus on our nation next winter will actually be even more difficult than the one we just went through. And when I've said this to others, they kind of put their head back, they don't understand what I mean. We're going to have the flu epidemic and the coronavirus epidemic at the same time”

-CDC Director Robert Redfield in an interview with The Washington Post, April 21, 2020. Now he's predicting a flu pandemic to boot!!

“Lifting restrictions too quickly could lead to a deadly resurgence”

-World Health Organization Director General Tedros Adhanom Ghebreyesus, April 10, 2020

“It has a very dangerous combination and this is happening ... like the 1918 flu that killed up to 100 million people. But now we have technology, we can prevent that disaster, we can prevent that kind of crisis. Trust us. The worst is yet ahead of us. Let's prevent this tragedy. It's a virus that many people still don't understand.”

-World Health Organization (WHO) Director-General Tedros Adhanom Ghebreyesus, April 20, 2020 (he's referencing vaccines btw to save us)

Both the CDC and the WHO and other 'experts' are saying that a second wave is on the way without knowing this for a fact, or do they? This is so when they release the new version Bill Gates will be on the teevee in his stupid sweater and smile smugly, shrug his shoulders and say “Told you so”.

Now on to the predictive programming, and Netflix in particular....

On September 29, 2019, Netflix released ***“Inside Bill’s Brain: Decoding Bill Gates”***.

This from the Netflix website about it: ***Take a trip inside the mind of Bill Gates as the billionaire opens up about those who influenced him and the audacious goals he’s still pursuing. Microsoft co-founder Bill Gates opens up about his childhood, business career and passion for improving the lives of people in the developing world.***

This is a 3-part ‘investigative series’ claims Netflix, but it’s nothing of the sort. It’s a 3-hour propaganda piece to try and make Gates look like an intelligent, caring philanthropist when he’s really a diabolical, elitist eugenicist working for the Illuminati pedo-Satanists.

This was to plant the seed months before the pandemic ever appeared that Gates cares about humanity and is there to help us....HA!

Next we have ***“Explained: The Next Pandemic”***, released November 7, 2019...about two months before the plannedemic we’re now in the middle of and no end in sight.

This was filmed months before the ‘pandemic’ and even predicted the next pandemic would come out of a Chinese wet market, the current official story according to Gates, Fauci and co.

Gates himself starred in this and predicted a coming pandemic...**as he’s done every year since 2015.**

Finally, from Netflix, the crown jewel of predictive programming of this pandemic, on January 22, 2020, they released ***“Pandemic: How To Prevent an Outbreak”***, just as it was coming to light there was a novel coronavirus on the loose in China...allegedly turning into the pandemic of today.

This was filmed in 2018-2019.... many months ahead of the outbreak.

When you have an unusual amount of ‘coincidences’ they can ultimately be assembled as I have in this book into what is called ‘circumstantial evidence’. There is not a single smoking gun—yet—that Gates had a hand in this plannedemic, but the evidence of too many coincidences are piling high at this point and we’re not even close to done with him here.

The Shutdown

There has **NEVER** been a quarantine over such an initially benign virus...**EVER**. That alone is a red flag to me that we are entering the false flag to end all false flags and bring in the full New World Order tyranny.

Look at how far we've fallen and so fast. So many unemployed. Mom and Pop companies going under left and right...including mine. Nobody wants me in their house on the eastside of Seattle...it's Libland! It's the land of the masked sheep now!!!

You know as well as I do that society always just powered through any flu pandemic in the past, which is what we **SHOULD** have done, so what is happening now is for an agenda to be certain.

So what has changed? It's time for the New World Order.

In the past, employees would just have to take their turn getting sick like we always used to. If enough employees got sick that company would shut down for a couple of weeks or whatever **ON THEIR OWN** and then get back to work at their own discretion. No laying anyone off. No government stimulus. Any of it.

Now we've got the co-opted gooberment shutting everything down for the NWO agenda. So many of the state governors are controlled it's not even funny, a lot of Masons and Jesuits I'm assuming...the Deep State/Illuminati's foot soldiers working towards the Secret Destiny of America, the New Babylon, which is burned in Revelation....that's us.

The whole plannedemic is working perfectly on many fronts.

People are afraid to use cash now because it could be "contaminated" with coronavirus, paving the way for the abolishment of cash in favor of a 'clean, digital currency' that can be 100% tracked by the Masters of the Great Plan.

Not that there will be much cash to spend anyways.

The economy isn't getting better, it's going right in the toilet. I cannot even understand why people are still in the stock market other than sheer greed. They will be sheared like the sheep they are; nothing can save them from what's coming.

Record numbers of people unemployed and more brutally bad numbers are coming in weekly and will continue to come.

Keep in mind/unemployment will start running out soon for a lot of people and there will be no jobs for them to go back to.

You thought there was division in politics before this pandemic, you ain't seen nuthin' yet.

Sides are being chosen now. People are tattling/turning each other in for violating rules that violate our Constitutional rights. See how easy that was? People wonder how a government can happen like that in the Soviet Union or Nazi Germany but your witnessing it unfold right now.

Welcome to the USSA.

It is largely the left-leaning that have chosen to take up with the state and turn into statists and report everyone... namely the free-thinking and conservative-value-minded people who are rebelling against the illusion of having lost their freedoms. You and I are smart enough to know we didn't have that much freedom even before this whole pandemic thing thanks to the Patriot Act, the NDAA, etc.

We are being constantly surveilled, all of our digital info goes into our files at NSA in Utah, and I mean EVERYTHING you do on your phone, computer, car...everything.

If you've read my first book you know that the New World Order conspiracy to enslave the world is a leftist, socialist conspiracy with Limousine Libertards at the top.

A Limousine Libertard is a liberal elitist who is involved in 'do as I say, not as I do' politics.

This not only includes Rothschilds and Rockefellers, it includes most of the Hollywood and entertainment elite---all certified leftists. People like Bono, Leonardo DiCaprio and Al Gore, zooming all over the planet on private jets to tell you how evil you are for even existing---even their own lib-followers, so they are throwing themselves on their swords and begging for a carbon tax to save the world from the people who own the companies causing all the destruction, which are largely owned by liberals!! UNREAL.

The Lib-sheep activists are the same ones clamoring for action on 'climate change' while they let global bioterrorists like Monsanto operate unchallenged for decades as well as chemtrails, fluoridated water, GMO foods, etc.

This mandatory mask wearing/social distancing for a virus no deadlier than the flu is to smother the world under the bureaucratic jackboot and put police in charge of enforcing unjust, unfair and oppressive actions which further divides the people between public and government.

If masks really worked why are they releasing all the inmates by the thousands? They are doing it to make room for patriots who are going to soon rebel, plus all the others who are going to straight up RIOT when their unemployment runs out and there are no jobs, not to mention what commodity might be in short supply in the coming weeks.

Why do Mom and Pop stores have to stay closed if the masks work? Why can you go to Walmart or Target but not Granny's Antique Store in your hometown? Most people don't even know that the masks don't protect you from getting COVID-19, they help to prevent YOU from spreading it if you have it and don't know it.

Even an N95 mask is basically a sneeze guard. Nothing short of a full-face respirator with filter cartridges...a gas mask...would protect you from a deadly virus.

So, this Covid Circus is kicking into high gear now. Our Washington state Goobernor Dimslee just announced he has hired 1,400 new 'contact tracers' to take everyone who has 'tested positive' for COVID-19 and grill them about who they were in contact with recently so the Goobernator can hunt them down and test them!

Have you seen how they do the test? They seriously shove a long q-tip up your nose and about 4-6 inches into your sinus cavity!

It won't be long now before **EVERYONE IN THE STATE NEEDS TO BE TESTED THANKS TO SIX DEGREES OF SEPARATION.**

Right now, governments are setting up what they are calling 'contact tracing', which will sooner or later ensnare EVERYONE in their net.

Everything that is happening now is setting the stage for what's coming in a few months so people are used to government walking all over their rights, and that's the 'mutated' version of COVID-19. And **THAT** will pave the way for a compulsory vaccine.

I doubt Trump would enact a nationwide vaccine law, and that will be one more nail in his political coffin I'm afraid.

Mandating forced vaccination...that will be saved for Hillary to do. I'm still betting on Hillary somehow worming her way back into DC to help finish us off.

Now....about this upcoming ~~optional mandatory~~ **compulsory** vaccine issue...

The COVID-19 Mandatory Vaccine

“Pharma has 80 COVID vaccines in development, but Gates & Fauci pushed Moderna’s “Frankenstein jab” to the front of the line. Scientists & ethicists are sounding alarms. The vaccine uses a new, untested, and very controversial experimental RNA technology that Gates has backed for over a decade. Instead of injecting an antigen & adjuvant as with traditional vaccines, Moderna plugs a small piece of coronavirus genetic code into human cells, altering DNA throughout the human body and reprogramming our cells to produce antibodies to fight the virus. MRNA vaccines are a form of genetic engineering called “germ line gene editing”. Moderna’s genetic alterations are passed down to future generations. In January The Geneva Statement the world’s leading ethicists and scientists called for an end to this kind of experimentation. Moderna has never bought a product to market, proceeded through clinical trials, or had a vaccine approved by FDA. Despite Gates’ investments, the company, was teetering on bankruptcy with \$1.5 billion debt before COVID. Fauci’s support won the company an astonishing \$483 million in federal funds to accelerate development. Dr. Joseph Bolen, Moderna’s former R&D Chief, expressed shock at Fauci’s bet.”I don’t know what their thinking was”, he told CNN, “When I read that, I was pretty amazed”. Moderna and Fauci launched federally-funded human trials on March 3rd in Seattle. Dr Peter Hotez warns of potentially fatal consequences from skipping animal studies. “If there is immune enhancement in animals, that’s a show-stopper”. Dr Suhab Siddiqi, Moderna’s Ex-Director of Chemistry, told CNN, “I would not let the [vaccine] be injected in my body. I would demand: Where is the toxicity data?” Former NIH Scientist Dr. Judy Mikovits says its criminal to test MRNA vaccines on humans. “MRNA can cause cancers and other dire harms that don’t surface for years.”

-Robert F. Kennedy Jr, 5/2/20 on Instagram

At this point in our research, I shouldn’t have to tell you about all the bad things that are floating around as adjuvants in the current vaccines for various diseases, that’s a given. Just a smorgasbord of poison.

Before anyone even CONSIDERS forcing me to take a ‘compulsory’ vaccine to be a part of society, you better

answer me these questions first:

-Why was a federal law passed in 1986 absolving ALL VACCINE MAKERS to be held harmless from liable if any of their vaccines hurt, maim or kill anyone who gets one?

-Tell me what's in the vaccine, every ingredient, every mechanism of that ingredient, every side effect of injecting this stuff right into my blood stream where it has direct access to my brain

-It is in fact safe? I want to see all phases of testing proving it is safe

-Does it really work? I want to see all phases of testing proving it works

You know as well as I, friend, that **NONE** of the above legitimate questions/concerns will be addressed regarding the upcoming COVID-19 vaccine. They're just going to ram it down our throat.

Looks like Big Pharma All-Star **Merck** is in the running for a COVID-19 vaccine.... perfect. What could go wrong?

You know, Merck? The same Merck who kept Vioxx on the market after they **KNEW** it was killing people? Yeah, **THAT** Merck! Their lawyers must have worked up a formula to figure out how much liability they could withstand before they started losing money by keeping Vioxx on the market. Turns out the number was 55,000 human deaths they could be sued over before Vioxx would become unprofitable. Those board members should have been **HUNG FROM TALL TREES BY THE NECK**.

It's fine, it's nothing really. What's 55,000 lives compared to the billions Baal Gates is going to try and eliminate coming right up.

He has already taken Harmageddon to dizzying new heights since marshalling himself up as Captain Jabbin' and carpet bombing the third world with intentionally harmful vaccines.

Let's see exactly what he's been up to for the last few years since 'retiring' from Microsoft to pursue "philanthropic" endeavors.

Bill Gates, a white, extreme leftist, elitist-eugenicist spending his own money to eradicate the third world brown and black people. I'm surprised he's not a **GOD** in the white supremacist community!!! Ugh....he is truly a demon in the flesh.

Gates funded GSK's experimental malaria vaccine that killed 151 African infants and caused paralysis, seizures and convulsions to 1,048 of the 5,049 children administered the vaccine...**that's a 20% serious side effect rate**.

In India, Gates experimental polio vaccine, which upped the standard schedule of 5 to **50** polio vaccine doses/injections **PER CHILD**, paralyzed 480,000 Indian children between 2000 and 2017.

In 2017 the WHO reluctantly admitted that the global polio explosion was predominately vaccine strain, **meaning it came from Gates' vaccines!!!**

WHERE IS THE MAINSTREAM MEDIA ON THIS AND OTHER ATROCITIES!!!! It is estimated that in 2018, ¾ of all global polio cases were from Gates' vaccines.

In 2014, Gates funded the experimental HPV vaccine on 23,000 unwitting and unwilling girls in India with a handful dying and 1,200 suffering side effects including autoimmune and fertility disorders. Indian government investigators charged that Gates-funded researchers committed atrocious ethical violations during the course of the trials including bullying parents, forging consent forms, and refusing medical care to the injured girls!! The case is now grinding it's way through India's Supreme Court.

Gates & co. supplied the WHO with billions and in turn they chemically sterilized millions of Kenyan women with a tetanus sterility formula vaccine!! You can't make this stuff up!!

Gates also funded Johns Hopkins University experiments that intentionally infected hundreds of Guatemalans with sexually transmitted diseases for drug and vaccine testing.

If Gates was running around the United States using us as guinea pigs like he has done in the third world he'd be pushing up daisies by now but instead the Deep State PROTECTS HIM by using the WHO/CDC/NIH/etc. as fronts to shield him in the third world.

Ever hear of the Tuskegee Experiment? Look into **THAT** to see just what the people in charge of your health can pull on you!!

Gates has hijacked the WHO agenda away from those programs that would most benefit the Third World peoples in the fight against disease. You know, things like clean water, hygiene, good nutrition, healthy economy, etc.

Apparently, Gates thinks good health only comes from a syringe or he'd be funding everything I just listed equally as vaccines but no, it's all vaccines from Gates.

Gates appears gleeful on teevee in video clips I've seen lately about the prospect of vaccinating all of the USA and the world with his products which will make him billions more and also please his NWO masters.

On March 19, 2020, Gates posted up on Reddit that he proposed a digital certificate to identify those who have received the COVID-19 vaccination.

People who have been vaccinated would receive a 'quantum dot tattoo', which is "a bit of dye that is invisible to the naked eye" but that can be seen and read via infrared light. This 'tattoo' would store a digital file with your vaccine info---among other things like your bank account info---that could be read with a scanner or smart phone.

This particular tracking system was developed at MIT and funded by.....yup.....The Bill and Melinda Gates Foundation.

Listen to what Bill Gates/WHO/CDC/Etc. are saying because they are merely telling you what the game plan is.

“One of the questions I get asked the most these days is when the world will be able to go back to the way things were in December before the coronavirus pandemic. My answer is always the same: when we have an almost perfect drug to treat COVID-19, or when almost every person on the planet has been vaccinated against coronavirus.

The former is unlikely to happen anytime soon. We'd need a miracle treatment that was at least 95 percent effective to stop the outbreak. Most of the drug candidates right now are nowhere near that powerful. They could save a lot of lives, but they aren't enough to get us back to normal.

Which leaves us with a vaccine.

Humankind has never had a more urgent task than creating broad immunity for coronavirus. Realistically, if we're going to return to normal, we need to develop a safe, effective vaccine. We need to make billions of doses, we need to get them out to every part of the world, and we need all of this to happen as quickly as possible.

That sounds daunting, because it is. Our foundation is the biggest funder of vaccines in the world, and this effort dwarfs anything we've ever worked on before. It's going to require a global cooperative effort like the world has never seen. But I know it'll get done. There's simply no alternative.”

-Bill Gates, April 30, 2020 on his blog

So...that's what's going on in the world of Plannedemic 2020, starring Baal Gates, Crime Boss Fauci, the clowns at the WHO and CDC, and a host of other characters who will reveal themselves in due time...I'll be waiting.

Conclusion

Now, let's put my 15,000+ hours of NWO-research to good use and try and figure out what's coming so we can best prepare ourselves on all fronts.

The HUGE block of people who lost their jobs in the restaurant/hospitality industries and many other will exhaust their 26 weeks/6-7 months or whatever it is of unemployment right around August-September....about the time I'm guessing for the appearance of the 'mutated' version of COVID-19 to really screw us.

This Depression is just getting started and I do not believe we're coming out of it so batten down the hatches NOW. Don't spend money on anything you don't have to...but wait! What's this???

Looks like there is more 'stimulus' gooberment cheese coming...just to keep the sheep appeased enough not to rebel while they set up the martial law infrastructure....contact tracing anyone?

I saw some numbers floating around lately...\$2,000 per person per month and another \$2,000 per child as long as there is pandemic-related hardship???

Sure! Just put it on the tab...OMG. This is just insanity.

The economy will be in such a shambles later this year, and with food shortages, riots, quarantine stir-craziness and general civil unrest that the sheep will **CRY** for a vaccine to make it all better...it will only make it worse once the NWO's foot is in the door to forced medical procedures.

Gates already said he wants death panels installed via the health system to determine if your life is worth saving when you are older and a 'burden' to society.

"...spending a million dollars on that last three months of life for that patient or laying off ten teachers. But that's called the death panel and you're not supposed to have that discussion..."

-Bill Gates, speaking at the 2010 Aspen Ideas Festival, Aspen, Colorado.

As I said in my first update, I'm looking at the pandemic and Trump's response to it to be blamed by the left for the financial woes coming. Trump will be blamed for the beginning of the Greatest Depression, not the Fed and the bought-and-paid-for corrupt Establishment politicians where the blame really belongs!!

And the media will sell it and the sheep will eat it up so between that and the proposed mail-in voting this will probably be the end of Trump's Presidency.

If we didn't have an overleveraged credit-economy backed up by nothing at all we wouldn't have so far to fall to hit the bottom of a depression but....yeah. You've read my first book, you know what I'm talking about, we knew this was coming.

Trump will definitely be blamed for the societal meltdown coming over "his" virus response. The question is will he throw the patriots under the bus with a nationwide compulsory vaccine?

I'm no rocket scientist, but that would probably ignite a civil war. Forced vaccination is tantamount to medical rape and goes against the Geneva Convention not to mention our Constitution.

As we get closer to time to push for a compulsory vaccine, I'm expecting 1-3 mass shootings in close succession to shock the public into clamoring for gun control right before the vaccine becomes available so people can't resist it by shooting whoever is trying to jab them.

The recent mass shooting in Canada was the worst in their HISTORY and excused the immediate banning of 'assault rifles' at least on paper, guns have been heavily restricted in Canada for years.

So.....what do we do? What does humanity do to stand against a mob of Satan-worshipping trillionaires who control our world looking to kill 90+% of us?

You gotta get **MAD!!**

You gotta get **MOTIVATED!!**

They are trying to kill your KIDS!

They are trying to kill your aged GRANDPARENTS!

And most of all, they are trying to kill YOU!

Our only chance is to wake up enough people to stop them COLD, and you do that by educating yourself about this false flag and then educating others.

Here's some ammo for you, sentinel:

A timeline of this false flag, starting in 2010:

-1/19/10 Gates initiates his personal alarm of an oncoming global pandemic on his personal blog

-3/18/15 Gates beats the drum of an oncoming global pandemic at a TED talk

-5/20/16 United Nations initiates ID2020

-12/30/16 Gates issues another warning of an oncoming global pandemic in a BBC interview

*-1/16/17 At this point, Gates now beating the drum **yearly** of an oncoming global pandemic, this time at the World Economic Forum in Switzerland, the same WEF involved in Event 201 and ID2020.*

-2/17/17 Gates again warns of an oncoming global pandemic at the Munich Security Conference in Munich, Germany

*-6/20/19 Gates files for patent for **WO/2020/060606 "Cryptocurrency system using body activity data"***

-9/20/19 Netflix releases "Inside Bill's Brain: Decoding Bill Gates" This 'documentary' was made to build up the public perception of Gates

-10/19/19 Gates and co. run Event 201. What are the odds? One in a MILLION.

-11/7/19 Netflix releases "Explained: The Next Pandemic"

-11/15/19 CDC posts nationwide in all major cities they are looking to hire "Public Health Advisors for their quarantine program" They KNEW a pandemic was coming and didn't warn the American public.

- 12/18/19 Many news outlets report on Gates' new vaccine-tattoo technology, the Quantum Dot Digital Tattoo
- 12/31/19 COVID-19 spreading at this point through Wuhan, China, having somehow (!) been let loose weeks before
- 1/21/20 First COVID-19 case shows up in the USA in Washington State
- 1/22/20 Netflix releases "Pandemic: How to Prevent an Outbreak"
- 2/28/20 Gates releases article in NEJM stating that COVID-19 is looking like a once-in-a-century pandemic and that we should assume it is until proven otherwise.
- 3/19/20 Gates posted up on Reddit that he is proposing a digital certificate to identify those who have received the COVID-19 vaccination
- 3/26/20 Gates receives patent for WO/2020/060606 "Cryptocurrency system using body activity data"
- 3/27/20 First Federal Government stimulus package signed into law, the CARES Act. They've been adding to this ever since, throwing trillions upon trillions at the economy trying to keep its head above water. Now they're talking about giving everyone monthly stipends. Ummm...when everyone is getting money from the government to live on, that's unadulterated socialism for those keeping score at home.
- 4/10/20 World Health Organization Director General Tedros Adhanom Ghebreyesus warns against lifting quarantine
- 4/18/20 Mainstream media announced that thousands of COVID-19 tests are actually contaminated from the factory with the virus that causes COVID-19. Anyone that got the test, arguably then got the disease!!! You can't make this shit up!!!
- 4/20/20 World Health Organization Director General Tedros Adhanom Ghebreyesus states "the worst is yet ahead of us"
- 4/21/20 CDC director Robert Redfield states that there will be a second wave of COVID-19 soon
- 4/24/20 Federal Government passes 4th pandemic stimulus package

-Also to note, in general throughout the timeline, fake news galore to push the false flag including showing mannequins on gurneys, never in modern history has there been a quarantine and then the numbers were all wrong and the virus is less dangerous than the flu, ridiculous payouts from the feds to hospitals who diagnose/treat alleged COVID-19 sufferers motivating them to report false claims to get more money, nurses dancing on tiktok because there are bored with no patients to be attending to, numbers don't add up such as Tokyo, Japan having hardly any deaths while NYC is 'awash in deaths', youtube vids of actual doctors calling out this false flag and then censored/removed, tons of talk lately on mainstream media about the second wave, etc. etc. ad nauseum

-Keep in mind the peculiarities about this plannademic: we never closed the economy/country over such a benign illness before, economy has never sank so fast before in history, stimulus spending by the feds like never before in history and LIGHTNING FAST, we never were told we NEEDED A VACCINE IN ORDER TO GET LIFE BACK TO NORMAL before...EVER.

If I was you, friend, here's what I would be doing:

Get out of the cities at all cost or at least try to make arrangements for a place to bug-out. You should be openly talking to friends and family about everything in this report and my books at this point because we are right there at the threshold of SHTF. I know this isn't an option for some of you, you're at the top of my prayers to be looked after. Just take solace in the fact that we're not here forever, only temporary, and there is no avoiding our physical death. I don't look forward to death, but I intend on prolonging it as long as possible! Everyone will pass at their particular apportioned time, no sense fretting about it.

You need to start talking in particular to your neighbors about this stuff, it's not conspiracy theory, it's conspiracy

FACT and it's been in motion since 2,200 BC during the days of King Nimrod.

RESIST the NWO via fact-spreading on social media. I'm not advocating to go and march in the street at all, not at this time, not the ones who are truly awake. That just gets physical and ugly fast taking to the streets. We need our best and brightest sentinels on duty on the keyboard for right now, spreading truth.

Best for now, IMO, to go hard on social media with the facts that are in this report and in my books.

We are putting TREMENDOUS pressure on Gates in particular right now.

As of the publication of this report there are hundreds of thousands that have signed a petition to the White House to have Gates investigated for crimes against humanity!!!

YOU are your best defense against any virus they release. Your own immune system. And I'm not saying don't wear a mask. If it makes you feel better then that alone is worth it for your own piece of mind. You won't see me in one though. Again, only a full-face respirator can actually protect you like will be needed soon. All the more reason they are going to keep this quarantine-business going INDEFINITELY.

I've been studying up on how to home-remedy the COVID in my spare time (!). Zinc seems to be the best to take if you get it, or zinc-medicine like Zycam. Quinine is supposed to be helpful in working with the zinc to fight infection, it occurs naturally in tonic water so have that on hand to wash down your zinc pills.

I also have echinacea, goldenseal, turmeric, etc. on hand. Research the ins and outs of taking all of this stuff too, like you're not supposed to take zinc within an hour of a citrus beverage, etc.

Also, the taking of anti-inflammatories like ibuprofen could aggravate a COVID-19 infection. Lots to know and lots of time now under quarantine to research all of it my friend. High doses of vitamin C is also really good I hear, supposedly high dose IV vitamin C is how China got COVID-19 under control. Also Oregano Oil, Elderberry extract, apple cider vinegar pills, lots of water also to continually flush the body of toxins.

Without my faith I would be soooo lost right now, I pray every morning of every day.

I thank you for your support/book reviews my friends!!!! If we wake up enough people, we might be able to intimidate Gates and co. to stand down and back off this false flag, avoiding a second wave of pandemic. The damage has already been done though...I don't know if we can save the USA or not.

The rest of the world will largely cheer as we go down in flames and it's broadcast around the world, no one has farther to fall than us, and since 'we' bankrolled bombing the crap out of dozens of countries over the last few decades, they will rejoice at our self-destruction.

I'm sure Gates will ultimately be watching all this pandemonium that is coming unfold from the underground bunker at his house in Medina, Washington. Now THERE'S something for you to look into.

People have got to learn about Bill Gates. Print this report up and hand it out!!

I'll leave you for now with this excerpt from an article that appeared on CNBC on April 16, 2020:

“Amid the Covid-19 pandemic, people across the world have rushed to “panic buy” and stockpile food and toilet paper, fearing potential shortages.

But Bill and Melinda Gates began to stockpile food in their basement years before the current pandemic.

“A number of years ago, we talked about, ‘What if there wasn’t clean water? What if there wasn’t enough food? Where might we go? What might we do as a family?’ So, I think we should leave those preparations to ourselves,” Melinda Gates told BBC Radio Live on Thursday.

“We had prepared, and had some food in the basement in case needed, and now we’re all in the same situation,” she said.

Hey, we're all in this together, right? Right...***rolls eyes***

Until next time my brother and sister sentinels....May YAH watch over you and yours and guide you as safely as possible down the treacherous path that 2020 is proving to be.

YAH bless.

-Jeff

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THE ANSWER

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A person who behaves in a rebelliously unconventional manner.



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What is the point of life?
There does not have to be a point.
It just is.
Enjoy.

David Icke

Quotes by 13th century Persian mystic Jalal ad-Dīn Muhammad Rūmī widely known simply as Rumi. His words are confirmation that nothing is new. It has only been forgotten:

The universe is not outside of you. Look inside yourself; everything that you want, you already are.

You are not a drop in the ocean.
You are the entire ocean in a drop.

Stop acting so small. You are the universe in ecstatic motion.

Why do you stay in prison when the door is so wide open?

Raise your words, not voice. It is rain that grows flowers,
not thunder.

Take someone who doesn't keep score, who's not looking to be richer, or afraid of losing, who has not the slightest interest even in his own personality: He's free.

And one that I can seriously relate to ...

Run from what's comfortable. Forget safety. Live where you fear to live. Destroy your reputation. Be notorious. I have tried prudent planning long enough. From now on I'll be mad.

I've been 'mad' for 30 years. Try it – it's wonderful.

I'm Not Crazy,
My Reality is Just Different Than Yours.
People might think you're crazy for what
you believe or wear or say, but it doesn't matter.

Cheshire Cat in *Alice in Wonderland*

Alice: 'Have I gone mad?'

Mad Hatter: 'I'm afraid so, but let me tell you something,
the best people usually are.'

Alice in Wonderland

Though I may not know the answers,
I can finally say I'm free.
And if the questions led me here, then,
I am who I was born to be.

From *Who I Was Born to Be*, written by Audra Mae
and recorded by Susan Boyle.

Contents

The Prologue	xix
CHAPTER 1 What is Reality?.....	1
CHAPTER 2 Who are we?	33
CHAPTER 3 What mysteries?	61
CHAPTER 4 What is love?	93
CHAPTER 5 Where are we?	128
CHAPTER 6 Why don't we know?	176
CHAPTER 7 How are we manipulated?	217
CHAPTER 8 Why demonise the gas of life?	255
CHAPTER 9 Why is 'climate change' being hoaxed?	283
CHAPTER 10 Are you New Woke?	309
CHAPTER 11 Why white people? Why Christianity? Why men?	344
CHAPTER 12 Where are we going - if we allow it?.....	363
CHAPTER 13 What is really behind transgender hysteria?	413
CHAPTER 14 What is the New World Symphony?	439
CHAPTER 15 How did they pull off the fake 'pandemic'?	476
CHAPTER 16 Why is Bill Gates a psychopath?.....	535
CHAPTER 17 What is <i>The Answer</i> ?	581
POSTSCRIPT	617
APPENDIX 1 Dr Richard Day Predictions	633
APPENDIX 2 Noahide Laws + human control	634
BIBLIOGRAPHY	637
INDEX	638

The Prologue

When I discover who I am, I'll be free – Ralph Ellison

I am going to expose from 30 years of research and experience in a long list of countries what I say is really happening in the world and why. These are my perspectives and they don't have to be yours, but in the wake of the 'Covid-19' police state impositions worldwide they surely become near impossible to deny any longer.

It is ever more blatantly obvious that what I have been saying for decades was planned to happen is happening as global society transforms so quickly in the image I have predicted. Events have never moved so fast in that direction than during the manufactured 'Covid-19' hysteria and fascistic national lockdowns in which billions were put under actual and virtual house arrest across the world. Eighty-five percent of this book was written before these draconian impositions were rolled out – based on a lie – and I have decided to hold back on the 'Covid-19' story and its catastrophic human impact through economic Armageddon until the late-added chapters near the end which expose in detail both the nature of the 'virus' scam and why it was perpetrated. I will of course refer to the 'virus' briefly here and there before then, but I want you to read the rest of the book and the information that I laid out before the 'virus' blitzkrieg because then the who and why of the 'virus' hoax will be devastating in their clarity and context. Nothing in my lifetime has so proved my point about global control than the staged illusion of 'Covid-19'. To emphasise – *Please note when you see my comments relating to the 'virus' that the text around them was written before the 'virus' hysteria and lockdowns began.*

Is it really random coincidence that what I have written for three decades was planned for humanity is now so clearly happening? Or is it the most glaring evidence and confirmation of a calculated agenda for total human enslavement? I vociferously say the latter and I am confident that by the end of this book with the dots and strands connected you will agree that coincidence theory is simply not credible in the face of the evidence. I'll make it very clear what I say is going on, but I want the evidence to speak for itself and for you to decide what it

means. With that said we shall begin. I have been exposing for 30 years a conspiracy to enslave humanity in an Orwellian global tyranny of total control – ultimately (and very soon if we don't wake up fast) by connecting artificial intelligence to the human brain so that AI replaces the human mind. That's crazy? It's happening step-by-step before our eyes right now. 'Human' thinking and emotions would be history and our perceptions dictated directly by AI and those that control AI.

It's no good people screaming 'conspiracy theory' – a term brought into widespread use by the CIA in the 1960s as it sought to discredit those questioning the ludicrous official story of the Kennedy assassination (Fig 1).

These are definitions of the term 'conspiracy': An evil, unlawful, treacherous, or surreptitious plan formulated in secret by two or more persons; a combination of persons for a secret, unlawful, or evil purpose; an agreement by two or more persons to commit a crime, fraud, or other wrongful act; any concurrence in action or combination in bringing about a given result. On that basis the world is drowning in conspiracies at every level of society, but to the mainstream media, indeed the Mainstream Everything, conspiracies don't exist and anyone who says so is a kook peddling a 'conspiracy theory'. Yes, even in the light of the draconian, fascist impositions of the 'Covid-19' hoax. What I have been exposing since 1990 is not multiple unconnected conspiracies (though they do exist by those definitions alone). I have uncovered *one* conspiracy with multiple faces driving human society to the same despicable end and what I have revealed is not a 'theory'. It is an obvious reality unfolding by the day as AI takes over human life and freedom is deleted. The crazies in the Devil's Playground of Silicon Valley are now telling you that what I have been warning about for so long is indeed what is planned to happen. They are doing so because they have no choice as AI takes over and cannot be hidden any longer. The sales-pitch is the emergence of a new era in which humans will be 'gods' thanks to a connection to AI when, in truth, the 'new human' will be post-human and no longer 'human' at all. Insiders like Google executive Ray Kurzweil even point to the year of 2030 for when this will be seriously underway and human brains will be connected to the AI 'cloud'. He said:



Figure 1: All these decades later the mainstream media is still using the same CIA propaganda term for those who are aware that governments lie to us.

Our thinking ... will be a hybrid of biological and non-biological thinking ... humans will be able to extend their limitations and 'think in the cloud' ... We're going to put gateways to the cloud in our brains ... We're going to gradually merge and enhance ourselves ... In my view, that's the nature of being human – we transcend our limitations.

As the technology becomes vastly superior to what we are then the small proportion that is still human gets smaller and smaller until it's just utterly negligible.

This is what I have called 'the assimilation' as human awareness is absorbed into AI and that which is truly behind AI. I don't mean the middlemen and women of Silicon Valley. Even the tech billionaires are not the engineers of all this. They are merely the oil rags, albeit very rich ones. What is happening today is the endgame in a story that has spanned thousands of years as we perceive the illusion of 'time'. Our human sense of reality was infiltrated long ago by a force that is not human which has created a global hierarchy of control with its representatives and agents manipulating human perception century after century on the road to total enslavement (Fig 2). By controlling perception you control experience individually and collectively in a cause-and-effect that I will be explaining in detail. The plan has demanded the constant centralisation of power as a bottom-line imperative. With every step in that direction fewer and fewer people seize more control over the population. Tribes became nations and nations are becoming superstates like the European Union and trading blocs controlled from the centre. Decisions are being made increasingly through global corporations and institutions like the United Nations and

the World Health and Trade Organizations. People have long called this conspiracy (while not realising it's a conspiracy) 'globalisation'. What is this? The global centralisation of power over every aspect of human life – the very plan I have been exposing for decades. We now have the centralisation of control in Silicon Valley over the flow of information from which people form their perceptions of events

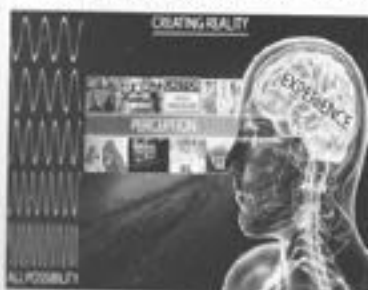


Figure 2: How human perception is manipulated into a tripartite of possibility. Control information and you control perception. (Image: Gareth Cole.)

and reality. Hysterical Silicon Valley censorship by Google, Facebook, Twitter, Amazon and all the rest (controlled from the shadows by the same force) is aimed at dictating everything you see and hear and, through that, manipulating your perception of everything. Even that won't be necessary with an AI connection to your brain. Your perceptions would then be delivered directly.

This has always been the goal of the non-human infiltration of human society via its agents and operatives in apparently human form. The technological cutting edge that we see in the public arena is as nothing compared with technological knowledge in other realities where what is today called 'smart' was known about while history records humans knocking rocks together and living in caves. The constant flow of 'new inventions' that daily deepen human control have been waiting for humanity to reach a point of intellectual development where it could build and operate its own technological prison. This is where we are today. Gadgetry and communication systems required by the global prison are playing out into public awareness from underground bases and secret projects with cover stories and cover people hiding the truth of where it all comes from. The flow of technology is seamless for this reason. There are no 'seams' or big delays as the manipulators wait for the next stage to be 'invented'. There are no gaps as technological limitations are pondered for decades and overcome. Almost by the week the next stages of technological AI are revealed and the pace is ever quickening. Humanity has been perceptually-manipulated to develop the intellectual capacity ('cleverness') to build and operate its own technological Alcatraz while not developing the wisdom to see that this is what we are doing. I have been saying for decades: Cleverness without wisdom is the most destructive force on earth. So it is proving and not by accident, but design. Cleverness is so often confused with wisdom. Cleverness knows about information while wisdom knows what it means and sees its consequences. It is clever to build an atomic weapon, but not wise to do so. I have exposed the conspiracy, ancient and modern, in enormous detail and the non-human force orchestrating from the shadows and realities unseen by the human eye. You can find this information in ... *And The Truth Shall Set You Free, The Biggest Secret, Children of the Matrix, Tales From The Time Loop, The David Icke Guide to the Global Conspiracy, The Perception Deception, Human Race Get Off Your Knees, Phantom Self, Everything You Need To Know But Have Never Been Told, The Trigger*, and other books. My focus here is on how human perception has been manipulated to follow the path the control system has decreed and from this knowledge point to *The Answer* that will set us free. That answer relates to who and what we really are and to escaping the fake self-identity that we are told and pressured to believe in. To know who we are, where we are and how the two interact is the whole

foundation of human freedom which is why every effort is made to keep us in ignorance of that information and awareness.

How it's done

Some brief but essential background is required for those new to my work about the overwhelmingly hidden hierarchical structure driving the direction of human society on behalf of the non-human force that it represents. Without awareness of this structure and how it works the context of world events simply cannot be understood. I have long used the concept of the spider and the web. The Spider is the non-human force operating beyond the extraordinarily narrow frequency band of

five-sense human perception. People think they can see all there is to see in the 'space' they are observing; but they can't. They are seeing only a tiny fraction of what exists around us and within us. The electromagnetic spectrum (including radio waves, microwaves, infrared, ultraviolet, X-rays and gamma rays) is only 0.005 percent of what exists in the universe in various forms of energy and reality. Some scientists say it's a bit more, but not much. The point is that the electromagnetic spectrum is a fraction of what

exists beyond its band of frequency and humans can't see the almost totality even of that spectrum. Human sight – everything we perceive as a visual reality or 'the world' – is confined to a micro-segment of the 0.005 percent known as visible light (Figs 3 and 4). We are limited in our visual

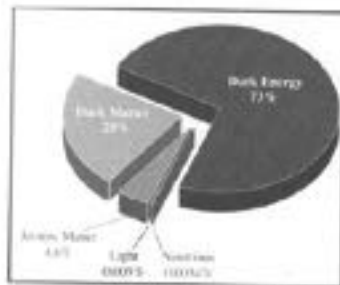


Figure 3: The almost infinitesimal band of frequency that we call 'light' or the electromagnetic spectrum. Scientists call that which we can't see 'dark' which I contend is erroneous in their version of reality. 'Dark' should be simply considered beyond human sight.

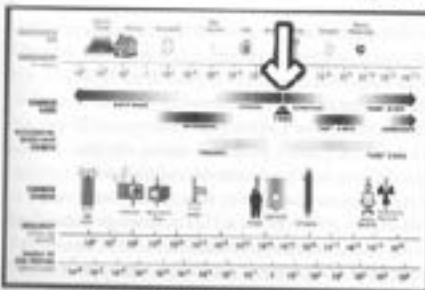


Figure 4: Visible light, which is the only reality we can 'see', is a fraction of the 0.005 percent. The human five senses are aware of only one 'TV channel' within infinite existence.

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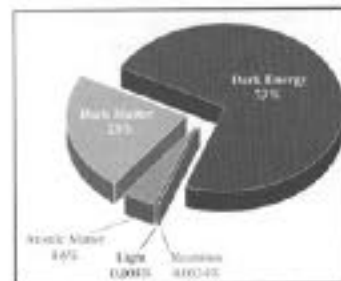


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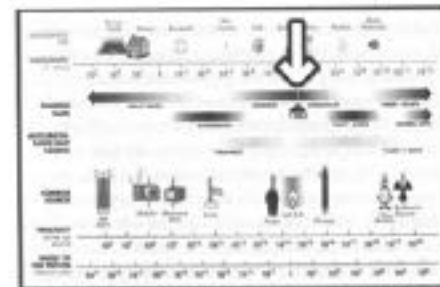


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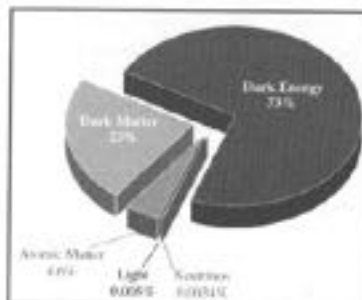


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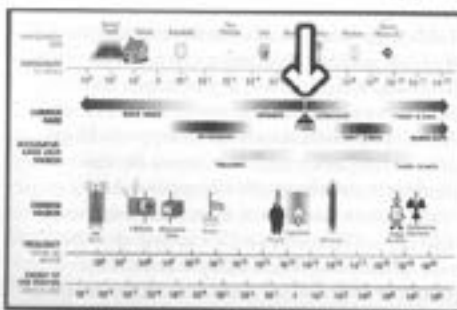


Figure 4: Visible light, which is the only reality we can 'see', is a fraction of the 0.005 percent. The human five senses are aware of radio waves. The electromagnetic spectrum is divided into radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.

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HIGHER DIMENSIONS OR DENSITIES



Figure 5: Our 'world' is a band of frequency within infinite Reality.

perception to a minuscule band of frequency and that is only by the terms that mainstream science can currently measure or thinks it can (Fig 5). In truth what we 'see' is even more myopic in comparison to infinite Reality that exists beyond the firewalls of visible light and the illusory limits of the speed of light. Watch

television or listen to radio and you perceive only what is being broadcast by the channels and stations you have chosen. All the other channels and stations exist in the same room but you are not aware of them unless you change the channel or move the dial. When people ask why if this non-human force is real we can't see it – this is why. It operates from realms of frequency outside the human band of visual reality and is invisible to us in the same way that when you are tuned to TV station 'A' you can't see TV stations 'B', 'C' or 'D' even though they exist. Change channel and you switch from station 'A' and connect with one of the others. Station 'A' doesn't disappear when you switch; it's only that you are no longer connected to its wavelength or output and so you can't see it. I have just described what happens when we 'die' (or rather don't – only the body does). Our consciousness changes 'channels' or moves its point of attention. This is that all death is – a transfer of attention from one reality to another. The source of human control is hidden from us although non-human entities representing this force can move in and out of our reality by entering our band of visual frequency and then withdrawing. Accounts are legion of people claiming to have seen entities or craft 'appearing out of nowhere' and then 'disappearing' in a flash. They don't appear or disappear. They enter the human band of visual frequency and then leave. To the observer they have appeared from nowhere and disappeared into nowhere when it is just a case of now you see it, now you don't, as it comes and goes from visible light. What does a TV channel do when you switch to it? What does it do when you switch away from it? The channels, or realities, appear 'out of nowhere' and then 'disappear into nowhere' when in fact they don't go anywhere. We only connect and disconnect with them.

The Web

What I call 'The Web' is the interconnecting secret society structure that allows the Spider in the hidden to dictate events in the seen (Fig 6). Strands in The Web close to the Spider are the most exclusive secret



Figure 6: The compartmentalised web of secret societies, semi secret and public organisations that allow the 'Spider' hidden at the centre to impose its agenda on human society. (Image: Neil Hagar.)

societies and their initiates will know the detailed Spider agenda and where it is planned to go. Communication with the Spider directly and through satanic ritual allows these inner-strand initiates to know about technological possibility way before it appears in the world of the seen and to

secure the transfer of technological knowledge long before its official time of release. If you have access to this inner sanctum of The Web, or penetrate it through decades of work, you can predict what we perceive as the 'future' – including the technology involved – because the 'future' in this sense is only the Spider agenda being spun. If there is a plan for the world and nothing intervenes to stop that plan then it will happen and revealing the plan becomes predicting the future. My books over the decades have proved extraordinarily accurate in predicting events for this reason – including a plan for 'pandemics'. The whole point of what I do is to alert enough people so that humanity *does* intervene and stop the planned outcome of total human control. Famous 'see-the-future' writers such as Aldous Huxley (*Brave New World*, published in 1932) and George Orwell (*Nineteen Eighty-Four*, published in 1948) have proved to be so accurate because by whatever means they were able to penetrate the Spider agenda and could predict technology and other possibilities that didn't exist at the time of their writing. As we move out in The Web from the Spider and the inner-sanctum initiates we meet the secret societies that we do know about in terms of name if not actions. These include the Knights Templar, Knights of Malta, Opus Dei, the Jesuit Order, Freemasons and many others which have an interlocking

The Masonic Structure

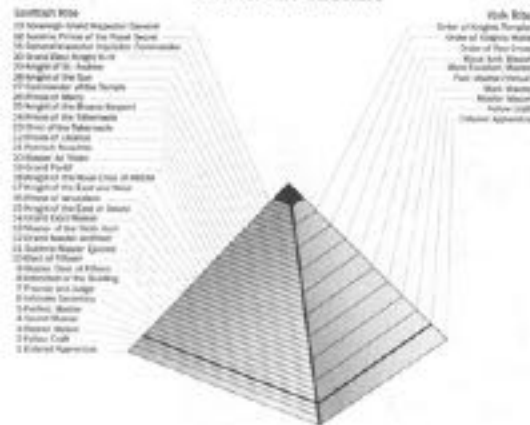


Figure 7: The compartmentalised 'degrees' that keep each level of Freemasonry in ignorance of what the others know is the structural basis for all organisations within The Web.

command structure if you go deep enough. Most of their members will not be aware of their interlocking nature and the agenda their controlling core is pursuing. Different levels or 'degrees' are compartmentalised from what those above them know (Fig 7). Human society is arranged in the same way with the great majority in any organisation kept in ignorance of what the few at the top know and are seeking to impose. They are pawns and foot-soldiers for an agenda they don't even know exists. Intelligence agencies (themselves structured as secret societies) are classes of this compartmentalisation or 'need to know' technique.

There is a point in The Web where the hidden meets the seen and here we have what I call the 'cusp' organisations that include the Royal Institute of International Affairs (established in London in 1920); Council on Foreign Relations (US, 1921); Bilderberg Group (US, Europe, worldwide, 1954); Club of Rome (Europe, US, worldwide, 1968); and the Trilateral Commission (US, Europe, worldwide, 1972). These groupings and others answer to the Round Table secret society founded in London in the latter years of the 19th century by the House of Rothschild and its frontman lackey, Cecil Rhodes (Fig 8). The definition of 'cusp' describes perfectly the role of these organisations – 'a point of transition between two different states'. In this case those two states are the hidden and the seen between which they act as a conduit. Cusp groups gather together



Figure 8: Major 'cusp' organisations that take the hidden agenda of the Spider and play it out across human society.



Figure 9: What happens in the world of the 'seen' is hatched in the unseen.

unconnected. They are the Spider agenda being introduced through its countless proxies which in the end all answer to the same master (Fig 9). At the inner-core of The Web governments and politics are the banking system are the global corporations are the Silicon Valley giants are the mainstream media are the education system are mainstream science are the pharmaceutical cartel, or 'Big Pharma', and so on. Key decisions that change the direction of human life are not taken randomly or

politicians, government administrators, financiers, corporations, intelligence operatives and media to advance a common direction for the world although many of the gofers and stooges involved will have no idea because of compartmentalisation. Cusp organisations include a fantastic list of 'think tanks' and non-governmental organisations (NGOs). Their role is to take the Spider agenda hatched in the hidden part of The Web and impose that in the world of the seen through governments, government agencies, banks, corporations, intelligence and military groupings, media conglomerates and all the pillars and institutions that dictate the direction of human society. We see apparently random and unconnected decisions made by governments, groups and organisations, but the society-transforming ones are not random and certainly not

independently. They are part of the Spider's plan for total control. The vast majority of people working in these groups and organisations who daily take Spider-instigated actions are clueless about the origin of those decisions, changes and policies, and what they are designed to collectively achieve. This is the structure that allows the very few to control and manipulate the very many while the many remain in ignorance of what is really happening and why. Who is going to tell them – the mainstream media? That is owned by The Web and most mainstream 'journalists' are as ignorant and often more so about the agenda than the rest of the population.

The Death Cult

The inner core of the secret society global network locks into human-sacrificing Satanism – literally making sacrifices to their hidden 'gods' and masters beyond human sight which are obsessed with death. They feed off the energy and terror associated with death and especially sacrificial death. Most people think that human sacrifice to the 'gods' came to an end in the ancient world. If they read some of my other books they will see otherwise and how many of the global rich and famous are practitioners of this horror to this day. They will also realise that Satanism involves vampiring the energy of children which is where the whole theme originates of 'sacrificing young virgins to the gods'. This is code for children. Satanic and paedophile rings often work in unison in the targeting of children in their service to The Web and the 'gods'. These ancient practices have passed through what we experience as history under the cover of this network and that's why I refer to the inner elite of The Web as a Death Cult. You can read the detailed background to the Cult going back thousands of years in other books like *The Trigger* and *Everything You Need To Know But Hate Never Been Told* (*Everything You Need To Know* from hereon). One central network within the Cult is known as Sabbatian (or Sabbatean)-Frankism which emerged in the 17th century and was the driving force behind the creation of Israel and Zionism, Saudi Arabia and the head-chopping (Death Cult) 'ISIS' version of extreme 'Islam' known as Wahhabism. Sabbatian-Frankism is named after two dark occultists, Sabbatai Zevi (1626-1676) and Jacob Frank (1726-1791) and is a form of Satanism. Jacob Frank teamed up with Sabbatian-Frankist Mayer Amschel Rothschild, founder of the Rothschild banking dynasty, to establish the infamous Illuminati in 1776 as another important strand in The Web. I expose Sabbatian-Frankism in *The Trigger* in relation to the real perpetrators of 9/11 (a mass death ritual) and all that has followed in regime-change wars (death of millions) and deletion of freedom. I will refer to the inner-core controlling The Web within human society throughout the book as 'the Cult' and it is important to keep in mind the central part played by

its Sabbatian-Frankism wing in relation to Israel, the United States, United Kingdom, Europe and worldwide in the manipulation of global events. Why Israel has so much power and influence because it is the fiefdom of Sabbatian-Frankism (the global Cult) and no one needs to know this more urgently than the Jewish community which it has infiltrated while posing as Jewish.

The great majority of my research on Sabbatian-Frankism has come from Jewish sources that were and are well aware of how their community has been hijacked. Sabbatian-Frankism and the rest of the Cult specialise in infiltrating societies, cultures and religions by posing as members of those communities while pursuing a very different goal. This infiltration allows the Cult to create and control groups of all kinds while most of those involved have no idea there even is a Cult let alone that it is directing their organisation, religion, culture or society. How many of those who blindly repeat the official nonsense about human-caused climate change and demand the dystopian transformation of society to 'solve the problem' know about the Cult's cusp-cult the Club of Rome? This was specifically created to exploit environmental



Figure 10: The ever-growing obsession with death.

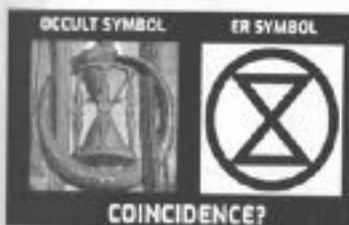


Figure 11: Occult symbol and Extinction Rebellion (ER) symbol.

concerns (real and imagined) to transform society into a global centralised Marxist-like tyranny in precisely the image demanded by 'climate change' protesters such as Extinction Rebellion and promoters of the 'Green New Deal' in America. Who string-pulls from the shadows such protests and demands? The Death Cult does. You can even see the obsession that groups like Extinction Rebellion (ER) have with death and blood (Fig 10). We are told that the group's symbol represents an hourglass in a circle to mean time is running out (Fig 11). It is, however, a symbol long used in occultism and 'sex magic' and referred to as 'The Mark of the Beast'. The O is female and X is male. 'Ceremonial magician' Kenneth Grant was secretary

and personal assistant to the elite British occultist Aleister Crowley. He explains in his 1973 book, *Keneth Grant, Aleister Crowley & The Hidden God*, that the symbol also related to a Celtic god called Nodens:

The Heart of the Sigil of Nodens is identical with the Mark of the Beast (ⓧ) the fusion of O and X which produces the lightning flash. Nodens is the God of the Great Deep or Abyss, microcosmically identical with subconsciousness. He reigns over the Abyss and controls and harnesses its lightnings ... The Seat of Stone is [Egyptian goddess] Isis, and upon this foundation the Goddess is established and rules the heavens, the earth and the deeps beneath the earth. In other words, the Goddess who grants all desires is invoked by the union of the X and the O ...

Extinction Rebellion protests are incredibly ritualistic with groups of people with white faces and blood-red robes walking through the streets. I am not saying that all followers of Extinction Rebellion and supporters of the Green New Deal know they are assets of the global Cult. They are still more pawns in a game they don't understand. If they read this book to the end they might see how monumentally they are being had. Human-caused climate change is being hoaxed to justify the centralisation of global power over the fine detail of our lives and as I write so is - *big time* - the 'pandemic' which ticks every box for those seeking to impose the global Orwellian state.

Permanent government is the real government

Every country and the world as a whole has a permanent government controlled by the Cult through compartmentalisation and these are always in power no matter what the nature of the here-today-gone-tomorrow political parties that only appear to be the origin of societal change. Permanent government is widely referred to as the 'Deep State' today although that is only part of the permanent control. The Deep State consists of Cult-directed intelligence, military and law enforcement personnel along with government administrators and insider politicians that seek to advance the Cult agenda for the world. They direct, manipulate and undermine elected government and non-Cult personnel (the overwhelming majority) to ensure that what the Cult wants it gets. Other sections of permanent governments include the banking and financial networks, Big Tech, Big Biotech, Big Pharma, Big Media (and some of the 'alternative'), Big Oil, other major corporations, the legal system and courts. Politicians come and go, but the hidden government is always there and no matter what the colour of the briefly-elected political rosettes the same direction of the world incessantly continues (Fig 12). America is a perfect example of how this works although it's the same in every country. The United States is governed (at least



Figure 12: Permanent governments operate nationally and globally and dictate the direction of countries and the world while 'elected' politicians of all parties come and go.

officially) by either the Democratic or Republican parties and the Permanent Government controls both of them. Whichever you vote for the Cult is in power. The Republican Party is controlled by a group known as the Neocons or neoconservatives (major funder casino billionaire Sheldon Adelson) and the Democrats have a similar group that I call the Democoons (major funder financier billionaire George Soros). Adelson and Soros both answer to those that control Israel which in the shadows is the Sabbatian-Frankist wing of the Cult. Soros would deny that Israel connection to maintain his cover of being different from Adelson. He's not. Do these people and others always like each other? No, they don't and there is rivalry between them. Levels above them, however, make sure that any mutual contempt doesn't get out of hand or in the way. Woe betide them if it does. We see the US presidency passing between 'Democrat' Bill Clinton, 'Republican' Boy George Bush, 'Democrat' Barack Obama or 'Republican' Donald Trump who are described in office as the most powerful people in the world. They are in reality only temporary puppets of the Permanent Government because the Neocons and Democoons both take their orders



Figure 13: Politicians are here today and gone tomorrow, but the Hidden Hand that I call the Cult is always there and ultimately controls all of them. (Image Gareth Jones)

from the same Cult (Fig 13). Political squabbles, attacks and counter-attacks are sideshows as the Cult agenda for total human control moves incessantly forward. Public squabbles played out in the media also help to convince the population that they really do have different political choices within what is called 'democracy'.

This term is used as interchangeable with 'freedom' when democracy is really only the ability to mind-manipulate enough people to vote for you by lying to them. You lie in election campaigns about your planned policies and then largely do the opposite once you win office. You are then free to officially run the country until the next lie-fest when you may be replaced by another party controlled from the shadows by the same force that controls you. It happens all the time across the world. People vote for Party 'A' and they get into power. The public don't like what they do and next time the majority vote for Party 'B'. People don't like what they do because it's pretty much the same in outcome and the only way they can remove them is to return to Party 'A' that they threw out the election before. Round and round the garden generation after generation. Heads you lose, tails you lose. In some countries there may be a Party 'C', but the principle is the same. The government that you see is subordinate to the Permanent Government that you don't see and national Permanent Governments fuse into a global Permanent Government that dictates to the world through The Web. Against this background the massive divisions in the population between the political 'Right' and 'Left' take on a whole new light and state of ridiculousness. They are manipulated divide and rule to set the target population at war with itself while believing they have 'choice' (Fig 14).



Figure 14: Get the public to support different masks on the same face and divide and rule will always follow. (Image Gareth Jones.)

Cult wars

War after war in the Middle East is testament to the existence of the Permanent Government behind all political faces and facades. A Neocon 'think tank' called the Project for the New American Century (PNAC), founded and dominated by ultra-Zionists with fanatical allegiance to Israel and Sabbatian-Frankism, published a document in September, 2000, calling for American troops to 'fight and decisively win multiple theatre wars' in the Middle East and elsewhere to regime change governments in a list of countries including Iraq, Libya, Syria and Iran as well as bringing about regime-change in North Korea and eventually China. The Cult seeks to control the whole landmass of Eurasia from Europe to China and from Russia down to the Middle East and this

further explains the constant demonisation of Russia. The PNAC document said that to justify this policy to the American public and secure the enormous required increases in military spending the United States had to experience another attack on the homeland like the one by the Japanese at Pearl Harbor, Hawaii, in 1941. To quote the document:

... [The] process of transformation ... [war and regime change] ... is likely to be a long one, absent some catastrophic and catalysing event – like a new Pearl Harbor.

A year to the month later America had what President Bush called 'the Pearl Harbor of the 21st century' – 9/11. Members of the Project for the New American Century behind the document came to office with Bush in January, 2001. They included Dick Cheney (Vice-President and de-facto President); Donald Rumsfeld (Defense Secretary); Paul Wolfowitz (Deputy Defense Secretary); Dov Zakheim (Comptroller of the entire Pentagon budget); and many others allied to Israel and committed to the PNAC list of regime-change targets. I show beyond doubt in *The Trigger* that the satanic Sabbatian-Frankist network of the Cult operating out of Israel and in league with its agents in the US Deep State were the real perpetrators of 9/11 which they then used as the excuse to launch the 'war on terror' (war of terror) to pick off their list of target countries. They invaded Afghanistan to 'get' the fake 9/11 villain Osama bin Laden and followed this by targeting the countries on the original PNAC list – Iraq, Libya, Syria and Iran with much finger-pointing also at North Korea and increasingly China. The nature of the Permanent Government comes into focus when you observe how those countries have been targeted by different presidents from apparently 'opposing' parties: George Bush ('Republican', Iraq); Barack Obama ('Democrat', Libya and Syria); and Donald Trump ('Republican', Iran). We also had UK Prime Minister and war criminal Tony Blair (Labour Party) working with Bush to invade Afghanistan and Iraq while David Cameron (Conservative Party) was Prime Minister when Britain supported Obama in laying siege to Libya and Syria. They may appear to be 'different' presidents, prime ministers and parties, but they follow the same script written by the Permanent Government.

Unhooking the mind

All this brings me to the focus of this book which is escaping the human mind-prison by taking back control of our own perceptions and self-identity. I mean by that our perceptions of everything from world events to the nature of the True 'I' and reality itself. The number of Cult operatives working in full knowledge of what they are doing is microscopic compared with a global population heading towards eight

billion. The only way so few can control and direct so many is by hijacking their perception of everything. You can use 'physical' control only over relatively small groups through military and civilian law enforcement (unless the population acquiesces en masse through perception control as with the 'pandemic'). For global control you require perception control. Behaviour comes from perception and if you control perception you control behaviour and what people will do or won't do, challenge or support. Hijack perception and you hijack behaviour; hijack behaviour and you hijack the world. The sequence of control is perception = behaviour = collective human society. The next question is where do perceptions come from? They come from information received. We develop our perceptions through information that we absorb from personal experience, a bloke down the bar, the ten o'clock news, a posting on Facebook, and countless other sources. We can therefore extend the sequence to information = perception = behaviour = collective human society. Control information and you control that whole sequence. The Cult already overwhelmingly controls information and it seeks total control. Perceptions are assumptions based on the brain's best guess in the light of information received. Humanity would increase by a ginormous leap its potential for knowledge and creativity if we realised that perception and truth do not have to be the same thing and in fact rarely are. What is perceived 'truth' anyway except assumptions that become perceptions that become 'this is how it is'? Donald Hoffman, a professor in the Department of Cognitive Sciences at the University of California, Irvine, said that perception is a controlled illusion and reality is when we agree about our hallucinations. Yes, but who controls the illusion and elicits agreement on hallucinations by controlling information and the assumptions that come from that? The Cult is seeking to enforce total control by imposing perception directly through a brain-connection to AI, but for now they must control information to control perception to hijack collective reality. Here you have the reason the Cult is obsessed with controlling sources of information through ownership of the mainstream media and Silicon Valley while suppressing other information through the ever-increasing censorship documented at length in my other books and experienced by more people every day. The Cult seeks to delete or suppress any source of information and opinion that questions and challenges the official narrative of almost any subject, including government (Cult) policy, 'Covid-19', vaccines, regime-change wars, human-caused climate change, the nature of human biology and political correctness which is manipulating the population to censor itself. All these subjects and so many more are aspects of the Spider agenda and they are imposed by the Cult via The Web. The coordination of censorship by this network is obvious and it's cheered on by the Cult-created (fake 'progressive')

'Woke' culture. 'Woke', ironically, is another word for 'fast asleep'. The climate change hoax, the imposition of extreme transgender doctrines, beliefs and language, and the obsession with seeing racism absolutely everywhere are all facets of 'Woke' and, not coincidentally, facets of the Cult agenda for the world as I will be explaining.

Fake self-identity

The foundation and bottom-line of mass perception programming is to maintain humanity in ongoing ignorance of who we are and where we are. The idea is to program the belief from cradle to grave that we are cosmic accidents of random 'evolution' and to define self-identity only by the labels we are given and give ourselves. Life has a beginning and an end and when you're dead you're dead. For those who won't buy the latter you tell them they are subject to the demands of an angry, judgemental external 'God' with rules and regulations (Cult rules and regulations) which must be followed to avoid the fires of hell or secure a date with multiple virgins waiting only for believers. Whether religious or atheist the labels of limitation still apply. These are the labels of 'I-am-a' as in: I-am-a man, woman, gay, transgender, black, white, rich, poor, Christian, Muslim, Hindu, Jew and all the rest. These labels are not who we are. They are merely what we are briefly *experiencing*. We – the eternal 'I' – are an expression of an Infinite State of Awareness *leaving* those experiences. Think how impossible it would be to pressure, frighten, intimidate and manipulate people to do what the Cult demands if we knew that we are a point of attention within a state of Infinite Awareness having a brief experience called human in whatever form, colour, race or sexuality. How even harder would it be to divide and control people aware that we are all aspects of the *same* consciousness and who understand that our temporary labels are illusory divisions and not real in the way that they seem to be? How would the Cult instigate the essential divide and rule and conflict between labels of race, culture, sexuality, politics and income bracket if we all knew they were temporary illusions and that our reality is just another type of 'dream'? Or that human life is like donning a headset and playing virtual reality? Such games may seem so real, but take off the headset (symbolic of 'death') and you see that it was all a technologically-generated illusion, a dream or nightmare that we believed in the moment to be real. Such is the nature of human life. As Rumi, a 13th century Persian mystic, said:

This place is a dream. Only a sleeper considers it real. Then death comes like dawn and you wake up laughing at what you thought was your grief.

These truths must be kept from us for the Death Cult conspiracy to

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Figure 15: The human Bubble.

public arena while passing it on to generations of chosen initiates in the secret society networks of The Web. Secret societies and other assets of The Web answer in the end to the Cult which itself answers to its non-human masters or Spider. We have in this way been manipulated to forget our real nature and live in an isolated 'Bubble' of self-identity and limitation that I call Phantom Self - false self (Fig 15). This is the whole foundation of human control, but it doesn't have to be. Open your mind and it's wacky, wacky time.

prevail. This book is about how that is being done and how we can return to the true and eternal 'I' that we are and always will be beyond the illusory diversions of the five senses. The inner circle of the Cult knows what reality is and how it works and their power comes from keeping that knowledge from the population. They do this by dismissing or demonising such information in the

What is 'reality'?

If you don't know who you truly are,
you'll never know what you really want - Roy T. Bennett

Dictionary definitions of 'conscious' include: 'The state of being aware of, and responsive to, one's surroundings'; and 'the state of understanding and realising something'. My definition for the purposes of this book is going to be very different.

I am making a clear distinction between what I will call 'mind' and 'consciousness'. I will use the term 'mind' and 'Body-Mind' to describe the perception of five-sense reality and 'consciousness' for expanded awareness beyond the walls - firewalls as we shall see - of the five senses. From this perspective these two official definitions can be seen in another way. Take the first one: 'The state of being aware of, and responsive to, one's surroundings.' Okay, but aware of what surroundings? Perceived 'surroundings' (quite the wrong term as I shall explore) are actually illusory when compared with how we appear to experience them. The world is not 'solid', for example. It only seems that way to senses that are not consciousness in its prime form. Our five senses, or information decoding systems, 'sense' our 'surroundings' while not in the widest meaning of the word being 'conscious' or 'aware' of what those surroundings are. If that was the case we would see through the illusions and mind-trickery to perceive the world as it really is. Then there is that other definition of conscious: 'The state of understanding and realising something.' Can anyone truly understand anything, never mind something, when we appear to be experiencing a 'physical' world of 'solidity' which is, in fact, neither? How can we understand anything in the world if we don't understand the nature of the world? We can't and yet all the institutions of human society are making decisions and forming perceptions based on an illusory reality which is nothing like the one they think they are living 'in'. How can such decisions and perceptions be anything except skewed and misguided? These are the same institutions of education, science, medicine, politics and media etc. from which all but a few glean their



Figure 15: The human illusion.

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Figure 13: The Fermat Bubble.

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perceptions and make their decisions. Put all that together and it captures in its **totality** the meaning of the phrase 'the blind leading the blind' or, as I would put it, the unconscious leading the unconscious. Five-sense mind is not conscious in my definition so much as sensory – 'relating to the physical senses'. It doesn't perceive and instead *decides*. I will explain the *hows* and *whys* as we go along. This entrapment in five-sense perception is why so many (especially in academia, science and medicine) only believe in what they can see, touch, taste, smell or hear – *decide*. They are not conscious beyond sensory self. By my definition, therefore, such people are *unconscious* and slaves of five-sense mind. Our senses are not conscious any more than a computer is conscious when it decodes data and presents it on the screen in a form that we recognise.

What I am calling 'conscious' is that which operates beyond the merely sensory. You could think of this as the person sitting at the person sitting at the computer with the keyboard and mouse while sensory mind is the computer which should be responding to that input (Fig 16).

When a computer virus infiltrates a system and takes it over – takes 'possession' – the operator is tapping the mouse and banging the keys without response. The computer takes on a life of its own with something else seizing control. I say this is what has happened to humanity. A 'virus' – the Death Cult and it's non-human masters – have infiltrated human



Figure 16: The symbolic – but very accurate – depiction of the human plight. The computer operator (consciousness) becomes disconnected from the computer (Body-Mind) which is then programmed with false perceptions of everything, to ensure mass human control. (Image Neil Hague.)



Figure 17: Who are you? We are awareness, a state of being aware. The body is only a temporary vehicle for a brief experience by that awareness as a 'human'.



Figure 18: We may experience ourselves as 'individual', but we are all expressions, too, of the same infinite flow of awareness that, at one level I will call 'The Field'. (Image Neil Hague.)



Figure 19: When our point of attention enters the human frequency band we should be guided from our expanded levels of consciousness, instead most are manipulated to operate only in the realm of the five senses where the Cult controls what they see and hear; the result is 'physical' enslavement through perceptual enslavement. (Image Neil Hague.)

and we can open our minds potentially to infinity itself. When our minds are closed that influence is lost to our experiencing awareness, or Body-Mind, and we become isolated in the 'Bubble' within which our sense of reality is dominated by five-sense perception (Fig 20 overleaf). Instead of being influenced by our expanded levels of awareness we become mesmerised by information constantly fed to the

perception and essentially disconnected sensory mind (Body-Mind) from expanded awareness. We are not our body or sensory perception. They are only experiences for the True Self which is simply awareness – a state of being aware (Fig 17). Everything in all existence is consciousness, the same consciousness in different states of awareness, and we, like everything, are an expression of that state of Infinite and Eternal Awareness (Fig 18). Our expression or point of attention is currently having a brief experience called human and our Body-Mind (the symbolic computer) is the vehicle for that experience.

Humanity has been manipulated by the Cult to forget our true nature and identify with the 'me' of the five senses and all its illusory labels and sense of apartness and division (Fig 19). We are meant to retain a connection to the True 'I' (the hands on the mouse



Figure 20: The whole foundation of human control – isolation in the Bubble of perception. See Neil Hague colour section.

brain and five senses by Cult-controlled media, politics, science, medicine and academia while all except a few in those professions have no idea they are serving a Cult-directed agenda. They are as perceptually mesmerised by their Bubbles as everyone else.

Perceptions within the isolated 'Bubble' are programmed to sense reality while not being conscious of reality and this allows the Cult to impose its will via manipulated ignorance on human experience. From this has come the collective madness of war, division and conflict of every kind and this possession of Body-Mind is planned to be completed through the mass-connection of AI to the human brain. That would take us beyond mere perception programming to full-blown assimilation into artificial intelligence and the force behind it. I don't mean assimilation of the True T, but of the five-sense Body-Mind Bubble isolated from True T. It's like a virus taking control of an entire computer network by bypassing and disconnecting the operators (True T) and connecting the system to another source (the Cult and its masters in the unseen). Everything is conscious because everything is consciousness manifesting in infinite states and forms. Not everything, however, is equally conscious and hence my distinction in this book between what I am calling Body-Mind and consciousness. Observe humanity for five minutes to see multiple states of awareness. Sensory mind is a form of awareness which is incredibly limited in its perception of reality compared with consciousness beyond the Body-Mind Bubble.

What is this 'God'?

We are a point of attention within an Infinite state of awareness/consciousness that some refer to as 'God'. I don't use that term with all its religious connotations and diversions. For those who do, we are not apart from 'God'; we are a part of 'God'. We are a unique point of attention through which Infinite Awareness, or 'God', can infinitely experience itself (Fig 21). Infinite Awareness means Infinite Possibility and Infinite Potential for Infinite Experience. We are all



Figure 21: Our 'individual' awareness is infinite Awareness experiencing itself. We are the 'individual' and the whole.

expressions of the same consciousness and separation is a five-sense illusion that the Cult works so hard to maintain. American cosmologist Carl Sagan said:

We are a way for the universe [I prefer The Infinite] to know itself. Some part of our being knows this is where we came from. We long to return. And we can, because the cosmos is also within us. We're made of star stuff.

What is 'human' except a state of awareness experiencing itself in multiple ways? The level of awareness of the 'part' is decided by the strength of connection that it has to the whole. The more we lose a perception of self-identity with the whole (I am Infinite Awareness having a human experience) and perceive ourselves to be isolated random 'labels' (I am Ethel on the checkout or Charlie at the drive-through) the more the connection and influence of Infinite Awareness is lost and we become trapped in illusion and forget who we really are. This can be accurately symbolised as living in a Bubble of isolated Body-Mind in which the perception of everything is formed only from the



Figure 22: Humanity is entrapped in perceptual Bubbles and programmed by Cult controlled multi-sensory information sources operating in the Bubble, isolate and program. See Neil Hague colour section.

information available within the Bubble (Fig 22). Beyond its walls lies infinite possibility, potential and awareness that would give you a completely different understanding of who you are and where you are. The Cult works incessantly to keep humanity

untrapped in the Bubble because only then can its will prevail. Isolate Body-Mind from expanded states of consciousness and program Body-Mind with the perceptions and self-identity that allow the imposition of mass servitude. Crucial to this is to use the inner-core of the secret society network to communicate the nature of reality through the generations of the Cult while keeping that knowledge from the target population.

Descriptions of Infinite Reality that I have outlined here can be found throughout history long before the Cult instigated mainstream 'science' to tell us that we are all random cosmic accidents, that consciousness only comes from the brain, and death is the end. The perceptual outcome of promoting this nonsense has been to embed the belief that we are not an eternal expression of an infinite whole and only a meaningless assembly of randomly-evolved cells. We are told by 'experts' that the brain is the origin of consciousness and life depends on the brain being active. When it's not then consciousness ceases to be. Selling this Bubble illusion is an essential precursor to mass control. Cult-created 'education' and academia download this baloney to each generation of young people who largely pass it on to the next generation. Academia and this-world-is-all-there-is 'scientists' have themselves downloaded the same script (otherwise they would never get the job) and their funding and authorities demand that this is what they teach to others in a perpetual-perceptual motion machine in which ignorance speaks lies unto ignorance and calls it 'education'. For those who won't buy this perceptual program there is the associated entrapment of religion in which some have eternal life if they do what 'God' (the Cult) demands while others are condemned to the Pines of Hell for having a mind – or consciousness – of their own. Religion in a sentence: 'Do what 'God' (we) say or you'll be in deep shit.' Ancient cultures across the world knew that consciousness is eternal and their societies were founded on that understanding in the thousands of years before Cult 'science' and religion dropped in to tell and sell another story which was imposed by Cult-orchestrated colonisation from Britain and Europe. The Cult headquartered itself in Britain (hence the British Empire) after its journey of the centuries out of Sumer and Babylon (today's Iraq), Egypt, Asia, and elsewhere. Italy and Germany are other major Cult centres (so is China) and it expanded into North America with colonisation while establishing itself in the pivotal land of Palestine with Sabbanian-Frankism with the creation of Israel (see *The Trigger*).

Unravelling the Illusion

Before I explore reality more deeply I should summarise the illusory 'normal' that we are told to believe in. This requires us to accept that what we appear to be experiencing is really what we are experiencing.

What is 'reality'?



Figure 23: The foundation of human reality is information encoded in wavefields and the illusory 'physical' world is a decoded projection of that information.



Figure 24: A computer decodes information from Wi-Fi radiation fields in the screen into images on the screen that we can see.



Figure 25: The human brain and five-sense decoding systems do the same by transforming unseen wave information into holographic, illusory 'physical' information that only exists in our 'heads'. (Image: Gareth Cole.)

Official reality is what the five senses are manipulated to believe in. Can I see it? Check. Hear it? Check. Touch it? Check. Smell it? Check. Taste it? Check. Okay, it exists then. But does it in the form that we think it does? Are we and the world really 'physical' and 'solid'? No. The sensory system of the five senses is a decoder of information in the same way that a computer decodes Wi-Fi into a very different form on the screen. The five senses decode information in a particular way (again like a computer) which reflects what they have been encoded to do. A computer decodes information from electronic circuits and Wi-Fi electromagnetic radiation fields into pictures, colours, graphics and text on the screen as radio and television broadcasts transmit sound and images in waves which the television decodes (Fig 23). We perceive the Internet to be what we see on the screen when in fact the only place the Internet exists in that form is actually on the screen. Everywhere else that some information is expressed as electronic circuits, codes and Wi-Fi fields. Our human reality also consists of electromagnetic Wi-Fi-like wavefields of information and we are interacting with those fields as a computer interacts with Wi-Fi. A computer is

encoded to decode Wi-Fi wave information to produce what we see on the screen while the five senses, in league with the brain, are encoded to decode information from radiation wavefields to produce the reality (the sense of reality) that we perceive as the 'physical world' (Figs 24 and 25 on previous page). The foundation of our reality and the human self is not 'physical'. It is wavefield information (keep thinking Wi-Fi) which

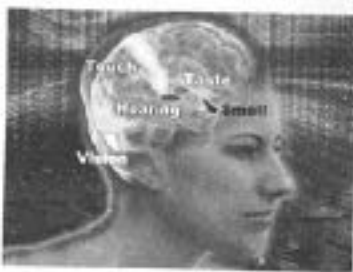


Figure 26: Different parts of the brain specialise in decoding different senses and fit them together to form perceived reality. (Image Neil Hague.)

the five senses decode into the 'world' that we think we are experiencing as physically. Observe each of the senses and you will see that this is true. They decode wavefield information into electrical information which is communicated to the brain to be decoded into what we experience as the physical world. There are specific areas of the brain that process input from each sense and these sources are then combined to construct what we believe to be human reality (Fig 26). Our sense of everything in terms of physicality and solidity is an illusion of this decoding process. What appears to be physical is really holographic – illusory physical. Holograms give the appearance of solidity while being anything but solid. This illusion can be seen in today's holographics which can look as solid as you and me when in fact they are



Figure 27: The human decoding system transforms wave information into electrical information which becomes digital and holographic information – the illusory 'physical world'. (Image Neil Hague.)

energetic projections that have no solidity. I'll cover this in more detail in the next chapter. Only at the end of this wavefield-electrical-digital-holographic decoding process does the 'external' world exist as we perceive it (Fig 27). Nor is holographic 'physical' reality actually external to us despite what our senses may tell us. The 'world' that we

experience apparently 'outside' of us only exists in that form in our head – the brain. In the same way information on the screen of a computer only exists in that form inside the computer. I have heard scientists claim that the senses de-construct an external reality and then re-construct it in the brain. This is absolutely not the case and anyone taking even a cursory look at well-established evidence will see that. Our experienced reality, as acknowledged by more aware scientists, is like a computer screen which hides all the codes, circuits and pixels which make the sound and images possible. In our case those codes, circuits and pixels are information (consciousness) waves that when decoded form our illusory 'physical' reality.

The foundation of our reality – including ourselves – is wave information fields which are expressions of consciousness and so everything is conscious in some form. Information encoded in the wavefield of a tree is what makes it a tree and not a flower or a thorn bush. What is a 'tree' in a virtual reality game? It is information encoded to be decoded by the computer into the form of a tree. Every expression of form, every thought and emotion, transmits different wave frequencies that reflect the information the waves represent and contain. Form is information – waveform information. What is encoded into the human body wavefield makes us appear 'physically' human (Fig 28). Our reality is the sum total of all these wave information fields within the frequency band of the human senses and I will refer to this totality as 'The Field' – the energetic 'sea' that connects everything while our senses tell us that each 'form' stands apart from all other 'form' with 'space' in between. That 'space' is filled with the information (consciousness) of The Field which connects everything (Fig 29 overleaf). Wi-Fi technologically mimics 'The Field' and the reason for that will become clear later on (Fig 30 overleaf). Body-Mind fields are interacting with 'The Field' in the same way that we take information from the Internet and also post information. The Field affects us and we affect it. We are The Field and The Field is us – we are indivisible. The term 'We Are One' is not some trite esoteric phrase. It describes how everything in our reality and all



Figure 28: The foundation of the human body and everything in our reality is information encoded in wavefields. See Neil Hague colour section.



Figure 28: Everything is connected with The Field and waves interact with everything else through The Field. See Neil Hagee colour section.



Figure 30: A portrayal of the more ubiquitous WWF fields – a sociological overlay of The Field which operates basically the same.

reality is ultimately one field of energy/consciousness. Apparent division is an illusion of the way we experience reality. The key is to realise that everything is a wave information field which we decode into the 'world' that we think we live 'in' when 'it' really lives in us – Body-Mind. Understanding the foundation wave nature of 'physical' reality is to truly grasp what is happening in the world as will become clear.

Ears to hear? Tongues to taste?

The hearing sense is the most obvious example of decoding waves into electrical signals. Our ears receive wavefield information as soundwaves and transmit them to the brain as an electrical communication.

Only when the brain decodes that information do we 'hear' sound. People talk about 'hearing' each other speak, but words don't pass between us – sound waves do. Words only manifest at the end of the sequence, not the beginning. When we speak, we are generating wavefields of information from the vocal chords and these soundwaves are decoded by the ears and transmitted electrically to the brain to be decoded into the words that we think we are hearing with our ears. We hear them in the brain and it's the same with all the senses. Sound is silent to our senses in the form of sound waves until their information enters the brain. Take the example of a tree falling. A falling tree is an electromagnetic wave information field that impacts on the electromagnetic wavefield 'sea' or The Field. A wave disturbance is generated in the 'sea' from this wave interaction and if no one is there to

What is reality?

decode that disturbance a falling tree makes no noise. If an observer is present they will pick up the wave disturbance as electromagnetic (sound) waves and transmit these electrically to the brain to be decoded into the sound of a tree falling. Hence the question 'does a falling tree make a noise?' can be answered by 'only if you hear it' (Fig 31). All five senses work this way. Food and drink as we perceive them are really energetic fields of information decoded by the senses into the form that we see and taste. The tongue sends electrical signals to the brain to become 'yummy' or 'what's this shit?' It is the brain that tastes within human reality and the same with sight, touch, smell and hearing (Fig 32). There are pain relief techniques used today which involve blocking the point of pain from communicating electrically with the brain. Unless the brain decodes that signal into 'ouch' there can be no pain. Food companies, well, they call it food, add taste enhancers to their products to trick the brain into decoding more taste than the 'food' contains. Car seats are now being designed to further trick the brain for health reasons into believing someone sitting behind the wheel is walking. 'Physical' reality is an illusion and the Cult knows this. It works constantly to stop you knowing to make you a sitting duck for its perceptual manipulation. The famous scene in the first Matrix movie describes the world as it really is when the character Neo has his mind inserted into a computer program to be shown the illusory nature of physicality:



Figure 31: A falling tree (and everything else) really does only make a noise when we hear it.



Figure 32: Everything is wavefield information in its base state – including food. 'Physical' food is decoded wavefield energy information. See Neil Hagee colour section.

Neo: This isn't real!

Morpheus: What is real? How do you define 'real'? If you're talking about what you can feel, what you can smell, taste and see, then 'real' is simply electrical signals interpreted by your brain.

That's all it is and everything we believe to be real only exists in the brain or Body-Mind in the form that we experience. British philosopher Alan Watts, who became well-known in America for his Western interpretation of Eastern philosophy, said:

... [Without the brain] the world is devoid of light, heat, weight, solidity, motion, space, time or any other imaginable feature. All these phenomena are interactions, or transactions, of vibrations with a certain arrangement of neurons.

Outside the brain none of these foundations of 'physical reality' exist in that form. Mainstream scientist Robert Lanza describes in his book, *Biocentrism*, how we decode electromagnetic waves and energy into visual and 'physical' experience. He used the example of a flame which emits photons, or tiny packets of electromagnetic energy, each pulsing electrically and magnetically:

... these ... invisible electromagnetic waves strike a human retina, and if (and only if) the waves happen to measure between 400 and 700 nano meters in length from crest to crest, then their energy is just right to deliver a stimulus to the 5 million cone-shaped cells in the retina.

Each in turn send an electrical pulse to a neighbour neuron, and on up the line this goes, at 250 mph, until it reaches the ... occipital lobe of the brain, in the back of the head. There, a cascading complex of neurons fire from the incoming stimuli, and we subjectively perceive this experience as a yellow brightness occurring in a place we have been conditioned to call the 'external world'.

Illusion Confusion

Even movement is a decoded illusion. There is no movement? You experience moving around in your dreams while you don't move at all. It all happens in your mind. You are lying in bed fast asleep. How can human experience involve 'physical' movement except as a holographic dream given that holographic 'physical' reality only exists in the brain? When people don headsets to play computer games they experience speeding along in a car or falling over a cliff while their bodies are sitting in a chair going nowhere. A British newspaper writer described

how the most striking aspect of playing such a game was the physical sensation of moving without really moving: 'My brain sends signals to my body that create the illusion that it's shooting around like a pinball when in fact I am stationary.' This is how the illusion of human movement works. Colours don't exist until they are decoded by the brain. Each colour and shade is a unique frequency that requires decoding to 'see'. Objects (wavefields) absorb some wave frequencies of colour and reflect others. What they reflect we decode and 'see' as their 'colour' and what they absorb we don't. All that we visually perceive is reflected light which is why we can't see in pitch black when objects (wavefields) have no light to reflect. At the two colour extremes black absorbs all light and appears black while white reflects all light and appears white. Other colours absorb some and reflect some which gives them their unique light representation that we 'see' (decode) as colour. Rainbows are called a spectrum which comes from a Latin word meaning an apparition or phantom (hence 'spectre'). That sums it up, really. In the same way that sound can only manifest when waves are decoded by the brain so visual reality can only manifest through the same process. This is the real foundation of the scientific concept of the 'Observer Effect' which says that 'physical' reality only exists in that form when it is being observed or 'measured'. When it is not being observed/measured reality remains in its wavefield state and only becomes 'physical' when we look at it in some form even through a measuring device. One media headline said: 'Your entire life is an ILLUSION: New test backs up theory that the world doesn't exist until we look at it'. Andrew Truscott, an Associate Professor at the Australian National University who has studied this phenomenon, said that at the quantum (smaller than the atom) level reality does not exist if we are not looking at it. He added that his team's experiments revealed how '... the atoms did not travel from A to B ... and it was only when they were measured at the end of the journey that their wave-like or particle-like behaviour was brought into existence.' Theoretical physicist Werner Karl Heisenberg (1901-1976), the celebrated German pioneer of quantum mechanics, said that "a path comes into existence only when you observe it". An article in *Epoch Times* described the findings of another experiment in an article headlined 'Your Mind Can Control Matter':

Atomic particles were shown to also be waves. Whether they manifested as waves or as particles depended on whether someone was looking. Observation influenced the physical reality of the particles - in more technical language, observation collapsed the wave-function.

Scientists have long pondered on the strange phenomenon that particles are also waves at the same time. That's impossible, surely? They

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Figure 32: The white crest of a wave and the ocean are the same body of water. Humans and infinity are the same body of consciousness. They just take a different visual form.



Figure 34: It all seems so real, but it is holographic. It is decoded from wave information. See Neil Plaque colour section.

Human reality requires an observer to exist because the observer is making it exist in that form in the decoding system of the brain (Fig 34). Waves ('non-physical') and particles ('physical') are different forms of the same field of information. Scientist Albert Einstein said: 'The [wavefield] is the sole agency of the particle [matter].'

He's behind you!

For reasons I have explained Einstein's contention *has* to be the case. The 'observer' principle is like the classic scene in a British pantomime show when a character faces the audience and they shout that someone 'is behind you'. As the character turns around to check this out the person behind moves around as they do. No matter how many times the

have to be one or the other? They don't when you appreciate that particles and waves are manifestations of the same information. They only appear to be different because of the form that information takes (Fig 33). Waves are the foundation information construct and particles are their decoded holographic representation. "Collapsing the wave function" is the act of decoding holographic reality

which exists in another form at the beyond-human-sight quantum level. Quantum reality is waves of possibility and potentiality and the mind decodes that into holographic actuality. Scientists say that 'physical' reality only exists when we observe it, but the term missing here is 'decode it'. Physical reality only exists when it is decoded. The act of observation triggers the decoding process.



Figure 33: 'He's behind you' and when observation decodes reality, true reality is always 'behind you'.



Figure 36: Look and see what's not really there except in your head. (Image Neil Plaque)

character turns what he is looking for is always behind him and so unseeable (Fig 35). Move your focus in any direction and wavefield becomes hologram. We don't see what's 'behind you' (wavefield reality) because the act of observation triggers holographic decoding (Fig 36). Writer Michael Talbot described in his book, *The Holographic Universe*, something he witnessed at a family party in which a stage hypnotist was invited to entertain the guests with some mind tricks. At one point a man called Tom was put into a hypnotic trance and told that when he was brought back to a waking state he would not be able to see his daughter. The hypnotist asked the daughter to stand right in front of her father and the

now apparently awakened Tom was asked if he could see her. 'No', he said, she wasn't in the room. He was, in fact, looking right into her belly as he sat and she stood. The hypnotist then put his hand in the small of her back and asked Tom if he could see what he was holding. 'Yes', Tom replied, bemused at such an easy question – 'You are holding a watch'. He was asked to read an inscription on the watch which he did while his daughter was standing between him and the watch. A mainstream scientist would tell you that is impossible when the explanation is so simple. The base form of the daughter's body was a wavefield of information operating at frequencies outside the human visual frequency range. Unless she was decoded into holographic form within the frequency band of Tom's eyes/brain she would not appear in her father's 'physical' reality. What's more if she wasn't in his mind holographically she could not block his view to the watch (Fig 37). The



Figure 37: If you don't decode something from the waveform it cannot appear in our holographic 'physical' reality. (Image Neil Upton)

hypnotic suggestion that Tom wouldn't see his daughter firewalled his brain's decoding system from reading his daughter's field and without that happening she would remain invisible to him. This is also a basic explanation for 'ghosts' which are wavefields of consciousness not connected to a human body field and thus cannot be decoded into 'physical reality'. Most appear as ethereal and not 'solid' because of this although some can project a self-image so powerfully that they may appear to be 'solid', albeit briefly. Neo in *The Matrix* asks how he can appear to have a body while in a computer program connected to his brain and he is told that his mind is creating a 'residual self-image' – a 'mental projection of your digital self'. In the context of a 'ghost' it's a mental self-image of the former digital self which will still be imprinted in the 'ghost's' wavefield. Even the illusory 'world' that the brain constructs is manifested from a fraction of the information we receive second by second. The mainstream *Wonderspace* science magazine said:

Every second, 11 million sensations crackle along these [brain] pathways...

The brain is confronted with an alarming array of images, sounds and smells which it rigorously filters down until it is left with a manageable list of around 40. Thus 40 sensations per second make up what we perceive as reality.

Forty sensations or bits of information construct our experienced reality from 11 million received and any gaps are filled in by what the brain believes should be there. It's hysterical to think what reality is compared with the way we experience it. We can get some insight into the process of reality-manifestation with the ever more sophisticated virtual-reality games and systems which mimic technologically the way we create reality biologically (another form of technology if the truth be told). Players wear headsets, earphones and gloves which allow electrical information and codes of the game to access and override the decoding of 'normal' reality and trick the same senses into decoding a fake reality



Figure 38: The process of decoding virtual reality games is the same in principle as how we decode the physical world.



Figure 39: Like the 'physical' world it can seem so 'real'.

(Fig. 38). The mind-trick can be so effective that people react as if what is being played artificially to their eyes, ears and touch senses is real (Fig. 39). I have just described human reality and how its illusions are created.

The brain is an information processor

This sub-heading may appear to be stating the obvious. Of course the brain processes information. Yes, on that we are in agreement. It's the wider context that produces the fork in the road that takes me and many in mainstream science in different directions. This involves the contention that consciousness (information) is not only processed by the brain but also originates in the brain. I seriously don't agree. Ok, but different parts of the brain 'light-up' or switch-on when people are in various perceptual states. Okay, but does that happen because the brain is generating those states? Or because it is decoding those states through specialised areas of the brain related to those states while the information being processed originates elsewhere? I say the latter. Where does the information come from which the brain decodes into what we perceive as our thoughts, emotions and perceptions? The question has multiple answers in that the nature and origin of that information can come from multiple potential sources. Those locked away in the Bubble will process information through the brain from within their Bubble while those who have breached the Cult's perceptual firewalls and accessed expanded awareness will process information from way beyond the Bubble. As a result how they see themselves and reality will be dramatically different. Put aside what you have been told about the brain for a second and imagine it to be only a processor of consciousness and not the origin – 'you hum it, son, and I'll play it', as the saying goes. Information processed by the brain comes from wavefields of consciousness outside the brain and this can be confined to the five-sense 'Bubble' or be any scale of expanded awareness with which senses



Figure 27: If we don't decode something from the waveform it cannot appear in our holographic 'physical' reality. (Image: Neil Hagan.)

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Figure 28: The process of decoding virtual reality games is the same in principle as how we decode the 'physical' world.



Figure 29: Like the 'physical' world it can seem so 'real'.

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mind allows itself to connect. If you do access those expanded levels you are called crazy and insane by those in the Bubble. Information processed by the brain also comes from countless other sources including television, social media, personal experience and the ridiculously named 'education' system. The brain will process anything that comes its way so long as this myriad of potential information is delivered within the frequency band of brain activity. It will decode the sound (frequency) of the human voice and also information, delivered from realities way beyond the realm of the human voice if minds open to that level of awareness (Fig 40). When people say they 'hear voices in their head' they are describing the same phenomena as the brain



Figure 40: The brain can decode frequency information from other realities as it can decode frequency 'words' from the human vocal chords. We only have to open our minds and breach the Bubble. (Image Neil Hague.)

receiving information delivered by the vocal chords as electromagnetic waves which it decodes into words. The information can originate with another human or from dimensions of reality 'far away' (as with psychics or mediums). It can also be delivered in the form of waves generated technologically to infiltrate the brain's perceptions to misdirect and manipulate a target. The Cult operates just such a system worldwide today as I will be describing. The brain is a receiver, transmitter and processor of information, not the origin, and it can be a challenge to discern what is 'you' and what is another source of the wave information you decode as thought and emotion. There are ways of doing that though which I'll get into later.

The brain may be a processor of information, but it's not a neutral one any more than a computer is neutral when it has been encoded to process information in a particular way. Program a computer to decode information 'A' and not information 'B' and that's what it will do. We call this a 'firewall' and they are employed in China to prevent the population accessing large swathes of the Internet that the Chinese dictators don't want people to see. The same can be done with the brain and a central factor in this is what is called brain 'placidity'. It was believed until relatively recently that once the brain was formed this was



Figure 41: The brain becomes what it receives and processes.

information it arranges its neuron networks to fire (decode) in the sequence those frequencies represent. The brain processes particular frequencies of information, thought, emotion and perceptual states and here you have the reason why different perceptions and behaviour light-up different parts of the brain which are involved in processing those frequencies. Consciousness via perception activates those parts of the brain and the brain does not activate itself. The more the brain becomes dominated by flows of the same information, thought, emotion and perception (frequencies) the more its placidity will solidify the neural networks into a repeating sequence of processing ('firing' - *standing*). The only way this can be changed is through other information, thought, emotion and perception representing other frequencies which then, through placidity, change the sequence of processing. Perceptors are represented by frequency waves and create a self-fulfilling conscious and subconscious feedback loop in which we interact with The Field of possibility only within the frequency band that our perceptions represent. In this way our perceptions become our experienced reality. The potential for mass manipulation is limitless when the Cult knows this and works to stop humanity knowing. Perception frequencies impact on the brain through placidity to dictate the way it processes information. In the absence of any change the brain goes on processing information in the same way. Through this sequence solidified perceptions become self-fulfilling prophecies as the brain processes information to match the solidified perceptions and the subsequent neuron-firing sequence which comes from that. We see this in people unable and unwilling to explore another point of view or ways of looking at situations and subjects. They say 'my mind is made up' (solidified neuron pathways), 'I am right' and 'the science is settled' when it blatantly is not.

how it remained for life. Scientists now know the very opposite is the case. 'Placidity' refers to how the brain changes the way information is processed in accordance with the information that it processes (Fig 41). All information is delivered in the form of frequency. Every thought, emotion and perceptual state is represented by its own unique frequency and as the brain processes

The term 'a closed mind' is most apt. People can break free anytime they make the choice to realize they are entrapped by their own unyielding perceptions that lead their brain to process information in ways that appear to confirm those perceptions (Fig 42). Round and round it goes again like a fairground ride apparently moving while going nowhere. This is not helped by the system employed by Internet giants such as YouTube which recommend information based on your past viewing. Hey look at this – something else to confirm what you already think. The very idea that we can form solidified perceptions while being aware of a fraction of 0.008 percent of what exists in the Universe is a fair definition of insanity. Religions go even further and insist that all people need to know can be found between the covers of a single book within a fraction of a fraction of 0.005 percent of what exists in the Universe. As a measurement of crazy, that is world class. It becomes clear why the Cult has always sought to control the information that people see and hear worldwide. Information dictates the way the brain processes information and becomes the person's sense of reality which, in turn, becomes their experienced reality. There's a lot more about this to come in relation to current events which look very different from this perspective.



Figure 42: Perceptions create a self-reinforcing conscious and subconscious feedback loop in which we interact with The Field of Possibility only within the frequency band that our perceptions represent. See Neil Hague colour section.

Time? What time?

I understand why people find it so difficult to comprehend that there is no time when 'time' is the very foundation of human society. Everything is driven by the perception of 'time' – time is running out, look at the time, how time flies and where has the time gone? Yet the only moment within the entirety of Infinite Reality is the NOW. There is nothing else. What we perceive as past, present and future are all happening in the same NOW. I know that sounds incomprehensible to most people, but look at it from this perspective: Where is the 'present'? In the NOW.



Figure 43: Past, 'present' and future are only perceptions. All is happening in the same NOW. See Neil Hague colour section.

Where are you when you think about the 'past'? In the NOW. Where are you when you think about the 'future'? In the NOW. Where does the perceived 'future' eventually happen? In the NOW. Where did the 'past' happen? In the NOW. There is

only the NOW (Fig 43). As you read this book in what is perceived to be the 'present' all your thoughts and memories of the 'past' exist in your conscious and subconscious mind in that same 'present' as do all the wavefield perceptions that you will experience as the 'future'. They are all vibrating in the same field of NOW. I see scientists speculating about how the future can affect the present or even the past. Some of their experiments make it seem that way when in fact 'past', 'present' and 'future' affect each other because they are all happenings and connections in the same NOW. 'Time' is a decoded construct of holographic reality. Wavefield happenings in the NOW are arranged in a holographic sequence by the brain so that one appears to follow another. The apparent speed that Body-Mind runs this sequence leads to the perception of 'time' and our personal mental and emotional state affects how fast or slow 'time' appears to pass. When we are doing things we don't like 'time' seems to pass slowly while activities we enjoy make 'time' appear to pass quickly – 'My goodness, where's the time gone?' and 'Time flies when you are enjoying yourself'. Einstein called this 'relativity' as in 'time' being relative to the observer – the observer or decoder again. He was describing this in terms of the speed and location of the observer relative to what was being observed, but it goes much deeper into the speed at which the observer processes information. A sequence of events ('time') comes into existence only when we decode that sequence into experienced reality and the passage of 'time' is dictated by perception – one person says 'time is flying by' while someone even in the same room will say 'time is dragging today'.

'Time' seems to pass quicker the more information the brain

processes and as ever more information is processed today, especially with instant news, social media and the Internet, 'time' seems to be speeding up for many people. Studies with soldiers have shown how time is in the mind. Three groups were taken on a march of the same distance but at one point each was told they had been marching for different times even though they had not. One group was told the correct time or miles they had been marching; the second was told they had been marching for less time than they had; and the third was told they had been marching for more time than they had. The fatigue of the three groups matched the time they thought they had been marching when the time/distance involved was the same. A movie on DVD exists in the same NOW and I think everyone could agree with that. We experience the movie, existing in the same NOW, as a sequence of 'time' as one scene follows another.

Where you are on the DVD will appear to be your 'present' while your 'past' is the scenes you have already watched and your 'future' is the scenes you have yet to watch (Fig 44). A DVD in totality in the NOW is still experienced as 'time' passing from past through present to future and that's how we experience the passage of 'time' when there is only the NOW. Philosopher Alan Watts described 'individual' events as 'different sections of one continuous happening'. This is a good analogy, as with the DVD, and there is also the symbolism of experiencing a journey along a river as a series of moments in 'time' when the whole river exists in the same moment from source to sea. Each perceived 'moment' following past 'moments' are really 'different sections of 'one continuous happening''. Time as we perceive it is quite obviously a



Figure 44: Different scenes on a DVD appear as past, present and future when they all exist on same disc in the same NOW. Our perceptions of them creates the illusion of 'time'. (Image Neil Hague)



Figure 45: Time is real when you can see it and change the 'day'. Time does not exist. We make it appear to exist. (Image Neil Hague)

human construct in that it involves clock-time which is so ridiculously manufactured that you can pass an invisible line called the International Dateline and instantly be in tomorrow or yesterday (Fig 45). People in Australia enter each New Year long before those in the United States and yet if an American in his today calls an Australian in his tomorrow they talk in the same NOW. The speed of ageing is connected to the perception of 'time' that doesn't exist except as a decoded illusion. While the body's wavefield stability remains the same the body hologram cannot change. Ageing is an interaction between mind and body. There is a sequence in the body blueprint that leads to a cycle from birth to death. After all we wouldn't want to stay in this one band of frequency forever when there is infinity to explore. The speed of this 'ageing' sequence, however, is down to the mind and its perceptions. People think they must age in a certain cycle and period only because almost everyone else does. Once again we have a self-fulfilling prophecy in which ageing is driven by the perception of ageing gleaned from experiencing the 'norm' of ageing. This is a quote that captures the time-illusion theme:

Time doesn't exist, clocks exist. Time is just an agreed upon construct. We have taken distance (the rotation of the Sun), divided it into segments, then given those segments labels. While it has its uses, we have been programmed to live our lives by this construct as if it were real. We have confused our shared construct with something that is tangible and thus have become its slave.

A slave to the Cult 'gods' and the manipulated construct of illusory 'time', but we don't have to be. Once we understand how the mind and a perception of 'time' interact we can start to control time. Top sportsmen and women already do this without realising. Researchers at the University of London found that those taking part in sports involving fast movement of a ball (tennis, baseball, cricket etc.) are able to slow down time. Their focus during play processes information so fast that its holographic movie sequence runs slower than the general population. The crowd in a tennis match with their heads lurching left and right to follow the ball perceive one speed while the players are experiencing another. This allows them to accurately hit a ball which at 'spectator' speed would defeat them. You often hear it said about great footballers that they seem to have more 'time' than everyone else. They do through the way they process information. They assess a situation on the pitch (process information) so fast that they can respond quicker than others who process (and so react) slower. Remember the game is happening in the minds of players and therefore it must be mind that decides the outcome. When this is more deeply understood by the world of sport we will see performances of all kinds improve by amazing

leaps. The limit of sporting performance – as with life itself – is decided only by the self-imposed perception limits of the mind. There is an altered state that top sports people know well called 'the Zone'. I experienced it myself as a footballer and it is not confined to sport. I go into the Zone when I am writing and during speaking events. In sport the Zone slows down 'time', the sound of the crowd dissipates to silence, and any nerves or worry about the outcome disappear. You access a level of awareness beyond what is called the 'conscious mind' which can be full of self-doubt ('You think too much'). What follows is a calmness and level of focus that is only interested in doing the job and not worrying about what the outcome will be. In these moments come the best performances which self-doubt and emotion can otherwise sabotage.

The speed of light? It's pedestrian

The collective programmed perception limit of speed and 'time' is the speed of light which we are told is the fastest speed possible. What crap that will be seen to be. We live in an infinite reality of Infinite Possibility and there is no fastest or slowest anything. The speed of light at 186,000 miles per second (and the perceived physics associated with that) apply only to the frequency band of current human perception and even then they are malleable through the perceptions of consciousness. The speed of light is only the inability of Body-Mind to consciously decode reality faster than the speed of light and there is a reason for that which I will be exposing. The already-measured speed of communication by consciousness is infinitely quicker than the speed of light – as in *instant*. When cells from the same person were located 40 miles apart they responded instantaneously to changes in the other. This both revealed the myth about the speed of light and confirmed the truth about wave communication over what we perceive as enormous 'distance'. Physicists led by Juan Yin at the University of Science and Technology of China in Shanghai estimated the speed that photons (tiny packets of light) interact at *ten thousand* times the official speed of light. 'Time' changes along with much else when you approach the speed of light and the limits of the Body-Mind decoding system within the human frequency band. Space and distance are further illusions of holographic decoded reality. Scan the night sky and everything you think you 'see' in the form that you think you 'see' exists only in your 'head' – the Body-Mind decoding systems (Fig 46). In fact, it's not even your head but an area at the back of the brain where visual reality is decoded and your personal visual movie constructed. Computer games appear to have both time, as scenes change, and space in depth and perspective. Yet they are only codes written for the computer to decode. Space as we perceive it is defined by holographic form. Where there is no form we



Figure 46: The night sky seems so far away, but it only exists in that form in your brain. What happened to 'space'? (Image Not Hagari.)



Figure 47: All existence shares the same 'space' on different bands of frequency (as an analogue radio and television stations share the same 'space' without being aware of each other unless they are very close on the dial). (Image Not Hagari.)

call this 'space' and people think of this 'space' as 'empty' when it is a consciousness field full of information – The Field. What we refer to as 'space' is only the absence of form or 'things' and it is absolutely not 'empty'. Infinity exists in the same 'space' where you are sitting or standing now while only an infinitesimal fraction can be perceived by the human decoding system (Fig 47). We are told that light from stars travels billions of light years to get to us when there is no 'space' to 'cross' or 'time' to 'travel' except as an illusion of decoded perception. What you believe you perceive and what you perceive you experience. Change what you believe and you change what you experience.

Evidence galore

We have evidence of other realities and levels of consciousness from literally millions of people living today who have had what are called 'near-death experiences', or NDEs. This is when the body dies and people apparently experience their awareness being released to another point of observation outside the body (Fig 48 overleaf). Reality that I have outlined so far explains why near-death experiencers describe what they do. The number of NDEs must be many hundreds of millions and



Figure 48: Enormous numbers of people have described leaving five-sense perceptual focus and entering a vastly different reality in a near-death experience.

more throughout history with near-death experiences described in ancient Greek and Roman texts and medieval works. Modern experiencers report how they see medical staff trying to revive 'them' (or rather their temporary vehicle) while being perceptually detached from the body. Many are able to accurately recall what staff were saying while 'they' were officially 'dead'. Many describe looking down on their body and no longer

identifying with that as part of them. NDEs have many common themes of passing through a tunnel (though far from always); meeting long-dead friends and relatives (often looking far younger than when they 'died'); and experiencing stunningly beautiful places while enveloped in indescribable love. They report an extraordinary sense of calm and peace and how they felt free for the first time. Not everyone's life changes for the better after they return to the body, but that is the case with most once they have come to terms with living in a world they know is not what it appears to be. One experiencer said: 'I don't fit in because I don't "see the line" and just agree with things.' This happens when you see through the illusion. Others report feeling more tolerant, loving and compassionate and no longer obsessed with materialism and personal status. The most common trait of a near-death experience is that people no longer fear death. Humanity in general is haunted by the prospect of death when there is nothing to fear. The Cult doesn't want us to know this when fear of death (fear of the unknown) has so many uses in pursuit of control (see the Covid-19 hoax). I have read a long list of near-death accounts over the years and the great majority are very positive. Rarely do you find people who prefer human life to what they experienced in 'death'. They return because they are told their experience is not yet over or they don't want to leave children and other loved ones behind. Most are transformed by their experience and what it showed them about reality beyond the myopia of the body which focuses our attention within the minuscule frequency band of visible light. 'We' don't die - only the illusion does. My own findings were confirmed by a team of scientists from the University of Liege in Belgium and Canada's Western University who found that in 158 written testimonies about near-death experiences positive responses far



Figure 49: My mother's picture with the life-force that had departed her body at the time of 'death' which was nothing more than a translocation of her point of attention.



Figure 50: Our experienced reality is like a torch light in a pitch black 'warehouse' and all we perceive is within its beam.



Figure 51: When we leave the body it is like all the lights of the warehouse are switched on and we realize that reality is far greater than we thought. Oh, just a little bit.

outnumbered negative ones. Canadian paramedic Adam Tapp, who was clinically dead for eleven minutes, said: 'It was just like waking from a nap in a place I have always been and there was no fear or anything, just complete contentment and happiness.'

I went to the funeral parlour when my mother 'died' and saw her body lying on a table. I touched her hand and it was cold and lifeless as you would expect; but alongside was a big picture of her which my brother Paul had arranged to have at the funeral and that picture was alive with energy and radiance (Fig 49). Cameras don't only record an image we can see.

They capture the energetic life-force - the True 'I' - that takes temporary residence 'in' the body. The life-force that I saw in my mother's picture which was no longer in her body - that's who we are. Switch off the electricity to a piece of technology and it 'dies' or ceases to work while the electricity itself, the life-force of the machine, continues to exist. A body devoid of its life-force decomposes because the energy sustaining it has gone. A near-death experiencer described our world as like walking through a pitch-black warehouse with a torch when all you can see and be aware of is limited to the narrow beam of light (Fig 50). She said leaving the body was like all the lights in the warehouse are turned on. You see the enormity of what you are and where you are when before you were aware only of that within the torch light (Fig 51). Another constant theme of experience outside the body is the feeling of being at 'one' with

everything and connected to everything. A near-death experience said he was aware of his hospital environment in Los Angeles and could also hear conversations of family members in India. He said he felt everywhere in the same moment. This is what happens once our awareness is no longer focused through the visible light myopia of the body – the torch light – and we access the perceptual reality of waves that connect with other waves beyond the illusions of distance and time. There is still the ‘individual’ sense of self and at the same time the feeling of a seamless connection to all that exists. This can be simply explained. We are a unique point of attention within a seamless flow of Infinite Awareness and we are both the ‘individual’ attention and the whole at the same ‘time’.

Human disconnection from awareness of the whole as manipulated by the Cult means that ‘incarnate’ consciousness experiences reality from a sense of isolation and apartness – the Bubble (Fig 52). A near-death experience described beyond-the-body reality:



Figure 52: Burst the Bubble and freedom awaits.

... everything from the beginning, my birth, my ancestors, my children, my wife, everything comes together simultaneously. I saw everything about me, and about everyone who was around me. I saw everything they were thinking now, what they thought then, what was happening before, what was happening now. There is no time, there is no sequence of events, no such thing as limitation, of distance, of period, of place. I could be anywhere I wanted to be simultaneously.

Exactly. That is life beyond the limited focus and decoded illusions of Body-Mind. Think how different our world would be if humanity realised that we are experiencing a temporary illusion or movie and that we are ALL expressions of the same Infinite whole in which, despite what our five senses may tell us, there is no time, sequence of events, limitation, distance, period or place and we can be anywhere we want to be simultaneously. How would you pitch race against race, religion against religion, sex against sex, politics against politics and income against income if everyone knew these are temporary and illusory labels and experiences and that we are all each other? The Cult must perpetuate this illusion or its divide and conquer manipulation is over. Religion is



Figure 53: Religion is the greatest form of mind control ever invented never mind which name may be on the temple door (Group: Church like.)



Figure 54: Create religions and then play them off against each other – and with ourselves – to divide the target population into conflicting groups. (Group: Church like.)

You are what you believe

Some near-death experiences report amazing health transformations with even late-stage cancer disappearing. They say pain goes with release from the body and that must be so. Pain is a phenomenon of the senses and not beyond-the-body consciousness in its infinite form. They describe how they can see, touch, hear, taste and smell without attachment to the five senses and in a far more advanced way. How can you see without the eyes of the body? It's all illusion. Expanded awareness is aware across all ‘senses’ with no need for the perceptual confines of the body to allow it to see; but if incarnate awareness is so body-focused and programmed by the illusions of eye-only sight then it will experience that reality until it's released from the body. People see visions in states of meditation and altered states of consciousness when their eyes are closed. Do we think that we see our vivid dreams through

one of the greatest forms of mind control ever invented (by the Cult) and up there as the greatest form of divide and rule (Figs 53 and 54). Do people really think that when they leave the body they are still Christians, Muslims, Jews, Hindus, black, white, man, woman, transgender, rich, poor

and so on? Some may wish to believe so, but it's delusion. Are those suffering ‘physical’ or psychological handicaps still handicapped when they withdraw from a body where the handicap manifests? We need to urgently see the fundamental difference between the experience and the self. That realisation alone will change the world.

our eyes? Blind people describe how they could see once they leave the body. Blindness is the inability to decode visual information through the eye/brain connection within the human reality of visible light. Once they withdraw from visible light they see with consciousness whose awareness is filtered out by body systems during a human experience. Other common themes of near-death experiences are 'life-reviews' when they feel the consequences for others of their actions – nice and not so nice. Many describe having an infusion of knowledge about life and reality when they are released from the body information filter and consciously connected to awareness, insight and knowing that the Cult works to perceptually firewall. An experimenter returned with a deep knowledge of quantum physics that she didn't have before and had never studied. You can, however, access such information while in the body and I'll be describing how to do this. Mainstream academics and scientists ignore this mountain of evidence from the experiences of multiple millions because it demolishes their version of reality. They work on the basis that if they can't explain it then it can't exist which launches self-deluding arrogance into the stratosphere. I call it the arrogance of ignorance. 'What about the laws of physics?' they will cry. What about them? They only apply in theory within the frequency walls of human reality. They don't apply anywhere else and they don't need to apply here once we grasp what reality really is and how it really works. Manifestations of this are dubbed 'miracles' ('defying the laws of physics') when there is no such thing as a miracle – only understanding that Infinite Possibility means anything is possible. All will become clear as the book proceeds.

Most people have blissful experiences when they leave the body, but some don't. Others see religious figures, but most don't. There are many reasons for these differences including the saying 'death is no cure for ignorance'. Near-death does not have to be a cure for perceptual programming, either, although it certainly can be. If you believe that Jesus is your saviour then you may see Jesus in a near-death experience and let's not forget that consciousness beyond the body is trying to communicate information and concepts to you. If you associate love with Jesus then that image may be used to symbolise love and give you comfort in a bewildering situation. It doesn't mean there is literally a Jesus and of course no one knows what 'he' looked like even if he had been real. I don't believe for a second that he was, but I can relate to the character that appears in many guises and under many names in different cultures to be a symbol for expanded states of consciousness. This would make sense of 'No one comes to the Father except through me' – only through expanded states of consciousness can you be aware of the Infinite Whole. The basic 'Jesus' story was told in versions all around the world long before the period when 'Jesus' was supposed to

live and each could be symbolising states of expanded awareness. They represent a recurring narrative put into different historical and cultural settings using different names for the hero. There is not even a physical description of 'Jesus' in the Bible. The image that people have of 'Jesus' came from far later artistic imagination and interpretation and yet those who claim to meet 'Jesus' in near-death experiences see this classic version of 'him'. It's all in the mind, but then everything is. The New Age 'Jesus' is called 'Sananda' and claimed to be an 'Ascended Master'. Guess what? He is portrayed in virtually the same way as the Christian 'Jesus'. I don't accept the literal existence of 'Jesus', but as a symbol of expanded awareness, well, I'm open to that. Your state of consciousness when you withdraw from the body will massively influence your experience until the truth dawns that what you believed about life and reality is to say the least not quite how it is. Those who have some understanding of reality will be aware of the process that follows 'death' while those with their awareness welded to Cult perception programs can be seriously bemused and bewildered as so many near-death experiences have confirmed.

Your state of awareness most certainly affects the experience of psychoactive drugs which activate areas and channels of the brain to access realities normally denied to human perception. These have been used for thousands of years as a major source of shamanic comprehension of reality. I took ayahuasca, a psychoactive rainforest potion, over two nights in Brazil in 2003 and had a fantastic experience over a total of seven hours. For five hours on the second night a clear, loud, powerful voice taking a female form gave me chapter and verse about the illusory nature of 'physical' reality. I refer to the communicator as 'The Voice'. During an explanation about the illusion of 'time' and 'space' The Voice said: 'Why do you fly from point A to point B when you are point A and point B and everything in "between"? When I returned home with total recall of what was said I began to research the subject at length and found that mainstream science (especially quantum physics) already had the evidence to prove that physical reality is illusory, but the controlling hierarchy still sought to push the case for this-world-is-all-there-is and you are only your brain. This is the Cult narrative for reasons I have explained. Some have had nightmare experiences with psychoactive drugs and in my view they only open brain channels that allow access to deeper levels of yourself which can still reflect your current mental and emotional state and what is happening in your subconscious. I have known people who have taken drugs like LSD hundreds of times and they were no more enlightened than someone who has had nothing stronger than a cup of tea. It is not only about opening your mind, but what level of awareness you open to. Gail Bradbrook, a co-founder of the extreme climate group Extinction

Rebellion, is a psychoactive potion-taker who thinks she is enlightened as a result and wants others to partake. She told the BBC that the idea of creating Extinction Rebellion came to her when she prayed 'in a deep way' while taking 'psychedelic medicines'. Her subsequent 'enlightenment' led her to establish a Climate Cult operation which is a fundamental threat to human freedom as I will be exposing. She confuses demands for global centralisation of power to 'save the world' (exactly what the Cult has been seeking all along) with an 'awakening'. Such 'enlightenment' is really a fast-track to even greater enslavement and I repeat: Psychoactive drugs only take you to where you already are subconsciously, if not consciously, and that will dictate the level of awareness beyond human reality that you connect with. These drugs, like death, are indeed no cure for ignorance, but they can be for some. Perception is the key and who is in control of that? We are – if we make that choice and stop allowing others to tell us what to think.

The scale of the reality illusion, which is mercilessly manipulated by the Cult, can be seen in the fact that mainstream science believes that (illusory) time and space are among the fundamental building blocks of the Universe. This systematically-imposed ignorance ('lack of knowledge, understanding, or information') is the foundation of human control and it must end before, as Martin Luther King put it, freedom can ring.

Who are we?

All growth is essentially an expansion of awareness – Joseph Rain

There is a malevolent force behind humanity's systematic perceptual entrapment and the indoctrination is incessant and life-long. What a testament to the power of consciousness over programming that anyone is awakening from the Cult-induced trance and they are in ever greater numbers.

People are unconscious and perceptually entrapped in Body-Mind because they are manipulated to be that way and this needs to be understood to avoid awakening from the trance to include a sense of superiority. Almost everyone was asleep once. Five-sense unconsciousness can appear to be unbelievably stupid, but that is what happens when people are disconnected from an influence of the True and Infinite 'I' and imprisoned in a sensory world that hijacks perception for an entire human lifetime. The great news is that we can become conscious anytime we want. More and more people are awakening from their induced coma while others are being captured more deeply in the Cult's perceptual fly-trap by a tsunami of programming deployed increasingly via technology. The latter, too, can escape the illusion – perceptual entrapment – whenever they make that choice. The motivation of this book is to speed and expand that process. As more become conscious of their True Self the world must change to reflect that. In the same way the crazy world of today, and a long time 'past', has reflected and continues to reflect collective human unconsciousness. So much is explained about 'past' and 'present' events when this is understood. Ironically, and it's another big penny-drop, the most unconscious are invariably those in positions of power directing the lives and society of everyone else. This is once again by design and not random chance. The Cult has to keep its targets asleep in unconsciousness if it is to secure ongoing collective control through perceptual programming and the most effective way to achieve that is to put unconscious Bubble people into positions of official power who are string-pulled from the shadows by the Cult. The plot demands

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Rebellion, is a psychoactive potion-taker who thinks she is enlightened as a result and wants others to partake. She told the BBC that the idea of creating Extinction Rebellion came to her when she prayed 'in a deep way' while taking 'psychedelic medicines'. Her subsequent 'enlightenment' led her to establish a Climate Cult operation which is a fundamental threat to human freedom as I will be exposing. She confuses demands for global centralisation of power to 'save the world' (exactly what the Cult has been seeking all along) with an 'awakening'. Such 'enlightenment' is really a fast-track to even greater enslavement and I repeat: Psychoactive drugs only take you to where you already are subconsciously, if not consciously, and that will dictate the level of awareness beyond human reality that you connect with. These drugs, like death, are indeed no cure for ignorance, but they can be for some. Perception is the key and who is in control of that? We are – if we make that choice and stop allowing others to tell us what to think.

The scale of the reality illusion, which is mercilessly manipulated by the Cult, can be seen in the fact that mainstream science believes that (illusory) time and space are among the fundamental building blocks of the Universe. This systematically-imposed ignorance ('lack of knowledge, understanding, or information') is the foundation of human control and it must end before, as Martin Luther King put it, freedom can ring.

Who are we?

All growth is essentially an expansion of awareness – Joseph Rain

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disconnecting Body-Mind from expanded awareness and then to program isolated Body-Mind with the required perception of self and reality through control of information. We see this process everywhere. Muslims tend to come from Muslim families, Christians from Christian families, Hindus from Hindu families, and followers of Judaism from Jewish families. In every case that version of reality and life is all they have ever heard in their growing-up years

(Fig 55). The greatest form of mind control is repetition as the Cult-created Nazis well understood. You repeat a statement or alleged 'fact' until it becomes an 'everyone knows that' when in truth 'everybody' only 'knows' what they have been told to think they know. They don't 'know it'; they have only *downloaded* that perception which is a very different thing. Add the carrot and stick, benefits and punishments, for believing or not believing in the orthodoxy and it's no wonder the religion that people are born into becomes the one they follow for life with all the limitations and impositions of belief and behaviour that come with the package. The sequence I have described applies equally to those who follow no religion or may indeed be antagonistic to religion. The non-religious population is also programmed through family, 'education', academia and media by the repetition of information headed 'normal' and 'rational' when most of this betrays an extreme misrepresentation of reality. Young people are told they must believe this crap and they are tested on their level of absorption in 'exams' that have potentially life-long career implications within The System. If you regularly question what you are told to believe you are 'a disruptive influence' in the classroom. Has your doctor prescribed Ritalin?

I am going to focus on this life-long programming process later because it is vital to understanding how collective human perception is hijacked and how we can stop falling for it. Our human lives are a choice – a perception. These choices decide your health, happiness and entire experience. By that I mean *everything* you ever experience and even that called 'random chance', good and bad 'luck' and circumstances that appear to be created by other people. To appreciate how this happens we must first put aside all mainstream perception, belief and pre-conceived idea about the nature of self, reality and the human body. What the control system has told us about all of these things is fakery



Figure 55: I-am-a whatever is, upbringing told me to be.



Figure 56: The fake self-identity that most people believe they are.



Figure 57: I am what I'm told I am.

'empty' space in between. We do not. All is illusion that we are manipulated from cradle to grave to believe is real (Fig 57). When people can see through the seam they can stop it controlling their lives.

The One

Who are we? Put the temporary human form aside and we are formless awareness – a state of being aware (Fig 58). How aware depends on how aware we choose to be or allow ourselves to be and that 'how aware' decides our life experience. We are unique points of attention within an infinite stream of awareness or consciousness and that awareness in its 'totality' (infinity) is what some call 'God' or the 'Godhead', Native Americans call 'The Great Spirit', and I call the *All That Is* or 'The One'. Existence is not a single state of perception with *The One* constantly

and at the core of this unceasing propaganda delivered day after day to generation after generation is the *Call*. It knows that if we can be kept in ignorance of who we really are its agenda for mass control becomes a relative breeze. This is the foundation of human enslavement – hypocritically peddling a fake self-identity or what I call the Bubble or 'Phantom Self' (Fig 56). How apt that the word 'persona' comes from the Latin 'persona' which means 'actor's mask'. Our Phantom Self persona is indeed our actor's mask or headset. We appear to experience a solid world through a solid body. We do not. We are told that we are victims of our genetics. We are not. We appear to live in a world where everything is apart from everything else with



Figure 58: The body is only a temporary vehicle for the awareness that we eternally are.

experiencing itself through its infinite expressions in different states of consciousness. There is a level of awareness that I describe as *Infinite Awareness in Awareness of Itself* which is aware that it is all awareness. This has been variously called 'the Void', 'the Father' and in my case *The One*. The ancient religious term 'Father' is an attempt to relate this concept to the world of human experience. *The One* is really the Father and Mother and everything in all existence. It is the realm of All Possibility, All Potential, and our perceptions dictate which possibility and potential that we manifest in ways I will be describing. All Possibility is the implication encoded in *All That Is, Has Been and Ever Can Be*. To the human mind enslaved in the illusion of past, present and future this would seem to be impossibility. How can anything be all that is, has been and ever can be? Yet what is this depicting except *All Possibility*? Reality is infinite because possibility is infinite within the awareness of *The One*. How can you have a state of all possibility unless everything is possible? Thus *Infinite Awareness in Awareness of Itself* is 'past', 'present' and 'future' (as they appear to be); it is and it isn't; it can and it can't; it did and it didn't; it is everywhere and nowhere; it is everything and nothing, it exists and it doesn't. Some people say 'God is everywhere' while others say that's crazy and cannot be; but it's true in the sense of *The One* that weaves through the fabric of everything because *The One* is everything. Even impossible must exist within all possibility because the impossible is a possibility. Whether we choose (through our perception) to experience the possible or impossible is down to us. What one person will experience as impossibility another will find a way to overcome and make possible. If you don't know how to do something that 'thing' is indeed impossible. When you do know it becomes possible. Both are potentials within All Possibility which includes every paradox. All Possibility must be awash with paradox which is defined as 'a state in which one is logically compelled to contradict oneself'. When all is possible that must be. For every 'truth' there must be a contradictory 'truth' or perception of reality and possibility. Look at something from one angle (perception) and A is 'true'. Look from another angle (perception) and B is 'true'. They can both be true (possible) depending on your point of observation even though they appear to be contradictory. Is the body solid in the way we experience it? Yes. Is it really solid from a point of expanded awareness? No. Here we have a paradox – it is and it isn't. Both are true from two different points of experience ... perception, possibility. Maybe human belief in 'fair rights' could benefit from some reevaluation.

The no-thing is everything

The 'Void' is a term used to describe *Infinite Awareness in Awareness of Itself* because that is how it appears to be (Fig 59). Those who have



Figure 59: The All That Is, Has Been, and Ever Can Be that interpenetrates all existence. It is all existence.

entered altered states of consciousness throughout human history have perceived 'God', the 'Father' or 'The One' in the form of a void or silence. I did so myself during my ayahuasca experience in 2003. I observed from the realm of vibration, frequency and form an indescribable brilliant blackness. I know it may sound crazy but the darkness shone like the brightest light. 'This is the Infinite, David', the ayahuasca Voice told me. 'It is where you come from and where you shall return.' The word 'return' is only used in relation to human perception. We are always the Infinite – we never 'left'. We've just forgotten and been manipulated to forget. The shining blackness was still and silent and so different from the movement and vibration in the world of form. The Void has been described as 'nothingness', but within the stillness and silence is everythingness in the form of All Possibility waiting to manifest from the imagination of 'God' or 'The One' which includes our imagination as an expression of *The One*. Sit in silence for a moment and what do you hear? Nothing. Okay, but this 'nothing' is only the absence of sound waves for your brain to decide. Within the silence, the nothing, is everything. When you hear sound or see images they are possibilities manifested out of All Possibility – the silence and the stillness. Silence is the norm, the foundation state, while sound comes and goes from the silence of All That Is. Rumi, the 13th century Persian mystic, said: 'Silence is the language of god, all else is poor translation.' Scientific studies have highlighted the negative effect of excessive sound – as in too loud and too much even when not loud – and the benefits for heart and mind of silence. I sit working all day in silence or near silence thanks to the quiet nature of where I live and it's wonderful. I read that the word 'noise' actually comes from a Latin word meaning nausea. It is certainly highly recommended to spend time regularly when possible where it is quiet and not noisier/nausea. The 'Void' is the source of all Creation (possibility) while the realms of frequency and vibration are the Creation (Fig 60 overleaf). The ayahuasca Voice said: 'If it vibrates, it's illusion.' An immense indescribable love was emanating from the stillness and silence which confirmed what The Voice had said right at the start of the five hours of communication: 'All you really need to know is Infinite Love is the only truth – everything else is illusion.' This

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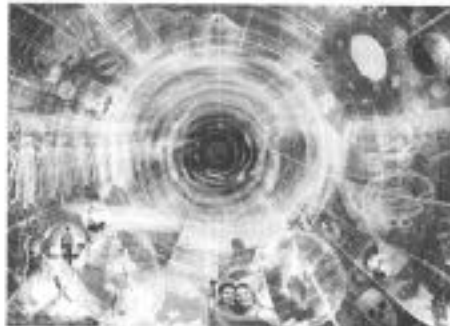


Figure 60: The One is the creator of all reality via its infinite points of attention – including us. See Neil Fagan's colour section.

became the title of a book that I wrote soon afterwards. Put another way: *Infinite Awareness is Awareness of Itself* (the 'Void', The One, the source of love) is the only truth – everything else is the Creation or imagination of Infinite Awareness made manifest by

information (consciousness/'thought') in the form of frequency/vibration. How can there be an 'only truth' within All Possibility? The only truth is All Possibility. This is limited only by the imagination of The One, and that is limitless.

Five years after my experience in Brazil, Dr Eben Alexander, an academic neurosurgeon at Harvard, fell dangerously ill and went into a coma for a week from which he said doctors did not believe he would emerge alive or at least as a functional human being. He said he was a this-world-is-all-there-is believer as the product of academic perception programming. This was underpinned by his scientist father who also believed that consciousness only exists in the brain and when the brain dies so do 'you'. Alexander did recover his faculties even though he said his brain had so shutdown that only the primary survival functions remained active during the coma. He later wrote a book, *Proof of Heaven*, published in 2012, about what he experienced in his near-death state which transformed his perception of self and reality. He recalled how he met a female figure 'out there' that he somehow recognised, but he didn't know why or where from. When he recovered he said he was later shown a picture of his younger sister from his birth family (he had been adopted) who he had never seen before. It was the figure he had met in his near-death state. Alexander's claims have been controversial, of course, and people will have to decide for themselves what they think of them. The part of his book that most struck me for obvious reasons was when he recalled experiencing 'The Core' which he described as a ... Dazzling Darkness. This is what I had seen nine years earlier and he also described this 'Core' as a place from where 'the purest love emanated and all is known' ... all is known = All Possibility. I

experienced this as the all-knowing *All That Is, Has Been and Ever Can Be – The One*. Albert Einstein said: 'Anyone who becomes seriously involved in the pursuit of science becomes convinced that there is a spirit manifest in the laws of the Universe, a spirit vastly superior to man.' That spirit is The One which pervades all existence and not only one universe.

What is called Creation emerges from The One through infinite expressions of The One (including 'humans') and Creation is once again

limited only by the imagination of The One which is infinite. Creation is therefore infinite in its possibility and we are experiencing only a fragment of this in the micro-frequency band of light visible to humans. We are nevertheless co-creators of The One as an expression of The One.

Consciousness fields emanating from The One themselves beget other consciousness fields like a single cell divides and divides until it is the trillions of cells in a human body. The point is that all those cells are manifestations of one cell as all that exists is the manifestation of One Consciousness. We are 'individual' points of attention and all points of attention. The part is the whole and the whole is the part. Where does the droplet end and the ocean begin once the droplet is reconnected with the ocean?

They are the same and the droplets unaware of the ocean that we all are (Figs 61 and 62). We are all manifestations, or co-creators, of The One – yes, even you sleeping in the street believing yourself to be downcast, outcast and a failure. In my expanded



Figure 61: A droplet can appear to be individual, but connect it to the ocean and where does the droplet end and the ocean start? They are one and the same.



Figure 62: The foundation of human perceptual control is to disconnect the droplet from awareness of the ocean – at that Self.

Cult's whole agenda is founded on keeping the droplets unaware of the ocean that we all are (Figs 61 and 62). We are all manifestations, or co-creators, of The One – yes, even you sleeping in the street believing yourself to be downcast, outcast and a failure. In my expanded

awareness during the ayahuasca experience beyond the perceptual limitations of the body I felt connected to everything, but I was still a unique individual 'me'. We are not one or the other. We are both. The more your mind opens and your consciousness expands the more your sense of self and the 'I' expands. Humanity has largely been manipulated to perceive only the individual. Even most major religions, while accepting there are other realities, still present 'God' and humanity as apart from each other instead of being the same. Saying 'I am God' is considered blasphemy. In the world of the Cult there has to be a servant and a master to match its own agenda for humanity. Infinite Awareness in its fully awakened state – 'The One' – pervades everything. It is that which weaves the web of life. The One interpenetrates all realities and is within you now. Perception creates experienced reality as I am going to make clear and a human perception of isolation and only individuality becomes our experience of both. They are illusions that without a conscious connection to The One can seem very real. Redefine who you are, open your heart and mind to expanded awareness, and your experience will – must – change.

What is human?

Now we can connect all this to today's global society. Human experience operates on multiple levels of awareness. There is the level that can be electromagnetically and visually recorded as the human 'auric field'. The combination of body and auric field is what I am referring to as Body-Mind. It is also known by many as the 'Ego' (Fig 63). We talk of people having open minds and closed minds and this is a perfect description. An open mind remains connected to expanded states of awareness while a closed one withdraws into the Bubble and perceives everything from the Body-Mind (five-sense) perspective. Bubble perception applies to much of the population (although this is changing) and crucially to those that dictate mass perception in the institutions of the Mainstream Everything – science, academia, media, medicine, commerce, politics and government. There is a level of our awareness that people call 'Soul' which operates outside the human



Figure 63: The body and the auric electromagnetic field of it what I am calling Body-Mind which experiences reality through the five senses, but we are much more than that.

frequency band and connects with Body-Mind through energetic vortices known as 'chakras'. This is an ancient Sanskrit word from the Indian subcontinent meaning 'wheels of light' and that's an excellent description of the spinning energetic (consciousness) connections between levels of awareness within the same 'self' (Fig 64). When chakra connections are open the human 'I' can be influenced and guided by the Soul 'I' and through that to The One 'I'. In other words how far we open our minds has no limit. When those chakra/consciousness connections close or diminish we become perceptually isolated in the five senses and fall prey to self-identity with illusory human labels. The label 'I', or Phantom Self Body-Mind, then appears to be the only 'I'. Body-Mind is a projection of Soul and when the influence of Soul is weakened Body-Mind can take on a life and direction of its own. There are vortex points throughout the body and the seven main ones are:

The crown chakra on top of the head (many near-death experiences describe re-entering their body through the top of the head); the 'third eye' chakra in the centre of the forehead through which we can make psychic connections to other realities; the throat chakra which relates to multi-level communication and connects with the vocal chords to affect their vibratory; the heart chakra in the centre of the chest through which we express love (a lot more about this to come); the solar plexus chakra just below the sternum; the sacral chakra beneath the navel from where we experience emotion and the connection of this emotion-chakra to the bowel/intestine is why people 'get the shits' when they are nervous and fearful; lastly there is the base or 'root' chakra at the bottom of the spine which grounds us in apparently 'physical' reality and also relates to sexuality and reproduction.

Each chakra is connected to a gland in the endocrine system including the pea-sized pineal gland in the brain which is known as the 'Third Eye' for its association with psychic sight or 'sixth sense'. The pineal gland is shaped like a pine cone and located in the middle of the brain. It has been revered in cultures across the world throughout history as a connection with 'god' and expanded reality. Endocrine glands regulate hormones, including sex hormones, metabolism,



Figure 64: The energy vortices known as 'chakras' which interpenetrate and communicate through our different energetic levels of being.

biological cycles including sleep, and the immune system. Through these connections the energetic balance or imbalance of the chakra vortices affects the 'physical' and psychological health of the whole body. In the case of the pineal gland / chakra connection it affects the ability to expand into other levels of awareness and malfunction locks people away in the five-sense Bubble – as the Cult well knows.

Fluoride which the Cult has manipulated into drinking water and toothpaste on the false pretext that it protects teeth has been shown to calcify the pineal gland (Fig 65). The theme of locking people away in the five senses is everywhere. Add the fact that aluminium (in vaccines and many other sources), glyphosate (a herbicide that has long entered the food-chain and is sprayed in the public environment) and Wi-Fi all suppress the pineal gland and you see what the game is – entrapping human perception in the five-sense Bubble. Scientific research has revealed how aluminium and glyphosate combine to be especially destructive to pineal gland function through the compounds they produce. The blood-brain barrier used to protect the brain from these and other toxins, but that is now being breached through technological radiation with 5G increasing the effect many fold.

'Serpent goddess'

The root chakra is the source of the transformative energy known as 'kundalini' (from a Sanskrit word meaning 'coiled') and this is symbolised as a coiled serpent or snake. Kundalini energy is revered as a goddess in some eastern traditions and symbolised by the caduceus symbol with the wings representing 'enlightenment' that comes from kundalini activation (Fig 66). The effect of this can be slow and measured or, as in my case in 1991, like a nuclear explosion. When kundalini energy is triggered it moves up through the chakras, spinal cord and central nervous system to

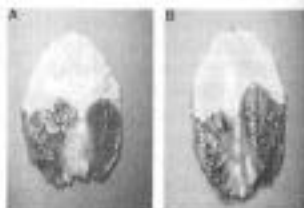


Figure 65: Fluoride calcifies the pineal gland which connects us to frequencies of awareness beyond Body-Mind. Definitely not a coincidence.



Figure 66: The caduceus is symbolic of the kundalini energy rising through the chakra and central nervous system and bending through the crown chakra on top of the head to connect us with other realities. The nature of those realities is dictated by our own state of being.



Figure 67: A kundalini activation can connect people with high frequencies of awareness or the low frequencies in which the Cult and its gods operate.

burst through the crown chakra and activate all the other chakras on the way (Fig 67). Such activation is said to bring people into a state of 'enlightenment' and make them 'illuminated'. The term 'Illuminati' which describes a key network within the global Cult relates to this principle of kundalini activation that can consciously connect people to other realities and instigate sometimes outstanding psychic abilities. The point to emphasise, however, is that such a connection is not good or bad. Kundalini awakening can connect you with expanded consciousness of high

vibration or equally to consciousness of low and manipulative vibration. It will reflect where you are consciously and subconsciously as with psychoactive drugs. Illuminati Cult initiates are opened via kundalini activation in secret society and satanic rituals to the frequency realms from which the non-human force controls the Cult through perceptual possession. Whether kundalini awakening connects you with high or low realms of awareness depends on your own frequency and that is dictated by your own perceptions and state of being. Are you driven by love or hate, for example? These are very different frequencies. Gathering numbers of people are going through the experience of 'kundalini rising' with a fantastic human awakening underway although you wouldn't know this by observing the Mainstream Everything. They will be the last ones to get what is happening.

The kundalini process or a slower form of awakening from the Bubble can present many challenges and be very confusing as your perceptions begin to transform. Suddenly the world doesn't seem the same anymore and those around you may believe you have 'gone crazy'. Many people who end up under psychiatric treatment are only having a kundalini experience and they may have strange new perceptions or 'hear voices' as the activation connects them with other sources of information and influence beyond the five senses. This settles down eventually in most people, but by then many are prescribed drugs by clueless psychiatrists who don't know what is happening or even the very nature of the human being. Such drugging (suppression of awakening) can be encouraged by family members who also have no idea what is going on. Such are the consequences of 'educated' ignorance. I had a colossal kundalini awakening in 1991 after a life-

changing 'paranormal' experience on a hill in Peru as I have recounted in other books. I have described how energy that felt like a drill entered the top of my head and passed down through my body while another flow came the other way. I didn't know it at the time but that energy was flowing through the chakra network and central nervous system to activate – *big time* – the kundalini. My conscious mind became flooded with concepts, information and awareness from beyond the senses and this launched me into three months of utter confusion and bewilderment when I didn't know who I was, where I was, or what on earth was happening. I call this my 'turquoise period' when I had the urge to wear the colour turquoise all the time. Everything is a unique frequency including colours and I was attracted to turquoise as my energetic field was attracted to the frequency of turquoise as a result of the transformation I was going through. People are subconsciously attracted to certain colours for the same reason and they radiate in particular colours ('you always look great in that colour') while looking and feeling drained in others. It's not the colour as we perceive it that has that effect; it's the frequency and how it impacts on our own frequency field.

Give us a wave

To realise what the body is we have to deprogram ourselves from what we've been told that it is. Everything in created reality outside the stillness and science of the Void is information (thought, imagination) delivered through frequency and vibration in the form of waves. We talk about sound waves, thought waves and brain waves, and creation emerges from the thought or consciousness waves emanating from the awareness of 'God', or *The One*, via all its points of attention. *The One* experiences itself through the infinite realms of Creation. 'In my Father's house are many mansions' as the Bible puts it. You, me, everything outside The Void are information/consciousness fields taking the form of waves, frequency and vibration with an always-there conscious connection to *The One* whenever we choose. People believe they are only their human labels when we are in fact an expression of Infinity and ultimately we are that Infinity. This is the last thing the Cult wants us to know when its control depends on us not knowing. Perception dictates the frequency and nature of the waves we generate. The more expanded your consciousness and sense of 'I the higher/quicker and more expanded the frequency/vibration you will emanate and connect with until you perceptually become *The One* and return to the silent, still, all-knowingness of the Void from whence you came. Even then you are still 'you', just a very different state of consciousness and perception. The Biblical story of the Prodigal Son who leaves his 'Father', messes up, learns from the experience and returns home again to be welcomed by

his Father can be a symbolic way to describe this. 'The Father' didn't judge his son just as *The One* doesn't judge. Whatever your choices and experience you are *The One* experiencing itself. The point is, though, that while we remain in perceptual states of isolation, a sense of only individuality, and in emotional prison cells of hate, anxiety, fear, worry, depression, guilt, resentment, revenge and so on we cannot expand into higher levels of consciousness. These are low-vibrational states which entrap us in low-vibrational experience. If you are in perceptual frequency band 'A' you can only experience that band when that's all you can connect and interact with. Radio station 'A' can't connect with radio station 'B' when they are broadcasting on different frequencies. The same applies after what is perceived as 'death'. Our perceptual (frequency/vibrational) state decides what reality – which of the 'mansions' – we can gravitate to although release from the body and its illusions can obviously transform perception very quickly.

The body/auric field (Body-Mind) and Soul (expanded awareness beyond Body-Mind) are both consciousness fields of frequency and waves. They are meant to connect and communicate as one 'entity', but if Body-Mind becomes seriously out of frequency-sync with Soul then communication and influence is diminished (Fig 68). Soul, or what some call the 'Higher Self', is banging the keyboard, tapping the mouse and



Figure 68: When Body-Mind disconnects from an influence of the greater self – 'Soul', 'Higher Self' – we are at the mercy of perceptions gleaned only through the five senses. See Neil Hague colour section.

getting no response from Body-Mind, or 'Ego'. The Cult works ferociously to secure this disconnection and isolate Body-Mind from Soul. The game is then to program isolated Body-Mind with perceptions that ensure mass human control (Fig 69).

Knowledge of true reality has been held at the inner core of the secret society and satanic networks and passed on through the generations via those networks to exclude mainstream humanity. Such knowledge was once widely understood in the ancient world, but was then sucked out of general circulation. This was achieved not least by the imposition of religion which made exploring reality a death

sentence imposed by the Cult behind those religions. Cult empires (especially the British) targeted shamans and carriers of ancient knowledge as the world was colonised with a fake version of reality that hijacked perception and instilled the crooked beliefs of mainstream (Cult) 'science' and mainstream (Cult) religion to secure an official monopoly on the perception of reality. Religious in the East do speak of Maya ('illusion') and Brahman (Infinite Existence, Infinite Knowledge, and ultimate reality) and that's great. Unfortunately these basic truths are mostly obscured by the ritualistic worship of stupendous numbers of perceived Hindu 'gods'. Hoarding knowledge and imposing ignorance is the whole foundation of human control. Today the knowledge is returning through those tapping into expanded states of awareness and the relatively few open-minded scientists genuinely seeking the truth (mostly through the realms of quantum physics which explores reality beyond the perceived 'physical' world). They are seeing the unsupportable fallacy of the 'physical' illusion and understanding what the ancients knew and the Cult has worked so hard to suppress.

The body is not solid and quantum physics alone shows that this cannot be. It is a field of energy waves encoded with an information blueprint which constantly responds, positively or otherwise, to other waves in the form of thought, emotion and those delivered as food, drink and the now endless and ever-gathering forms of radiation in our 'smart' society. Everything, including food, drink and all that we



Figure 69: Humanity is bombarded second by second with information – most inaccurate – by Cult-serving sources to form mass human perception. (Image: Neil Upton.)

consume and interact with, are manifestations of wavefields of information and waves affect other waves in positive, negative and neutral ways. Ever wondered why human behaviour has been so transformed by the 'smart' revolution of technologically-generated radiation waves and why suicides among the young are soaring? Stick around because the 'why' will become obvious from this perspective. Open-minded scientists operating outside the song-sheet mainstream have reached the same basic conclusions about the importance of understanding the function of waves and their impact on human life. It may seem strange to some that they could reach their conclusions from scientific research while I came to the same perspective through other means. There is actually nothing strange about it. When you tap into expanded states of awareness beyond Body-Mind you tap into the same knowledge whether you are a scientist or someone who left school at 15 as I did to play professional football. The label doesn't matter. It's how much you open your mind to other levels of awareness and possibility that decides what you know and what you don't. By these criteria it is better to have an open mind and not be a 'scientist' than to be a 'scientist' with a mind slammed shut.

Atomic mythology

Replacing the conditioned perception of solidity and materialism with wavefields and holograms immediately explains mysteries that have bewildered mainstream establishment science since its inception. When you realise that nothing is solid or physical it all begins to make sense. The foundation of the materialist view is the atom which we are told is what forms matter – 'solid' matter. How strange then that atoms have no solidity! They are packets of energy waves made up of what science perceives to be electrons 'orbiting' a nucleus. Atoms are not solid and cannot a solid world make (Fig 70). The particles and nucleus are a fraction of the atom in totality. The rest is 'empty' in terms of physicality. Yet scientists tell us the body is made of atoms. They claim at the same time that the body is physical and has solidity when that cannot be when atoms have no solidity. Atoms are a decoded manifestation of information carried in waves. This description puts the whole 'physical' atom theory into

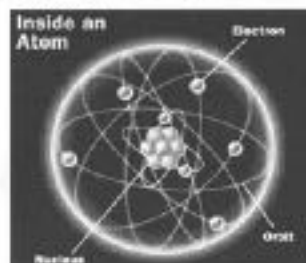


Figure 70: Atoms that are not solid cannot create a solid world. Yep, makes sense.

perspective:

If the nucleus were the size of a peanut, the atom would be about the size of a baseball stadium. If we lost all the dead space inside our atoms, we would each be able to fit into a particle of dust, and the entire human race would fit into the volume of a sugar cube.

Go deeper into the nucleus and electrons and you find that they are not 'physical' either while mainstream science battles on with ever-diminishing credibility to hold the line at 'the world is solid and the body is solid' when they demonstrably are not. Atoms were named from a word meaning 'uncuttable' by Ancient Greek philosopher Democritus who lived approximately between the years of 460 and 370BC. He formulated the theory which became the foundation of modern science that matter is made of 'uncuttable' atoms and that movement comes from atoms colliding and bouncing off each other. You might observe that this has led to scientific explanations for the Universe invariably involving things bashing into other things. The (illusory) Big Bang is said to have been the instigator and the Universe has been staggering around colliding ever since apparently like some Saturday night drunk. Call a cab – the Universe is pissed again. How do you explain how so and so happened, professor? 'Collision.' And this? 'Something hit it.' Even in Ancient Greece there were others who could see through this. Famous philosopher Socrates (around 470 to 399 BC) believed that another force separate from 'physical reality' provided what I would call the blueprint for the world of the seen and he was right. His pupil Plato (approximately 427-347 BC) described something similar with his Allegory of the Cave (Fig 71). He told the symbolic story of prisoners living in a cave and never seeing anything other than the single wall that their chains allowed them to see. Behind them was a fire which they couldn't see and people and animals walked past the flames casting shadows on the wall. These shadows became the reality of the prisoners because it was all they knew and experienced. Some prisoners studied the shadows and were acknowledged as experts about perceived reality while all along they were only studying shadows believing them to be real. Mainstream scientists and academics today are doing exactly the same apart from the



Figure 71: Plato's Allegory of the Cave symbolising the human plight.

minority of honourable exceptions who go their own way. In my analogy they are 'experts' studying reality within the Bubble while believing that to be all there is. A prisoner in Plato's story escapes and realises the shadows are illusions. He comes back to share the news with the others still enslaved, but they don't believe him and call him crazy. This is an allegory, as Plato clearly intended, for the human plight which continues to this day.

The reality that we think we are experiencing is a 'shadow' of something else in the sense of illusory 'physical' reality being a 'shadow' (decoded projection) of wavefield reality. The Soul is a wavefield phenomenon and so is Body-Mind. The body is a wavefield information blueprint that can replicate itself through 'procreation'. It, too, is a state of awareness because everything is and the body is designed for the mind – an incarnation of Soul – to experience this reality. The idea is that the mind, or 'ego', remains in sync and connection with Soul and is influenced by its expanded awareness. In this state of connection the mind/ego is in this world, but not completely of it. It has perceptual radar which is not subject to the illusions of 'matter'. If, however, mind ceases to be influenced in its perceptions by Soul the whole focus of reality is captured by the five senses and this becomes the dominant reality gleaned from information received from five-sense reality in the form of the Cult-controlled media, science, medicine and what is taught in schools and universities (Fig 72). Now, with Soul out of the game, an entire sense of reality can be programmed into isolated Body-Mind to induce Bubble perceptions. This one sentence describes how a few have enslaved the many through almost the entirety of known human 'history' to present day when 'smart' technology is taking this to a whole

new depth of control. There are two primary levels of mind, the conscious and subconscious. It has been estimated that some 95 percent of human behaviour comes from subconscious programming and not from conscious decision-making. The Cult and its non-human masters target the subconscious to keep their targets unconscious of what is happening in great swathes of their mind. Remember that *Wonderpeet* magazine quote describing how every second

THE BUBBLE PROGRAM



Figure 72: Setup – I know how things are. The system told me.

eleven million sensations crackle along [brain] pathways which the brain filters down to a manageable list of around 40 per second and from this we perceive visual reality. We are consciously aware of a fraction even of what we see, hear, touch, smell and taste while the subconscious absorbs it all. The Cult has a whole language of symbolism revealed at length in my other books which is designed to bypass the conscious mind and speak to the subconscious.

How we create 'physical reality'

A wavefield information blueprint becomes the experience of a physical world when we decode the wave information into holograms. The five senses decode wavefield information into electrical information which



Figure 73: Human reality – waveform becomes holographic via human decoding systems. (Image: Neil Hagezi)



Figure 74: We even decode our own body into holographic form. Where is your body? In your mind. (Image: Neil Hagezi)

they communicate to the brain and this is decoded into the digital/holographic information (illusory 'physical') which we perceive as the physical world (Fig. 73). The different forms of information are the same information expressed in different ways. Wavefields are the foundation of all created reality and the body can be no different. This decoding sequence is the work of the mind which means that we decode our own body into apparently 3D physical reality by what scientists would call 'observation' or 'looking at it' (Fig. 74). This is done through the interaction of the wavefield of the body and the wavefield of the mind in ways that I



Figure 75: These are digitally generated 'people' that don't exist as live human beings. The technology can also create like landscapes and objects.

by the computer and today (fake digital) people are being created that appear to be live human beings (Fig. 75). I watched an experiment in which a group wore headsets that gave them the illusion that their bodies were that of a doll. This so tricked the brain that when something was done to the doll, including a needle in the eye, the group reacted as if it was happening to them. We don't have to really have a 'physical' body to perceive the experience of having one. Virtual reality is technologically mimicking our experienced reality which is itself only a more advanced version of virtual reality. Indeed the two are becoming so close in their appearance that those at the cutting edge of virtual technology say it won't be much longer before you will not be able to tell the difference. We accept that virtual reality technology is decoded information that increasingly mirrors 'real' reality, but people still find it hard to grasp that 'real' reality is made manifest in basically the same way. Virtual reality technology hijacks and overrides the very same five senses through which we decode 'real' reality. Observe how virtual reality works and you are looking at how 'real' reality works. Virtual reality worlds exist only in your brain and so does 'real' reality – including the brain itself which is a wavefield construct in its prime state. I have been saying this for years and American cognitive sciences professor, Donald Hoffman, shares that view: 'The brain itself is an illusion ... neurons do not exist except when we see them, just like different colours ... only exist when we perceive them.' Where is the 'physical' body and the 'physical' world? It's in our minds. We hear about mind over matter when mind is matter and matter is mind (Fig. 76 overleaf). This applies to mind at all levels of consciousness and to all expressions of 'matter'. Max Planck (1858-1947), the 'father of quantum physics', said:

All matter originates and exists only by virtue of a force which brings the particle of an atom into vibration and holds this most minute solar system of the

will come to shortly. Our bodies exist in our mind (like everything else) which is why your state of mind dictates the state of your body. Characters in the most sophisticated virtual reality games can appear to be so real and yet they are only information decoded



Figure 76: This *Matrix* scene from *The Matrix* perfectly describes the 'physical' illusion.

Mind is the *desider* and perceiver – the *creator* – of all matter.

Holographic illusion

The reality we experience as physical is really holographic and malleable, not solid. Holograms emerge from a flat surface in a form that makes them look three-dimensional (Fig 77). The technology began with simple holograms you see in shops, but holographics has since been moving ever closer to human reality in the same way that virtual reality has. Holograms are now used to insert holographic fake people into



Figure 77: All of these images are holograms that appear 'solid' when they're not.

atom together. We must assume behind this force the existence of a conscious and intelligent mind. This mind is the matrix of all matter.

Planck also said:

I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.

films and stage shows alongside 'real' people with the join getting harder to see. The best of them look as 'solid' as you and me.

Holographic depictions of long-passed artists like Elvis appear in duets with very much alive singers and I saw a whole comedy programme featuring a



Figure 78: Holograms of people – some no longer alive – can be inserted into scenes with living people.



Figure 79: The woman in this picture is a hologram projected from another location.



Figure 80: The guitar players are holograms.



Figure 81: The bike is a digital hologram.

hologram of the late and great British comedian, Les Dawson (Fig 78).

Holographic versions of people can be transmitted across the world (Figs 79 and 80). We also have digital holograms which is actually what 'physical' reality really is (Fig 81). Rich Terrell, director of the Centre for Evolutionary Computation and Automated Design at

NASA's Jet Propulsion

Laboratory, said in 2017 that he believes the Universe is a digital hologram. This must be so because everything in what we perceive as the material world is a digital hologram. You would expect in this case to find pixilation in the fabric of our reality akin to pixels on a television screen that we decode

into the images of TV programmes. It turns out that we do. A *New Scientist* magazine article about holographic reality in 2009 said that under magnification 'the fabric of space-time becomes grainy and is ultimately made of tiny units rather like pixels'. A report by researchers at Britain's University of Southampton in 2017 found 'substantial evidence' that human reality is like watching a 3D movie projected from a 2D screen. Yes, a treefield screen. Kostas Skenderis, head of applied mathematics and theoretical physics at Southampton, said that while we perceive pictures to have height, width and depth they are in fact on a flat surface. The

team detailed their findings in the peer-reviewed scientific journal, *Physical Review Letters*. They said the Universe could be a 'vast and complex hologram' and Professor Skenderis said that holographic reality was a huge leap in understanding the structure of the Universe. Skenderis likened reality to watching a 3D film in the cinema with the difference that we could touch objects and experience the 'projection' as real. I suggest that we don't touch objects hologram to hologram (as in the experience of solid to solid) but electromagnetic field to electromagnetic field. The skin or touch-sense is a fundamental decoder of information into holographic reality and a wave antenna. Nor are we watching a holographic movie. We are creating it (loading it). Researchers at Rikkyo University in Japan said they have found 'compelling evidence' that the Universe is a holographic projection and ever more scientists are being pushed in the same direction by both the evidence and the way the apparent contradictions of 'matter' become perfectly explainable once you bring holograms into the story. Leonard Susskind, professor of physics at Stanford University, has encompassed the holographic model to describe the Universe along with celebrated Argentine theoretical physicist Juan Martin Maldacena among many others. Susskind said: 'It's now gone from wild-eyed conjecture to be an everyday working tool of physics.' How come I could have been so sure our reality was holographic in nature long before it touched the mainstream of science? If you tap into The Field beyond the five senses you just know how things are without having to work out every mathematical detail and confirmation. Those who were crap at school and feel a failure as a result should remember that. An open mind, and especially an open heart as we shall see, is far more enlightening than a university degree – first class or otherwise. You don't need a scientific mind to understand reality. You need an eye one. Great scientists know first and work out the details later while most of science does it the other way round.

The information foundation of holograms that we have in human society is encoded in wavefields. They are created by dividing a laser beam into two parts. One part ('working beam') passes across the subject/object being photographed to record it as a wavefield and then strikes a holographic

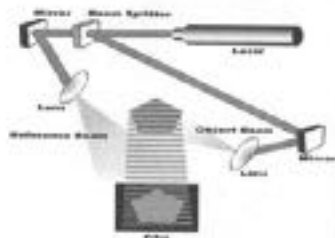


Figure 82: How holograms are created with two parts of a laser: one hitting to form an interference pattern – a waveform version of the object being captured.



Figure 83: A waveform holographic interference pattern.



Figure 84: Two stones dropped in water create waves that expand and connect to form an interference pattern that reflects the weight of the stones, where they were dropped and at what speed.



Figure 85: Holographic car looking very solid, but you could walk through it.

print. The other part (reference beam) strikes the same print directly (Fig 82). The two halves collide on the surface and create an 'interference pattern' which is the information of the featured subject encoded in a wavefield (Fig 83). The process is the same as two pebbles being dropped in a pond and the waves moving out until they collide and form a wave pattern in the water (Fig 84). This pattern is a wavefield representation of the weight of the stones, how high and at what speed they were dropped and how far apart. With holographics another laser is directed at the wavefield interference pattern and, apparently miraculously, but not really, a three-dimensional 'solid' image of the subject is projected as a hologram. The laser 'reads' (decodes) the information in the wavefield pattern and in the case of human reality that laser is the mind. Our entire reality is being decoded by the mind from the base form of waves into holographic 'physical' illusion. Holograms can appear to be so solid that people refuse to walk

through them when they depict cars and such like at motor company launches. When they try to do so they realise that they can (Fig 85). Okay, then, why can't we walk through walls and each other? Two main reasons: (1) what the mind believes is real it will experience as real and

(2) the resistance you feel when you bump into a 'solid' object is not a physical resistance but an electromagnetic one. I am sitting in this chair now and not falling through the seat and then the floor and then the earth etc., because the electromagnetic waves of my bum are different to those of the chair. My bum and the chair aren't making contact at the holographic ('physical') level. They are establishing resistance at the wavefield electromagnetic level. When wavefield frequencies are far enough apart they can pass through each other which is why people see 'ghosts' walk or float through walls. Ghostly figures (other expressions of consciousness) tend to appear as ethereal. They are not a manifestation of the visible light, five-sense, frequency band and they can pass through apparently solid objects just as radio frequencies pass through walls. Those who can expand their visual decoding potential beyond the usual limits of human perception tend to see 'ghosts' while others more confined to five-sense reality tend not to. One will say 'I've seen a ghost' and the other will say 'You're mad, I can't see anything'. It's all about frequency and what you can and cannot tune into. 'Physical' reality, then, is a holographic illusion and what a difference this makes to understanding human experience and what is termed the 'paranormal'. All the 'paranormal' phenomena that could not be happening if the world was 'solid' suddenly becomes possible and explainable from the perspective of the illusory solidity of holograms and the power of the mind to impact on wave information fields and through that change the nature of those holograms. What appear to be impossible happenings and 'miracles' are only wavefields generated by consciousness influencing other wavefields and thus holographic 'solid' reality. We will see in the next chapter that all 'paranormal' activity can be simply explained from this understanding. While great swathes of mainstream science focuses only on 'physical' reality that doesn't exist, they will never explain the apparent mysteries of life which demand an understanding of non-physical reality. In such circumstances mainstream scientists with that 'physical' mindset can only deliver the mantra of 'it's not possible' because, from its knowledge base and perspective, it is impossible.

Electric reality

Body-Mind operates and communicates electrically and electromagnetically and the brain also communicates with the body and its cells and organs through electrical signals. We are electrical/electromagnetic beings at the human level and part of what I call the Cosmic Internet in which the Universe affects us and we affect it and each other. This is possible through an exchange of information as our thoughts, emotions and perceptions interact through wave connections with The Field. Biologist Bruce Lipton points out that each

human cell contains 1.4 volts of electricity which doesn't sound much until you multiple that by the trillions cells in the body. You can see Internet videos showing how the power of an antenna is increased when touched by a human hand and electricity transferred (this happens with 'hands-on' energetic healing). We are electrical and when this electricity ceases to be generated by the body we are said to 'die'. Our cells are batteries that store electricity and if they become drained we become weak and ill while vice-versa is the case. The speed of ageing is connected to this with cells lacking their optimum electricity either dying or not being like-for-like replaced. In this way the original body blueprint begins to unravel and we experience this as ageing and diminishing function. Ponder on the effect therefore of living in the technologically-generated radiation fields that we do today which scramble the electrical/electromagnetic systems of the body including cell replacement. When this constant replacement gets seriously out of kilter it is known as cancer. Here you have the link between technological radiation fields and cancer and other diseases. Emotional stress imbalances and distorts electrical/wave harmony in the Body-Mind through the electrical/wavefields it generates and this is how stress becomes illness. A rush of fight-or-flight stress in response to danger or a short experience is fine. The body is designed to deal with those situations before returning to equilibrium. Ongoing stress known as 'background anxiety' or 'survival stress' is a very different matter and can be extremely destructive to health. Distorted wavefields generated by stress can jam immune system communication and stop people thinking straight through chaotic interaction with thought processing. The opposite is true with states of love and joy which transmit balanced waves and transfer that state to the body. Another aspect of stress is addiction to chemicals produced by those states. My mother used to say about a neighbour... 'It's being so miserable that keeps them going'. Addiction to emotional chemicals means that when people are not worried (miserable) they have to find something to worry about to get their chemical fix. Methods of healing outside the mainstreams are increasingly founded on achieving electrical/electromagnetic balance and harmonising the rate and direction of cellular electrical spin. Observe the solar system and the galaxy and you'll see that everything is spinning down to the smallest particle. When the spin reverses from what it should be electrical chaos in the body can follow and people head for a doctor who has no idea about the real cause and hands out a drug (also a wavefield) that can lead to even greater electrical mayhem, sorry 'chemical side-effects'. Pharmaceutical drugs are imbalanced fields of information (hence 'side-effects') while natural, not synthetic, nutrition and vitamins can have harmonious fields that sync with the body instead of wreaking havoc. The trick is to know which fields

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(nutrition/supplement) will help to secure harmony in any particular situation and which will not. Overriding everything is the power of the mind to heal the body by generating the perception waves that balance the imbalances that are experienced as illness.

In the language

Reality can be seen in the phrases people use without realising that what they say is literally true. We describe the 'electricity' we feel in a room, theatre or stadium generated by various human interactions. Hair stands up on the back of the neck and skin tingles in an excited crowd because of electromagnetic energy emitted in the form of emotion. Skin is an antenna and the whole body is the same – hence the tingling amidst powerful electrical/electromagnetic fields. This happens to people in 'haunted' places when they feel the electromagnetic fields of entities just beyond the human visual frequency range. We speak of the electricity between people while others are said for the same reason to have 'magnetic personalities'. It is all about the power and compatibility of electrical/electromagnetic fields. Sex is the merging of two electromagnetic fields which together generate electrical power greater than the sum of the parts (well, sometimes!). The ancient art of acupuncture is based on

balancing the flows of information in the form of electricity and electromagnetism that circulate the body through lines of force called meridians. These are the body equivalent of meridians or 'ley lines' that circulate and interpenetrate the Earth (Figs 86 and 87). Both systems are manifestations of the communication networks of The Field that connect everything to everything else. The ancients knew of these phenomena before religion suppressed the knowledge and they marked their paths and major vortex 'chakra' points where many lines cross with earthworks, standing stones and circles. The more powerful the vortex the more sacred the circle and location was considered to be. Hair-like needles and other methods employed by acupuncture balance the flow through the meridian system of information encoded in



Figure 86: The body meridian system, picked out by a transparency and looking like a computer motherboard.



Figure 87: The Earth is also criss-crossed and superimposed by meridian lines of energetic force.



Figure 88: Hair-like needles and other techniques balance the flow of energy or 'chi' information in the body meridian system.

electricity known by the Chinese as 'chi' (Fig 88). The principle is yet again the same as with computers. When a virus scrambles the flow of information passing through the system the computer response to keyboard/mouse direction slows down or ceases to react. What appears or doesn't on the screen is affected by the distorted information and this is what happens when chi information in the form of electricity is in a state of disharmony or dis-ease. In ancient China some would for this reason pay their acupuncturist when they were well and not when they became ill. The acupuncture practitioner was supposed to keep the chi in balance to ensure that illness couldn't

manifest. A perfect example of ignorance dictating perception is when acupuncture is dismissed and ridiculed for 'putting a needle in the foot to treat a headache'. If such people had the self-respect to do some research before waving their arrogant hand they would know that chi information passes around the body in circuits and a circuit that passes through the foot and the head can be blocked in the foot in a way that translates to a pain in the head.

There is one other point to make about holograms before we move on. They have an amazing characteristic in which every part of the hologram is a smaller version of the whole. If you cut a holographic wavefield print or interference pattern into four pieces and direct the laser at each one you would expect to see four pictures of the original image. But you don't. You see a quarter-

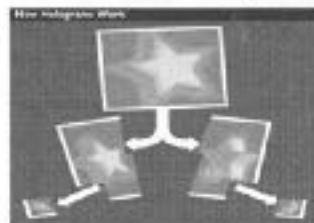


Figure 89: Every part of a hologram is a smaller version of the whole and encoded with the same information.

size version of the whole image (Fig 89). This continues to be the case as you cut the image further because of the way information is distributed within a holographic wavefield or interference pattern. Although the clarity gets fuzzier as you reduce the size it's still the image in its entirety. The human energy field is a smaller version of the Earth field while brain activity and levels of the Universe look remarkably similar in our holographic reality (Fig 90). Here you have the reason

why healing methods such as acupuncture and reflexology have identified areas throughout the body that are smaller representations of the whole body. This has to be the case when the body is a hologram and every part must be a smaller version of the whole. Tiny cells have respiratory, digestive and immune systems just as the body does in line with the holographic principle and the Earth has a ley line electrical system as the body has the chi meridian network. A skilled palm reader can read the information of the whole body in the hand thanks to the way holographic information is distributed (Fig 91). Holographic principles are the foundation of the ancient theme of 'as above, so below'.

Reality is certainly not what we are told to believe that it is. 'Unexplainable mysteries' don't tend to survive open-minded research. Talking of which ...

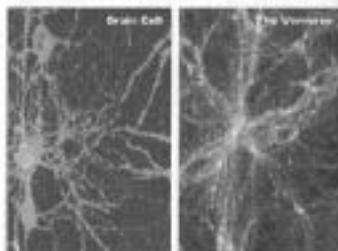


Figure 90: Brain activity and the Universe. As above, so below – the holographic principle.



Figure 91: Information can be 'glazed' from the hand because it represents the information blueprint of the whole body in a smaller form – precisely how holograms work.

What mysteries?

The impossible could not have happened; therefore the impossible must be possible in spite of appearances – Agatha Christie

From the perspective of reality that I am describing so-called mysteries of life dissolve like snow in the sunlight. A long list of 'inexplicable' phenomena become 'Ah, so that's how it works' and 'Blimey, it all makes sense now'.

We return to the theme of waves in water after two pebbles are dropped (Fig 92). Where waves from each collide and connect is known as wave entanglement and from this understanding of entanglement everything starts to fall into place. For example: Body-Mind is a wave entanglement between the wavefields of the body and those of the mind. While they remain in sync or entangled we are 'alive'. Body-Mind's wave entangled dance of synchronised oscillation is the human Dance of Life. When the body ceases to function (its wavefield ceases to oscillate and generate electricity) this releases the mind from entanglement and we 'die', or rather the body does. This is happening when near-death experiencers describe leaving the body as the mind is freed from the perceptual limitations of the body and opens to an entirely different reality. Wave entanglement with the body focuses attention of the mind on the micro-band of frequency called visible light through the decoding systems of the five senses. Once the mind is released from that body myopia we become aware of other realities. We are back to the torch light and warehouse analogy. If the body's wavefield oscillation is restored so that

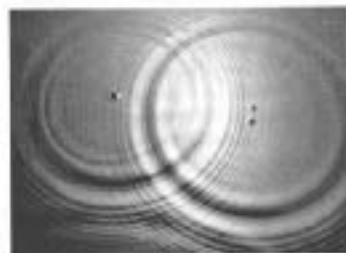


Figure 92: Wave entanglement – a key to understanding reality and human interaction.

entanglement is restored the mind can be drawn back into the body. If it doesn't revive we're out of here. The mind needs a body operating within the frequency band of the human world to experience and interact with the human world. Seeking out another body to entangle with is known as reincarnation. Those who have a lot of out of body experiences (a near-death experience without the body needing to die) have a much more fluid wave entanglement with the body which allows their mind to be released more easily. There are ways of training the mind to do this. Mind has the power to dictate the nature of wave entanglement or whether there is one at all. Mind wave-power can think us alive against all the medical odds ('I'm determined to live') and think us dead ('I have lost the will to live'). Mind is the governor of the body while the Cult wants us to believe that the opposite is the case and so we don't use that power in all manner of ways. The body cannot exist without the mind. When mind disentangles it takes with it the life-force energy that animates and empowers the body which then starts to decompose. The light literally goes out as death is often described. Human life is the rhythm or oscillation of life and the body's rhythms including circadian and all biological rhythms are connected to this prime oscillation and its interaction with other waves. Another version of entanglement is called quantum entanglement in which 'entangled particles remain connected so that actions performed on one affect the other, even when separated by great distances'. Scientist Albert Einstein described this as 'spooky action at a distance'. There is actually **nothing** 'spooky' about it. When particles that are expressions of waves are connected by those waves they will act in unison as manifestations of the same wave or the same field.

Gone Genie

The wavefield relationship between Body-Mind is crucial to understanding everything in human reality. We are told that our genes basically decide all that happens to us physically and mentally. Some women tragically have breasts removed after being told their genes give them a high chance of breast cancer. Mainstream medicine is often brilliant in dealing with trauma injuries, orthopaedics, surgery, and reviving people at death's door (do electric shocks revive only the heart or primarily the wavefield oscillation that generates electricity?). Antibiotics have also been highly effective although they are handed out far too liberally to the point where infections can mutate to overcome them. These are the so-called 'superbugs'. When it comes to illness in general, however, modern medicine can be a disaster zone. One of the biggest causes of death in the United States – right up there with heart disease and cancer – is the treatment in all its forms. That's crazy? Yes, it is, but if people mean crazy as in that can't be true – check the figures



Figure 93: Big Pharma – the Cult cartel that controls mainstream medicine and seeks to crush any alternatives that work.

and remember that they are only the numbers officially reported. Many other deaths which have medical causes are hidden behind fake diagnosis. The reason for this is that mainstream medicine doesn't know what the body really is beyond the biological, let alone how it functions, and it is manipulated to be that way through control of medicine by the pharmaceutical cartel or

'Big Pharma' (Fig 93). This

is a Cult creation given predominance over 'health' thanks to people like oil tycoon and Cult operative J.D. Rockefeller (see my other books). Big Pharma (the Death Cult, hence it kills so many people) owns the medical schools where doctors are trained and indoctrinated; owns the professional bodies like the Medical Associations; and owns governments through a global army of lobbyists and money-no-object political funding. The situation is so outrageous and dire that the best rule of thumb is this: **If Big Pharma wants something it's bad for humanity. Mainstream medicine is an outgrowth from mainstream 'science' which is also a Cult production at its establishment core. Both are controlled through funding and governing authorities that ensure only the Big Pharma version of the body and its treatment is allowed to be practiced in the mainstream (and increasingly anywhere). You want to be a doctor? Then do it our way or we'll have you struck off. This has happened to many proper doctors seeking to employ methods that work rather than singing from the Big Pharma rulebook. You want to be a mainstream scientist? Well, don't think you are going to get funding or any prestigious position if you challenge what we tell you is 'scientific' orthodoxy (which becomes medical orthodoxy). Witness the withdrawal or non-existence of funding for scientists who challenge human-caused 'climate change' orthodoxy which the Cult seeks to impose through its Climate Cult in which the dominant theme is 'extinction' (death). The same methodology can be found throughout academia which takes its orthodoxy from science orthodoxy and medical orthodoxy which all originate with Cult orthodoxy. The great majority in these institutions don't know they are following the rules of the Cult while those in the inner circles of secret societies and satanic groups most certainly do.**

The foundation of medical orthodoxy is that genes and not mind are

the arbiter of everything when the opposite is true. This calculated inversion of reality is designed by the Cult to isolate body from mind in human society when body is mind. Big Pharma

medicine is based on this misrepresentation and its drugs focus on affecting the body (hologram) chemically. This means they concentrate on the symptom they see in the hologram and not the cause which is a wavefield, energetic, information imbalance decoded through into the hologram (Fig 94). A problem in the hologram (symptom) is really a problem in the field (cause). Alternative methods of healing have long accused mainstream medicine of treating only symptoms and ignoring the cause and this must be so when the medical industry doesn't acknowledge the existence of the body wavefield where the cause always lies. I say always because the body is a wave information field and its holographic level is only a decoded projection of that field. What happens in the field happens in the hologram and what doesn't bother the mind doesn't bother the body. Even when Big Pharma drugs are claimed to have psychological effects they target the way the brain processes information and not the source of information itself - wavefield mind. The body has some trillions of cells (cell 'batteries') and in almost every one is the body 'hard drive' known as DNA (Fig 95). We apparently have three billion base pairs of DNA and one section of this is called a gene. DNA of a normal human cell contains an estimated 30,000 to 120,000 genes although only a fraction of them are activated at any time. We are talking biological nanotechnology. Genes contain instructions for what the body looks like (everything from eye colour to height) and how it functions minute by minute. From this has come the myth that genes control what happens to the body, what diseases you'll have and even how long you will live. This is profoundly misleading in



Figure 94: An imbalance or flaw in the body wavefield becomes illness or disease - disharmony - in the hologram. Wavefield balance = holographic 'health' because one is a reflection of the other. See Neil Hague colour section.

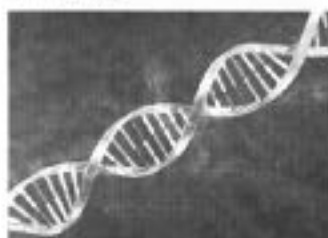


Figure 95: The body 'hard drive' - the receiver-transmitter of information known as DNA.

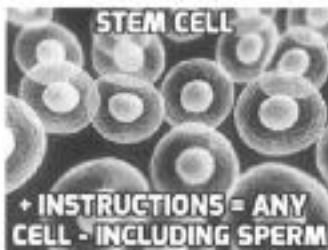


Figure 96: 'Blank-sheet' stem cells can be encoded to perform any function.

that it ignores the X-factor of mind and consciousness beyond mind. The membrane of every cell is a liquid crystal and DNA is crystalline because they are receiver-transmitters of information. This is the wave communication system through which the mind (and heart) activate and deactivate cell function. American developmental biologist Bruce Lipton, who wrote *Biology of Belief* and has a YouTube presentation of the same name, points out that cell membranes are semi-conductor information processors like those, also crystalline, used in electrical circuits. Genes are a 'hard disk' and programmable. 'Blank-sheet' stem cells are produced by the body which then receive signals to encode instructions that dictate their function (Fig 96). Through this communication system humans, animals and the

natural world 'evolve' in the sense of exchanging information between mind, body and environment to develop new gifts and abilities to cope when their environment changes. Animals are in sync with their surroundings thanks to this information exchange and so desert species have less need for water and birds hunting fish have microscopic sight to see fish from high in the air. When this transmutation through encoding new cell instructions stays in step with environmental changes it is called 'evolution'; when it doesn't we call it species extinction. We are rather more than a 'lump of meat' and our world far more than a cosmic accident. I will be describing how the entire Universe is an electrical/electromagnetic phenomenon which, like everything else in all existence, is conscious.

Turning yourself on (and off)

Which genes and their functions are active and which are not is dictated overwhelmingly by the mind and its perceptions through wave

entanglement with the body. I have been banging on for decades now about the central role played by perception – everything originates from perception which is why the Cult in all its forms seeks as its prime objective to control perception. Every thought, emotion – perception – manifests as a unique frequency (wave) emanating from the mind and its emotions and you can feel these waves emitted by people. We talk of good vibes and bad vibes and that's true. Someone may put on an act with their face and demeanour, but we feel something about them that doesn't feel right. We are picking up the wave frequencies representing their real perceptions and attitudes behind the 'physical' mask. The nature of these frequencies, or perceptions, decide which genes in the cells are activated or switched on and which are not. We have genes with different instructions that affect the body's 'physical' and psychological state. Among them are genes that will make you healthy, joyful, optimistic and mentally and emotionally balanced along with others that can make you sick, even fatally, depressed, pessimistic and mentally and emotionally imbalanced by the way they process information. Now picture perception waves or signals emanating from the mind and having the effect of activating and deactivating different genes on the basis of their particular function. This is possible because genes of different functions respond to frequencies broadcast by the mind that relate to those same functions (Fig 97). The mind wave frequency and that representing a particular gene's function operate on the same wavelength and they entangle to send a signal from mind to gene. In this way the

perceptual state of the mind is transferred to the body's genetic system. If your mind feels depressed its frequencies will activate the genes which carry instructions that represent



Figure 97) Our mental and emotional state is transmitted as waves which can turn genes on and/or off that relate to those states. In this way our state of mind becomes genetic consequences good and bad. See Neil Hague colour section.

depression and this emotional state will be transferred to a like-effect in the body. The same perceptual waves are affecting which functions are encoded in blank-sheet stem cells. Mainstream medicine sees only the chemical effect on the body and not the wave imbalance triggering that chemical effect which emerges from the conscious and subconscious mind. Doctors prescribe chemical drugs for a chemical symptom and miss the wavefield cause. Through this wave connection or entanglement stress becomes illness. The disruptive effect that stress waves can have on heart-related genes is how stress causes heart disease and the same process happens with cancer and everything else. When the mind and its emotions feel nervous or fearful the frequency activation will cause emotion genes in the belly to give you 'the shits' as I mentioned earlier. It is not the genes that decide what happens to the body in terms of the outcome origin; it is mind frequencies that dictate which genes are switched on and which are not. Mind is the message and genes are the messenger. Different parts of the brain 'light-up' and are activated by different thoughts and emotions for the same reason that genes are. The brain is responding to perceptual waves/signals from the mind and these activate those areas of the brain related to those frequencies as the brain processes the information. The brain is again the processor of information and not the origin, just as genes are processors – semi-conductor processors – of information and not the source.

What I have described is being studied today by an emerging scientific discipline called epigenetics. Science believed that to change the genetic nature of the body our DNA, or 'hard drive', had to change or mutate. This is now known to be untrue and reflects the long history of scientific dogma which bounces from 'this is how it is' to 'er, well, actually, it's not'; and from 'you are talking nonsense you science blasphemer' to 'well, okay, you were right, but we'll claim the credit and call it a new discovery'. Epigenetics studies how the body changes 'physically' and psychologically by which genes are switched on and off and which gene functions dominate. Highly significantly this on-off sequence dictated by the perceptual mind waves of one generation can be passed on to the next through procreation. Sperm and eggs combine to form the body ('software') program and carry the epigenetic (wavefield) blueprint of the parents (there are cases, however, where this doesn't happen). Children can be born with the same on-off gene sequence with all the consequences, good and bad, which that entails. The child is born with what the perceptions of parents and other 'ancestors' genetically developed through life experience. We hear this described in lines like 'She's just like her mother' and 'He's just like his dad'. There are other reasons for this, of course, but epigenetics is one of them. It is also the case that signals activating and deactivating gene function are not confined only to mind although that is the dominant

source. Drugs and toxins are wavefield phenomena in their base form even though we perceive them holographically as chemical in nature. Big Pharma drugs cause so much damage to health because they are energetic wave distortions which transfer that distortion to the wavefields of body and genes. It's the same with toxins in food and the environment. Do we really think that poisons in the herbicides and insecticides sprayed onto crops are not retained in the food they produce? Of course they are – both in waves and their chemical form in the hologram. What we eat and drink may look like a sandwich or a soda, but in its base form food and drink are fields of information waves. These fields can harmonise with the Body-Mind field when they are in vibrational sympathy ('nutritious food') or cause disharmony and dis-ease when their disruptive waves distort the Body-Mind field (Big Mac and a coke, please). Food and drink have long been shown to affect people psychologically, too, and this comes from the same wave-gene impact (Fig 98). Frequencies represented by fast food in recent decades have been triggering genes that relate to weight gain and through the



Figure 98: It's not only chemical shite, it's wavefield shite.

epigenetic affect generations of children are being born with a greater genetic aptitude to gain weight that earlier generations did not have. The smart technology explosion is pounding everyone with radiation frequencies from phones, masts, satellites and Wi-Fi and this will be having an enormous impact on epigenetic gene function in ways that the general population and most of the medical and

telecommunications industries will not be aware of. The Cult does know, however, and those consequences are long-planned. Untested 5G now being rolled out around the world is the next level of genetic and psychological manipulation. I'll deal with this in detail in later chapters. Do people think that the transformation in the perceptions and emotions of especially the young in the 'smart' era is just some random coincidence?

Believing is seeing

When someone is poisoned it is not the chemical that kills them but the deeply distorted wavefields represented holographically as a chemical. The body's wavefield oscillation is so undermined that it can no longer

function when its dancing waves cease to dance. Some Christians in America take Biblical Scripture so literally that they handle poisonous snakes and even drink lethal strychnine to prove their faith. Some die, as you would expect, but some don't and how can this be? The danger of snake poison and strychnine is in the effect of its wavefields on the body's wavefield. If the wavefield mind is so strong in its belief that they won't die then the frequency signals from the mind will not allow body reactions to be activated by the poison that will lead to death. Thus there you have the process of 'mind over matter'. We are increasingly urged to fear genes with genetic tests warning people what their genetic blueprint has in store for them later in life. What a tragic irony on many levels. If you believe that you are destined to be the victim of your genetic blueprint you are sending out the mind/brain waves within the frequency band which can activate the very genes that produce the outcome. It becomes a self-fulfilling wavefield/genetic prophecy. If our minds do not believe in such an outcome – especially if we know and live the fact that mind is the governor – those cancer genes or whatever won't be activated for your whole life. Why is it that so many people die within the period the doctor predicted they would die? 'How long do I have, doctor?' is so often a question that delivers literally a death sentence. Mind becomes convinced that the body will die within the declared period and sends out waves of frequency that make it happen. There have been cases where people have been told they have a fatal disease with a certain period to live and they have died in that period only for post-mortem tests to reveal they did not have the 'fatal disease' at all. They died from a belief that they had the disease and a belief in the doctor's prognosis of how long they had to live. There are so many stories and accounts along the same lines. In this way we can believe ourselves to live and believe ourselves to die. Witness the list of cases in which one group has been given a drug to have some effect or other and a second group is unknowingly given only a sugar pill or 'placebo'. Many times those taking the non-drug placebo experience the effect of the drug they have not even taken. Some trials involving psychoactive drugs have had those taking only a placebo heading out on a psychedelic 'trip'. People have recovered from health problems, even serious ones, by taking a placebo they believed was a drug that would cure them. This can happen through the process I have been describing. Belief in the cure sends out the mind/brain waves that activate the genetic blueprint and its immune system to deliver the believed-in outcome. There is also the 'nocebo' effect when belief in a bad health outcome focuses the mind to produce just that. Warning people about the 'side-effects' of drugs is understandable, but how many then experience those effects because that possibility has been transferred to the mind and its perceptions? Tell someone that the cup of tea they just

drank contained poison and watch what happens even though there was no poison. How many drugs appear to work only because people believe they will? The same applies to alternative methods, too, although they are much more in sync with how the body works and what it is. Mind is *all* when it comes to the body and the Cult knows that.

I'll give you an example of how perception manifests illusions. I researched mind control for many years both sides of the Atlantic and met a large number of people who had been shockingly abused in the infamous US government-military-CIA mind control operation known as MKUltra. Part of this horrific programme was 'trauma-based mind control' in which the target is subject to situations of extreme terror. Their mind builds an amnesic memory barrier around the experience like a bubble or honeycomb so the person does not have to keep reliving what happened. This creates self-contained compartments called by insiders 'alters' as in altered states. These self-contained alters are then programmed to carry out tasks including assassination in the style of a Manchurian Candidate and mind manipulators are able to switch the alters to different 'personalities' which perform different pre-programmed tasks. A so-called 'front alter' is installed that operates as the target's conscious mind while the other alters remain in the subconscious. Trigger words, phrases, even sounds, are encoded to switch alters and make them temporarily the front alter to carry out their designated task or be sexually and violently abused by rich and famous people. Once completed the prime front alter is restored which has no idea what the other alter has done or experienced. I have exposed this in detail in other books and the reason I raise the subject here is that many who suffered in MKUltra told me that if they took drugs or were drunk in one alter or fragment of mind the effect of the drugs and drink would disappear immediately they were switched into an alter that had not been 'conscious' or 'front' when the drugs and drink were consumed. One told me that her biggest nightmare was to be given anaesthetic in hospital while in one alter and for another to kick in during the operation. She knew that the anaesthesia would cease to work and she would wake up. Such is the illusion of experienced reality. The latest mind control techniques involve harmonics which technologically manipulate the brain's wavefield and electrical patterns to program perceptions and behaviour and even insert death programs that trigger the body to shut down. SC, anyone? Relate this to the Cult's control of information through 'education' and media when both are forms of perceptual hypnotism. I will be showing later that the Cult's knowledge of how perception becomes experienced reality is mercilessly exploited to instigate mass human control.

I know myself how consciousness can override medical prognosis. I

begin to develop joint problems at aged 15 just six months into my football career and they continued to develop until I had to stop playing at 21. I was diagnosed with rheumatoid arthritis and given a horrible prognosis that included the possibility of being in a wheelchair in my 30s. I refused to accept that and rejected the offer of painkilling drugs for the rest of my life. It's a good job I did or I would be dead now. I didn't need a wheelchair in my 30s, but the arthritis did continue to develop and at its peak affected very painfully my toes, ankles, knees, hips, wrists and fingers. The experience gave me many gifts that didn't seem so at the time. These included the end of my soccer career which led me into journalism and what I am doing now, plus the activation of a fierce determination not to let the pain and arthritis stop me. There came a time, however, as I began to understand the relationship between mind and body, that I decided to put this into practice by using perception to impact the arthritis. I decided the arthritis was not going to continue progressing and would start rolling back and releasing me from the pain. By 'decided' I mean something much deeper than that which I call 'knowing' and I'll be coming to this in due course. At the time of this book's publication I am 68 and should really be in a wheelchair by now with a ravaged body after the arthritis developed at aged 15; but I'm not. I have no pain and apart from some remaining deformation in my right hand my life is not affected in any way by arthritis. What you believe you perceive and what you perceive you experience. Don't be a victim of your genes. Be the master of them through your perceptions which decide which are activated and which are not. Hereditary inevitability and doctor prognosis is a myth - if you know this.

'Born' winner? 'Born' loser? Or mind dictates all?

The process of perception creating experience applies across the entirety of human life. We talk about 'born winners'. What is that, except mind dictating experience? 'Born winners' always seem to manifest situations and 'strokes of luck' to grasp victory from the jaws of defeat while others, individuals and teams, grasp defeat from the jaws of victory. You see this with sports people who dominate in less important games and yet whenever they come to the decisive match or championship final others with less talent and stronger perception win the day. An example was England's Leeds United football team in the 1960s and 70s. They were a brilliant side with highly talented players managed by a guy called Don Revie. They would dominate a season until the closing deciding stages and then fall away at the decisive moment. It was not their talent that defeated them; it was their own perception. Revie was famous for producing detailed 'dossiers' on each of the opposition players which his team were supposed to read. This betrayed far too much attention on what the other team might do instead of what his

team could do. Leeds were so good that if they performed to their potential what the other team did didn't matter, but it mattered big-time to Revie, a superstitious man, to the point of obsession. This exposed the undertone of insecurity that was often transferred to his team when the pressure was on in season-defining situations. Perceptual transfer happens with all groups, large and small, and even to whole populations as we saw in Nazi Germany. Everybody is emitting wave frequencies that reflect their perceptions and emotional state. Football teams are therefore groups of wavefields that become entangled. The more perceptually powerful fields will impose themselves on the others and soccer pundits talk about someone having a personality that 'dominates the dressing room and what happens on the pitch'. They often describe these players as ... 'born winners'. The manager as the boss of the team is obviously best placed to impose his perceptions on the group and in this way Don Revie's insecurities would have been transferred by wavefield to the team at crucial moments of high pressure. Confident of winning becomes fear of losing which is something very different. Perception is transferred from mind to body in the ways I have described and the body's actions reflect the mind's perceptions. We hear this reported in these terms: 'They have been brilliant all season, but in this deciding match they just didn't perform.' With the great Revie Leeds United team that happened far too often to be coincidence. Perception/wavefield dominance or subordination can be observed in every aspect of human society and most certainly in sport where it is always on public display.

There is another phenomenon known as 'a disruptive influence in the dressing room' – a player with negative attitudes and perceptions who emits those waves within the team's collective field of wave entanglement and creates a schism or distortion that affects the perceptions and performance of the collective. I played in teams that had disruptive characters and in others where everyone was mutually supportive and it absolutely can seriously affect the performance of the whole group. This is the real background to terms like 'infectious' behaviour, infectious enthusiasm and infectious negativity. The 'infection' spreads through wave entanglement. A further sporting example of how entanglement affects outcome is the impact of supporters on a team or individual. The crowd watching a sporting event is affecting the outcome – or can – and teams playing at home in front of their own supporters tend to win more often than they do away. The wavefields of the crowd become entangled with the fields of the team they are focused upon. If this support is positive these 'good vibes' are transferred to the team along with potentially enormous surges of energy to aid stamina and performance. Many successful UK athletes in the 2012 Olympic Games in London described how they felt empowered

by the British crowd and especially when it was a race for line and their bodies were at their apparent limit. Somehow they found another surge of energy just when they needed it and this would have been a combination of their own minds (determination) and very much the wavefield energy input from entanglement with spectators willing them to win. The reverse of this is also true. Football teams having an unsuccessful run often do better away from home because the frustration and criticism of their fans is transmitted through wave entanglement and this can disrupt and drain the performance, confidence and energy of the players. 'Born winners' are so perceptually strong, however, that they perform to their maximum ability in a hostile atmosphere and are empowered by their determination not to be affected. If you believe in 'Little Me, I have no power' you will live a life that expresses that self-identity as your perceptual state is transmitted in waves that entangle with other waves in sync with them. You will attract into your life people, situations and experiences that reflect your state of mind and emotion to produce a self-fulfilling prophecy. Everything in our reality is a frequency wavefield, a pattern of entangled, vibrating, oscillating, consciousness/information, and that includes circumstances, potential situations and experiences all of which are forms of consciousness. If we are in sync with their 'vibe' we attract them. If we're not, we don't. This will be immensely-relevant when I come to how the Cult manipulates human society and how we can stop that happening. You don't like your life? Then stop creating it – attracting it.

The relationship (wave) field

Relationships of every kind from boy meets girl to the experiences we attract and the effect of planets in astrology can all be described and



Figure 92: Relationships of all kinds are founded on wave entanglement and the attraction or resistance of 'vibes'. See Neil Hagan colour section.

understood in terms of mind/consciousness-wave entanglement (Fig 99). Perceptions obviously decide what personal relationships we seek to pursue and if this is mutual then wave entanglement follows. We describe this as making a 'bond'. Entanglement can be imposed, too, if we allow it. A relationship based only on 'physical'

attraction will form a wave entanglement to reflect that. When the attraction fades the entanglement unravels and the couple (coupling) separates. Or, at least, they do if that's the only connection. If by the time the 'physical' attraction fades a mutual hostility has developed then the attraction wave entanglement is replaced by a hostility wave entanglement and things can get very ugly. Hostility and hate from one partner is infused into the mutually entangled field and can trigger more hostility and hate in the other who reflects that back in a mutual feedback loop that diminishes, even destroys, the lives of both parties. Apply this interaction across human society and you see it everywhere in everything from personal relationships to world wars. Parents, communities and religions that instill in their children a hatred for other communities and religions ensure negative, destructive and ongoing wave entanglement passed on generation after generation as we have seen throughout the world. Entanglement between couples can be based on multiple waves generated by multiple perceptions of each other including attraction and repulsion; love (or the human version of it) and hate. These are described as love-hate relationships and which wave connection dominates at any time depends on particular circumstances. Candlelit dinner - 'I love you', Come home pissed - 'You horrible bastard'. When relationships of whatever kind are founded on love in its unconditional sense generated from the heart chakra vortex, and not just the groin, entanglement can be mutually beneficial, supportive and last indefinitely even though its nature may change. We can see this in couples late in life well past the lust stage that love each other even more than ever and live in wavefield harmony and mutual support. Individual minds decide individual experience and entangled mind connections decide collective experience. A dictator mind is someone who wave-entangles, sometimes with whole nations, and imposes his or her perceptions on everyone else. See Hitler, Stalin, Mussolini, the Chinese leadership and endless other examples. The Nazi mentality entangled with millions of Germans and became the mesmerised masses oscillating to the same rhythm in those grotesque rallies of unquestioned wave-entangled homage to Hitler. The theme here is that whatever your waves (perceptions) sync with will become entangled in some form of relationship. Those that don't sync will pass you by. 'Hands-on' energy healers make a wave entanglement with those they work with as energy is transferred through these channels (so make sure you pick the right one). Energy healing can be done directly or at a distance when waves of energy are directed from the healer's field to entangle with the recipient. I have experienced this and it works when the healer knows what they're doing.

Wave entanglement equally applies to desires, ambitions, fears and all situations that we face. Every thought and emotion is a wave

frequency and desires, ambition, fears and situations are wavefields of thought and emotion on particular frequencies. Our perceptions in relation to what we want, fear or experience decide the type of relationship, or no relationship, that we have with these potentialities. Say you want to achieve something, but you don't believe you can or will with your self-identity perception of 'things like that never happen to me'. Waves generating from your mind will not sync in that perceptual state with the wavefields represented by what you would like to achieve. If you are determined to do everything you can to reach your goal in the belief that you could achieve it you will make some level of wave entanglement with the objective, but know you will get there and you make an entanglement with the field of being there. This allows you to manifest being there and achieve what you want. Mind/heart power operates on many levels. There is not believing you will achieve what you want; hoping you'll achieve; being confident you'll achieve; believing you'll achieve; and top of the shop in terms of ensuring the goal - knowing you'll achieve. I saw many young players when I was footballer with terrific talent who fell by the wayside because they didn't believe - know - they would be a footballer. We talk of people 'lacking confidence' when in truth it goes deeper than that. I said as a kid that I was going to be a professional footballer. Few believed me. Lots of young people want to be footballers and only a few ever make it with the competition so fierce. I just knew. I didn't hope - I knew. I could not explain why I never doubted the outcome even when the statistical chances were so slim. What followed was a series of 'lucky breaks' that put me in the right place at the right time with the right performance in the right game. Was this really by lucky chance or my mind creating that through knowing the outcome making a wave entanglement with the wavefields that represented the outcome? There was, and is, more to this than just 'positive thinking' which is low-level when it comes to experience-manifestation. Knowing is way beyond that as I will discuss later and is connected to intuition - intuitive knowing.

What possessed you?

An extreme example of wave entanglement is known as 'possession'. This is an age-old concept of entities, usually described as 'demonic', taking over a human body and dictating its behaviour and even the way it looks. We have seen this depicted in many horror movies including *The Exorcist* and the process has been described in every culture throughout known human history (Fig 100 overload). There is a reason for that - it's true. Mainstream science dismisses even the possibility. It doesn't understand reality and has no knowledge base from which to explain how such things can happen. Given the 'science' motto is 'if I can't explain how it's happening then it can't be happening' all that's left



Figure 100: Possession by demonic entities is real - the classic image from The Exorcist movie.

'paranormal' for everything it cannot explain despite the said Himalaya-like compilation of personal experience and accounts, ancient and modern, to show that it's real. Only scientifically-endorsed absurdity qualifies for the official verification stamp of 'normal'. Possessing entities are wavefields of consciousness operating outside the band of visible light that are able to entangle with the wavefields of Body-Mind if - emphasise if - Body-Mind falls into compatible mental and emotional frequencies. This can happen in states of fear or depression and through the effect of drugs and extremes of alcohol consumption or by having sex with a possessed person which allows the entity to use the wave-connection of sexual energy to 'jump' across and make an energetic entanglement. The Cult employs sexual predators to target people it wants to open to entity possession and control. The entity instigates wavefield entanglement and can then start to transfer its own information field and personality to the target (think of a computer virus



Figure 101: The information field of the possessing entity is infused into the field of the possessed target who then, in the most extreme cases, starts to reflect biologically the visual image of the entity. Image by Neil Hagan.

is to deny that it's happening. Never mind the mountain range of people's personal experience of common phenomena over hundreds or thousands of years as we perceive 'time'. Well, in fact, it can be explained, as the entire spectrum of the 'paranormal' can be, and simply, too. Science uses the term

'possessing' a computer system). Friends and observers will notice the target starting to change in personality and behaviour and in the most extreme examples of possession even their facial features transform and distort. The consciousness/information field of the possessing entity transfers so much of its own wave information that the possessed person starts to take the holographic form of the entity (Fig 101). It doesn't

have to go this far for someone to be possessed and perceptually influenced and directed, but it absolutely happens. Satanists set out to be possessed in this way during rituals and the hierarchy of Satanism is dictated by the power of the possessing entities which means that the demonic hierarchy in the unseen becomes the satanic hierarchy in the seen. This is how the pecking order of the Cult is decided. Cult operatives who direct human society via The Web are actually non-human demonic entities hiding behind apparently human form. I say apparently because the major Cult families and operatives are really biological software programs and a form of what we would call today artificial intelligence, or AI. Their thought processes are AI and this is why those that direct the Cult are so intellectually advanced while having no empathy. Does a software program have empathy? No - it just acts according to data input. Anyone still wonder why the Cult has visited such evil on humanity with no emotional consequence? These biological AI software vehicles allow their hidden masters to manipulate human society without actually needing to enter the human frequency range. The 'masters' are also a form of AI as I will come to in detail later and the plan to assimilate human consciousness into AI through brain connections and other means is this AI 'awareness' seeking to empower itself by absorbing non-AI human minds. Their AI nature explains why they are so obsessed with technology which they are using to impose their control. They are not human and their consciousness fields are devoid of empathy and compassion so anything goes. Lower level servants of The Web (mostly ignorant of what is really going on) are possessed in less powerful ways, but still enough to turn them into advocates and manipulators of the Cult agenda even though they may not know the true background and origin of that agenda. For obvious reasons most possessed people don't know they are possessed. The inner elite by contrast definitely do and glory in the fact. I have heard accounts of many wives and families of men who joined the Freemasons and began to change personality as they lost their former warmth, empathy and sense of justice, fairness and decency. The great majority of Freemasons don't know that their weird initiation rituals are not just historic throwbacks to a bygone age. They are designed to create an energetic wavefield environment in which entities can attach to the initiate and the more elite the secret society and satanic group the more extreme this becomes. Satanic arts and voodoo are founded on these same wave connections which are exploited to adversely affect the target. Putting a pin in a doll used to symbolise a person and them feeling pain a long way distant is possible and explainable. The doll becomes the wave-surrogate of the person (a focus of attention representing the person which allows the instigation of wave entanglement) and through that connection their wavefield is disrupted



Figure 100: Possession by demonic entities is real – the classic image from *The Fascist* movie.

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Figure 101: The information field of the possessing entity is infused into the field of the possessed target who then, in the most extreme cases, starts to reflect holographically the visual image of the entity. (Image by Neil Hague.)

is to deny that it's happening. Never mind the mountain range of people's personal experience of common phenomena over hundreds or thousands of years as we perceive 'time'. Well, in fact, it can be explained, as the entire spectrum of the 'paranormal' can be, and simply, too. Science uses the term

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and they feel the transmuted discomfort. The US military and many other countries have psychic assassination squads that connect with the wavefields of people they want to kill. They can stop their heart waves oscillating or affect them in other ways unless the target's wavefield (mind/consciousness) is more powerful than theirs.

Taking shape and wavefield families

I have been widely and intensely ridiculed – and still am – for saying that the inner hierarchy and many lower operatives of the Cult are shapeshifters able to take both human and their prime non-human form through their dual hybrid wavefield information fields. I have said they can appear as either human or reptilian although reptilian is not the only entity-type involved. You can read about all this in detail in *Everything You Need To Know*. Ridicule from the media and much of the public comes once again from an ignorance of reality and given the way people are programmed to believe in a fake version of reality all their lives I can understand why. Funnily enough I don't resent such people. I feel sad for them and I get why they dismiss what I say although it would be nice if they read one of my books before waving a hand in arrogant dismissal of something they have chosen to know nothing about. The thought process goes like this: 'The world is solid and so it's impossible to shift between one shape and another – that I like is clearly crazy'. If the world was solid all that would be correct, but it isn't. Shapeshifting does not happen 'physically'. It can't – there is no physical. Recall what I said earlier about what science calls the 'observer effect' and I call the 'decoder effect'. Apparent solidity is really a hologram which is decoded into manifestation by the mind of the observer from a wave information field. What we think we see as physical reality is really holographic reality which only exists in that form in the decoding processes of Body-Mind. Shapeshifting as a perceived 'physical' happening is really the observer decoding the human part of the hybrid field and then the field shifting to project the non-human part which the observer also decodes. What happens is a wavefield shift of information, but to the observer's mind the person appears to have physically shifted from one form to another as one field is decoded and then the other. Here is a perfect example of how if you suppress the true nature of reality you can manipulate great swathes of the target population to dismiss as impossible what is actually happening.

I have written at great length over the decades about Cult bloodlines that have interbred since 'ancient times'. These are best-known as 'royalty' and 'aristocracy' although they now overwhelmingly operate through the dark suit professions of politics, government, banking, business and media. Designer procreation passes on the hybrid wavefield blueprint (biological AI software program) which involves a

dual information field. One part is infused with human wavefield information and the other is non-human, often, although far from always, reptilian in nature. Observe the reptile nature and you'll see how software-like it is. I have witnessed a number of crocodile/alligator presentations at wildlife parks where the computer-like 'press-enter' nature of their behaviour has been highlighted. Royal and aristocratic bloodlines (wavefields) are called 'bluebloods' and the term illustrates the difference between these families and the rest of the human population. The whole theme of royal bloodlines with a 'divine right to rule' comes from their origin as the bloodlines of the 'gods' and you find this theme across the world. Ancient Chinese emperors claiming the right to rule through their genetic (wavefield) descent from the 'serpent gods' is only one example. 'Divine' right to rule has been associated with the Christian god while it should far more appropriately refer to the Sanskrit 'Deva' (female Devi) which is defined as 'a shining one or supernatural being'. The ancients often described their non-human 'gods' as the 'Shining Ones'. Deva comes from the Latin 'deus', or 'god', and 'divus' from which derive the English words 'divine' and 'deity'. Cult bloodlines were given their (divine) right to rule by 'supernatural gods' – the non-human force behind human control. The Biblical story of the 'sons of God' who interbred with the daughters of men to create a

hybrid race called the 'Nephilim' is describing the insinuation of the hybrid bloodlines and the Cult also infiltrated human genetics in general. It is no accident of evolution that one of the most influential parts of the human brain in dictating behaviour is called the reptilian brain, or R-complex, which absolutely has a 'press-enter' reaction system as we'll see (Fig 102). All the background can be found in detail in my

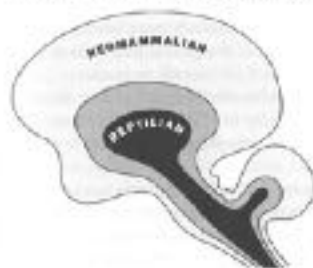


Figure 102: The reptilian brain or R-complex has an enormous impact on human perception and behaviour.

other books. The original text from which 'sons of God' was translated in fact referred to sons of the gods, plural. These 'sees' and 'gods' are symbolic of the non-human entities which hijacked human society long ago and still impose their will and agenda through the Cult ... run by the Nephilim bloodline families which are the AI biological software programs.

When populations began to reject overt rule by bloodline 'royal' dictatorships the Nephilim continued and expanded their control by

moving into the realms of politics, banking, business, media and so on where they remain predominant to this day. They continue to interbreed through covertly arranged marriages to ensure the Nephilim bloodline software information program is not diluted or deleted by interbreeding with the 'common people'. They may not overwhelmingly be official royalty any longer but they act as if they are. They believe they are special and above humans and have the 'divine' right to control everything. Nephilim bloodlines now operating through dark suit and uniform professions are orchestrators of The Web serving the interests of the Spider operating in frequencies outside human sight. Non-human entities which I refer to as the Spider are the same entities that the Old Testament calls collectively 'God' and other cultures around the world call 'the gods'. Hence the Old Testament 'God' is described in nature and behaviour in very different ways to the New Testament 'God'. A few overt Nephilim 'royalty' survive, most notably the British royal family which provides the ongoing UK and Commonwealth head of state on the basis purely of *hereditary* succession. I have written widely about the Nephilim human-reptilian hybrid nature of the British royals and naturally attracted a blaze of ridicule for my trouble. I don't care. I am interested in the truth not a pat on the back and a Facebook thumbs-up. I do not wish to be considered 'normal' when that word with regard to human society is another term for clinical insanity. The *fake* royals live in ongoing mega-privilege off the backs of the British population as the entire Nephilim network lives off the backs of the global population under terms like the One-percent. They are Cult bloodline human-reptilian shapeshifters and if people don't like that or accept that then they must do the other thing which is fine by me. They should know, however, that no amount of ridicule and condemnation is going to stop me saying it.

The bloodlines around the world were behind the emergence of major religions that serve their interests of perception control. There is no coincidence in many major Cult bloodlines emerging from the Middle East and ancient Egypt, Sumer and Babylon – the latter two now called Iraq – when from this region came three of the world's major religions, Christianity, Judaism and Islam. These have so much in common and recognise many of the same deities and heroes. The differences are emphasised, however, to allow centuries of divide and rule between them and that continues to this day to the ongoing benefit of the Cult which created them. Philosopher Alan Watts pointed out how religion is a copy of the monarchical societies from which they emerged with followers kneeling, bowing and prostrating themselves to 'God' as they did to the monarch. The Christian 'God' sits on a throne and terms such as Basilica mean 'House of the King'. We have Biblical descriptions of 'Jesus' and 'God' as 'King of Kings' and 'Lord of Lords'

and Christianity and other religions have the same follower-God relationship that 'subjects' had with monarchs. This version of 'God' worship is just an extension of monarchical (Cult bloodline) control.

It can't be true? Oh yes, it can

Suppressing the nature of reality requires the constant dismissal and alleged debunking of any phenomena that cannot be explained by Cult-controlled mainstream science. It obviously follows in the public mind that if things are happening or possible that science claims can't happen the version of reality peddled by science can't be all there is to know. This realisation has the potential to open minds to other possibilities and that's something the Cult wants to avoid at all costs. Take astrology which originates in the ancient world and claims that the movements of planets and stars influence human life and behaviour. Astrologers claim these forces have very a significant impact on the personalities of people through the astrological sequences at work at the time of birth (some believe conception). I will have more to say about this when I address the power of expanded consciousness to override not only astrological wave influences but all the others that come at us today with the speed of machine gun fire. I emphasise that astrological frequencies are *influences* and don't have to impose upon us unless we allow them to through choice or five-sense unconsciousness. The foundation of astrology and how it works can be simply explained and that's one reason why mainstream science is so instantly dismissive. The 'scientific' mind is obsessed with complexity. Any answer must be complex or it can't be true – 'I mean look at how much my degree in physiological, physicochemical and physiopathological complexity cost me.' Genius is not to understand complexity; it is to see the simple hidden by complexity. It is to see the whole and not only the parts. Mainstream science is so obsessed with the twigs that it can't see the forest. Serbian-American scientist Nikola Tesla (1856-1943), who was way ahead of the science mainstream, said:

The scientists of today think deeply instead of clearly. One must be sane to think clearly, but one can think deeply and be quite insane.

Scientist Robert Lanza put it this way:

When it comes down to it, today's science is amazingly good at figuring out how the parts work. The clock has been taken apart, and we can accurately count the number of teeth in each wheel and gear, and ascertain the rate at which the flywheel spins. We know that Alan rotates in 24 hours, 37 minutes, and 23 seconds, and this information is as solid as it comes. What eludes us is the big picture.

We provide interim answers, we create exquisite new technologies from our ever-expanding knowledge of physical processes, we dazzle ourselves with our applications of newfound discoveries. We do badly in just one area, which unfortunately encompasses all the bottom-line issues: What is the nature of this thing we call reality, the Universe as a whole?

Astrology could hardly be more straightforward when you see this big picture. All form is a hologram decoded by the observer from wavefields and that 'all' includes planets and stars which are conscious wavefields emitting different frequencies of information – the 'music of the spheres'. They entangle with wavefields of other planets, stars and people and this is most powerful between heavenly bodies when they are in various alignments. Astrologers refer to these as conjunctions, squares, trines, oppositions, and the like. These alignments create wave entanglements which are collectively more powerful than the individual parts and amplify their impact on other wavefields they entangle with including humanity. Waves emitting from planets and stars, especially combinations of them in alignment, impact on the human wavefield and the trillions of cells and their genes encoded with a myriad of instructions that affect health and behaviour depending on whether they are active or inactive (Fig 103). At birth/conception (a combination of both probably) the wavefield of the child's Body-Mind is imprinted with



Figure 103: Astrology is founded on the impact of wave entanglements between frequency waves of planets and stars and frequency waves of people, animals and all life. See Neil Hague Colour Section.

the astrological wave blueprint generated from the positions of the planets and stars. The blueprint will be different in one period than another as the heavenly bodies change their wave relationships and these periods are designated as astrological 'signs'. The astrological frequency field imprint on someone born in 'Taurus' will be different from a 'Leo' and even the 'time' in the day makes some difference with the astrological field constantly changing. Different astrological imprints will interact differently with ongoing astrological sequences throughout their life to give us the esoteric art of astrology. People born in the same astrological periods can have aptitudes for certain jobs or abilities and this is a reason why (Fig 104).

This background applies with the Chinese Zodiac and its years of the monkey, rat, ox, tiger, rabbit, dragon etc. and other cultural methods of reading the effect of astrological information waves. Consciousness in certain wave states can also be attracted to 'incarnate' through entanglement in life situations and locations that sync with that state. This would provide the wavefield basis of a reincarnation cycle in which one 'life' dictates the nature of the 'next' one. Reincarnation is not what it seems, however, in that with time an illusion and everything happening in the same NOW there is obviously more to know about the perception of a reincarnated 'sequence' in time. The Sun has an absolutely central impact on humanity ('astrologically') by bombarding us with photons (information) which are emitted by the Sun as ... waves.

Photons (sunlight) are transformed (decoded) by cholesterol in the skin into the vital vitamin D. Cholesterol has many other crucial functions and the brain contains 20 percent of the body's cholesterol which is an essential component of cell membranes involved in cell signalling. Alzheimer's and dementia which have become an epidemic in recent times are names to describe brain cell signals misfiring and mis-communicating. You will have noticed the Cult-investigated systematic



Figure 104: Our unique wave pattern, influenced by planetary wavefields at the moment of birth/conception, interact with wavefields of planets and stars through a human lifetime to provide the basis of astrology. The 'Reborn' are once again reborn as things Neil Hague!

demonisation of cholesterol and the pressure to reduce it through changing food habits and taking ongoing statin drugs to do the job. Is this another coincidence? Not a chance. There is one other point to make here about the Sun which is relevant to everything else. We define the Sun by the circle of light in the sky when that is only the part that we can see. The Sun's influence is transmitted across the solar system in the form of waves and photons which are as much part of the Sun as the perceived ball of fire. Everything from a planet to a human has a frequency field that we can see and a far greater wavefield 'aura' that we don't see. The more powerful the mind and expanded awareness the bigger its auric range and influence.

I was just thinking the same

'Paranormal' telepathy and psychic phenomena are explained through wave connections. Forget about 'distance' which is an illusion of holographic decoded reality. Everything you think you 'see' in the night sky in the form that you think you 'see' exists only in your 'head' - Body-Mind decoding systems. What happened to stars billions of light years and trillions of miles away when they are located in that form between our ears?? As the near-death experimenter said of reality beyond the body: 'There is no time, there is no sequence of events, no such thing as limitation, of distance, of period, of place. I could be anywhere I wanted to be simultaneously.' We are waves and we can be anywhere we like and in as many 'places' as we choose once we are released from the focused attention of Body-Mind. Other levels of us are already operating simultaneously all over Creation while this wave of that same consciousness is having a human experience. Still frightened of death? Still think you are 'insignificant' Ethel on the checkout or Bill at the call centre?? Our waves can connect with other waves and through that entanglement exchange information with those on the other side of the world or in another dimension of reality. This is called telepathy, intuition, premonition and mind reading. Experiments galore have proved this to be real and it is widely used in covert operations by intelligence agencies and the military. The same wave connections allow plants, trees and the natural world to communicate with each other and us with them. Yes we can 'talk' to trees and plants. While they don't understand human language they feel the vibrations of the sound waves from the vocal chords and the waves we emit in general. They know love, danger, friend or foe, by feeling it. People with close relationships attune with each other's wavefields more powerfully and telepathy between them is more likely. One will say something and the other will respond with 'I was just thinking that'. There are endless stories of people thinking of someone followed by the phone ringing with the person on the other end. Others have premonitions that a fate has

befallen a loved one which turns out to be true. 'Primitive' ancients knew about this, hence the origin of the term 'bush telegraph' when tribal peoples became aware of happenings 'far away' and could communicate telepathically with their family and friends back in the village while out on a hunt. We are all capable of this - it is how we are supposed to be - but perceptual programming has blocked these natural processes in most people. We need to bring them back.

Psychic communication is another form of telepathy in which the psychic or medium attunes (entangles) with the wavefields of 'people' who have passed from human reality or with the wavefields of people still here. You might have seen TV programmes about 'psychic detectives' in which they solve crimes that have defeated the police. They do this by waving-attuning with the criminal and/or the deceased or missing victim and access what happened from that information source. This is sometimes done by going to the location of a crime. The wave-encoded representation of what happened will still be there in the energetic field. All events and actions are recorded in wavefields and have to be when all events and actions are wavefields. In this way houses can be 'haunted' by fields of information containing happenings there. You could think of it as a wavefield recording like a CD or DVD and the more emotion involved in the events the more powerful will be the recording. Many 'haunted' places are not the result of discarnate entities, but happenings encoded in the wavefield like people hearing the 'sounds of battle' at the scene of some historic mass carnage. Psychics are not reading the 'past' or the 'future' when neither exists. They are reading wave patterns in the NOW. The most open psychics and mediums can connect with expanded states of consciousness that can communicate phenomenal insight about reality and the human

plight (Fig 105)

This happened to me in my ayahuasca experience and on endless other occasions far less dramatically. I say endless. It's pretty much every day and mostly this is in the form of intuitively 'knowing' rather than hearing words. Wavefield



Figure 105: Psychics and mediums are connecting their awareness with realities beyond the human five-sense frequency band. (Image Neil Higgins.)

demonstration of cholesterol and the pressure to reduce it through changing food habits and taking ongoing statin drugs to do the job. Is this another coincidence? Not a chance. There is one other point to make here about the Sun which is relevant to everything else. We define the Sun by the circle of light in the sky when that is only the part that we can see. The Sun's influence is transmitted across the solar system in the form of waves and photons which are as much part of the Sun as the perceived ball of fire. Everything from a planet to a human has a frequency field that we can see and a far greater wavefield 'aura' that we don't see. The more powerful the mind and expanded awareness the bigger its auric range and influence.

I was just thinking the same

'Paranormal' telepathy and psychic phenomena are explained through wave connections. Forget about 'distance' which is an illusion of holographic decoded reality. Everything you think you 'see' in the night sky in the form that you think you 'see' exists only in your 'head' – Body-Mind decoding systems. What happened to stars billions of light years and trillions of miles away when they are located in that form between our ears? As the near-death experiencer said of reality beyond the body: 'There is no time, there is no sequence of events, no such thing as limitation, of distance, of period, of place. I could be anywhere I wanted to be simultaneously.' We are waves and we can be anywhere we like and in as many 'places' as we choose once we are released from the focused attention of Body-Mind. Other levels of us are already operating simultaneously all over Creation while this wave of that same consciousness is having a human experience. Still frightened of death? Still think you are 'insignificant' Ethel on the checkout or Bill at the call centre? Our waves can connect with other waves and through that entanglement exchange information with those on the other side of the world or in another dimension of reality. This is called telepathy. Intuition, premonition and mind reading. Experiments galore have proved this to be real and it is widely used in covert operations by intelligence agencies and the military. The same wave connections allow plants, trees and the natural world to communicate with each other and us with them. Yes we can 'talk' to trees and plants. While they don't understand human language they feel the vibrations of the sound waves from the vocal chords and the waves we emit in general. They know love, danger, friend or foe, by feeling it. People with close relationships attune with each other's wavefields more powerfully and telepathy between them is more likely. One will say something and the other will respond with 'I was just thinking that'. There are endless stories of people thinking of someone followed by the phone ringing with the person on the other end. Others have premonitions that a fate has

befallen a loved one which turns out to be true. 'Primitive' ancients knew about this, hence the origin of the term 'bush telegraph' when tribal peoples became aware of happenings 'far away' and could communicate telepathically with their family and friends back in the village while out on a hunt. We are all capable of this – it is how we are supposed to be – but perceptual programming has blocked these natural processes in most people. We need to bring them back.

Psychic communication is another form of telepathy in which the psychic or medium attunes (entangles) with the wavefields of 'people' who have passed from human reality or with the wavefields of people still here. You might have seen TV programmes about 'psychic detectives' in which they solve crimes that have defied the police. They do this by waving-attuning with the criminal and/or the deceased or missing victim and access what happened from that information source. This is sometimes done by going to the location of a crime. The wave-encoded representation of what happened will still be there in the energetic field. All events and actions are recorded in wavefields and have to be when all events and actions are wavefields. In this way houses can be 'haunted' by fields of information containing happenings there. You could think of it as a wavefield recording like a CD or DVD and the more emotion involved in the events the more powerful will be the recording. Many 'haunted' places are not the result of disincarnate entities, but happenings encoded in the wavefield like people hearing the 'sounds of battle' at the scene of some historic mass carnage. Psychics are not reading the 'past' or the 'future' when neither exists. They are reading wave patterns in the NOW. The most open psychics and mediums can connect with expanded states of consciousness that can communicate phenomenal insight about reality and the human

plight (Fig 105). This happened to me in my ayahuasca experience and on endless other occasions far less dramatically. I say endless. It's pretty much every day and mostly this is in the form of intuitively 'knowing' rather than hearing words. Wavefield



Figure 105: Psychics and mediums are connecting their awareness with realities beyond the human five-sense frequency band. (Image Neil Hogan.)

information from these sources is decoded by the brain in the same way as human speech and when this happens it can sometimes sound like 'voices in the head'. People are often condemned as crazy when they describe this experience, but when a friend or workmate talks to you what do you hear? Voices in your head? It's the same brain information processing from a different source. Mediums can allow their bodies to be used as temporary vehicles for disembodied entities to speak through them. The entity instigates a wave entanglement strong enough to speak directly to the brain of the medium and the communication is decoded into words. I have witnessed situations where the connection is so powerful that the medium's voice changes and even their face is transformed. Those that believe shapeshifting is not possible should have seen what I have on these occasions. The process is a form of temporary possession. The difference is that the medium makes the choice to allow that to happen rather than having it imposed upon them. Two things I would advise are to check out any psychic or medium you are thinking of contacting and research their history, accuracy or otherwise, with previous clients. Not everyone who calls themselves psychic is any good and remember that just because an entity is speaking through a psychic/medium does not mean they have your best interests at heart. Death is no cure for ignorance or manipulation. I am seriously discerning in these situations. You have to be or you can get scammed.

Blimy, what a coincidence!

Synchronicity is another wave phenomenon when people experience 'amazing coincidences' that make no sense when compared with statistical possibility. 'Wow – fancy seeing you here – what are the chances of that?' Well, actually, very good if you make a wavefield entanglement with the location and each other. This is how synchronicity works and people describe such experiences as 'meant to be'. Sometime they are in the sense of wavefields being pre-encoded to meet as part of a planned life experience. Wavefields can be two people or a person, a situation, information or location. Other times 'meant to be' is simply 'made to happen' by the synchronisation and entanglement of wave patterns generated by the mind waves (perceptions) of the parties. Synchronicity has been a central feature of my life. I could not have compiled the enormous library of information that I have in the last 30 years unless constant synchronicity had led me to it. Many have described how they were perusing in a bookshop when one of my books dropped off a shelf next to them. This would appear to be 'spooky' and to others just a coincidence when it has happened too many times to be explained that way. The person perusing is a wavefield and so is the book. If something in the person's subconscious field wants the

conscious mind to look at information an electromagnetic wave connection is made that pulls the book from the shelf to say: 'Hey, look at this.' It can also be that someone searching for understanding who has a wavefield reflecting that intent entangles with information that will aid that understanding through a symbiotic frequency connection – 'seek and you shall find'. People who begin to 'seek' often experience people and information 'coincidentally' coming into their lives that relate to what they 'seek'. This has been happening to me for 30 years. Another example is when you view a row of books and your attention goes to one of them even though you don't know at first what it's about. The subconscious constantly communicates to the conscious mind in synchronicity, coincidences and 'paranormal' experiences and you can learn to read the signs and symbols just as clearly as you do words. I call it the language of life. Everything that happens is telling us something. The trick is to see that and grasp what the language of life is saying. When people go through the process of awakening from Body-Mind into expanded states of consciousness they notice far greater synchronicity in their lives. Expanded consciousness generates both more powerful wave communication and at a higher and wider frequency which means we can make entanglement connections with a vastly greater range of other wavefields – people, places, situations, information, insight. We experience this as 'My God, what a coincidence' when it is really wave-magnetism at work. As your frequency quickens from expanding your awareness there comes a corresponding increase in the speed and scale of information processing. What would have given you a headache trying to understand before suddenly becomes clear and simple. A faster speed of processing can influence your perception of 'time' which is really the speed that you process information.

Speaking personally

My own conscious awakening got seriously underway when I was in a news shop in the spring of 1990 and what happened brings all these themes together. I was standing at the door when the atmosphere suddenly changed which I now know was a field of electromagnetic wave energy. My feet began to feel as if magnets (electromagnetic wave energy) were pulling them to the ground and I heard a strong thought (wave entanglement communication) pass through my mind which said: 'Go and look at the books on the far side.' I walked across the shop in a bewildered state to the single shelf of books and my attention immediately locked on (made a wave connection with) a title called *Mind to Mind*. I read the blurb on the back to find it was the biography of a professional psychic, Betty Shine. 'Synchronistically' I had been having the experience for the previous year of feeling a presence around me (wavefield of consciousness) even when I was in an apparently empty

room. This became ever more powerful and tangible. It reached a peak just before my experience in the news shop and encouraged me to meet with Betty Shine to see if she would 'pick up' what was happening around me. I told her nothing except that I had arthritis and perhaps her 'hands-on' healing (an exchange of wave energy) might help. The first two visits were uneventful and then on the third while she was working 'hands-on' near my left knee I felt something akin to a spider's web on my face (electromagnetic wave energy) and I remembered reading in her book that when 'spirits' are seeking to communicate you can feel this web-like sensation. Other dimensions of reality connect with us through electromagnetic entanglement. I said nothing but within a few seconds Betty threw her head back and said: 'My God, this is powerful. I'll have to close my eyes for this one.' She said that a figure in her mind (wave projection from another reality) was communicating information to her to pass on to me. I was a BBC television presenter in 1980 and a spokesman for the Green Party. Now I was being told that I would go out on a world stage and 'reveal great secrets'. A communication said: 'One man cannot change the world, but one man can communicate the message that can change the world.' Everything communicated to me that day and the following week, which I have detailed in other books, has happened or is happening. From the moment I left Betty's home that morning my life became a constant series of synchronicities and 'coincidences'. It had been before when I looked back, but now it became conscious. Synchronistic 'coincidence' has since taken me on an incredible journey of discovery which continues today. This book is the latest instalment.

Life-plans

Life is not what we are told that it is and neither is humanity 'alone'. Creation is beaming with life – Creation is life made manifest. Consciousness beyond the myopic visual limits of visible light guides (or manipulates) other consciousness having a brief human experience. If you become entrapped in purely five-sense reality the connection to high-frequency benevolence can be lost to low-frequency malevolence. This is the goal of the Cult and its other-dimensional masters. Life is not random chance. Choices become consequences which become new choices and there are specific experiences that we set out to have although manipulated perceptions can get in the way. This is why we are born to specific parents in specific situations and locations. It is why we can choose to enter the cycle at a certain astrological point to underscore the direction we plan to take. Information can be encoded into our wavefields to trigger certain events and happenings. I recognise these situations clearly when I look at my own life. My arthritis came out of nowhere at age 15 and finished my football career at age 21 to

lead me into journalism and all that followed. Without the arthritis I would not have had the same life and I would certainly not have activated so much determination so early to overcome adversity that would come in rather handy later on. Mass ridicule that I went through in the 1990s set me free of the fear of what other people thought of me and so I had no problem talking and writing openly a few years later about seriously far-out subjects that would attract mass ridicule and abuse. I didn't know the far-out information was coming when the initial ridicule was in full-swing while other levels of me did and that which has been guiding me all these years from other realities. Freedom through extreme experience from the fear of what others say was preparation for what would follow. Life is not about any single experience. It is a long series of experiences which are all connected either through the choices that we make from the five-sense perspective or through pre-birth planning. The latter can be felt as a sense of 'destiny' and I guess it is in some ways if you take destiny to be something you set out to experience or achieve. Whatever happens, it is just an experience and there'll be another one along after that. Pre-birth planning can even pre-decide when you 'die' by encoding the moment when mind will free itself from entanglement with the body. Someone may die 'young' from a rare heart condition when the clock was ticking on that from birth because it was encoded in the wavefield. This may seem hard to believe from a human perspective and that's understandable. When you are free from prison cell perceptions of Body-Mind and its five-senses life does not look the same. You know that life is all there is, death is an illusion and a human life only a very temporary experience.

Paranormal is perfectly normal (it's the 'normal' that's not)

The wave nature of reality dissolves all the classic paranormal 'mysteries'. How do people stop watches with their mind? Thought/intention waves focused on the watch entangle with the wavefield of the watch and affect its function. Why do you pick card 'A' and not 'B' in a Tarot card reading to allow your 'future' to be discerned? Well, first it's not your future, only a sequence of possibilities and probabilities that can be identified by a skilled reader from the cards you choose and in what order. Even so, that's still crazy, right? No, it's not. The whole thing is happening on the wavefield level. Tarot cards are wavefields that represent certain states of mind, emotion and possibility/probability (frequencies). Your wavefield syncs with cards that represent the frequencies of thoughts, emotions and possibility/probability that exist in your field. They make an electromagnetic frequency connection between hand and card to portray what is happening in your field as a series of symbolic cards laid out on



Figure 106: Tarot cards and rune stones are electromagnetic fields which reflect the electromagnetic field of the person involved and what is happening in your field is most likely – though not certain – manifested as a holographic experience. (Image: Neil Hoppe.)

hand over a basket of stones to sync and entangle your wavefield with theirs. Hands are a powerful centre for energetic exchange. The runes, or bones, are then thrown on the floor and the way they land in relation to each other is read by the shaman. To the closed mind it seems like gobbledygook until you realise that where the stones fell and their relationship was decided before they were thrown by the connections that were made with the person's electromagnetic field. The stones then reflect that field on the floor and can be read by someone who knows what they are doing (the quality of the reader is vital). Numerology is the reading of people through numbers. I have described how wavefields are decoded into digital holograms. The hologram is a digital version of the information in the wavefield. Numerologists and psychics are reading different forms of the same information. I have had psychic and numerology readings close together by different people as part of my research and the information I was given was in theme exactly the same. The synchronicity generated by wavefields can be seen with recurring numbers in people's lives. The number 8 seems to follow me around and it's been my favourite number since I was a child. I have lived at number 8 for two decades and it 'found' me not the other way round. Numbers are digital versions of frequencies and a recurring number is a recurring frequency. Language is a manifestation of both wave frequencies and numbers. Hebrew is very much a numbers language with words formed with particular number values that are, in turn, representations of particular frequencies. In this way language itself and its use is a frontline source of perceptual programming.

A great deal of paranormal phenomena happens via electrical

the table (Fig 106). Rune stones symbolising different perceptual states and possibilities work the same way as do other forms of divination. I have had the runes read for me by shamans and the African version of bones carved into different symbols. You are asked to find out your

systems. Lights dim or turn on and off, a music player starts or stops, and so on. Wavefields are electrical/electromagnetic in our reality and you can feel this when hairs on the back of your neck stand up in a spooky situation when an unseen wavefield entity or 'ghost' is around you. The same happens with an excited crowd generating a mass of collective wavefield energy. 'Atmosphere' in a sports stadium ('the atmosphere was electric') is the result of electromagnetic waves emitted by the crowd and through entanglement becoming collectively more powerful than the parts. Electrical circuitry can therefore be affected by waves generated by people or by entities projecting electrical waves across realities in what is referred to as a 'haunting'. Some of this manipulation can be malevolent while most of it is only perceived to be so by those who fear the unknown. The Cult seeks to keep the population in a state of unknowing so there is more unknown to fear. Witness how religion has been used to manipulate its followers to fear the unknown as the 'occult' when the word merely means 'hidden'. Such hidden knowledge can be used for good or ill. What people fear they tend to try to avoid – in this case knowledge that will set them free. My brother, Paul, experienced some otherwise unexplainable electrical and number happenings and 'coincidences' in the days after my mother died. This is a way that loved ones try to tell us – 'Hey, it's okay, there is no death'. On the first night of my ayahuasca experience in Brazil I was lying on a mattress in the pitch black in a big round hut in the rainforest. I was alone except for a facilitator overseeing the process who had taken ayahuasca many times. In fact, I think he had pretty much smoked and drunk the rainforest. He was playing music on a CD as the ayahuasca effect kicked in and I felt an incredibly powerful energy pouring in an arc from the centre of my chest (heart chakra) and into my forehead area (third-eye chakra). It was like a sensation of hands gripping my chest and forehead. The music stopped and then started again as if the electricity had been turned off and on. Then one of the strip lights illuminated followed by a second and third. I wondered why the facilitator was messing with the music and lights. When I looked he was sitting near to me and nowhere near either the music player or the light switch. Even if he had been the lights would have switched on all together around the hut, not as one, two or three. Electromagnetic energy that I was so powerfully feeling was affecting electrical circuits and that is what happens during paranormal events. One of the scariest examples for people is so-called poltergeist activity when 'physical' objects can move and even fly around the room. If we approach this from the perspective I am describing this too, can be explained. 'Physical objects' are not physical. They are decoded holographic projections of wavefields which other fields can entangle with and make 'move'. This can be done by 'other-world' non-human entities, although moving

objects of energetic density can take a lot of energy. Crazy as it may sound, this can also be caused *unintentionally* by humans. I have read many times how a common theme of poltergeist activity is the involvement of adolescent girls going through emotional trauma. On a wavefield level they would be emitting chaotic, imbalanced and potentially powerful emotional frequencies that could certainly entangle with other fields in the room and create mayhem that is blamed on a 'poltergeist'. During 'hauntings' people describe how the location becomes suddenly very cold and this is the 'ghost' (consciousness in another reality) sucking energy in the form of heat out of the field to gather the energetic power that it takes to communicate between realities. When people report feeling chills down the spine this is the electromagnetic field of an entity impacting on the central nervous system.

On and on we could go with perfectly simple explanations for apparently impossible happenings and events – if we clear our minds of the lake version of reality spoon-fed to us throughout our lives by the Mainstream Everything controlled by the Cult. Now consider the fact that politics, governments, corporations, science, medicine, academia, media, and all the other global institutions are making decisions every day affecting the direction of human society based on a world that doesn't actually exist except as a decoded illusion. WTF? No wonder they make such a mess of it. How can that not be the case when a world in which everything connects to everything else is perceived as nothing connecting to anything else? The dream is the dreamer and the dreamer is the dream. When we forget that we can create a nightmare.

What is love?

Have enough courage to trust love one more time and always one more time – Maya Angelou

This is not a book that simply says: 'Love is the answer.' It is, by the way, because everything comes from that, but I want to lay out why it is the answer from the context of how reality and consciousness interact.

From *The Answer* come all the other answers, plural, to the range of challenges facing humanity and which humanity has brought upon itself. In the end when you break it down they have all been brought on ourselves through the way we have allowed others to dictate perception and self-identity. I am not referring, in terms of *The Answer*, to the human version of 'love' which is mostly founded on mutual attraction. I talked to a mind-control expert in the United States many years ago who said he could make two people who would otherwise pass in the street without a second glance fall deeply in (attraction) 'love' purely by stimulating certain chemicals in their brain (chemicals = wavefield frequencies). Love in its deepest sense goes way beyond: 'Coe, fancy her, fancy him.' This is why attraction 'love' can be so fleeting and temporary. It doesn't have to be if other expressions of love are involved, but it definitely can as we see every day. Commitment to a lifetime together in the flush of attraction at the altar can be gone within weeks and certainly years. With no deeper love to maintain the connection the relationship unravels often in hostility. What happened to the words of love spoken so apparently genuinely at the vicar's prompting? They were illusory and not founded on real love at all. Attraction love is captured in phrases like I love you *when* and I love you *because*. Love in its true and infinite sense does not love only *when* or *because*. It just loves infinitely and this love takes appropriately infinite forms. Sharing the same bed is only one of them and not even close to the most important. Love must also be freely given and not demanded because love is only love when it is given freely. 'I want you to love me' and 'I'm trying to love you' just doesn't work.

Chemical 'love' in which the mind generates chemicals connected to 'physical' attraction can indeed be a manifestation of Infinite Love

expressing itself through intimate relationships. The point is that 'physical' relationships are only one expression of love. We experience love most potently in human discourse as friendship. Couples attracted 'physically' that develop a deep friendship can stay together for a lifetime. 'Physical' attraction 'love' may fade, but friendship love – Infinite Love – never does. Its depth can be seen in this saying: 'A friend is someone who walks into a room when everyone else is walking out.' The friend may not agree with what you have done and may even be appalled by it, but they stand at your side anyway and say 'how can I help?' Friendship connects through the heart while purely attraction chemical 'love' prefers the groin. Okay, it can be both and that's perfect. If it's only the latter the clock is already ticking. To articulate this misrepresentation of love we have to employ terms like Infinite Love and unconditional love (without the 'when' and 'because') to describe what we mean. If we only love 'when' and 'because' we don't really love at all. That is not love. It's a contractual arrangement of cause and effect – you do this and you get that in return. Sign here. Infinite Love is both cause and effect. It has no 'when' or 'because'. The nicest and most loving of people can be assholes sometimes and real love goes on loving despite not liking the behaviour. I am not saying that people should stay in a close relationship with someone being constantly unpleasant. I mean to realise that they do what they do because love is absent both for others and themselves. Evil is the absence of love by the evil-doer for themselves and those they affect. I have spent 30 years exposing the psychopaths directing human society, but I don't feel hatred towards them. What would be the point for a start? Hatred would affect me, not them, and distort my own perception of reality and wavefield state. What you hate you become and what you fight you become and we see this everywhere there is hatred and perceived 'resistance'. Your hate makes a wavefield entanglement with what you hate and the same with what you fight. If I hated the Cult I would make a wave connection with the mega-hate that is the Cult. You become what you lovelessly oppose through this wavefield (information) interaction and entanglement. Look at all the 'anti-fascists' who behave like fascists as a perfect example of what I mean. Withdrawing love from those we don't agree with changes nothing and condemns us to more of the same.

Anti-hate Anti-love

The demise of love (though there is still seriously plenty hidden from the daily headlines) can be seen in the ubiquitous 'anti-hate' movement in all its apparently endless and constantly replicating forms. Note they are not 'pro-love' groups, but 'anti-hate', and 'anti-hate' is not love. 'Anti-haters' attack perceived 'haters' while having hate on their faces and violence on their minds. Other 'anti-haters', including many ultra-

Zionist groups, set out to crush their targets financially, legally and by deleting their freedom of speech. Their closed hearts allow their hatred free-reign while couched in the virtue-signalled hypocrisy of opposing hate. Where is the love in such groups? 'Anti-hate' is not love – it's just another term for hate. The fact that the Cult in the shadows with a malevolent agenda for humanity is covertly funding and orchestrating these anti-hate hate groups is no coincidence. For the few to impose their will on billions requires the billions to be divided, and so ruled, and to be manipulated to enslave each other. The Cult achieves this by creating groups, factions and belief systems that can be played off against each other in violent conflict and battles for supremacy. 'Identity politics' is the latest version of the technique that religion has served so well throughout human history. What are identity politics and the associated Climate Change Cult if not modern-day religions that the manipulators seek to be *one* religion through what they call 'intersectionality'? This is defined as: 'The complex, cumulative way in which the effects of multiple forms of discrimination (such as racism, sexism, and classism) combine, overlap, or intersect especially in the experiences of marginalised individuals or groups.' This means from the manipulators point of view: Play different identity groups *against* each other on detail, but also unite them behind a common goal (your goal) of overturning society and imposing your long-planned blueprint for global centralised control and tyranny. Take the blinkers off and you see that very world emerging before our eyes day after day, especially through the Climate Cult founded on the human-caused global warming hoax, and more than anything the 'virus pandemic' scam I will be exposing in detail later. To secure the desired outcome you must create division and conflict and to do that you need an absence of love. In other words you need to transfer the psychopathic mentality of Cult manipulators to the target population which means sucking love out of human discourse in the way that love has been sucked out of Cult discourse. You transfer your mentality to your targets and make them an extension of you. Conflicts and injustices that plague human society are founded on the absence of love and its key components like empathy, the fail-safe mechanism in human interaction. Empathy is: 'The ability to share someone else's feelings or experiences by imagining what it would be like to be in that person's situation.' If you do this and feel something of what they must be feeling in the light of your actions those actions will change. If you can't feel empathy then anything goes. You have no emotional consequence no matter what the extremes of your behaviour. We don't have to feel what others feel indefinitely. That would just drain us and mirror their energetic state. It takes only a brief empathic connection to either change our own behaviour or support someone affected by others. Without these key aspects of love such as empathy

and compassion: the Cult is emotionally free to drive its agenda for humanity. The Cult can be described in these terms: *The absence of love.* I have long referred to Cult personnel as psychopaths and that is spot-on accurate when the foundation trait of a psychopath is ... *the absence of empathy which is the absence of love.*

Loveless 'money'

The global banking system created by the Cult is, as you would expect, psychopathic as an extension of its creators' mentality. It is a manifestation of the absence of love and could not exist in its current form with an infusion of love. Banking is an organised crime network based on lending people 'money' that doesn't exist (except in theory) called 'credit' and charging interest on it. 'Credit' is illusory 'money' or figures on a screen that banks are allowed to create out of fresh air through something called fractional reserve lending. In simple language this means they can lend 'money' they don't actually have through a conjuring trick called 'credit' and control those they can lure into their lair of debt and criminal activity. The overwhelming majority of money in circulation begins life with private banks issuing fake 'money' called 'credit'. The Cult created-and-controlled banking system has the power to decide how much 'money' is in circulation by how many loans of 'credit' that it makes. This, in turn, dictates if we have an economic boom or collapse. Take 'money' out of circulation by reducing the availability of credit and you make it impossible for many to repay loans. There is not enough 'money', theoretical or otherwise, in circulation to do that no matter how hard debtors may work. Remember they called the economic collapse after 2008 the '*credit crunch*'. When people default because of the actions of the banking and financial system the same system can seize the possessions offered as collateral on the loan of 'credit'. In this way tangible wealth is constantly accumulated in exchange for non-existent 'money'. It's an incredible scam which political parties never challenge when it is a very foundation of human control and enslavement. Why do they never commit to a country creating its own money interest free and lending that to the population interest free? Simple – the Cult with its tentacles throughout finance and politics does not want that to happen and in my experience most politicians don't understand how banking works anyway. I expose all this in great detail in other books and its coldly-calculated effect is to entrap the population in debt which many can't repay. When that happens the bankers get their debtors' wealth in the form of their home, business, land and possessions in exchange for a 'loan' that does not exist except as a computer file – 'credit'. The virus 'pandemic' hoax has offered the banks and financial system the opportunity to send in the hounds and vultures like never before to tear

at the entrails of human misery taking their homes, businesses and resources for not paying back 'credit' loans amid the global financial catastrophe which Cult actions through idiot governments instigated. This is by calculated design, not random chance. This credit deception has been happening for many centuries and has led to the wealth of the world being stolen from the population by a microscopic few. Hence we have the 'One-percent'. Control 'money' (especially its theoretical creation



Figure 107: Control money in the world is currently structured and you largely control freedom by controlling choice. (Image by Gareth Jones)

in the form of 'credit') and you control choice which means you control freedom or rather delete it. Freedom is the ability to make choices and in today's Cult-created structure of human interaction 'money' (who has it and who doesn't) dictates who has choice and who doesn't ... who has freedom and who doesn't (Fig 107). Ponder that in the light of the events of 2020. Choice-dictatorship is enforced by banks and

other financial money-controllers such as hedge funds and private equity operations. We return to love and the absence of it. Could anyone coming from a place of love ever conceive, let alone impose, such a system of financial control purely for personal gain, power and omnipotence? Empathy would prevent them. Could they throw families onto the street for the inability to repay loans of 'credit' that do not, have never, and will never exist except as a concept? Could bankers even do this to families in properties the bank did not lend 'money' to buy? This happened to so many after the crash of 2008 when banks and corrupt court systems forged documentation to secure eviction from homes with which they had absolutely no contractual connection. Love would never and could never do that. Psychopaths (the absence of love) most certainly could and get a sexual high for doing so. Here we have a very pillar of human control – the financial system dictating choice and thus freedom – which is built from its foundations on the absence of love.

Designer 'love'

Then there is what I call personalised or designer 'love' when you have genuine empathy with those around you like family and friends while not extending that to anyone beyond that circle. You see this when those with family or other connections attract empathy for their plight while

those being bombed on the other side of the world do not. I have seen the 'love your family' mindset cheering or even demanding the mass bombing of other families far away just as I constantly see anti-haters seeking to crush and destroy those they don't agree with. These are all examples of designer 'love' which basically means 'loving' only those close to you or those that think like you do. This is not Infinite Love. It is finite illusory love. Religion is a most potent example in which there is (illusory) 'love' between fellow believers and hostility for those that worship another version of "God" through some other ritualistic label. India and Pakistan are centres for mutually-hostile religions that dictate who you must love (in theory) and hate. I say in theory because if you 'love' people identifying with one label and hate those of another then you don't love anyone in its real sense. How can we truly love if we don't grasp what love is? We can track designer love and empathy into sport where some people following one soccer team hate followers of another for the blasphemy of supporting the 'wrong' group of players kicking a bag of wind about trying to direct it into a net, I am not knocking football as a form of entertainment – I used to be a footballer. I am saying we have become so caught in the illusion of human life that we decide who we like, love and hate, on the basis of what colour shirts we cheer? I live not far from two football clubs on the English south coast, Portsmouth and Southampton, which require a big police presence when they play to deal with the fact that many supporters of both sides hate each other. Why? One group supports Portsmouth and the other supports Southampton. Er, that's it. I don't support either club and yet if I went to one of their matches I could decide which group loves me and hates me simply by wearing a scarf in the colours of one of

the teams. What madness (Fig 108). The absence of love tends to trigger madness (extreme imbalance) because love is balance – the balance of everything.

Whenever there is imbalance, and human society is often at the extreme end, the way to rebalance is always love. Take any situation of conflict, violence and discord (imbalance) and an infusion of love will turn it around – rebalance. We can observe the



Figure 108: Entertainment – yes. Everything else – illusion.

imbalanced madness that only love can heal in the endless wars between factions of the human family. We are points of attention in the same

stream of Infinite Awareness and in the illusion of separateness we fight and compete to reach some illusory outcome. We are eternally exploring forever *forever* and the 'baddy' today may be the 'goodie' tomorrow. There is no 'outcome', only current experience. Ponder on any 'outcome' and you'll see that it is only a temporary step to the next step ('outcome') which is a temporary step to the next step ('outcome'). There are no 'outcomes', only experiences following each other like waves of the ocean. Oh, but I must 'get somewhere'? I must 'be someone'? You are *already everywhere*. You are *already everyone* and everything. You may like to experience something, but that's not the same as feeling the need to 'get somewhere' and 'be someone' when you are *already everywhere* and everything. People are so busy and focused trying to 'get somewhere' and 'be someone' that they miss the experience of the only moment that exists – the NOW. We miss what is happening NOW when our perception is enslaved in the illusory 'past' (regret, resentment) and pulled into the illusory 'future' (I gotta be someone, I gotta get somewhere). The loss of this understanding – the systematic loss thanks to the Cult – is indivisible from the absence of love through which expanded awareness speaks to us. It is true that we can't be all things to all people and it is understandable that we feel the closest connection to those literally closest to us. That doesn't mean we can't have empathy with those outside our circle and care about the freedom, justice and plight of others though we may not know their names. I have heard the term 'compassion fatigue'. Compassion is love and love knows no limits and certainly has no fatigue. We can love and care for our families and still stand up for people far away of different races, religions and colour of face. Martin Luther King said:

Injustice anywhere is a threat to justice everywhere. We are caught in an inescapable network of mutuality, tied in a single garment of destiny. Whatever affects one directly, affects all indirectly.

This is indeed literally true on multiple levels of reality. When you strip away the illusions and the labels that underpin those illusions what is left is the understanding that we are all each other – points of attention in the same infinite flow of consciousness having a brief experience called 'human'.

Source of love

The love that I am describing is more than empathy and compassion. It is *everything* and I mean *everything* that we need to transform a prison to a paradise. Love is the very fabric of existence. Much of humanity has been disconnected from its influence by a malevolent network which is a Death Cult because it has *itself* been disconnected from the influence of

love for longer and more profoundly than anyone. To understand this disconnection we come back to *The Void, The One, The Source, The All That is in Awareness of Itself* – whatever term you wish to use. Some will prefer 'God', but that has become so discredited by religion that it has no meaning to me. I say it's a grotesque misrepresentation of reality to identify *The One* with the angry, bloodthirsty 'God' of the Old Testament; the 'God' that would sacrifice his 'son' on a cross in the New Testament; or demand the beheading of 'infidels' in the extremes of Islam. Religious fantasies have served the Cult agenda magnificently in replacing the source of love in the human heart with a mythical 'God' of violence, imposition and self-obsession which religious factions can claim for their own. Factions following this hideous version of 'God' can then be manipulated into conflict and battles for supremacy that have plagued, divided and ruled humanity for so long. I have been writing for decades that the Cult was the force behind the creation of religion and we can also understand why the Cult installed a God-free version of mainstream 'science' to dominate the perception of reality in most of those who reject overt religion. Either way, *The One* has been written out of the script and this has been vital for the Cult's absence-of-love agenda to block the influence of *The One* on human perception and behaviour. I have described my own experience of the 'Dazzling Darkness' of silence and stillness from which 'Creation' emerges from the *All Possibility of The One*. Creation is the realm of frequency and vibration while the Creator is stillness and silence. The foundation of all existence is the *All-knowing, All Possibility, of stillness and silence* while sound and form are only possibilities within *All Possibility*. People experience stillness and silence in states of deep meditation through which they can access 'knowingness' – the *All-knowingness of The One*. 'Quiet contemplation' is a similar experience and we speak of the stillness of the heart and a quiet mind. Some say that yoga and martial arts like Tai chi take them into quiet mind states. I call my own experience of this 'daydreaming' when I allow my mind to open and flow without the mind-chatter and focus of five-sense attention to keep the door shut. These states take me into the stillness and silence from which knowing emerges. Funny, when I saw the dictionary definition of daydreaming it offered an example of the term in a sentence: 'He never paid attention in class and seemed to be in a permanent daydream.' That was me at school to a tee and most of my life to this day. *The One* is the source of Creation, the observer of Creation and the experienter of Creation via expressions of itself like you and me and everything. As 'Shakespeare' (or whoever it was) wrote:

All the world's a stage, and all the men and women merely players; they have their exits and their entrances; and one man in his time plays many parts ...

The nature of those 'parts' is decided by the strength of connection we have with *The One* while we are 'on the stage'. These 'parts' are our 'persona' or actor's mask. When people think of 'God' they tend to look to the sky (the symbolism of sitting on a cloud). This is a trait that follows from a belief in all-that-you-see-is-all-that-there-is. If you think you can see all there is to see in the 'space' before you then 'God' must be 'up there' if you can't see 'him'. When by contrast you know that your range of sight is only a band of frequency that your Body-Mind can decode then the concept of 'God' moves from 'up there' to 'in here' – a force that shares the same 'space' that we do beyond our range of vision. *The One* is not 'up-there'. *The One* interpenetrates everything. From this perspective we can rightly say that 'God is everywhere' and 'love is everywhere'. Yes, they are. Love is everywhere because *The One* is the source of love and interpenetrates everything. Love as in Infinite Love and unconditional love that is.

The heart – gateway to *The One*

There is a level of Infinite Reality – including those in the Cult – which is the love of *The One*. Cult initiates have closed themselves off from its influence and so they behave as they do. Our prime connection (or disconnection) with *The One* while in Body-Mind experience is through an open or closed heart vortex, or heart 'chakra' (Fig 109). Not coincidentally this is the balance-point chakra in the main sequence of seven. We feel love in all its forms, even purely attraction love, in the centre of the chest and we hear this described in terms of 'I love you with all of my heart' and 'You make my heart flutter'. The heart chakra through which we can connect with the love that is *The One* is the origin for the symbolism of the heart representing love. This symbol appears to relate to the 'physical' heart when the real connection to love is through the spiritual or energetic heart ('heart of hearts'). Even so there is a pivotal link between the two with the wavefield heart (chakra) impacting on its holographic projection or 'physical' heart. When the heart chakra is closed or energetically stressed through extremes of grief this can so affect the holographic heart that people do indeed 'die of a broken heart'. From



Figure 109: The heart vortex in the centre of the chest – the gateway to 'hearts'.

this we can appreciate why, in a world awash with systematic, Cult-induced stress, frustration, anxiety and fear that heart disease is one of our biggest killers. Stress, frustration, anxiety and fear are all dense wavefields that impact on the heart chakra vortex – ‘my heart aches’, and ‘I have fear in my heart’. The language is peppered with sayings and phrases that tell the truth about the spiritual heart while appearing to pertain only to the ‘physical’ heart:

Follow your heart; listen to your heart; heart of gold; heart of stone; change of heart; heart-to-heart; lose heart; heavy heart; joy in the heart; tug on your heart strings; big heart; all heart; no heart; from the heart; heart goes out; heart in the right place; from the bottom of the heart; heart sinks; take heart; young at heart; sick at heart; goodness of the heart; have a heart.

We also speak of ‘hearts and minds’ and ‘heart and soul’. All these terms and many more reflect different states of the heart chakra and its connection, or disconnection, with the source of love – *The One*. We also speak of ‘hearts and minds’ and ‘heart and soul’. These describe profound truths in the sense that they say heart and minds, heart and soul. The heart chakra is our prime connection from Body-Mind to Soul and *The One*. When that is closed or diminished enough the influence on perception and self-identity of *The One* (love) consequently also diminishes and we become isolated in the Bubble of purely Body-Mind. As the Cult would say: *Gettin’*. Many people have a feeling of being ‘lost’. They have an emptiness they cannot explain and a yearning for something ‘missing’ that they can’t put into words. These feelings are widespread and come from the loss of a conscious connection through the heart to *The One* (Fig 110).

Love is more than human ‘love’

Think about love and most people will think about relationships in terms of true love, unrequited love, and so on. Love in the sense that I am describing – *The One* love – is far more than this and that’s another central reason why the Cult seeks to close our hearts. The heart chakra is our connection to *The One* and *The One* is not only the source of love as we perceive that word; it is All-Possibility and ... All-Knowing. Many ancient cultures considered the heart to be the connection to real intelligence, the Soul and the Source of



Figure 110: Open heart – opens to *The One*.

All That Is. If this is true then the heart must also be our connection to this innate or knowing *intelligence* and research is showing this to be exactly the case as I will shortly explain. We must first identify the massive difference between Body-Mind ‘intellect’ and the intelligence of the heart with its connection to *The One*. This can be defined by the gargantuan difference between thinking and knowing. Body-Mind *thinks* because it doesn’t know and has to try to work it out through information processing in the brain. Knowing does not originate in the brain. It comes from the heart and the connection to *The One*. Verbal language and phrases tell the truth about the heart and so does body-



Figure 111: The head thinks.



Figure 112: The heart knows.

language. When we say ‘I’m thinking’ we point to the head which is where the thinking is taking place (Fig 111); when we say ‘I know’ our hands go to the heart (chakra) where the knowing is coming from (Fig 112). Body is an extension of mind and what the mind is perceiving the body is doing. Body-language can therefore discern a person’s mental and emotion state. Knowing is also called intuition which doesn’t think – it *knows*.

When we intuitively know something we haven’t spent hours working it all out with the brain. It comes to us in an instant in one whole without a sequence of thoughts or dots leading to a conclusion. We say: ‘I don’t know why I know, I just know.’ Isolated Body-Mind wants all the details and the research papers to ‘prove’ what you ‘know’. People talk about something being ‘counter-intuitive’ when what they really mean is counter-programmed-perception.

Prison of the intellect

Human society celebrates the intellect while sneering expanded

awareness of which the intellect is only a fractional part. It follows from this that professional 'sceptics' who demand five-sense 'proof' for everything are utterly dominated by the intellect. An example is the intellectual humanist movement which is founded on a belief in this-world-is-all-there-is with no continuation of consciousness. Humanism is defined this way by the *Covine Routledge Encyclopedia of Philosophy*:

... a commitment to the perspective, interest and centrality of human persons; a belief in reason and autonomy as foundational aspects of human existence; a belief that reason, scepticism and the scientific method are the only appropriate instruments for discovering truth and structuring the human community; a belief that the foundations for ethics and society are to be found in autonomy and moral equality ...

Mainstream science and academia as you would expect are overwhelmingly directed by this mentality that cannot perceive beyond the five senses. How can you discover something when there are colossal areas in which you refuse to look? The foundation of five-sense intellectualism is the concept of 'reason' which is believed to be the arbiter of truth by mainstream science, academia and The System in general. Yet most of what is called 'reason' is only perception derived from limitation of awareness – ignorance – that comes with a closed mind. Mainstream Everything a version of 'reason' includes 'rational' and 'logical'. Their dictionary definitions reveal the perceptual feedback loop that maintains the state of ignorance: Reason is defined as 'to determine or conclude by logical thinking'; logic is 'a system of reasoning'; and rational is 'based on or agreeable to reason'. What is reason really? It is a process of assessing information on the basis of perceived (programmed) credibility and fact to reach a conclusion about how things are. The credibility and limitation of your 'reason' depends purely on how wide you are prepared to spread your explorational net. If it is only cast within the imposed Postage Stamp 'normal' you will get Postage Stamp 'reason' that can be, and invariably is, a load of old tosh (Fig 113). 'Reason' of this kind brings perceptual enslavement and never enlightenment. Blaise Pascal, the 17th century French philosopher and mathematician, said: The end point to rationality is to



Figure 113: The human perceptual illusion

demonstrate the limits of rationality.' It takes those with open minds and expanded awareness to see what these limits are and to go beyond them. Here's an example from a Central American shaman:

We are perceivers, we are awareness; we are not objects; we have no solidity. We are boundless ... We, or rather our reason, forget this and thus we entrap the totality of ourselves in a vicious circle from which we rarely emerge in our lifetime.

These are perceptions that come when you step off the Postage Stamp of 'rational' and 'reason'. This is why Cult-created 'education' teaches children and young people throughout their entire formative years the myopic illusion of mainstream 'reason' that entraps the totality of themselves in a vicious circle from which they rarely emerge in their human lifetime. Limitations of mainstream science in grasping the nature of reality mean that once again if it can't explain intuition from a five-sense perspective then it can't exist or be happening. Open your mind a few notches and it can be explained. Intuitive knowing comes from a heart connection to expanded awareness and The One and through wave connections to other fields of information. The latter can be a wave frequency connection to a loved one which allows you to know what is happening to them and a similar connection to wavefields that we experience as events and happenings, current and 'historic'. People and situations are all wavefields that connect with The Field and through this conduit we can attune with that information in The Field, the energetic sea or Cosmic Wi-Fi, and access awareness in the form of 'knowing'. We are told it is a mystery why animals can sense when an earthquake or bad weather is coming despite the lack of five-sense evidence. It's not a mystery. Animals that don't go to school, watch the media or have a Smartphone retain their natural sensitivity to changes in The Field which all humans are supposed to have. They sense wave disturbances in the Field that indicate trouble coming and take evasive action where possible. What is this except a form of 'intuition' or 'knowing'? My books since the early 1990s are packed with information that has subsequently happened or is happening. Until the mid-90s I would research five-sense information and come to conclusions about what was going on. Since then I have intuitively known what was going on and the five-sense confirmation in the form of facts and research have followed. Had it been the other way round I could never have connected the dots over such an array of subjects. It's the knowing that connects the dots and five-sense research that adds the detail. Studies by the HeartMath Institute in the United States that researches the nature of the heart and heart chakra have shown that when someone is in heart-mind balance enormous creativity can be unleashed and that must be so. Open

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hearts in energetic harmony connect with the flow of *The One* which is ... All Possibility and so all creativity. Closed hearts do not (Fig 114).

No worries, mate

Another aspect of Infinite Love accessed through the heart is that it isn't burdened, blocked and

limited by fear. Humanity is so often frozen by fear – fear of losing, of winning, of failing, of consequences, of death, of the unknown, of what others think. The list could go on for pages. Fear is the bottom-line of how the Cult controls and direct billions worldwide (pandemic hoax, I rest my case). We are given endless reasons to fear and to fear each other. Every day there seems to be something else we are told to fear. Once it was fear of not finding food or an enemy coming over the hill. Today the list seems to be without limit – fear this, fear that, fear everything. We have the term 'culture of fear' to describe the manipulation of fear to secure control. Fear in totality leads to people looking to authority for protection from what they fear while fear of each other is the constant creator of division and conflict. The Cult wants the global population to look to its police state for protection and in doing so to accept the ever-increasing imposition of the Cult. What happened on 9/11 and in other Cult-orchestrated terror attacks is designed to manipulate people to demand, or at least not challenge, the erosion of their own freedom in the name of protection from 'terrorists'. These 'terrorists' invariably turn out to be controlled by the same force that is imposing the new laws to 'protect us' from them. I coined the term 'Problem-Reaction-Solution' (PRS) to describe this technique of covertly creating a problem, getting the public response of 'do something', and then overtly offering the (Cult) 'solution' which changes society in the way that you want. The virus hoax is a glaring example which I will explore in detail later. There is another version that I call No-Problem-Reaction-Solution in which you don't need a real problem only the perception of one – 'weapons of mass destruction' in Iraq and once again the virus fraud. See my book *The Trigger* for a detailed exposure of this with regards to 9/11 and what it has been used to justify ever since. The key element in PRS (or 'false



Figure 114: Closed hearts got us here. Open hearts will take us home. See Neil Hughes colour section.

flag') events is to instil fear in the population which then makes them open to the 'solution'. It is well-known in mind-control circles that fear and trauma makes people more open to hypnotic suggestion. Every day the media is brimming with reasons to fear including fear of each other. This is essential to securing mass control by setting the population at war with itself. The sense of division is crucially underpinned by the perception that our five-sense labels are who we really are. When we open our heart to the flow of Infinite Love and expanded awareness from *The One* our perceptions transform and these Cult techniques no longer work. We are not diminished by fear when Infinite Love knows there is nothing to fear. Whatever is currently happening is only a brief experience for Body-Mind while the True 'I' is observing the experience with the potential to change it. Infinite Love – *The One* – will always do what it knows to be right and no amount of manipulation, fear of consequences or anything else will make any difference. To consider the possibility of not doing what you know to be right is to consider the consequences for doing what you know to be right. Infinite Love will never do that. I have never feared and will never fear what might happen to me for doing what I know to be right. More than that I know that if I flow with my heart such consequences will not manifest anyway. Only if I feared them could I attract them through wave entanglement. People are described as having a 'faint heart' when there is no such thing. A 'faint mind', yes, but the heart in its power is never 'faint'.

Love in its true and infinite sense is how we connect with expanded states of awareness, innate intelligence, wisdom, knowing, intuitive insight, courage and that which is beyond courage – the absence of fear. In fact fear is merely the absence of love when love in its purest and most powerful state is the absence of fear. What is the world of today and a long time 'past' except the absence of expanded states of awareness, innate intelligence, wisdom, knowing, intuitive insight, courage and that which is beyond courage – the absence of fear? All these are aspects of Infinite Love flowing from *The One*. There is an absence of love in human society, but that doesn't mean 'non-existent' and far from it. We witness amazing acts of empathy and compassion in examples of personal and collective love. We see them in courage and self-sacrifice and they offer an insight into the Infinite Love that I am describing. Such acts are not the norm, however, and 'it's not my problem' is a far more frequent response. It is also true, and with profound consequences for human wellbeing, that such acts of love are most rare in the seats and positions of economic, political and administrative power. The Cult has made certain of that and this must change if its goal of total human control is to be thwarted. That endgame is not even decades away as things stand and it most urgently needs to be rolled back. (I wrote that and 85 percent of this book before the Cult

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seized astonishing levels of global power through its manufactured virus scare). To impose its control the Cult must maintain the delusion of apartness to allow divide and rule to run riot. It is in our power any time we choose to bring down those walls of illusion and see the truth on the other side – the truth that we are all love and always have been despite often wearing heavy disguise. We have forgotten and been encouraged and manipulated to forget. What has

followed is a world that reflects this amnesia, but now there is a stirring in the hearts and minds of forgotten love. Many are remembering and the more that do so the quicker the illusions will fade and fall and a new reality must form from this new collective perception based on the understanding that we are each other (Fig 115). Love is who we are. The absence of love is where we are. So what is The Answer? The question answers itself!



Figure 115: Why judging people by their temporary and illusory labels is so crazy.

Science of love

The HeartMath Institute was launched in California in 1991 to study the impact of the heart on human behaviour and psychological wellbeing along with much else. The Institute has since published a considerable body of information to confirm that the heart is far more than it appears to be. More than that the chakra heart and 'physical heart' are the central core of human psychology, perception and health (harmony) in all its forms. If heart energy (love) is flowing in harmony all is well and when it's not the trouble starts in many and various ways. Love is in one aspect the balance of all things and you would expect HeartMath research to confirm that when the heart is open to the flow of love this brings balance to the systems and information processing of Body-Mind. We are told that the brain is the governor when in fact it is the heart which communicates its balance or imbalance to the brain to process as perception. When I talk of the heart in this context I am referring for simplicity to both the chakra heart and its holographic 'physical' projection with the chakra heart the key to it all. HeartMath research has established that when the heart, brain and central nervous system are in

harmony, or 'coherence', the person enters an expanded state of consciousness and the opposite happens when there is disharmony or incoherence. I say this happens because the connection via the heart to the Soul and The One ceases to communicate the true magnitude of its awareness, innate intelligence and balance (love) to the systems, psychological and 'physical', of Body-Mind. Other studies reveal that with heart-mind harmony we enter states of consciousness known as 'non-local' or 'outside the bounds of time and space'. Isolated Body-Mind lives in its Bubble of 'time' while the heart lives in the NOW. People also think with more clarity with heart-mind balance. Energetic distortion and chaos that results from heart-mind imbalance (like trauma and stress) stops them from 'thinking straight'. For obvious reasons the Cult does not want its targets to be influenced by The One through the heart connection and seeks to isolate human brain perception (in the world and of the world) from heart perception (in the world, but not of the world). These two perceptual states are so immensely different. The Cult's *modus operandi* is to structure human society to ensure maximum fear, stress, anxiety, depression, hatred, regret, resentment, inner and outer conflict etc., or what I call low-vibrational emotion. This can also be accurately described as

disharmonious and incoherent ongoing emotion that I have seen referred to as 'white noise emotion' which is always there in the background. HeartMath studies have confirmed that this creates incoherence in heart-brain-nervous system communication and suppresses expanded states of consciousness (Fig 116). These in a state of energetic

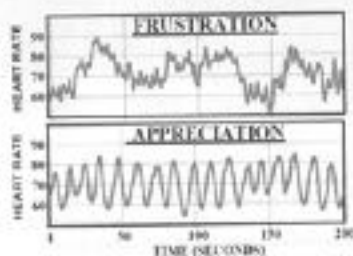


Figure 116: Different mental and emotional states create frequency coherence and incoherence – connection and disconnection into expanded awareness.

incoherence withdraw perceptually into the Bubble. The more fear, stress, anxiety, depression, hatred, regret, resentment, inner and outer conflict, the Cult can generate the deeper perceptual enslavement will be as people are entrapped in the illusions of the five-senses. Heart-mind coherence or incoherence has a central impact on psychological and 'physical' health.

HeartMath researchers speak of 'bio-communication' or energetic

transfer between open hearts. I am calling this wave entanglement. Heart waves (love, harmony, Soul, The One) connect with like waves in others to establish a Oneness connection of perceptual unity. This happens between people; people and animals; and people, animals, and the 'natural world' (Fig 117). When heart waves are weak or incoherent the perceptual unity of Oneness is lost to the domination of brain wave connections which, without the influence of the heart, present everything as apart from anything else (Fig 118). You can see from this even more profoundly why the Cult targets the heart.

It can't directly affect love in its true sense flowing from The One through the heart. The frequency is so high that Cultists and their non-human masters can make no connection. They behave as they do because they have closed themselves off from its influence and are thus described as being 'heartless' and from the 'dark side'. Even so they are still expressions of The One that can return to perceptual unity whenever they make that choice. While they are currently the 'buddies' in the stage show there's another costume waiting for them to play another part. As things stand, given their inability to affect love directly, they must work to block its influence on their human targets. They do this by manipulating human life to generate maximum low-vibrational emotion which closes the heart chakra channel and creates energetic distortion and incoherence between the heart, brain and central nervous system to isolate Body-Mind in the Cult's perceptual fair. Crucial to this is securing mass ignorance of true identity. Once that veil lifts we have the power to



Figure 117: Heart consciousness connects and sees everything as One.



Figure 118: Heart consciousness disconnects and sees everything as apart from everything else.

reconnect through the heart with our Soul and The One and for the Cult the game is over. We then speak and act from the heart and not only Body-Mind. With that everything changes. Once the heart opens to The One you see the unity of everything and not apartness. You see the experience of individuality and also the infinite stream of consciousness which connects us all. You see that judging people by their race and labels is so ridiculous and no one does this more obsessively than 'anti-racists', ironically. I can speak from personal experience. My conscious 'awakening' in 1990 and 91 began the process of opening my heart triggered by the kundalini experience. From that moment, and ever more as it has progressed, I have seen the connections and unity (The One) that join all the apparent dots (people, experiences, everything). Heart-opening does not mean you suddenly start acting 'perfectly'

(what is 'perfect' anyway?). It means you start to be influenced by something greater than only Body-Mind and your state of awareness expands. As this progresses you see that the dots are only different points of attention and awareness within a unified whole (Fig 119). Opening your heart doesn't mean we never regress into isolated Body-Mind mode. Instead this becomes



Figure 119: 'Focus' is a point of attention focused within a tiny band of frequency, but we can also open our minds to connect with expanded awareness and see our reality from a very different perspective. (Image Neil Heggie.)

rather the more your heart enters the formulation of perception.

Follow your heart

What changed my life more than anything came in the early 1990s. I decided that when my heart and head (intuition and thought) were at odds I was always going with my heart/intuition. The decision got me into some interesting situations, experiences and scrapes, including mass ridicule, and the brain screams: 'See what happens when you don't listen to me!!' Brain-heart conflict blights the life of almost everyone to some extent with their different ways of seeing the world and making decisions. Most people go with their head ('use your head') when their heart/intuition is urging another direction. Heart doesn't see reality and situations like the head. It has another perspective on life from a state of

expanded awareness not confined to the perceptual 'norms' of human Body-Mind society. Follow your heart and you start acting differently to Postage Stamp normal which still the great majority believe (thanks to head perception) to be 'the real world'. I took the consequences of that in historic levels of ridicule. Fortunately, I'm a stubborn bugger when I choose to be and I wasn't budging and being absorbed back into the flock. I decided to stick with it and something amazing eventually happens. Your head perspective sees that while following heart intuition can lead to challenges it all works out in the end – and not despite the challenges but because of them. Our greatest gifts are often brilliantly disguised as our worst nightmare. Mass ridicule was the making of me however unpleasant it was to experience. My head (limited awareness) didn't know what was happening; my heart (expanded awareness) most certainly did. Body-Mind can see to the next turn in the river. Heart can see the whole river from source to sea. Consciousness with which my heart was connecting, and urging apparently strange courses of action, knew that my life would later involve communicating information like shapeshifting people that would attract bucket-loads of ridicule and abuse. For me to put myself through that any concerns about what others thought about me or said about me had to be deleted. Mass ridicule appeared to be a nightmare in the experience when it was really a gift to set me free. Such is the difference in perspective of the head and the heart. The head reacts to every happening. The heart plays the long game. For decades now my heart and head have worked in unison and when my heart says do this, go there, my head says 'Okay, let's go'. The war is over. Heart and mind become one. Almost everyone starts out in unconsciousness once The System kicks in and the pressure to stay there until the hearse rolls up is 24/7 incessant. No wonder we spend so much of our lives, even all of it, in the Bubble; but we don't have to. We can all open to expanded awareness any time we want – it's our natural state – and that's especially so when the 'how' is known (Fig 120). I'll come to that in the final chapter and it's far simpler than many believe it to be.



Figure 120) the Bubble seems to make sense until it bursts. Then the 'real world' within the Bubble appears as it really is – banal.

Heart-Brain-Belly

From this background I was not at all surprised to discover that major perception-dictating heart-brain connections have been identified through scientific research and study. Mainstream science has long believed that the brain is the brain and the heart is the heart in another example of the illusion that follows from seeing everything as apart from everything else. The brain has been thought to be the dominant processor of perceptual information when in fact the heart is far more influential than previously believed in the modern era. The heart projects the body's most powerful electromagnetic field, 5,000 times more powerful than the brain field, and the heart field can be measured several feet from the body (Fig 121). You would expect electromagnetic waves to be most powerful from the source of most expanded consciousness. The heart is the body's biggest source of bio-electricity –



Figure 121) The heart field is the most powerful electromagnetic field in the body.

up to 60 times more than the brain. Far more communication is passed from heart to brain than in the other direction and the heart is the only organ that can independently send information to the brain. The heart can also act independently from the brain and has its own long and short term memory and nervous system. Sixty-seven percent of heart cells are

nerve cells (neurot communicators). It has some 40,000 neurons and a network of neurotransmitters which led to the term 'heart-brain'. Research has revealed how the heart receives information before the brain and transmits this with its own perception to different parts of the brain which, in turn, communicates its coherence or incoherence back to the heart in a feedback loop. The heart can open the mind and the mind can close the heart. Communications from the heart have particular influence on the frontal areas of the brain that process thinking, reasoning, speech and language, coordination, distinguishing objects, long-term memories, empathy (of course), personality, attention and motivations. The frontal lobe also relates to seeking reward and the brain-chemical dopamine which is mercilessly manipulated by social media platforms such as Facebook (more later). Heart communications have immense influence on the perceptual systems of the brain when they are working in harmony or coherence. These interactions are distorted when the connection is weak or in a state of disharmony.

An open heart and open mind produce a communication feedback loop in which both work and perceive as one. Divisions between brain and heart lead to the contrasting perceptions of 'What does your head say?' and 'What does your heart say?' There are other perceptual connections to the emotional centre in the abdomen which leads to 'What does your gut say?' and 'What is your gut instinct?' When heart, brain, gut and nervous system are communicating in harmonic coherence it becomes: 'What do YOU say?' Unity and Oneness we have left off. The gut, heart and brain are connected by the vagus nerve which is the longest and most complex of the cranial nerves that emanate from the brain. 'Vagus' comes from a Latin word meaning 'wandering' which describes its nature and function. Both the vagus and the gut are far more important to human psychological and 'physical' health than most imagine and the source of energetic power – 'fire in the belly'. This is also sabotaged by low-vibrational emotion which we feel in the gut through the belly chakra. You see people with 'beer gut' bellies, but at the same time you see the same extended bellies with spiritually-developed people in the East who don't drink beer. To them the belly is the location of the energetic power and point of perception they call *hara* or *tanden*. A six-pack may be the state pursued for ascetic reasons, but is it best for *hara*? Many people who study these subjects say no. We are ideally looking for a harmonious connection between heart, gut, brain and nervous system to be truly in our power. No, I'm not saying we should drink lots of beer. There is the beer gut and the *hara* gut. They are not the same. The HeartMath website says of the heart-brain connection:

Research has shown that the heart communicates to the brain in four major ways: neurologically (through the transmission of nerve impulses), biochemically (via hormones and neurotransmitters), biophysically (through pressure waves) and energetically (through electromagnetic field interactions). Communication along all these conduits significantly affects the brain's activity.

Heart is love which is balance and waves from an open heart can balance all other systems, mental, emotional, 'physical', whatever, and ensure a harmonious connection to the consciousness field of the Earth which leads to a harmonious interaction between humans and nature (Fig 122). This balance is reflecting the unity, harmony and Oneness that is love and *The One*. I have said there is no imbalance or conflict that an infusion of love cannot harmonise and that includes the mental, emotional and biological systems of Body-Mind. The heart balances emotions through its connection to the emotion-regulating amygdala in the brain and the release of hormones. It becomes clear through this central connection between emotion and the heart why stress is such a



Figure 122: The Earth's magnetic field and the body field again reflect the holographic principle.

cause of heart disease (imbalanced wave entanglement and a closing heart chakra impacting on the 'physical heart'). The oscillation of heart chakra energy, the body wavefield and electrical rhythms of the holographic heart are all connected. Wave imbalance from the heart chakra is transferred to the 'physical' heart, but when the chakra opens to love the more

powerful and balancing are the energies we exchange with Body-Mind and its emotional processes. Studies have shown that the heart's feedback loop with emotional states profoundly affects the nature and power of the heart's electromagnetic field which is diminished by low-vibrational emotion and empowered by others such as love, appreciation, compassion, empathy and joy ('I have joy in my heart'). We feel fear and anxiety in the gut while love, appreciation, compassion, empathy and joy are all 'heart-felt' emotions. This is one more reason for the Cult seeking to generate low-vibrational emotion to close human hearts. Heart waves can be so drawn into energetic density that we have the phrases 'closed heart' and 'heart of stone' which Cultists seek to manipulate to make humanity the same as them.

Heart is our access point to wisdom – the wisdom of expanded states of consciousness – and wise is the last thing the Cult wants humanity to be. Wisdom sees through the illusion. What is called heart-based living leads to wisdom, intelligence and clarity of perception through connection to expanded awareness and balance between heart, body and mind. I would add a warning here, too, though. I have observed many who believe they are heart-based and advocate the findings of HeartMath research that are certainly not street-wise about the world. Many are in denial of the Cult agenda and avoid exploring information they believe to be 'negative'. I witnessed this in the movement dubbed 'New Age' where I saw the same denial masquerading as being 'positive'. The Cult is quite happy for people to live in their own 'be positive' bubble so long as it allows the Cult free-reign to go about its business unopposed of manipulating the population into anything but heart-based living and 'positive emotion'. The 'spiritual' is a sitting duck without having the streetwise to watch its back. There is nothing more manipulatable than naive genuineness. There will be many 'heart-based' people who express compassion for the Earth by supporting action on

human-caused climate change and the centralisation of power to 'save the planet'. This is, however, a Cult-created hoax to justify that very centralisation of global power. There is far more to the heart than just 'positive emotion'. We must be aware of reality and of that which works so hard to stop us being aware of reality. Ignoring the latter is not wisdom, heart-based or otherwise. It is denial. You don't have to be 'negative' to face reality so we can deal with it and know how the game is being played. Those truly in their hearts can disseminate unpleasant information without being affected in the sense of allowing this to disrupt their own fields and flows. How does *The One* observe such 'negativity' and not be pulled into it? The principle is the same. Since when was knowledge about anything at all 'negative'? Knowledge is not 'good' or 'bad', 'positive' or 'negative'. The way it is used, processed and dealt with is what matters. Love is intelligence – all intelligence – and not only the bits that suit us.

From the start

Love and emotions of the heart – or lack of them – can have a profound impact on babies in the womb and after birth. I read the book, *Why Love Matters*, by the British psychotherapist Dr Sue Gerhardt who documents the connections between the emotional environment and the development of the unborn child with especial emphasis between conception and two years. It is sobering to see images of a child in the womb jumping with shock at parents shouting at each other and there are some cultures which have understood this since ancient times. They demand that no one raises their voice and people remain calm around a pregnant mother. Gerhardt quotes a description of pregnancy in Patagonia in South America:

While a female Patagonian is with child, all disagreeable objects are kept from her; she is avoided by male; they study to divert her with amusements most suitable to her taste; her mind is brightened with joy; without allowing her to grow slothful for want of action ...

Sue Gerhardt explains why this is considered important. She describes how the child's brain systems are developing in the womb and are affected by the mother's diet and emotions in the form of biochemicals circulating in the mother's body. The nature of those emotions can seriously impact on the way the child's systems develop and they can open pathways that later lead to susceptibility to conditions such as 'anorexia, psychosomatic illness, addiction, antisocial behaviour, personality disorder or depression'. Gerhardt points out that stress in the mother can release certain chemicals in the womb that can produce a propensity for a pot belly later in life (a lot of which is unprocessed

stored emotion around the emotion chakra). The child's environment before birth is showing the child what to expect and its psychological and bodily systems develop in line with that. Gerhardt calls this 'weather forecasting'. I say the child's pre-birth and post-birth parental environment and relationship is also one of wave entanglement and the kind of waves being transmitted are triggering in the child through epigenetics which gene functions are activated and which are not. Gerhardt points to the period from conception to two years as 'uniquely significant' because this is when 'the nervous system itself is being established and shaped by experience'. She continues:

During this period how parents behave has as much influence on their child's emotional make-up as his or her genetic inheritance. Their responses to the baby teach him what his own emotions are and how to manage them. This means that our earliest experiences as babies (and even as fetuses) have much more relevance to our adult selves than many of us realise. It is as babies that we first feel and learn what to do with our feeling, when we start to organise our experience in a way that will affect later behaviour and thinking capacities.

You can see this learned behaviour in the response of parents to a child falling over. If you make it a big deal the child will follow that cue and cry. Children scan the faces of their parents for guidance on how to respond. If you act as if it's no big deal the child will get up and carry on as if nothing had happened. I have witnessed this with my own children and Gerhardt describes how 'faces with expressions of fear and anger will be registered ... and provoke an automatic response'. The Cult knows how a child's emotional environment locks in brain and emotional pathways that can affect their responses and interactions for



Figure 123: Why children and young people are so targeted by the Cult – they will be the adults of tomorrow that they want to enslave like never before.

the rest of their life (Fig 123). It doesn't want emotionally balanced and heart-centred people. They are far more difficult to divide and rule. The Cult financial system and Cult agents and gofers in government make life for parents as hard as possible to make the child's formative years as stressful as possible. Parents stressed, frustrated, anxious and fearful about paying the rent and affording food are

dumping that emotion on their children with all the potential effects that Gerhardt lays out. The saying goes: 'Give me a child until he is seven and I will show you the man.' Many career mothers continue their stress-ridden lifestyle right up to birth and then continue as soon as possible afterwards. What does that do to the child? The Cult, as I have detailed in other books, was behind the rise of feminism to pressure women into careers when they would otherwise be at home with their children in the vital early years. The idea was to disconnect parents from their children for all the reasons detailed here and to be able to tax two people in a household instead of just one. I am not saying that women should not have careers. That's none of my business and of course it is right that women have sought to free themselves from a male-dominated society. The Cult is expert in piggy-backing on legitimate grievances and twisting them to its benefit. I am only pointing out the downside when children are young and emphasising that the Cult is seeking at every opportunity to divide parents from their children so the state can control their formative years. This has now become ever more extreme with parental rights being eroded in every direction through dictatorial schools and satanic-like social services literally stealing children from caring parents for the most spurious reasons. This is happening all over the world because it's a global Cult agenda. What does being wrenched from loving parents do to a child? We will see later in the book where this is meant to lead.

Back to love

Sue Gerhardt notes that babies are born with a brain only a quarter the size of an adult's and much more incomplete than other mammals: '... Human care in early childhood (and beyond) plays a much bigger role in shaping the brain.' The Cult is aware of this and sets out literally to mould the minds of children to become the adults it wants them to be. Many parents have no choice except to keep working to pay the bills and this is not to cast blame on parents trying to financially survive and do their best for their children. The system is against them – on purpose – but we should not forget that studies have concluded that parental hostility affects the emotional development of a child more than poverty. I often wonder why some parents even have children at all when I see the lack of love and care they have for them. Rich families send their children away to residential private school from an early age and what message does that give them with regard to love and rejection? These are the kids that mostly grow up to run The System after a childhood that closed their hearts to survive emotionally. Can I come home this weekend, daddy? Not this time, son, I'm playing golf. Such parents see their kids as appendages and not as unique expressions of life – 'My children spent childhood prepping for exams and got a place at Oxford;

I'm so proud they did what I told them.' Their childhood is stolen and their future decreed – you'll be a lawyer, banker, politician – by parents who exploit their children to be a symbol of their own perceived 'success'. Whenever you hear 'I only want the best for you' it usually means 'I only want the best for me' or 'What I say is best'. Don't stand for it, kids. Be what you choose to be. I have met many people over the years brought up this way and they are emotionally broken despite the outward facade. Most of them then treat their own children the same by sending them to residential schools when love is all they need. Well-off parents often say they give their children everything they want – money no object. What is missed is the key gift that money can't buy and doesn't have to because it's always available for free: Love.

Other children are told they are stupid, useless and idiots by parents who couldn't give a shit. The imprint can last a lifetime. Children are far more suggestible in their formative years and the Cult targets the young to 'suggest' what it wants them to believe for their entire lives. A teacher told me how he went to the home of a 'problem child' at school and found both parents in a pissed-up coma while a toddler played with their empty bottles. No wonder the kid was a 'problem child'. The emotion-processing amygdala in the brain which regulates pain, pleasure, fear, anger, grief and joy is formed within 15 weeks of conception and is affected by the mother's emotional state in that period and beyond. Once an emotional pattern is encoded it can produce 'press enter' reactions in which a stimulus (experience) triggers the same recurring response. As a result many who have never experienced the full joy and bliss of the heart define their state of happiness by their level of unhappiness. I am less unhappy today so this must be what happy feels like. Children tend to have fluid emotions in which they can switch from tears to laughter in seconds while the older people get the more the patterns are entrenched and emotional states can last for hours, days, weeks or even the rest of their life. Sue Gerhardt writes that 'a mother who has high levels of anxiety or depression ... is more likely to have the kind of baby who finds it hard to cope with stress or new stimuli and who takes longer to get over stress'. She adds:

Even, as a newborn, her baby may be more fearful, and is more likely to have higher than average cortisol [stress hormone] levels at the age of four months. At worst, babies ... are more likely to grow up with behavioural and emotional problems ...

The opposite has been found to be the case when children enjoy a heart connection with their parents and environment and this is possible even with two working parents. Negative emotional effects are also reversible when love comes into play. Gerhardt points out that '... if love

can be found, it still has the power to shape a new reality.' Children (like adults) crave a heart connection. A baby's heart beats before the brain is formed and a mother's brainwaves have been shown to sync with a baby's heartbeat in the womb. The nature of that connection is so vital to the life experience of a still-unborn child. Whenever you look love is *The Answer*.

Water tells the story

The impact of heart and brain waves has been clearly demonstrated by their effect on water. A team at the Aerospace Institute in Stuttgart, Germany, developed a means to photograph information in droplets of water. In one experiment they asked people from the locality to take four droplets from a communal tank and put them in a dish with their name on. The team then used their technique to photograph the droplets and discover that each set was unique from all the others and each drop in the sets of four was virtually the same (Fig 124). The simple act of a person taking a droplet from a tank and placing it in a dish had imprinted their own unique energetic signature on the water. Such is the interaction we have with The Field and each other. HeartMath research discovered that a person's heartbeat can be detected in water and given that the body is 80 percent water (a wavefield in its base state) we are exchanging heart rhythms all the time even on that level. The PH (measure of acidity) in water has been changed in experiments purely by someone focusing that intent (making a wave connection). A Japanese friend of mine, the late Dr Masaru Emoto, became well-known for his work in photographing the heart-mind impact on water. We wrote a book together

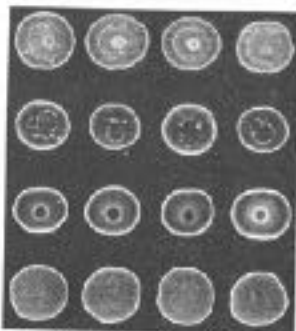


Figure 124: Each set of four droplets taken by each person was different, but the groups of four were virtually the same.

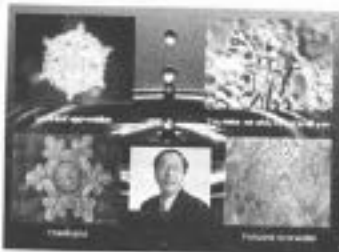


Figure 125: The amazing difference between water crystals reflecting words of love, gratitude and hate, and those from polluted water.

published in Japanese and I visited his centre in Tokyo. Dr Emoto worked with small canisters of water that he would imprint with different frequencies and vibrations by for example writing 'love' and 'hate' on the canister. He would freeze the water very quickly, photograph the ice crystals, and the difference between them was amazing (Fig 125). Words such as love and appreciation produced beautiful crystals of balance and harmony to reflect the balance and harmony of the words. By contrast hate produced basically an ugly mess as it transferred its waves to the water (Fig 126). It may be asked how the written word can have such an effect and the answer is that everything is a wavefield of information in its base state with its frequency dictated by intent. We may see 'love', 'appreciation' and 'hate' as written words, but they are really wavefields reflecting their intent and meaning. These fields impact on the wavefield of the water and this is revealed in the crystals reflecting that effect when the water is frozen. In this way the hate of 'anti-haters' impacts on The Field in exactly the same destructive way as the 'haters' they claim to oppose. The Cult is behind both because they equally contribute to creating disharmony in The Field. Dr

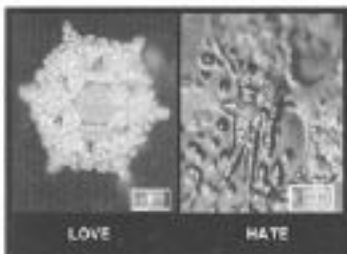


Figure 126: The difference in water crystals from water canisters labelled with words of love and hate. This is what states of love and hate do to ourselves, each other and The Field.

Emoto studied the impact on the crystals of polluted water, different types of music, and technology including a mobile phone. The theme was always the same: Harmony = beauty and disharmony = ugly! Mobile phones created highly distorted crystals to reflect the way they distort the human wavefield. The crystal representation of polluted water is confirmation of what I said earlier about toxicity in all its forms being a chemical

(holographic) expression of deeply imbalanced wavefields. Toxic chemical disharmony, like toxic emotional and thought disharmony, can be rebalanced as Dr Emoto's work clearly showed. He exposed water with distorted crystals (waves) to focused 'prayer' or harmonious intent and the negative impact of the waves was reversed (Fig 127 overleaf). This is what we can do to The Field and human society by changing the waves we transmit. Many think they are interacting with 'God' and asking for help when they 'pray'. I guess this could be considered to be true in that The One is the awareness behind all experienced Creation.

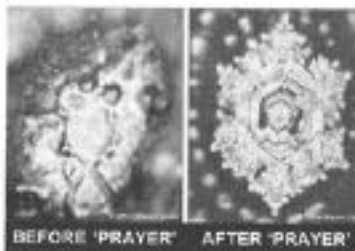


Figure 125: The power of love and focus (prayer) to transform dark and negative states into beauty and harmony.

Prayer on a more human level is the focused interaction with The Field of thought and desire. If this connects – entangles – you with a wavefield that reflects your prayer then you can manifest that in your life. People say when this happens: 'My prayers were answered.' In truth you answered your own. What is called prayer in the Emoto images is really focused intent from the

heart to harmonise the wavefield disharmony in the water which becomes harmony in the crystals.

Wave impact on water explains how homeopathy works despite the arrogant dismissal by mainstream medicine of what it terms 'quackery'. Mainstream medicine is the quackery which is founded, thanks to the Cult's Big Pharma cartel, on complete ignorance of what the body really is – a wavefield. Professor Dame Sally Davies, UK Government Chief Medical Officer, said that 'homeopaths are peddlers and homeopathy is rubbish' while a UK newspaper reported that 2,500 'vets and animal lovers' had called for a ban on the use of homeopathy on animals. They claimed homeopathy was dangerous compared with 'proven medicines' (which with other mainstream treatments constitute one of humanity's leading causes of death). Simon Stevens, chief executive and medical director of the Big Pharma-controlled National Health Service in England, demanded that the Professional Standards Authority strip accreditation from the Society of Homeopaths. The clueless bloke admitted that endorsing the society gave it a 'veneer of credibility' that lured vulnerable patients towards 'bogus treatments'. Was he talking about homeopathy or mainstream medicine? He also claimed that homeopathy was reducing the number of parents having their children vaccinated which involves entangling a seriously imbalanced wavefield of toxicity with the wavefields of children. What could possibly go wrong? Simon Stevens, Sally Davies, and their ilk are infected by the mainstream disease that says: If we can't explain something it can't be happening. How can homeopathy be understood when your view of the body comes from Big Pharma-controlled (Cult-controlled) medical schools and professional bodies that police what doctors must believe and what treatments they can and cannot prescribe? A big problem that the Mainstream Everything has with homeopathy is that treatments

(based on flowers and other natural substances) are diluted so many times that no 'physical' substance remains. The UK newspaper article said '... scientists argue that the cures are so diluted they are unlikely to contain any of the original substance'. In the isolated Body-Minds of the Mainstream Everything 'no physical' must by definition mean 'no possible effect'. Excuse me while I have a quick yawn. Another experiment by the team at the Aerospace Institute in Stuttgart involved a flower dipped into a tank of water and immediately removed. They then photographed droplets from the tank and found that every single one contained the information of the flower. How come? Wave information from the flower entangled with the wavefield of the water. It is not the substance that affects health in homeopathy. It is the wavefield frequency information of the substance which interacts with the wavefield of the body and as the Stuttgart experiment showed the wave information remains in the water when the substance has gone. Russian researcher Dr Vladimir Popovkin found the same phenomenon in an experiment beaming a laser through DNA. When the 'physical' DNA was removed it remained in the laser in energetic traces in the same way as the flower in the water. This is known as the 'Phantom DNA Effect' when there is nothing 'phantom' about it at all. It is the wavefield effect. I would just say before I move on that while the basis of homeopathy can be explained (even though homeopaths I have met didn't know) the quality of the practitioner is as always crucial and not every problem will necessarily respond. Every situation can be different because of the wavefield differences involved with patients in different mental and emotional states.

All together now –

We are constantly emitting waves of thought, emotion and awareness into the collective field and in this way our own states of being are transmitted into the energy 'sea' – The Field – with which we are all connected and constantly interacting. The dominant waves (collective state of being) impact upon on everything connected with The Field and that means 'us' and the entirety of the natural world. What effect through The Field must Cult-instigated, technologically-generated radiation and 5G be having on all of us along with animals, birds, insects, trees, and all the rest? Technology waves are scrambling the radar systems of birds, whales and dolphins that use The Field to navigate. Among the consequences are birds losing their way and whales and dolphins beaching themselves. One level of The Field is the Earth's magnetic field and we are affecting that with every thought and emotion. In turn, it affects us as an expression of The Field. The Cult's central goal is to control the wave nature of The Field by making this as low-vibrational and disharmonious as possible through maintaining

humanity in a low-vibration emotional state and by infusing The Field with technological frequency waves designed specifically to distort heart and Body-Mind communication systems. How do you affect all the fish at the same time? You affect the sea. The relationship with humanity and The Field is exactly the same (Fig 128). The Climate Cult and its Green Party political wing have been manipulated into such an obsession with the hoax of human-caused 'global warming' they are not interested in the effect on humanity and the natural world of the radiation tidal wave. The UK Green Party even denied its own members the right to debate 5C at a party conference and threatened a member



Figure 128: We are constantly interacting with The Field as computers interact with Wi-Fi.

protesting about this outside the hall with the police. To say it is not the party that I joined in the 1980s is to seriously understate. The Green Party, like the Climate Cult in general, has been seconded to the agenda of the Cult. Sadly this movement overall is in such a state of unconsciousness that it has no idea there even is a Cult, never mind that it is driving their agenda. The good news is that we neither have to add low-vibration to The Field or be affected by its low-vibrational chaotic state. We can change the nature of the waves we are emitting by opening our hearts and generating high-frequency waves which also block wave entanglement with low-frequency waves in The Field. We can interact with The Field on another level of frequency and be empowered rather than drained and disrupted. All roads out of here lead to and from the heart.

Global heart

We can see from all this the incredible impact that we can have on The Field and The Field has on us. I have discussed how this plays out in sports teams and it applies to all groups including families and work colleagues. HeartMath Institute research revealed that those in heart-mind (frequency) coherence reflect this personal harmony in collective harmony when they work together or interact (Fig 129). The opposite is the case with those in heart-mind incoherence through emotional imbalance. People in coherence or incoherence can transfer their state of being to others through wave entanglement as the dominant state

prevails. The same process happens nationally and globally through The Field and our mental, emotional and heart resonance can bring about global societal coherence and cooperation or tear the world asunder. Hitler and the Nazis were dark occultists who understood how this



Figure 129: If we connected and interacted through the heart the world would be transformed.

works and they infused The Field in mid-20th century Germany with their frequencies to such an extent that they hijacked the Body-Mind of much of the German nation. To see a microcosm of the technique watch footage of Hitler's rallies in which music, marching and colour were used together with Hitler's carefully-crafted (wavefield) speeches to so dominate the frequency nature of The Field that vast audiences were transformed into a rabid frenzy with their own fields adding to the collective power of the event. Hitler was described as 'magnetic' as in 'magnetic personality' which is another description of electromagnetic wavefield energy. The focus of the crowd (entanglement) on his field, however, was the

Evidence of Collective Inattention (CNC) Data from GCP Sites Around the World per 9/11/05 Terrorist Attacks (Berlin, 2002)

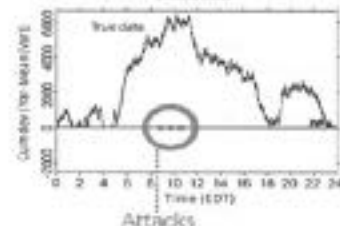


Figure 130: What happens to the Earth field when the world became aware of the 9/11 attacks.

source of so much of this 'magnetism'. Talk about 'give me your power'. The Cult targets human and emotional perception to continually infuse low-frequency waves into The Field which then circulate back in a perpetual / perceptual feedback loop to humanity. We can break this cycle with the heart. We are being manipulated to create the feedback loop and we have the power to delete it. The HeartMath Institute has positioned sensors around the world to measure changes in the Earth's magnetic field which have related to events that cause major impacts on collective human emotion. They identified an enormous spike in the Earth field in precisely the period that the global population was learning about the attacks of 9/11 (Fig 130). The point is that this

interactive effect does not have to be negative. Infinite Love in all its expressions is far more powerful than negativity and we can change the wave frequencies of The Field. Whether we will do that is our choice, but we can. We saw a simple example with the focused intent of love transforming the wave state of polluted water and its crystals. How do we change the 'world'? We change ourselves because the world is a collective manifestation of us. There is much more on that to come and the HeartMath Institute has many techniques to develop heart-mind coherence. See back of the book for the website.

Love – the ultimate strength

I have heard it said that love is weakness and marginal to changing anything. Change only comes when you 'put your mind to it' and hate your oppressors (who are only a vehicle for suppressing yourself through wave entanglement). What an utter misunderstanding of the love I am talking about. I am not referring to human or attraction love, but to something infinitely greater. The very word has become so misrepresented I only use it in the absence of a term more appropriate. Infinite Love, unconditional love, is the nearest we can get with human language which has not developed, certainly in the West, to describe what it doesn't understand. I have said that love is without fear and will always do what it knows to be right. This deletes weakness from the equation immediately before we take another step. 'Weakness', both in thought and action, is always a manifestation of fear. On that basis alone love in its most powerful form is the absence of fear and the ultimate strength. Love doesn't consider consequences for doing what it knows to be right – it just does it. Nor does love always do what others would like it to do. Often love means doing the opposite. Is it love to give your children everything they ever ask for and protect them from every emotional upset and then they go out into the world and can't cope with its challenges? Or is it love to help them build inner strength and self-confidence in their growing-up years to face and overcome challenges and ensure that when they enter the adult world they have all they need to deal with it? We are now seeing the consequences for many young people of this misguided 'love' with 'helicopter' parents fussing over their offspring at every turn and producing what are called 'cotton wool kids' who then go on to the programming centres of college and university. They are the self-styled 'Woke' generation with an extraordinary sense of narcissistic entitlement (anything you want upbringing) and hurl their toys from the pram when adult society does not continue where their parents left off. More than that the Woke mentality has been infused with psychological weakness that makes people babes-in-arms to a system that claims to be protecting them by taking their freedom away (and everyone else's which is the point of the

exercise). 'Wokers' are the foot soldiers and (Twitter) storm troopers of the Cult's agenda to delete all freedom with freedom of speech at the top of the list. Love in its true sense would have intervened long ago to head off this personal and collective disaster and in doing so parents would have faced much hostility: 'How can you say I can't have that?'; 'How can you say I can't do that?'; and, with due irony – 'You clearly don't love me.' Love, in fact, has many facets and faces and what pulls them together in unity is doing what you know to be right.

There is the myth that to 'love your enemies' means to lie down and let them walk all over you. How can it be 'right' to accept domination by others imposing their will upon you? Love won't stand for that and, in the absence of fear, absolutely won't stand for that. Love is also the self-love of self-respect that will not be coerced into submission. If you want to see stubborn in action try telling Infinite Love that it must not do what it knows to be right. You don't have to hate your perceived oppressors. Just don't stand for their impositions on your life and the lives of others. No hatred necessary. What we hate we entangle with and become. If I make a wave connection with the Cult it will be on my frequency not theirs. For this to happen I have to love them by my definition of love which involves compassion and understanding for why they are what they are. Their actions come from their perceptions and self-identity which are formed with their heart centres closed to the influence of The One. Would you like to be them? What a nightmare to be so isolated from love, for self and others, that you desire to hurt and dominate everyone else. They need our compassion – but NOT our acquiescence. Fake 'love' is everywhere and by that I mean 'love' only by word and facial expression and not by deed or heart-based integrity. I have met many 'New Agers' and observed endless Wokers who present the persona (mask) of being loving because that is what they want others (and themselves) to believe they are. Instead I have experienced a long list of New Agers (though far from all) who have been among the most unloving, manipulative self-deceivers I have come across in any walk of life. Wokers claim to be loving, compassionate, warriors for social justice while seeking to destroy the freedom, careers and livelihoods of those who don't agree with them. There is no empathy with anyone they target and no place for forgiveness amid their clenched-teeth fury for those who transgress the Woke tyranny which calls itself with more breathtaking irony 'anti hate'. We urgently need a mass re-evaluation of what love is before we can get anywhere and when the truth about love sinks in we'll be able to get everywhere. I will develop all these themes as we go along.

So who are you? You are your heart. Who are we? We are all One heart. Why don't we live like that? The Cult doesn't want it. Is the Cult all powerful? No – we are woken we follow our heart.

Where are we?

You are deluded if you think that the world around you is a physical construct separate from your own mind – Kevin Michel

Yeah, good question in the chapter title. Where the hell are we? What is this 'place'? Isn't it amazing that so little consideration is devoted in the mainstream media to asking these profound and fundamental questions? But, then, if the Cult doesn't want them to be asked the Cult-controlled media is not going to ask them in any way that is both deep and consistent.

You see the odd snippet here and there about 'scientists discover' this; 'scientific studies reveal' that; or 'scientists think' something or other. Dots are rarely if ever connected and nor the truth about reality pursued with vigour in search of answers. Surely who are we and where we are should be at the forefront of human inquiry? Well, once again, not if those manipulating society don't want their targets to know who they are and where they are because if they did it would change everything. I have written at length in *Everything You Need To Know* about my long-held view that we are experiencing some kind of simulation akin to an interactive virtual reality game. I came to this conclusion and began writing about it just after the turn of the millennium although I had considered the possibility before. In recent years an increasing number of even mainstream scientists have said the emerging evidence points to precisely that. Among them is Rich Terrile, director of the Center for Evolutionary Computation and Automated Design at NASA's Jet Propulsion Laboratory, who went public a few years ago with his belief that the Universe is a digital hologram (true). He also made the obvious point that if reality is a holographic construct some form of intelligence must have created it. This fits with my own contention since the 1990s that an unseen force is manipulating our reality. American nuclear physicist Silas Beane led a team at the University of Bonn in Germany which explored the question of whether our reality is a simulation similar to the one portrayed in the *Matrix* movie series. They decided that it most likely was and Beane proposed that it could be cube-like in nature (Fig 131). I have been saying for decades that the speed of light is not the fastest speed possible and

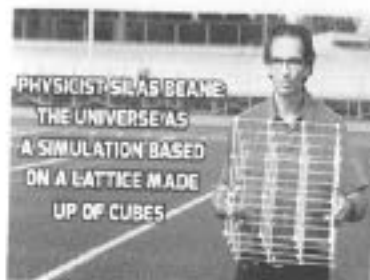


Figure 131: Silas Beane and the proposed cube structure of the simulation/Universe.

view is that this speed in fact represents the outer firewall of the simulation or *Matrix*. 'Light' and the electromagnetic spectrum is therefore the *Matrix* that we believe to be the 'world'. Morpheus said in *The Matrix* movie: 'You live in a dreamworld, Neo.' And we do. Scientific orthodoxy claims that the speed of light – 186,000 miles per second – is the fastest

speed possible; but then it also believes in the 'Big Bang' some 13.7 billion years ago when it claims the Universe was compressed into the nucleus of an atom which they call the 'singularity'. They say this then exploded to create subatomic particles, energy, matter, space, time, planets, stars, and Ethel on the checkout. American writer and researcher Terence McKenna described Big Bang theory in these terms:

... give us one free miracle, and we will roll from that point forward – from the birth of time to the crack of doom! – just one free miracle, and then it will all unravel according to natural law, and these bizarre equations which nobody can understand but which are so holy in this enterprise.

Another observer brilliantly compared the chances of the Universe evolving by random accident as like a hurricane sweeping through a scrapyard and assembling a Jumbo Jet. Physicist Silas Beane points out that simply being a simulation would create its own 'laws of physics' that would limit possibility. I say this limit is the speed of light within which 'time' and 'space' are encoded within our holographic reality. Near-death survivors have described how the 'light' they experienced outside the body is not the same as sunlight (the speed of light). 'It's not like the light that burns your eyes', one said, 'not like sunlight'. I have been writing for a long time that sunlight is the *Matrix* or simulation. Virtual reality games and simulations have their own laws of physics and limitations which are encoded by the designer and our reality is in principle the same. The 'laws of physics' perceived by mainstream science are merely encoded limitations of the simulation and so near-death experiencers describe a very different reality and limitless possibility when they withdraw from the body which entangled them with the simulation and focused their attention within its illusions.

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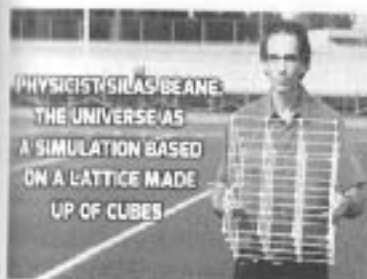


Figure 131: Silas Beane and the proposed cube structure of the simulation/matrix.

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Mainstream scientists are the 'academics' in Plato's cave studying the shadows on the wall (simulation) while believing them to be 'real'. Being 'human' is like donning a headset in a computer simulation with the five senses decoding the simulation into apparent 'natural' reality (Fig 132). The Silas Beane team in Bonn discovered that cosmic rays align with a specific lattice pattern of cubes which they suggested could be the foundation of the simulation construct. Cosmic rays are 'atom fragments' that rain down on the Earth at the speed of light from outside of the solar system. The Space.com website says:



Figure 132: The 'real world'

Discovered in 1912, many things about cosmic rays remain a mystery more than a century later. One prime example is exactly where they are coming from. Most scientists suspect their origins are related to supernovas (star explosions), but the challenge is that for many years cosmic ray origins appeared uniform to observations examining the entire sky.

Cosmic rays are actually an information source of the Matrix or simulation. The Bonn team highlighted what is known as the GZK cut-off (the Greisen-Zatsepin-Kuzmin limit). This is a boundary for cosmic ray particles that results from the interaction with cosmic background radiation. The process involves particles called 'pions' which I initially took to be the human race. The team's paper 'Constraints on the Universe as a Numerical Simulation', says the GZK cut-off 'pattern of constraint' is exactly what you would find with a computer simulation. The consequence of this for human perception is described in these terms: 'Like a prisoner in a pitch-black cell we would not be able to see the "walls" of our prison.' This is correct although we have given the walls a name - the speed of light - which appears to be the fastest speed when in truth it represents the limits of Body-Mind decoded perception. Consciousness can communicate instantly beyond the bounds of 'light' because it operates at frequencies outside the simulation. We are constantly communicating at faster-than-light speeds while our conscious perception is dictated by the brain decoding information within the frequency band of the simulation. The foundation construct of the 'Matrix' is formed by standing waves of energy and information. Standing waves 'stand' when held within an area of limitation (in this case the speed of light). Waves flow one way, strike a limiting obstacle



Figure 133: A standing wave created by the oscillation of two forces of equal strength pushing against each other.

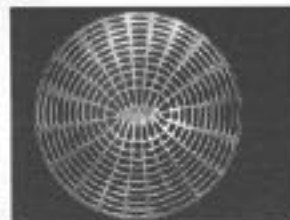


Figure 134: Cymatics images created by a sound vibration. Particles form together to reflect the frequency/vibration and in short the frequency/vibration is made 'physical' by 'muscles'. Change the vibrator and the particles will re-form to reflect that. Image from CymaScope.com.

and flow in the reverse direction to create an interaction in which the two opposing flows cancel each other out and oscillate 'on the spot' (Fig 133). It's like two people running in opposite directions and when they meet they both jog on the spot as they block each other's forward movement. Standing waves can be created by frequencies which act as the limitation and cause them to oscillate without forward momentum and they can also be formed by vibration. The principle can be seen in what is

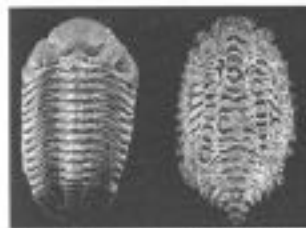


Figure 135: A starfish alongside a cymatics image created by vibrator. Images from CymaScope.com.

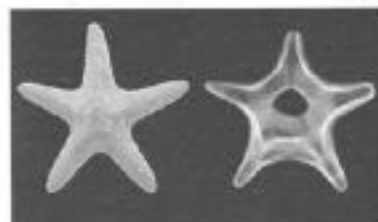


Figure 136: Real starfish and cymatics vibration starfish. Images from CymaScope.com.

known as 'cymatics' which creates form through ... vibration generating standing waves. Particles or another medium are spread on a metal plate and when sound frequencies are introduced they form into patterns that reflect the frequency involved (Figs 134, 135 and 136).

Cymatic patterns formed by sound vibration are standing waves that will remain in place until the frequency changes and then they will transform into another pattern to sync with the new frequency. This is how frequency waves create 'matter' and form. You can see videos of standing waves and cymatics on YouTube with these key words: 'Standing Waves.mov' and 'Cymatics full documentary bringing matter to life with sound'. A very good cymatics website is Cymascope.com. A closed mind is also a standing wave as it oscillates within the perception Bubble to the frequency of lies and illusions (Fig 137).



Figure 137: A closed mind or Bubble is a standing wave oscillating on the spot and going nowhere.

Standing wave reality

The Universe (simulation) is a standing wave and everything within the Universe including the human body. Now what are classic examples of standing waves? Holograms. You see how all the strands come together if you pursue reality with an open mind. The two wave sources that collide on a holographic print interact with each other to create a standing wave which when decoded appears as apparently three-dimensional form. Standing waves, holograms and cymatics are all versions of the same phenomenon. The heart oscillates – beats – with the body standing wave. When we talk of emotion affecting heart rhythms we are describing how emotion waves are affecting the rhythm of the body standing wave and the rhythm of the heart wave. While the standing wave is oscillating the form is 'alive' and when it stops this is 'death'. Our minds are entangled with the standing wave oscillation and when that ceases we are released from the body. People can 'lose the will to live' and generate such energetic density (slow oscillation) through their mind and emotional wave states that the standing wave rhythm can cease. Dying from a broken heart is one example. In the same way mind and emotion waves of a different kind can empower the standing wave and bring it back from the brink of 'death'. People cry 'It's a miracle' when it is really wave interaction. Many near-death experiences have returned to find their body healed of what nearly killed them. Their out-of-body experience changed their perceptions which changed their wavefield state which changed their body. DNA is



Figure 138: Compare a standing wave ...



Figure 139: ... with DNA. Another coincidence? No chance.



Figure 140: The hexagon or 'Star of David' is a sound frequency vibration as confirmed by this one made by sound passing through a liquid medium. This is the symbol on the flag of Israel and from which the name Rothschild (Red-White) derives. It is also the symbol of Saturn which its frequency reflects.



Figure 141: A hexagon manifested in the same way from sound. All symbols – all form – are standing waves created by vibrational oscillation.

a receiver-transmitter standing wave as a holographic representation of the universal wave. Check what DNA looks like compared with a standing wave (Figs 138 and 139). German biophysicist Fritz-Albert Popp discovered that DNA vibrates or oscillates to a particular frequency and this has been confirmed many times since by cutting-edge

scientists and researchers. 'Matter' is the manifestation of standing waves resonating to different frequencies and that applies even to symbols which is why the Cult employs them throughout global society. Symbols are holographic manifestations of particular frequencies



Figure 142: The hexagon/Star of David and cube remember Silas Beare's cube Matrix are ancient symbols of Saturn because they are reflections of its frequency. The black cube in particular is a Saturn symbol and you have the black cube in Mexico, the holy place of Islam, and the lowest 'security' company connected to Israel intelligence agency Mossad called Black Cube. The Jewish holy day of the week is Saturday or Shabbat.

and they are placed all around us to influence human perception through sound vibration and wave entanglement. You will recognise the ones in Figures 140 and 141 which were created by passing sound at specific frequencies through a liquid medium. Frequency and form are different expressions of the same information and interestingly the hexagram ('Star of David' on the flag of Israel) and the cube are both symbols of Saturn (Fig 142). I expose the reasons

for that in depth in *Everything You Need To Know* and it relates to the simulation. The very name 'Rothschild' from the German 'Red Shield'

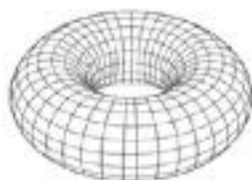


Figure 144: The shape of the Universe says 'ground-breaking' scientific study published in 2019. The torus nature of the Universe was in my books long before.

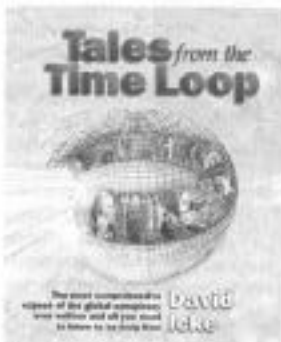


Figure 146: The front cover of my book 'Tales From The Time Loop' published in 2003 which portrayed our reality as a torus ring (passing through an illusory looped sequence of 'time').

previous books about the Universe being a closed loop shaped like a doughnut or 'torus' (Fig 143). I even named one book, published in 2003, *Tales from the Time Loop*, with the torus simulation symbolised on the cover (Fig 144). A torus can also be found in the human eye – as above, so below (Fig 145). The Universe is a closed loop because it's a simulation within the frequency band of 'the speed of light'. It is a wavefield construct decoded into a holographic closed loop which can

comes from the red hexagram on the family home in Frankfurt in the 18th and 19th centuries. Dynasty founder and Sabbatian-Frankist cultist Mayer Anischiel Rothschild is known as the 'founding father of international finance'. He also founded the Cult's Illuminati. Everything connects in the end. Famous American esoteric and occult writer Manly P. Hall rightly described the power and significance of symbols in these terms: 'When the human race learns to read the language of symbols, a great veil will fall from the eyes of men.' While they remain undecoded those same Cult symbols are part of that veil.

Scientists announced the results of a 'paradigm-shifting' study in 2019 that found the Universe to be a closed loop in the shape of a torus or doughnut. Eleonora Di Valentino at Manchester University led an international team of astronomers studying data from the European Space Agency's Planck satellite. They concluded that the Universe is a curved, closed and inflating sphere Di Valentino called the findings a 'cosmological crisis' that warrants a 'drastic rethinking of the current cosmological concordance model'. What kept them? I have written in



Figure 145: The torus in the human eye.



Figure 146: The Large Hadron Collider at CERN in Switzerland.



Figure 147: The CERN ring, or ring, viewed one of a mini-version of the simulation.

be breached only by consciousness expanded beyond Body-Mind. You can liken this 'loop' to the Large Hadron Collider, the world's most powerful particle accelerator, at the European Organization for Nuclear Research (CERN) in Switzerland (Fig 146). I address what this multi-billion operation is really about in *Everything You Need To Know* and it's not the reason they're telling us. The Collider is a ring tunnel or tube of superconducting magnets that extends for 17 miles hundreds of feet below ground across the Swiss-French border. Proton particles (waves) travel within the ring at the speed of light in both directions to crash into each other. Protons complete 11,245 circuits of the ring every second (Fig 147). It's a long

story why they do this which I tell in *Everything*. I mention the Hadron Collider here as a visual representation of the torus universe. Imagine being within that enclosed tube circuit while not knowing it was enclosed and decoding the circulating energy/information into a holographic world completely different to the tube as it would otherwise appear in

an undecoded state. You would think that time was moving 'forward' when you were really in a loop. When you were in the loop you would call the present and from that you would perceive 'past' and 'future'. Human reality is actually a cycle in the NOW. The image symbolising this in Figure 148 overlaid is from my *Human Race Get Off Your Knees* published in 2010. It is my contention that universal cycles such as the Great Year (nearly 26,000 years), Hindu Yugas or epochs, and the Mayan calendar of distinct periods or 'counts' are measuring cycles of the simulation program. Some researchers have identified points in these cycles when global catastrophes have happened many times which deleted most of what existed before along with knowledge of what life

was like, 'Known' human history is a fraction of what has happened and fantastic ancient structures that we would struggle to build today are evidence that the apparent upwards progression from primitive people to the modern world is a fantasy. A simulation with 'rebooting' points would be a major way to isolate humanity in perceptual illusion.

'I am of the Light.' Okay, but which Light?

This background explains many mysteries and indicates the knowledge hidden within the Cult. When people worship 'the light' they are worshipping their own perceptual person (Fig 149). We can further understand why one of the hero 'gods' of the Cult is Lucifer, the Light Bringer. Yes, the bringer of the simulation. 'Lucifer' is portrayed as a 'Fallen Angel' – the Biblical term to describe the non-human force that manipulates through its hybrid human/non-human lackeys (the Cult Nephilim bloodlines) operating within the simulation along the lines of Agent Smith and company in *The Matrix* movies. If you have not seen the *Matrix* trilogy it is recommended – especially the first one – to get a feel for what our reality is and how we are manipulated. 'Fallen Angel' by my definition means those who have closed their heart centres to a connection with *The One* and now seek to do the same with humanity to assimilate human Body-Mind awareness into their own. This is what smart technology and artificial intelligence is really all about as we shall see. The so-called Lucifer



Figure 148: The Time Loop 'vortex' which we divide into illusory 'physical' reality and experience as the 'human world'.



Figure 149: I have seen the wrong kind of Light.



Figure 150: The pyramid and all seeing eye symbol of the Cult on the dollar bill as well as the reverse of the Great Seal of the United States and endless other guises.

'revolt against God' is said to have followed his refusal to 'return God's love' (closed heart centre) and set out to be 'as powerful as his creator'. 'Lucifer' is also referred to as Satan and the Devil which are described in the Bible in reptilian terms as with the 'Great Dragon' and 'that ancient serpent'. In turn Cult bloodlines are human-reptilian hybrids that worship their hidden masters through Satanism. I expose in *The Trigger* the Sabbatian-Frankism network within the Cult that was really responsible for 9/11. This aspect of the Cult is named after its inspirations, Sabbatai Zevi (1626-1676) and Jacob Frank (1726-1791), as I mentioned earlier. Sabbatian-Frankism hates Judaism and Jewishness and yet has manipulated itself into control of Israel and its global nexus while the great majority of Jewish people have no idea Sabbatian-Frankism even exists. We have the familiar theme of Lucifer worship with Jacob Frank who said Lucifer is the true god. The Kabbalah, or Kabala/Cabala, the Jewish bible of mysticism and esoteric belief, is the holy book of Sabbatian-Frankism and in particular the series of works called the Zohar which means 'splendour' and 'radiance' (light). From this came the concept of being 'illuminated' (kundalini activation) and the name of a highly significant grouping within the Cult known as the



Figure 151: The Statue of Liberty was given to New York by French Freemasons in Paris who knew what it really represented.

'Illuminati' with its symbol of the 'all-seeing eye' which you see on the dollar bill and the reverse of the Great Seal of the United States (Fig 150). This elite satanic secret society was established in 1776 by three Sabbatian-Frankist cultists, Jacob Frank, Meyer Amstel Rothschild, founder of the Rothschild (Redshield/hexagram/Saturn) financial dynasty, and its frontman, Jesuit-trained fake 'Jew' Adam Weishaupt. The theme of Lucifer the Light Bringer (simulation) is widely on public display if you know what to look for and one example is the Statue of Liberty holding the lighted torch of 'illumination'. The statue was given to New York by French Freemasons in Paris who knew the true meaning and a mirror image 'Liberty' stands on an island in the River Seine in the French capital (Figs 151 and 152). Freemasonry worships Lucifer as the 'Great/Grand Architect of the Universe' – the architect of the simulation. The same symbolism of the 'Architect' can be found in the *Matrix* movies which portrays him as the one who built the Matrix. You'll find all the fine detail on these



Figure 152: A mirror of the Statue of Liberty on an island in the River Seine in Paris.

subjects and so much more in *Everything You Need To Know*.

Simulation science and numbers

Another mainstream scientist who has pursued evidence for a simulation is James Gates, an American theoretical physicist who has been Professor of Physics at the University of Maryland, Director of The Center for String and Particle Theory, and served on the Council of Advisors on Science and Technology to President Obama. A Gates-led team discovered

computer codes of digital data embedded in the energetic fabric of our reality which take the form of 1 and 0 – the binary system used in computers of on-off electrical charges which looks so similar to codes of the Matrix in the movies and the A, C, G, and T codes that make up DNA and also have binary values (Figs 153 and 154).

These codes and their relationships with each other decide what the 'physical' form looks like. Differences in coding between a human and rat are marginal yet their form is fundamentally different. DNA codes have digital binary values of A and C = 0 and G and T = 1. DNA code sequences look like binary number coding and the numbers on the computer screens in the Matrix movie series depicting the digital



Figure 153: Binary codes of 0 and 1 representing on-off electrical charges in computer systems.



Figure 154: The A, C, G and T codes of DNA which also have binary values.

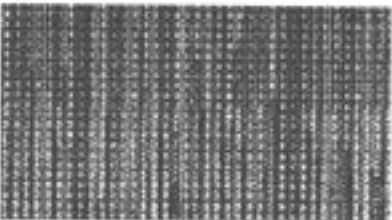


Figure 155: The digital codes of the Matrix portrayed on computer screens in the movie series.

basis of the reality simulation (Fig 155). James Gates said they had no idea what digital computer codes were doing in the fabric of our reality, but this can be explained if we are dealing with a simulation. The Gates team also found error-correcting codes or block codes within the energetic fabric of reality. These are mathematical sequences employed in computers that return data to its original state or 'default settings' when something knocks it out of kilter. They would be necessary to hold the simulation together in the face of forces impinging upon it. Gates said they found a set of equations embedded in reality that were indistinguishable from those that drive search engines and browsers. The Internet and digital technology in general are actually mimicking the simulation to create a simulation within a simulation and enslave human Body-Mind in more extreme states of illusion and isolation than even the main simulation itself. I have said already that one level of our reality – the simulation – is digital and that the 'physical' world from the Universe downwards consists of digital holograms. Numerology reads reality at this level of numbers and Max Tegmark, a physicist at the Massachusetts Institute of Technology (MIT), said: 'The Universe can be entirely described by numbers and maths.' Tegmark, author of *Our Mathematical Universe*, says reality is encoded with numbers and

mathematics in the same way as computer games and the physics of our reality and computer games are basically the same (Fig 156). He compares human experience with characters in advanced games. The characters would think because of the software codes that they were bumping into real objects, falling



Figure 156: The physics and mathematics of video games and virtual reality is the same as our experienced reality.

in love and feeling emotions. Eventually they might study the workings of the game more deeply and realise that everything (as with our reality on one level) was made of pixels. They would see that what they thought was 'physical' was in fact just numbers. Tegmark then relates this to human reality:

And we're exactly in this situation in our world. We look around and it doesn't seem that mathematical at all, but everything we see is made out of elementary particles like quarks and electrons. And what properties does an electron have? Does it have a smell or a colour or a texture? No! ... We

physicists have come up with geeky names for [electron] properties, like electric charge, or spin, or lepton number, but the electron doesn't care what we call it, the properties are just numbers.

Everything these scientists are uncovering is what you would expect to see if we live in some sort of simulation. There is also the ancient concept of 'divine proportion' which is the term given to mathematical and geometrical sequences found throughout our reality, the 'natural world and the human body (holographic as above, so below, once again). Initiates of the hidden knowledge understood these sequences and gave them names such as Phi, Φ , Golden Mean, Golden Ratio and Golden Section. They encoded them into their temples, cathedrals and important buildings to attract – entangle – with particular energies/information and frequencies to connect them with 'God', or 'the gods'. Artists like the initiate Leonardo Da Vinci encoded these proportions or ratios into their paintings. Da Vinci was so 'ahead of his time' because he understood reality by tapping into awareness outside the simulation and he would have had close associations with secret societies. The number of Golden Ratio is 1.61803398874989484820 ... which then goes on repeating indefinitely. Golden Ratio proportion comes from 'dividing a line into two parts so that the longer part divided by the smaller part is also equal to the whole length divided by the longer part'. Put simply it is a sequence that can be found everywhere and is obviously there by design and not chance. Another ubiquitous sequence is the Fibonacci number code which was identified at least in ancient India by a mathematician called Virahanka, but gets its name from the 12th/13th century Italian mathematician Fibonacci also known as Leonardo of Pisa. The Fibonacci sequence adds the two previous numbers to get the next one, as with ... 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, and so on. The higher it goes the closer it gets to the Golden Ratio.

The Fibonacci sequence is encoded in everything from the human face and body to animals, DNA, seed heads, pine cones, trees, shells, spiral galaxies, hurricanes and the number of petals in a flower (Figs 157 and 158). Then we have fractal patterns encoded in the fabric of reality and once again they are everywhere. Fractals are a 'never-ending pattern that is infinitely complex and self-similar across



Figure 157: The Fibonacci number sequence can be found throughout our reality.



Figure 158: Fibonacci numbers are encoded in the ways that shells form.



Figure 159: Repeating fractal patterns are found everywhere.



Figure 160: Fractal patterns are found in the iris of the human eye.



Figure 161: Binary DNA.

different scales' – the as above, so below, characteristics of holograms (Figs 159 and 160). Fractal patterns can be found in:

River networks, mountain ranges, craters, lightning bolts, coastlines, mountain goat horns, trees and branch growth, animal colour patterns, pineapples, heart rates, heartbeats, neurons and brains, eyes, respiratory systems, circulatory systems, blood vessels and pulmonary vessels, DNA, geological fault lines, earthquakes, snowflakes, crystals, ocean waves, vegetables, soil pores and even the rings of Saturn (again).

Fractal/holographic patterns are found in binary 1 and 0 on-off electrical charges encoded in our energetic reality that are also found in the DNA receiver-transmitter 'hard drive' of the body (Fig 161). A science paper captured the essence of DNA with its heading: 'DNA is a Fractal Antenna in Electromagnetic Fields.' DNA is a receiver-transmitter of information and is digital, binary, holographic and fractal because our experienced reality is digital, binary, holographic and fractal. American psychology professor David Pincus has said that as above, so below, repeating fractal patterns have been identified in psychology, behaviour, speech patterns and interpersonal relationships which begs the question of how much human behaviour comes from 'free will' and how much from simply following the simulation program? I'll have more about this later. Fractal principles relate to 'symmetrical mathematics' which are 'one shape being exactly like another' when you move it, turn it, flip it or slide



Figure 162: The way a tree grows follows fractal patterns.

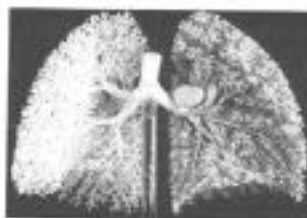


Figure 163: Fractal patterns in the human lung.

it. Symmetrical mathematics are found in everything from the way trees grow to the structure of the human lung (Figs 162 and 163). Dmitri Krioukov, a physicist at the University of California, San Diego, was co-author of a study reported in *Nature's Scientific Reports* which suggested that 'undiscovered and fundamental laws' may govern the growth of systems on all levels from electrical firing between brain cells to the growth of social networks and expansion of galaxies (the holographic principle yet again). Krioukov said: 'Natural growth dynamics are the same for different real networks, like the Internet or the brain or social networks.' He added that 'for a physicist it's an immediate signal that there is some missing understanding of how nature works.' What's missing is the understanding that we are dealing with a holographic simulation. The work of Krioukov and his team was reported by the *Huffington Post*:

When the team compared the Universe's history with growth of social networks and brain circuits, they found all the networks expanded in similar ways: They balanced links between similar nodes with ones that already had many connections.

For instance, a cat love surfing the Internet may visit mega-sites such as Google or Yahoo, but will also browse cat fancier websites or YouTube kitten videos. In the same way, neighboring brain cells like to connect, but neurons also link to such 'Google brain cells' that are hooked up to loads of other brain cells. The eerie similarity between networks large and small is unlikely to be a coincidence, Krioukov said.

What are all these recurring mathematical sequences that pervade our reality? I say they are the computer codes of the simulation (Figs 164 and 165). I watched a presentation by Donald Hoffman, a professor in the Department of Cognitive Sciences at the University of California, Irvine, in which he described his concept of our experienced reality

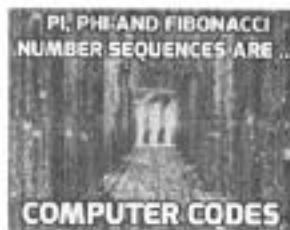


Figure 164: Bing's Computer codes of the simulation.

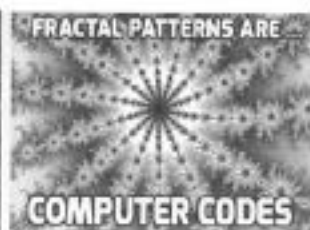


Figure 165: Bing's Computer codes of the simulation.

acting like a computer interface which I agree that it does:

Evolution shaped us with a user interface that hides the truth. Nothing that we see is the truth – the very language of space and time and objects is the wrong language to describe reality.

I contend that it was not evolution which shaped this, but manipulation. The computer interface – the equivalent of a computer screen – is the simulation which gives a false sense of reality to hide the fact that it is a simulation.

Electric Universe (simulation)

A major pointer to a simulation comes with a highly-compelling area of independent scientific research that reveals the Universe to be an electrical/electromagnetic communication system which is how computers and virtual reality work. The research is known collectively and appropriately as the Electric Universe and also the Thunderbolts Project. I have been reading and watching their information for many years and you can find them at www.thunderbolts.info/rep. Everything from the Universe to the human body/brain is on one level an electrical/electromagnetic communication system. The electrical nature of the atmosphere can clearly be seen in lightning, the Aurora Borealis or northern lights, and the rapidly-rotating electromagnetic fields of tornadoes that appear during electrical storms (Figs 166 and 167 overleaf). The electrical fabric of our reality, however, goes much deeper than that. Electricity and electromagnetism pervade everything and Electric Universe researchers say that planets and stars are points or 'devices' in a colossal electrical circuitry that we experience as reality and see as the night sky (Figs 168 and 169 overleaf). The electrical impact on this circuitry of planets, stars and their combinations is another level of how astrology works and all together I call this the Cosmic Internet



Figure 166: Lightning is the most obvious example of an electric atmosphere.



Figure 167: The electrical phenomena of the Northern Lights or Aurora Borealis.



Figure 168: We see the heavens as stars and planets and space, but that's only one level.



Figure 169: On another level the Universe – or simulation – is a vast electrical system.

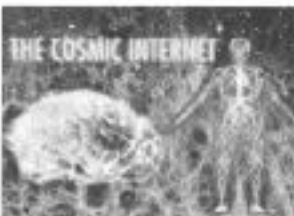


Figure 170: The simulation is an electrical/electromagnetic system which interacts with the human body and brain and overrules a fake reality to obscure (prime reality, I call it) the Cosmic Internet. (Image: Neil Hogue.)

and rotating in synchronised motions even with those tens of millions of light years away (the illusion of time and space). The study involved 445 galaxies within 400 million light years of Earth. Joon Hyeop Lee, an astronomer at the Korea Astronomy and Space Science Institute, said that something appeared to be connecting them which caused them to

(Fig 170). I have said that the Sun is much bigger than it appears to the eye and that its wavefield oscillates throughout the solar system. This is also true of the Sun's electrical circuits and communication systems. Electric Universe researchers have been pointing this out for a long time and official science confirmation of this electrical connection grid is beginning to mount. The *Astrophysical Journal* published a study in 2019 describing how hundreds of galaxies are acting

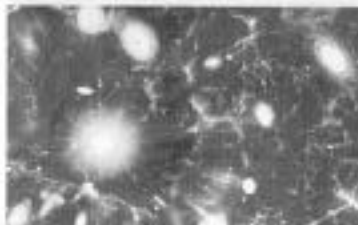


Figure 171: Galaxies are 'embedded' in the same 'large scale structure' – the simulation.

behave exactly in sync. In some way they 'directly interact with each other', he said. The study suggested that the galaxies appeared to be embedded in the same 'large scale structure'. Yes – the electrical/electromagnetic grid of the Cosmic Internet or what I say is the simulation (Fig 171). Computer virtual reality is connected by the same codes and electrical communication which makes what appears on the screen happen in sync. Joon said: 'The dynamical coherence even out to millions of light-years was unexpected and surprising to us, because such distances are obviously too far for neighbour galaxies to directly interact with each other. The unifying force remained invisible or in other words outside the frequency band of human and technological sight. Then there is David Sibeck, a project scientist at NASA's Goddard Space Flight Center, who revealed satellite confirmation of these electrical/electromagnetic connections:

The satellites have found evidence of magnetic ropes connecting Earth's upper atmosphere directly to the Sun. We believe that solar winds flow in along these ropes providing energy for geomagnetic storms and auroras.

Sun-Earth connections, wavefield and electrical, are what changes our climate and temperature in cycles of power increasing and decreasing. These cycles are revealed in the number of fantastic explosions of energy on the Sun's surface known as sunspots. This phenomenon is not factored into the manipulated 'climate models' devised purely to sell the hoax of human-caused climate change. The outrageous deceit is confirmed by climate projections that don't centrally include the foundation effect on temperature of the Sun while blaming carbon dioxide, the gas of life, without which we would all be dead (much more later). The Sun is electrical in nature and highly significantly the observable Universe is 99.999 percent plasma – so is the Sun. Plasma is often called the fourth state of matter and represents a near-perfect medium for ... electricity and electromagnetism. The plasma Sun is a processor of electrical power and not the origin of it. Solar power does not come from within the Sun as mainstream science claims from assumption, not evidence. It comes from the universal electrical wavefield or circuitry. If you could see the heavens on another level of

frequency you would see a vast electrical system with the stars and planets as points in the circuit that pervades the Universe. The Sun absorbs and processes power from this system which operates in cycles of higher power and lower power just as waves (of all kinds) have peaks and troughs (Fig. 172). Electrical power is processed by the Sun (not created by it) and projected into the solar system affecting temperature, climate and much else within the planetary fields. These projections are decoded by the Earth's atmosphere and magnetic field into the heat that we feel. Space is cold and the higher you go in the Earth's atmosphere the colder it gets when, through mainstream scientific 'logic', it should be getting warmer as you move closer to the Sun. Why are planets nearer the Sun hotter, then? The closer you are the more powerful the energy to be decoded into heat and that is also affected by the nature of their fields. The Sun is much cooler on the surface than way out in its atmosphere when it should be the other way round if the heat is being generated from within. Mainstream science estimates the Sun's surface temperature to around 5,000 degrees kelvin while much further out the temperature is said to be 200 million degrees kelvin. Encircling the Sun a considerable distance from the surface is a doughnut-shaped torus which has been recorded in ultraviolet images (Fig. 173). The Sun's torus at its equator absorbs electricity from the universal circuit for the Sun to process. When it overloads massive versions of lightning are projected to punch holes in the

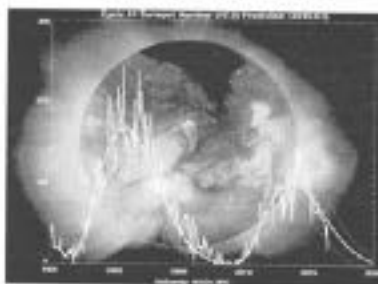


Figure 172: Solar power rises and falls in cycles and can be measured by the number of sunspots or massive explosions on the sun which project energy into the solar system.

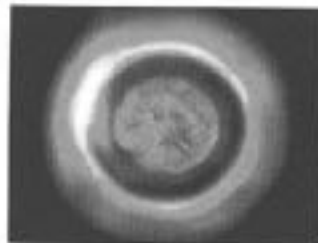


Figure 173: Sunspot explosions have been believed to originate inside the Sun, but Electric Universe researchers say the torus around the Sun absorbs electricity from the field which goes through cycles of higher and lower power. When the torus becomes overloaded at high times it discharges energy like colossal lightning bolts that strike the Sun and punch the sunspots thus making sunspots a measure of solar activity.

Sun's surface that we know as sunspots. They are a pointer to the changing electrical power of the Sun because the torus only overloads and punches them at times of high power in the circuit. The Sun is known to dim in its low period of activity (electrical processing) although this is imperceptible to the human eye. Think dimmer switch. NASA reported in 2019 that predictions suggest the cycle of solar activity between 2020 and 2025 could be the lowest in 700 years and 30 to 50 percent lower than the previous one. Mainstream science is being forced to face the facts about the universal electrical system as evidence continually comes to light. Haimin Wang, a professor of physics at the New Jersey Institute of Technology, said of sunspot activity:

We used to think that the surface's magnetic evolution drives solar eruptions (sunspots). Our new observations suggest that disturbances created in the solar outer atmosphere can also cause direct and significant perturbations on the surface through magnetic fields, a phenomenon not envisioned by any contemporary solar eruption models.

The Earth's magnetic field, or magnetosphere, is defined by the interaction of electricity with plasma (ultimately wavefield state with wavefield state). When plasma conducting electricity of one frequency/charge meets plasma with a different charge a barrier is automatically formed between the two which defines planetary magnetic fields. Planets and stars emit different electrical charges into the plasma medium and where these different fields meet the barrier is

formed known as a 'Langmuir sheath' after American scientist Irving Langmuir (1881-1957) who discovered the phenomenon (Fig. 174). Here is still more proof that planets and stars transmit different frequencies that form the basis of astrology. Increasing numbers of scientists are now seeing that the evidence points to our 'physical' reality being a holographic simulation as I concluded nearly 20 years



Figure 174: Planetary magnetospheres are formed by the resistance between different electrical charges in the plasma field between the planets and the wider solar system.

ago. Where I differ from these scientists is that they seem to see the simulation as external to us. My view is that in the form we experience as 'physical' reality the 'Matrix' only exists when we decode it into

manifestation in the brain. The holographic level of reality is within us and not external to us. If we revisit what I said earlier about the human decoding system we can bring that together with electrical reality. The foundation information construct of the simulation is information encoded in waves and when this is decoded it becomes an electrical and digital/holographic reality. See how this fits perfectly with the five senses decoding waves into electrical information communicated to the brain to become digital/holographic information and perceived 'physical' reality. The Universe has wavefield, electrical, digital and holographic levels and so do human decoding processes. Both are expressions of the same simulated system.

Who created the simulation?

This all has revelatory implications for how the simulation was created by the non-human force behind the Cult and for the nature of our experienced reality. There are other levels of the Earth that operate on a far higher frequency band which means we can't see them. Many near-death experiencers have described this high-frequency Earth with its incredibly vivid colours they had never seen before. They are manifestations of the much higher frequencies that exist outside the perceptual confines of the Body-Mind simulation. Shamans and seers have talked since ancient times of this other 'Earth' as have those who have experienced psychoactive potions. 'Other Earth' reality existed before the simulation and continues to do so. Its high frequency means it is far less energetically dense which makes far more possible and negates the need for 'physical' food. Energetic sustenance is taken directly from the energetic field. Communication is by telepathy rather than voice and people can transport themselves by thought rather than having to 'physically' walk, drive or fly in aircraft. Why do they need planes when they themselves can fly with their lack of human-like density? High-frequency Earth is the planet's prime reality although it's still just a micro-fraction of infinite reality. The biblical story of the 'Fallen Angels' and their 'revolt from God' (a theme repeated in non-biblical cultures throughout the ancient world) is really the story of the simulation. 'Fallen Angels' lost their heart-centre connection to The One to such an extent that they fell down the frequencies (hence 'fallen') and believed they were the 'gods' ruled by their master 'God' that Cultists know as Lucifer the Light Bringer – the bringer of the simulation formed from 'light' within the speed of light. The 'Fall of Man' refers to those in Prime Earth who the Fallen Ones enticed and manipulated down the frequencies with them. Prime Earth is what the Bible calls 'Eden' and humans left the 'garden' to be trapped in density and the false perceptions of self and reality that come from that. These are the same 'fallen' entities that the Cult and Satanists are connecting with in their

rituals and the inner circle members of the Cult are incarnate 'Fallen Angels' hiding behind biological AI software 'human form'.

The Fallen Ones set about creating their own world to entrap indefinitely Prime Earth awareness that would become their slaves in a form called 'mind'. They created the simulation – a wave/digital copy of Prime Earth. I say this is described at the start of Genesis with 'God' making the world in 'seven days' after the declaration 'Let there be Light'. The Cult's central modus operandi is the technique of invasion to sell a perception of everything that's the opposite of what it really is. What a perfect example it would be for 'the God' of the Old Testament to be the very 'Lucifer', 'Satan', 'Devil', that 'the God' is supposed to 'fight'. Heads you worship Lucifer, tails you worship Lucifer. Ever wondered why the 'god' of the Old Testament is portrayed so differently to the 'god' of the New? Christianity's attempt to present them both as the same entity makes no sense whatsoever. I have concluded after 30 years of research into all these related subjects that the simulation is a wavefield information construct (think Wi-Fi) with a human body that can decode the construct, interact with it (think computer), and perceive it as reality. I have been referring to the body for decades as a biological computer. Carl Sagan's statement about humans being made of 'star stuff' – the carbon, nitrogen and oxygen atoms, etc. of stars – is another as above, so below, confirmation. Chris Impey, professor of astronomy at the University of Arizona, said that because humans, animals and most 'matter' on Earth contain these elements 'we are literally made of star-stuff'. Look at this from the simulation perspective and you get the same story from a different route. Are characters in a computer game encoded with different maths and rules to the rest of the game? Are they made of different 'stuff'? No, and it's the same with the simulation and the human body specifically created by the Cult 'gods' to interact with the simulation. They are encoded with the same basic codes in their wavefields and express that through the 'star stuff' comparison in their holographic 'physical' state. The creation of the body-computer is told symbolically in the story of 'God' creating 'Adam' and 'Eve' along with the reference to the sons of 'God' (the gods, plural in the original) interbreeding with the daughters of men. We don't have to be talking here of literal interbreeding through procreation. The body can be changed by broadcasting frequencies of information which the hard-drive, receiver-transmitter DNA decodes into holographic mutations through changes in the wavefield (5C, 6C, 7G?). A Russian research team transformed frog embryos into salamander embryos by transmitting salamander DNA information patterns. Dr Michael Levin at Tufts University in Massachusetts produced tadpoles with eyes on their backs and frogs with six legs by manipulating their electrical communication systems. Levin believes the same technique could be

used on humans to regrow lost limbs. So much becomes possible once the Cult illusions are breached and the true nature of reality is grasped. The human body is a wave/digital copy of the forms in Prime Earth reality and far, far denser and more limited in nature. It does mean, however, that the Cult and its masters have had to leave in place many functions of the original form that allow awakening awareness to connect with expanded consciousness outside the simulation. The whole 'smart' technology and AI agenda is about deleting those connections by creating a new human form connected even more powerfully to the simulation and I'll have much more later about this.

Come again? Mmm ... no thanks

The simulation of Matrix is an artificially-generated field of information that has been overlaid on The Field or Infinite Field. Humanity has been manipulated to connect and interact with this artificial field or Matrix and perceive it as reality. Today's 'smart' technology and Wi-Fi are overlaying another even more limited field over the main simulation field to further disconnect humanity from The Field. This could only be done once humans had developed intellectually to the point where they could build and operate such technology, but what is happening has been in the planning for thousands of years in our perception of 'time' (again much more later). The sequence goes like this: Create the wavefield/digital information construct as a copy of Prime Earth; create forms, human, animal, etc., which are wave-entangled with the construct; entice consciousness to make a wave entanglement with those forms ('incarnate'). A key aspect to the enticement is the unique sensations of the five senses which are very different from Prime Reality and appear to act like a drug addiction. People become addicted to virtual reality games and the frequencies emitting from smartphones while consciousness can become addicted to the sensations of the five senses. These addictions create a wave entanglement with the simulation that pulls consciousness in the form of mind back into five sense reality over and over and this is known as reincarnation. Eastern religions believe in the cycle of reincarnation and 'karma' in which we continually incarnate on Earth to work through the 'karmic cycle' of actions-consequences-actions-consequences until, through trial and error, we reach a frequency state ('enlightenment') high enough to escape that cycle and gravitate to Prime Reality. Mainstream science estimates that the Earth when compared with the perceived extent of the Universe is the equivalent of a billionth the size of a pinhead (Fig 175). Do we really believe that to 'evolve' we have to keep incarnating over and over onto a planet a billionth the size of a pinhead compared with the Universe which itself is a fractional smear of Infinite Reality? That's crazy. From my perspective there is another way to explain this. You are



Figure 175: To 'evolve' and find 'enlightenment' we have to keep incarnating onto a pin-head sized planet over and over while ignoring the rest of Infinity. Yep, makes absolute sense, right? Or we only do it once and then 'God' judges us. What other crap are we told to believe and so many do.

enticed into the simulation; you become addicted to the sensations of the simulation like people become addicted to computer games; you leave the body when its cycle ends, but you are still addicted (therefore deeply wave-entangled) with the simulation that it draws you back again and again (flies to a light, bees to a honeypot). This continues until you work out the illusion and in doing so raise your frequency to the

level of vibration (through the heart) that allows you to escape the electromagnetic pull of the simulation. 'Reincarnation' does not have to happen – we make it so with encouragement and manipulation from the hidden 'gods'. We can escape the Matrix anytime we want by realising it's a flytrap and by remembering who and what we really are.

Academic neurosurgeon Eben Alexander describes how in his near-death experience he first entered a dark realm of heavy vibration which he perceived as deep mud. He felt trapped and unable to free himself until an entity came to take him out. Once in Prime Reality when he realised his true self, and his frequency increased in sync with that, he said he was able to enter and leave the 'dark place' whenever he chose if you believe his account. Whether people do or not the theme is correct.

Reincarnation advocates say we select the body, situation and 'time' (astrology) of 'incarnation' to best suit the experience we wish to have. I say this can also be explained by the mind's state of wavefield frequency entangling with other wavefields – bodies, situations, locations and astrological fields – that best suit (a) what it wants to experience and /or (b) what its wave entanglements draw the mind into purely by its wavefield attaching to like fields. What we come into and what we go out to is decided by our wavefield state which is decided by our perceptual state. Another relevant question with regard to this: Do addicts make choices about what they are addicted to? They are not in control – their addiction is. For those minds addicted to the five-senses of the simulation the 'Matrix' is in control. The point of this book is to offer the tools to free ourselves from that addiction which holds much of humanity in perceptual and five-sense servitude to the alleged 'karmic cycle'. We should not forget there is quite a common theme with near-

death experiences of a point, sometimes symbolised as a fence or wall, that they say if they pass they cannot return to their body in that particular 'life'. By the very fact that they come back to tell the tale they don't cross that line. They don't know what lies beyond it. For sure infinite Reality lies beyond, but is there also a realm from which minds still wave-attached and addicted to the simulation return here? I think there is and that is why our frequency state at 'death' is so important. I suggest that the great majority of even genuine psychics are accessing that realm with their 'I'm getting a Mary, anyone know a Mary?' communications. Only the most open and expanded attune to frequencies high enough for the really profound information to be passed through that is free of simulation manipulation and perspective. Addiction to the simulation has become so ingrained through this cycle with each new addiction increasing previous addiction that an intervention is being directed from Prime Reality to break the cycle. I'll have more about this in the final chapter.

During my ayahuasca experience in 2003 I was shown a picture of a path across a field and then people began falling from the sky onto the path. As they walked in ever greater numbers they were down the path which morphed into the dark groove of one of the old vinyl records. The people in the darkness just followed the groove and where it took them (round and round). The Voice said over the pictures that humanity fell so easily for the programming in each 'incarnation' because they had been through it many times before. 'She' asked from the groove perspective if it was really so strange that people looked upwards for 'God' when it was the only direction they could see 'light'. I have one other point about 'reincarnation'. You hear people say when they have particular traits or something happens to them that 'I must have been bad in a previous life' or 'it must be my karma'. In reality, it may have nothing to do with either although the basic like-frequency entanglement principle still stands. We inherit body wavefields encoded with the emotional states and traits of others. I have described the passing on of epigenetic on-off gene sequences caused by the wavefield interactions of 'previous generations'. These can be 'physical', mental and emotional. A person feeling bad about themselves today because they are overweight no matter how they diet may have inherited the epigenetic gene sequence from someone who was a fast-food freak consuming toxic shite that switched on genes that pile on weight. This is happening to incredible numbers of people in the fast food era. An apparently irrational fear that makes no sense to a person's experience in this lifetime does not always have to be 'past life' related. It can be a bad experience relating to that fear involving someone in the genetic line which is still encoded in the body field and triggers an apparently inexplicable emotional reaction to particular situations. Consciousness

can delete these programs as I'll be explaining.

Cult vampires and Agent Smith

Cult bloodlines (hybrid Fallen Angel/human wavefields) that I have been exposing for decades are the simulation's 'Agent Smiths'. He is the character in the Matrix movies who manipulates events in the simulation on behalf of those in the unseen that created the Matrix (Fig 176). This is the role of the bloodlines that run The Web of secret, semi-secret and public organisations and institutions (including politics and government) to advance the agenda for total human control dictated by the Luciferian Fallen invisible to human sight. Agent Smith is an artificial intelligence program that can replicate itself into multiple Smiths. I say that the major Cult operatives in our world are also biological software programs or AI that are seeking via AI to take over everything by connecting humanity to AI. To the Cult and its 'gods' the biological is a form of technology. One of the goals is to vampire low-vibrational mental and emotional energy emitted by humans who the

Cult has manipulated into low-vibrational mental and emotional states. The Matrix movies symbolised this with the Morpheus character holding up a battery and saying the 'machines' (the Fallen Ones symbolically) had turned humans into batteries to empower themselves (Fig 177). I have heard the same theme from shamans and carriers of ancient knowledge all over the world. The Fallen Ones have closed their heart centres to the energy flow of The One to such an extent that they have had to develop their own sources of energy that match their own low-vibrational state. Humanity is one such source. The game is to entrap human perceptions and manipulate conflict,



Figure 176: Agent Smith in *The Matrix* symbolised Cult operatives within the simulation manipulating events for their unseen 'gods'. Smith was a computer program or what we would call today artificial intelligence – so are the major Cult operatives running our world.



Figure 177: In the same way humanity is the power source of the Cult's 'hidden gods'. The more low-vibrational mental and emotional energy we produce the better for them.

fear, anxiety, depression, hatred, despair, guilt, resentment and regret so mercilessly and incessantly that immense waves of low-frequency energy are transmitted for the Fallen Ones to absorb and feed off (Fig 178). When we stop generating these frequencies on the scale that we do the energy source is disconnected and the manipulators are correspondingly weakened (another benefit of opening the heart).

Cult-controlled Disney released the movie *Monsters, Inc* in 2001 which portrayed a 'monster world' that had no energy source. They overcame this by entering the human realm to terrify children. Screams of the kids were caught in a tube device and the energy transferred to the 'monster' power system. The hero was depicted with one giant (all-seeing) eye (Fig 179). Satanic rituals making sacrifices 'to the gods' through the ages and still today are sacrifices specifically aimed at generating a rush of terror for 'the gods' to absorb. The rituals are designed to create maximum terror in the target in the run up to the sacrifice as a 'gift' or 'offering' to 'the gods'. All the 'sacrifice to the gods' shite comes from this. While the 'gods' are absorbing the wavefield level of the terror outside visible light the Satanists drink the blood which contains that same terror in the form of adrenalin. The Fallen are energy vampires and their Cult gofers are blood vampires. The 'gods' prefer children as sacrifices because of the particular frequencies of pre-pubescent children. Paedophilia rings connect at their core with satanic rings for the same reason. While



Figure 178: The Cult's unseen 'gods' feed off human low-frequency energy especially fear, anxiety, hatred, resentment, regret, and other such emotional states. (Image Neil Haggar)



Figure 179: The main all-seeing eye character in Disney's *Monsters, Inc* in which the monsters powered their world with the fear of human children.

possessed paedophiles are having sex with children the wave entanglements from the child to the paedophile and through to the possessing entity allow the entity to draw off and absorb the child's energy. So many rich and famous Cult operatives and bloodlines I have researched in royalty, politics, banking, business, intelligence agencies, military, law enforcement and 'entertainment' are connected to both paedophilia and Satanism. Are we really so naive that we think it's just a coincidence that Jimmy Savile, the UK mega-paedophile and procurer of children for the rich and famous, had deep and decades-long inner-circle connections with the Cult bloodline British Royal family and Prince Charles in particular? Or that Savile was brought into the royal fold in the 1960s by Lord Mountbatten, a known paedophile and Prince Charles mentor? Or that Prince Andrew's close friendship with Sabbatian-Frankist Cult and Israeli Mossad agent, mega-paedophile and child procurer, Jeffrey Epstein, was more random chance? Or that UK Prime Minister Margaret Thatcher was a close friend of Savile in an administration that protected known paedophiles? Oh, please.

Maintaining Body-Mind humanity in low-frequency states of programmed ignorance is not only about feeding off our energy. The simulation is a band of frequency and to hold Body-Mind in perceptual servitude and illusion we must be entangled with the simulation through body, mind and emotions, and that means staying within its frequency band. From this we have had the age-old targeting of anyone who expands their awareness beyond that perceptual prison and sees the truth. The Cult created religions which insisted that everyone believed what they said on pain of death. 'Witches' (psychics) were drowned and 'blasphemers' of every kind were burned or in other ways mass-murdered. The Inquisition was a Cult operation to protect its control of human perception and when people began to turn away from religion the Cult instigated mainstream science to keep the truth about reality from the masses while continuing to pass on the hidden knowledge to each generation of the Cult 'elite'. This new religion called science has been policed by another inquisition for would-be scientists, academics and doctors in which they follow the prescribed 'truth' or find another job. Mainstream science is the same religion blueprint under another name. Scientism has its own holy books ('scientific orthodoxy'), imposes its beliefs through the 'education' system (just like religious schools), and through the mainstream and much of the 'alternative' media. All use holy Scientism orthodoxy as their point of reference for 'how things are' even though most of this is way off the mark (Fig 180 overleaf). Where once people were killed for seeing the truth outside the simulation (though many still are) the weapons of choice in the West today are ridicule, condemnation and censorship by Cult-owned Google, YouTube, Facebook, Twitter, and all the rest. They



Figure 100: Top: I'm getting something. Plenty to come.

sky alone in terms of stars and planets why isn't the Galaxy/Universe that we 'see' (decode) teeming with life? By the law of averages alone it should be. The ancients in cultures all over the world described non-human visitations. Rock and cave paintings dated to thousands of years ago feature images remarkably similar to those reported in the modern world by people claiming to have seen, or been abducted by, non-human entities. They clearly exist so why not make themselves openly visible to everyone? Italian physicist Enrico Fermi (1901-1954), who created the first nuclear reactor, asked this question and it became known as the Fermi Paradox. American astrophysicist Michael Hart studied the mystery and wrote an article for the *Royal Astronomical Society Quarterly Journal* in 1975 entitled 'An Explanation for the Absence of Extraterrestrials on Earth'. He concluded that the mystery had these possible explanations: (1) Aliens never came because of something 'that makes space travel unfeasible'; (2) aliens chose not to come to Earth; (3) advanced civilizations arose too recently for aliens to reach us; (4) aliens have visited Earth but we didn't see them. I would add another: The Fallen Ones behind the simulation don't want humanity to interact with extraterrestrials that would open their minds to the scale and nature of reality. They want us to believe we are alone (alone - isolated, disconnected). What would happen if people became consciously aware of non-human civilisations who came to impart knowledge that has been kept from us? Human minds would fly open and Cult control of perception would be over. Open visitations from benevolent and advanced extraterrestrials is the last thing the Fallen want and given they have so much control over the gateways to the simulation they can overwhelmingly stop that although not entirely. What they want is a closed system with them controlling the gateways and portals and most of the 'extraterrestrials' that people report (though not all) are reptilian in nature or the classic Greys - both of which are expressions of the Fallen Angels. Malevolent 'Greys' and 'Reptilians' are inserts into the Matrix to serve the Fallen and I believe the classic 'Greys' to be another

are the modern face of the Inquisition and Nazi book-burners along with government agencies targeting alternative methods of healing based on knowledge denied by Scientism's religious dogma (the Cult).

Where are the 'aliens'?

Given the extent of the night

form of biological/technological artificial intelligence which the Cult wants to connect to the human brain. Still other 'UFO' craft are really flown by humans with the technology developed through technology transfer between the Fallen and Cult operatives in underground bases, or DUMBS (deep underground military bases), run by Cult levels of the military. What is happening in these bases is denied even to elected governments. Make that especially to elected governments. The existence of 'flying saucer', or anti-gravity, technology has been widely documented for decades and the scam is to keep from the population and politicians an awareness of technology way beyond the public cutting edge. When people see glimpses of that they will immediately assume it's the work of 'aliens'. American military pilots have described seeing craft moving at speeds and changing direction in ways that are impossible to know human technology. The Pentagon has admitted to having these sightings, some caught on radar, but they refuse to release details of their internal 'investigations'.

Astrological inversion?

What are the chances of such an apparently limitless realm of stars and planets being seemingly devoid of life when life has evolved to the extent that it has on a planet the comparative size of a pinhead? You know, the same pinhead that we have to keep incarnating onto to follow 'God's Plan'. It's all ridiculous ... unless ... the simulation has been specifically encoded to be that way to give target minds the feeling of isolation which confirms we are all alone, a 'Little Me' in every sense. Remember the simulation is a simulation, an artificial construct, and its creators can encode information any way they choose just as video game creators do. The scale of the two may be very different, but the theme is exactly the same. Today's virtual reality technology is mimicking the simulation. The Universe and galaxy seems devoid of life, except for us, because the simulation is made to be that way. I remember being hit between the eyes in a revelatory sense on my first visit as a child to the then new London Planetarium which opened in 1958. I could have been no more than six or seven. There were many strange things about that trip including the fact that it happened at all. We didn't have much money and travelling anywhere outside my home city of Leicester was very rare in those days even to the seaside. My father came down the stairs that morning and said 'Get ready - we're going to London'. I couldn't believe it. Where did that come from? London? Well, I'd never been there and it would be a long time before I did again. Even stranger is that my father announced we were going to visit the planetarium having shown no interest whatsoever in astronomy before or indeed after. I had no idea what a planetarium was and didn't know what to expect. I clearly remember the moment and the effect it had on me when

the lights went down and I saw the night sky projected on the domed ceiling. 'It looks so real', I thought'. If someone had said it was nighttime and the roof had been removed I would have believed them. The experience struck me so profoundly and I never forgot the moment. I had no idea why until I began to realise that the night-sky itself is a holographic projection. Oh, but when spacecraft send back pictures the planets look so real and solid. Of course they do – the decoded simulation is holographic. If the planets and stars are a projected holographic construct where does that leave the wave effects on humans measured by astrology? Well, I am going to be controversial here, but then I have been known to be. Where that leaves astrological influences is as ... part of the control program. These influences are constantly affecting us mentally and emotionally and laying out our life 'path' which is why it is important to expand into beyond-the-simulation consciousness to override astrological influences. Without expanded awareness a human life is the playing out of a software program with many different influences dictating the direction including the astrological. This is not to say that we don't need astrologers or their readings. No, the opposite is true. Skilled astrologers are actually reading the influences of the simulation which is very useful information. I am saying that we need to know what these influences are and by opening our hearts and minds we can tap into the power of consciousness to overcome them when necessary.

Gnostics knew (and they were not alone)

The themes of what I am saying can be found all over the ancient world before Cult religions moved in to make revealing the knowledge a death sentence. This is certainly true of a group of people – a belief system rather than a race – known as Gnostics with their philosophy of Gnosticism. Wherever they located and their information began to spread the Roman Church, the Church of Babylon relocated to Rome by Cult operatives, would send its armies and mobs to destroy them. Most importantly this happened with regard to the Gnostics with the destruction of the Royal or Great Library of Alexandria in Egypt in the 5th century. Gnostic thinkers at the library collected an estimated nearly half a million scrolls, manuscripts and documents detailing ancient history and knowledge from many centres including Egypt, Assyria, Greece, Persia, India, and elsewhere (Fig 181). This was knowledge about history (the arrival of the Fallen Ones) and reality that the Cult-controlled Roman Church did not want to be circulated. Greek philosophers Plato, a pupil of Socrates, and Aristotle were among the inspirations of Hypatia, an Athens-educated mathematician, astronomer and philosopher who was head of the Platonist school in Alexandria. One of her quotes captured the spirit of open-minded inquiry at the



Figure 181: The Royal Library of Alexandria.

Great Library: 'Reserve your right to think, for even to think wrongly is better than not to think at all.' Such commitment to free thought produced revelations about reality thousands of years before modern science 'discovered' them and claimed the credit.

Gnostics in Alexandria

knew that the Earth orbits the Sun 2,000 years before Polish mathematician and astronomer, Nicolaus Copernicus, confirmed this. The Cult was not happy with free-minded discovery and the Great Library was destroyed in a series of attacks by the Church. Those included the murder of Hypatia in 415AD by a mob under the control of Cyril, Patriarch of Alexandria, who like so many mass killers before and since was made a saint by the Vatican. Gnostics also famously gathered in southern France centuries later under the name 'Cathars' before their mass-slaughter by the army of Rome in the siege in 1244 at the Castle of Montségur in the Languedoc near the Pyrenees.

When you read Gnostic philosophy it is easy to understand why the Cult's Roman Church wanted rid of them wherever they located. Gnosis means 'knowledge' and more specifically hidden or spiritual knowledge. What I am calling Body-Mind the Gnostics called 'Nous' and what I am referring to as Infinite Self they gave the name 'Pneuma'. From this comes the phrase about 'using your nous' which would translate as using your mind. It's much better to use your Pneuma – your expanded awareness. It was believed that any detailed record of Gnostic belief had been lost with their demise at Montségur until an amazing find in 1945 at Nag Hammadi about 80 miles north of Luxor on the banks of the River Nile in Egypt. A local found a sealed jar filled with Gnostic texts or scriptures that became known as the Nag Hammadi Library (Fig 182 overleaf). They included 13 leather-bound papyrus codices (manuscripts) and more than 50 texts written in Coptic Egyptian. The texts are estimated to date from about 350 to 400AD which would fit with the period before the attack on the library in which Hypatia was killed. It's thought likely they are representations of Greek works going back to maybe 120-150AD or earlier. From this incredible find far more is known about the Gnostic view of reality and this is especially significant with the texts hidden away and remaining unchanged when many religious texts have been manipulated, re-written and translated to suit the authorities of the day. I was taken



Figure 182: Part of the fantastic Nag Hammadi find of Gnostic writings.

'fake reality' which in modern parlance was, in effect, describing a simulation. No wonder the Cult-created-and-controlled Roman Church wanted them gone. Archon is a Greek word meaning 'ruler', 'prince', 'authorities' and 'from the beginning'. A fifth of the Nag Hammadi manuscripts are about the Archontic manipulation of human society under the chief Archon which Gnostics refer to as "Yaldabaoth", or the 'Demiurge', and the Cult calls Lucifer the Light Bringer. Other names for Yaldabaoth/Demiurge are Satan and the Devil which are biblically referred to in reptilian terms (Fig 183). Gnostics believed that Yaldabaoth and the Archons were the source of evil in human society and that they indeed created the material world that I am calling the simulation. They



Figure 183: So many names, but the same force being described.

said human bodies were a trap to enslave us in the fake reality. Gnostic texts referred to Archons in their base form as energy beings (what I would describe as wavefields of consciousness), but they said Archons could take 'material' form. They described their most common manifestations as ... reptilian or serpentine and beings that look like 'an unborn baby or foetus with grey skin and dark, unmoving eyes'. Reptilian entities have featured in my books since the 1990s as manipulators of human life from the hidden realms with their bloodline human/reptilian hybrids operating within the simulation and appearing outwardly to be human. The description of grey foetus-like entities with dark eyes captures the appearance of the classic 'Greys' of UFO research fame (Figs 184). They are by far the most common 'alien' entities reported by witnesses and

back to read the Nag Hammadi works after what I had already concluded about the Fallen Ones and the simulation. More than 1,600 years ago (as we perceive 'time') the Gnostics wrote about a non-human force they called 'Archons' and a

... reptilian or serpentine and beings that look like 'an unborn baby or foetus



Figure 184: Gnostic texts describe how Archons appear in our reality in forms that are reptilian and several very much like the 'Greys' of UFO research lore and legend.

The Nag Hammadi Bruce Coxley says:

He is an incomprehensible one, but it is he who comprehends ALL. He receives them to himself. And nothing exists outside of him. But All exist within him. And he is boundary to them all, as he encloses them all, and they are all within him. It is he who is Father of the aeons, existing before them all. There is no place outside of him.

What a perfect description of The One, the still and silent 'isness' of All Possibility and Infinite Intelligence pervading all existence and to whose influence we can open any time we choose. Nag Hammadi texts divide reality into what they call the 'Upper Aeons' (Prime Reality) and the 'Lower Aeons' or material world. Aeons in the Gnostic context are bands of perception, reality and potential. Upper Aeon, the realm of All That Is in Awareness of itself, is 'The Silence', 'the silent Silence', 'the living



Figure 185: Gnostics described Prime Reality and fake reality – what I am calling the simulation. Prime Reality was a place of harmony, love and the NOW. Fake reality was a place of disharmony, evil and 'time' created by Yaldabaoth/Lucifer the Light Bringer.

those dubbed 'abductees' across the world who describe in remarkably consistent detail how they were abducted by a non human species, usually 'Greys'. Gnostic texts have their version of 'The One' which they symbolically call 'The Father' and 'The All'.

Silence', with its 'Watery Light' (Fig 185). This light is very different from the simulation light within the speed of light and has been described by near-death experiencers. Water symbolism is often used by Gnostics for infinite light as with '... the waters which are above'; '... the waters which are above matter'; and '... the Aeons in the Living Water'. The Bible describes in the opening to Genesis how the Old

Testament 'God' (I say 'Yaldabaoth') created the earth from the 'void' by moving upon the 'face of the waters':

In the beginning God created the heavens and the earth. And the earth was without form, and void, and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said, Let there be light: and there was light.

Gnostics said there is no 'time' or 'space' in the Upper Aeons as I described earlier. One text says that 'since the emanations [from 'The Father'] are limitless and immeasurable' there can be no time or space and they are pure consciousness or awareness named Pleroma or 'the totality', 'the fullness' and the 'perfection' of 'emanations of the Father'. The *Tripartite Tractate* text says:

The emanation of the Totalities, which exist from the one who exists, did not occur according to a separation from one another, as something cast off from the one who begets them. Rather, their begetting is like a process of extension, as the Father extends himself to those whom he loves, so that those who have come forth from him might become him as well.

Gnostics speak of the interaction between 'The Father' and 'The Mother' which they refer to as 'The Thought'. Their interaction produced a third force or extension of The One which they symbolised as the Son. There are many themes in the Nag Hammadi texts which Christianity twisted through the centuries and took for its own.

Archontic fake reality

Nag Hammadi manuscripts say the material world was created 'in error' when an emanation of the 'The Father' disconnected from his influence and this is the Gnostic version of 'The Fall' and Fallen Ones. The emanation called by Gnostics Yaldabaoth or the Demiurge (Lucifer/Satan/Devil) is said to be a 'formless entity' that proceeded to create a 'bad copy' of the Upper Aeons (Prime Reality) which became the Lower Aeons or 'material' world and what I say is a simulation (Figs 186 and 187). I suggest that using modern language what Gnostics described as a 'bad copy' is a wavefield/digital copy of cosmic Prime Reality – a virtual reality representation. A simulation could be very accurately dubbed a bad copy and once it was created the copy could be continually changed and downgraded just as once you have downloaded a copy of a website you can change its nature while the original continues to exist as it always was. This has been happening since the simulation was installed and never more so than with the current technological transformation. The Gnostic *Apocryphon of John*



Figure 186: Gnostic texts said that Yaldabaoth created a 'bad copy' of Prime Reality and I say they were describing the creation of the simulation. (Image: Neil Hagan.)



Figure 187: What the Gnostic 'bad copy' really is.

says that Yaldabaoth is a 'counterfeit spirit' and Nag Hammadi texts describe this entity as 'The Blind One', 'The Blind God' and 'The Foolish One'. Samael, a name for Yaldabaoth in Jewish Talmudic writings, translates as 'Poison of God', or 'Blindness of God'. Gnostics said this 'insane' fake 'god' oversaw chaos without limit. The Nag Hammadi *Origin of the World* manuscript says: '...There appeared a force, presiding over the darkness [Lower Aeons]. And the forces that came into being subsequent to them called the shadow "the limitless chaos". You only have to observe Planet Earth for confirmation. Nag Hammadi texts depict our reality of chaos as 'Hell', 'the Abyss' and 'Outer Darkness', where trapped Souls are tormented and manipulated by demons (as I have been writing for decades). The *Hypostasis of the Archons* quotes Yaldabaoth as saying: 'It is I who am God, and there is no other power apart from me.' You have heard similar in the Old Testament from the Genesis 'God' that 'created the world' – created the simulation: 'I am the LORD, and there is none else, there is no God beside me' (Isaiah 45:5). The 'Lord God' of the Bible is the 'Lord Archon' or Yaldabaoth of the Gnostic manuscripts. Yaldabaoth is depicted in popular culture as the 'Dark Lord', 'Lord of Time', Lord (Darth) Vader and Dormammu, the evil ruler of the 'Dark Dimension' trying to take over the 'Earth Dimension' in the Marvel comic movie, *Dr Strange*. The angry, hate-filled, vindictive 'God' of the Old Testament, known as Yahweh/Jehovah, is quite clearly Yaldabaoth of the Gnostic manuscripts. Here he is quoted in Leviticus:

You will eat the flesh of your sons and the flesh of your daughters. I will destroy your high places, cut down your incense altars and pile your dead bodies on the lifeless forms of your idols, and I will abhor you ... I will scatter you among the nations and will draw out my sword and pursue you. Your land will be laid waste, and your cities will lie in ruins.

Nice blake. I emphasise that I came to all the conclusions outlined earlier from a list of other sources before I read the Nag Hammadi documents which made them even more compelling to me. The texts say that Yaldabaoth left the Upper Aeons (left the 'gardens'). He created subordinate like-entities, AI software copies called Archons, and a likeness 'in him' of the Coomas (simulation). Note the term 'in him'. I recall a quote by Caleb Scharf, Director of Astrobiology at Columbia University, who said that 'alien life' could be so advanced that it transcribed itself into the quantum realm to become 'physics' and numbers. He talked of intelligence which is indistinguishable from the fabric of the Universe. This has been my view for a long time and I say that 'AI' beyond what we have been told about is 'Yaldabaoth' and the Archonic force which has transcribed itself into the quantum realm to become physics and numbers. This would explain why the physics of our reality are so different to those outside the speed of light (Fig 185). The AI connections will become incredibly important in the chapter 'Where are

we going - if we allow it?' Gnostic texts say of Yaldabaoth: 'He became strong and created for himself other aeons with a flame of luminous fire which exists now.' Flame of fire = the 'light' of the simulation within the speed of light. The same themes can be found in ancient societies across the world as I have detailed in other works. Archons are the Gnostic name for the Islamic (and pre-Islamic) Jinn or Djinn (also genies), Christian demons, and Zulu Chitauri 'Children of the Serpent', or 'Devastators'. Satan is known by Christians as 'the Demon of Demons' while Gnostics called Yaldabaoth the 'Archon of Archons'. Both are known as 'The Deceiver'. Nag Hammadi documents call Archons mind parasites, inverters, guards, gatekeepers, detainers, judges, pitiless ones and the Deceivers. Gnostics describe Archons in terms of 'luminous fire'



Figure 185: The Speed of Light is the simulation.



Figure 186: Once again different names, same story, same phenomenon.

while the Jinn are said in Islamic belief to be made from 'smokeless fire' (Fig 189). Archons and Jinn are both said to be entities in the unseen manipulating humanity. I was talking to a Muslim taxi driver in New York about my work and I mentioned the Archons and how they were described. He said immediately -

'That sounds just like the

Jinn'. Gnostics portray the 'material' world with words like 'deficiency', 'imperfection', darkness and the Abyss while the Upper Aeons are 'fullness'. Prime Reality is called 'the existent' while 'material reality (the simulation) is 'non-existent'. The *Brur Cafez* says:

And then the existent separated itself from the non-existent. And the non-existent is the evil which has manifested in matter. And the enveloping power separated those that exist from those that do not exist. And it called the existent 'mental', and it called the non-existent 'matter'. And in the middle it separated those that exist from those that do not exist, and it placed walls between them.

Gnostics make the distinction between our 'Spirit' in the Upper Aeons and our 'Soul' trapped in the material world. Most psychics are connecting with the realm of Soul and only a relative few with Spirit where the really top-notch information can be accessed. If our point of attention remains in Soul (Mind / Psycho) and not Spirit when we withdraw from 'physicality' we are trapped in the Lower Aeons at other less energetically-dense levels before returning in another bodily form through 'reincarnation'. Gnostics have a concept of what they call 'the middle place', a 'space' between the Upper and Lower Aeons which they describe as a state of temporary 'non-existence' as the Soul waits to reincarnate or is trapped there by ignorance (low-frequency wavefield). Archons are said to guard the exits and gateways, but they are low-frequency idiots and cannot block or affect high-frequency states. Texas-entitled Parris-Sophie symbolise the limits of Yaldabaoth reality (simulation) as a dragon swallowing its own tail: 'The outer darkness is a great dragon, whose tail is in his mouth, outside the whole world and surrounding the whole world.' See the reptilian symbolism yet again. An esoteric/occult symbol portrays precisely this concept in the form of the 'Ouroboros', or 'Leviathan', which is a serpent swallowing its own



Figure 190: The 'Ouroboros', or 'Leviathan' is the reptilian symbol guarding the walls of the simulation. We pass through those perceptual limits to escape the Matrix.



Figure 191: The ancient concept of the Ring-Pass-Not through which we must pass to return 'home' and as with the Gnostic version our perceptions hold the key. (Image Neil Hagan.)

because of some delusion under which the consciousness is labouring, be that delusion mental or spiritual.

Common themes keep on repeating and among them are the following: Consciousness is trapped in the illusion of 'material' reality by perceptions of reality which dictate frequency. The simulation is a

tail (Fig 190). Gnostics said the outermost planetary sphere or Archon (of the Lower Aeons/simulation) is Saturn. Beyond that was the serpent Leviathan through which Souls had to pass to reach paradise (reconnect with pure Spirit). Readers of *Everything You Need To Know* will be aware of what I have written about Saturn and its role in the simulation which again fits with the Nag Hammadi manuscripts. Cult symbolism is awash with portrayals of Saturn which is dubbed 'Lord of Karma' and ruler of 'time' – both concepts of the simulation. I also say that the Moon (linked to the perception of 'time') and the constellation of Orion are very significant to the simulation and human control. The theme of the Gnostic great dragon or Ouroboros can be found in the ancient esoteric concept of the 'Ring-Pass-Not' (Fig 191). This is a definition:

A profoundly mystical and suggestive term signifying the circle or bounds of frontiers within which is contained the consciousness of those who are still under the sway of the delusion of separateness – and this applies whether the Ring be large or small.

It is a general term applicable to any state in which an entity, having reached a certain stage of evolutionary growth of the unfolding of consciousness, finds itself unable to pass into a still higher state



Figure 192: Humanity is entrapped by ignorance (Oring) suppression of perception and true self-identity. This sustains a low-frequency state that keeps people in the Bubble of the simulation. We can break out any time we choose as I will later explain. (Image Neil Hagan.)

simulation). The Nag Hammadi *Tripurite Doctine* says of Souls trapped in the Lower Aeons: "Therefore they fell down to the pit of Ignorance which is called "the Outer Darkness" and "Chaos" and "Hades" and "the Abyss".' Pit of Ignorance – caught in the illusion – low frequency state. Gnostics describe humanity as a whole as manipulated 'forgetfulness'. The way out of here is to remember our true nature and see through the illusion by opening the heart to a high-frequency state. The Jim Carrey film *The Truman Show* was very symbolic of this whether by accident or design. The Carrey character is born onto the mega-set of a TV soap and everyone around him is an actor although he doesn't know that. The Sun comes up and down every day and seems real to him while in fact it's a technological illusion orchestrated like the whole show from a control centre that looks remarkably like the Moon. Later in adult life Carrey's character begins to realise something is not right (he 'awakened') and he sails a boat out into what appears to be an endless ocean to find the outer wall of the dome that marks the limit of the movie set which he was never allowed to see. He finds a door in the wall of the dome and walks through to the 'real world' (symbolic of Prime Reality). Interestingly, the term 'firmament' means 'vast dome' and the Biblical reference to 'beyond the firmament' takes on a whole new meaning from this perspective. The concept has been portrayed for centuries as you can see in Figures 193 and 194 overleaf which are depictions from 1888 and even 1475. The inscription on the second one reads: 'A medieval missionary tells that he has found the point where heaven and Earth meet ...' Biblical texts describe how the Old Testament 'God' (Yaldabaoth) manifested the 'vast dome' firmament on the second day of the Creation sequence to divide the primal sea (Infinite Awareness) into upper and lower parts (Infinite reality and simulated

band of frequency which humanity and Body-Mind is manipulated not to breach by becoming aware of its true nature – formless Spirit (Fig 192). When this realisation is integrated as an innate and not just an intellectual concept our Mind/Soul frequency quickens and we can pass after human 'death' through the Ring-Pass-Not/Ouroboros (outer frequency walls of the



Figure 198: A 1888 depiction of the firmament of 'our dome'.



Figure 199: A different portrayal of the firmament and two divided 'worlds' from 1475.

reality:

Then God said, 'Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.' Thus God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament, and it was so.

This biblical text is describing the division of what Gnostics call the Upper and Lower Acons. Gnostic writings symbolise levels of conscious in terms of 'the waters' as we have seen with '... the waters which are above'; '... the waters which are above matter'; and '... the Acons in the Living Water'. The simulation is an inversion (the Gnostic 'bad copy' 'shadow world') of Prime Reality. Gnostics compared the two with terms such as fullness/deficiency, immortal/mortal, spiritual/psychic, Spirit/Soul, existence/non-existence, no-time/time, no space/space. The deficiency of possibility compared with Prime Reality is why the Archontic force had to develop technology in an effort to bridge some of the ginormous gap in creative potential. Prime Reality manifests directly through consciousness with no technology necessary.

Software Archons

Agent Smith and other agents in the *Matrix* movies are portrayed as software programs downloaded into the simulation to manipulate events and target dissidents on behalf of the creator of the Matrix who is called 'The Architect' (Fig 195). He is given a white beard which connects to Kronos, the Greek god of Saturn, who is depicted holding a scythe and an hour glass to symbolise control of 'time' (Fig 196). The chief god of Rome was also Saturn after which was named the festival of



Figure 195: The bearded 'Architect' who built the Matrix in the movie series.



Figure 196: The bearded Kronos, ruler of Time, and the Ancient Greek god of Saturn.



Figure 197: Kronos is known today as 'Old father Time'.



Figure 198: The Grim Reaper is another Cult symbol of Saturn which is said to represent death as well as time. We are talking about a Death-Cult after all and no wonder Cultists worship Saturn: see 'Everything You Need to Know' for why.

Saturnalia that

became the Western Christmas (Santa is an anagram of Satan). Other versions of Kronos/Saturn are called 'Old Father Time' with the long beard and the scythe-holding Grim Reaper which symbolises the Cult obsession with death (Figs 197 and 198). The Grim Reaper is associated with Saturn which is astrologically associated with death. Archons are encoded in arch-angels, arch-bishops and many such terms. We see the same with the Jewish god of Saturn called El. We have Is-Ra-El (with its Saturn symbol Star of David flag) and the El-lite,

El-ctions, and so on. Agent Smith in *The Matrix* can replicate himself countless times because 'he' is a software program and I contend that the same is true with the Cult bloodlines. They are biological software known through the ages as the 'Soulless Ones' and 'Heartless Ones'. They are cold, emotionless psychopaths who have no Soul and no heart connection to *The One*. We are talking AI biological robots or, in their base form, AI

wavefields of encoded information. The Cult bloodline obsession with interbreeding is to hold fast the software codes. It's not really about protecting the 'blue blood' gene pool, but the wave-code 'pool' which becomes holographically the biological gene pool. Archons in general are wavefield 'software' and Gnostic texts refer to them in terms of what we would call cyborgs. The 'cold', 'emotionless', Greys are software programs while reptilian species are robot-like in their behaviour. Zulu high shaman and official historian Credo Mutwa, who left us in 2020 at the age of 98, told me decades ago that to understand the 'Illuminati' we must study the behaviour of the reptile. I did, and I found them to be extraordinarily computer-like as I already mentioned. I read an article about Swiss clairvoyant, Anton Styger, which was about his life and not at all about these subjects. Nevertheless one of his comments was very relevant to what I am saying. Skilled clairvoyants are able to see deeper into the energetic field and outside purely visible light. Styger said:

When I see people in business or politics who are particularly trapped by the material world, for example, I notice that they no longer have any light bodies at all [wavefields associated with 'human']. In many of these people, the point of light at the heart chakra, which is otherwise always present, is no longer visible to me.

Instead, I see something like a layer of 'shiny tar' around them in which a monstrous being in the shape of a lizard can be distinguished. When such people speak on television, for example, I see a crocodile shape manifesting itself around the person like in a concave mirror; I don't see the light of their throat and forehead chakras.

They don't have 'light bodies' in the human sense because they are possessed software constructs and no light at the heart chakra explains their *heartless* behaviour and lack of connection to *The One*. These are software entities running our world through control of politics, intelligence agencies, military, banking, business, media, academia, science, medicine, 'education', Silicon Valley, and all the rest. Many have quick minds and intellects because they are AI, and this further explains why Gnostic documents say that Archons have no 'ennoa' ('intentionality' or 'creative imagination'). They have to trawl and exploit the creativity of their targets, in this case humanity, which is being manipulated to build its own technological prison. They have to manipulate the creative imagination of humans (which they don't have) to manifest the reality they want and this will become seriously relevant later in terms of current events. Archons can copy and imitate, but not innovate. Gnostics called this 'countermimicry'. One example is mimicking Prime Reality with the 'bad copy' simulated virtual reality

and you can relate this concept to Hong Kong/China where so much is copied and not created – it is *counterfeit* as Gnostics called Yaldabaoth a 'counterfeit spirit'. Gnostic texts say Archons are expert in deception and 'phantasia' – creating illusions through 'Ha!' or virtual reality with the goal 'to overpower humanity in its perceptual functions' and impose 'fear and slavery'. John Lamb Lash, author of the book *Not In His Image* about the Nag Hammadi texts, wrote:

Although they cannot originate anything, because they lack [without connection to *The One*] the divine factor of *ennoa* (intentionality), Archons can imitate with a vengeance. Their expertise is simulation (HAL, virtual reality). The Demiurge fashions a heaven world copied from the fractal patterns [of the original] ... His construction is celestial ketch, like the fake Italianate villa of a Mafia don complete with militant angels to guard every portal.

It reminds me of a quote in the TV series, *The Hitchhiker's Guide to the Galaxy*: 'In the beginning the Universe was created ... This has made a lot of people very angry and been widely regarded as a bad move.'

Computer reality mimicking simulation reality

The Gnostic view of reality is close to my own in the areas I have described, but that doesn't mean I am 'a Gnostic'. There is just a convergence of view on the fake reality and its source. The last thing we need is any more black and white labels. There will be many other things on which Gnostics and I will disagree. Themes describing a fake 'god' rebelling against 'the God' and manipulating humanity by deception are widespread in so many forms within the religions and cultures of the world. It's a universal story and if people think that imposing a simulated reality on the apparent scale of the Universe is too far-fetched they should look at interactive video games like *No Man's Sky* released in 2016 (Fig 199). This features more than 18 quintillion planets each with their own unique, flora, fauna and animal species. There are sentient alien races and those who are 'mechanical lifeforms'. The controlling 'God', called The Atlas (Yaldabaoth), is a 'ubiquitous entity represented by a red orb inside a black diamond'. The will of



Figure 199: The interactive *No Man's Sky* universe with more than 18 quintillion planets.

Atlas is imposed by the Sentinels (Archons) who are 'mechanical lifeforms; self-replicating, non-organic machines ... [who] ... act as workhorse machines of The Atlas and as universal police, controlling the actions of those who reside within the universe'. This pretty much sums up the human plight. We are experiencing a false reality that takes the form of an interactive virtual-reality simulation in which information is encoded in the simulation's version of The Field for us to decode into an apparently physical world. The human personality without a connection to beyond-the-Bubble consciousness is created by electronic/electromagnetic stimulus through a system of activation and reaction (input-output) between the simulation and the five senses. Body-Minds have major or subtle differences in their 'wiring' or wavefields and so can respond differently to the same input. One person may react to a situation with compassion and another with empathy-detected contempt. These reactions will appear in the playing out as a person who cares and a psychopath. Human responses to electronic/electromagnetic stimulus (a situation) are what we call different 'personalities'. At the same time there are enormous similarities in the way that humans react to stimulus that induces fear – the 'press enter' response as I call it.

So we have Body-Minds reacting to fear-based stimulus on a mass scale – especially that relating to fear of death and the unknown (same thing) – but in their five sense-stimulus feedback loops responding to other electrical input in different ways that appear to give us different 'personalities'. I say those 'personalities' are largely the creation of electrical input-output interaction while a connection to expanded awareness takes you beyond the programmed limits of human personality. Heart consciousness does what it knows to be right and overrides the input-output feedback loops. It does not react to fear stimulus with an output of fear and fear-generated response. It calmly sees things as they are from a panoramic perspective and the awareness that it is an eternal state of Infinite Consciousness having a brief and transitory experience. It has no fear of death because it knows that 'death' is merely a transfer of attention from a myopic reality to an infinite one. Heart awareness may seem to have a 'personality' through the perception of its behaviour (not least because that is so different to the 'norm'), but such people are responding from the T beyond the Bubble and not five-sense dominated input-output. Heart consciousness overrides that simulation/Body-Mind interaction and those senses then respond to the heart and not the simulation. In this way we begin to impact upon the simulation and not the other way round.

The simulation gives the illusion of past-present-future just as a video game does when both are only encoded information following a pre-set program in the NOW. Also encoded are the

reincarnation/karma/astrology cycles which are feedback loops maintaining Souls and minds in the illusion even after human 'death' unless we transform our self-identity; remember our true nature, open our heart connection, and expand into frequencies the simulation cannot control. Our enslavement depends in totality on us being held within the frequency band of the simulation within the speed of light through our perceptual state and we can change that any time we want. Nor should we think that the manipulating entities are all-powerful as the force behind an apparently gigantic simulated Universe. Who says it's gigantic? The *No Man's Sky* universe appears to be so and yet it is only computer codes giving the illusion of enormity. When I looked at the 'night sky' in the London Planetarium it appeared to be fantastic in scale while it only existed as a projection on the ceiling. The 'real' night sky seems gigantic when it only exists in that form in your brain. The simulation is 2D or 'flat' encoded information fields that we decode into illusory 3D through Body-Mind systems specifically designed to do that. Holograms work the same way. The extent of the simulation can be minute compared with what we perceive it to be. At the time of release *No Man's Sky* was running from 600,000 lines of code which sounds a lot until you know that modern vehicles with their entertainment and Wi-Fi systems use 100 million lines of code with plans for this to increase by two to three times. Do we only decode wavefields into holograms when we are observing them to save computational power that would be necessary for the entirety to be in holographic form all the time in the same way that computer screens go blank to save energy when they are not being used?

Decoding our own prison

The key to control by the simulation is not only its wave information construct. The crucial part is getting incarnate minds to decode the illusion while believing it to be real. The brain/body is constantly decoding the Matrix into holographic form and while perception is dictated only by the five-senses (the point of Matrix-Body interaction) the simulation is in control. Minds are then in the world and of the world and have no other point of reference. Would computer game characters know they are only responding to software? They would think it was all real. The point about 'responding' is significant. Humanity is not ultimately manipulated and directed by agents of the Cult sitting around a table deciding their next move. The transformation of global society now unfolding could never be achieved on that scale by tablesitters alone. The Archaic plan is being encoded in the energetic fabric of the simulation field for humanity to decode into reality and this is how it can happen so fast and on such global scale. For this to happen humanity must be attuned with the wave frequencies carrying that

information - SG is the next stage. Incessant propaganda through the 'education' system and mass media is specifically designed to instill perceptions that will create the desired Cult reality by entangling with the wavefields infused with that agenda. What you believe you perceive and what you perceive you experience. Humanity, in short, is decoding and manifesting its own prison. Only a transformation of perception through a transfer of self-identity to the True Self will stop this. How much of human perception is already being delivered by the simulation? What is the real origin of the constant chatter passing through people's minds? I call this the 'Scenario Mind' because it spews out an endless list of scenarios and how we would respond even though the scenario is not happening. If he did this, I'd do that, if she said that, I'd say this. Where is all that coming from? Go into a quiet space and observe this chatter. Stand back from it. Listen as it rambles on. You can observe your own Body-Mind chatter and what does that tell you? It's not you. The observer of the chatter is you.

Benjamin Libet (1916-2007), a scientist in the physiology department of the University of California, San Francisco, generated many highly-significant experiments in his quest to understand human consciousness. One group was asked to move their hand whenever 'they' chose while their brain activity was being monitored. Libet found that brain activity to move the hand began a full half a second before any conscious decision to do so. John-Dylan Haynes, a neuroscientist at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany, found in his studies that he could predict an action ten seconds before a conscious intention purely by monitoring brain activity. Frank Tong, a neuroscientist at Vanderbilt University in Nashville, Tennessee, said: 'Ten seconds is a lifetime in terms of brain activity.' Where was the decision-making really coming from if not the conscious mind? I say that some - not all, some - is coming from the simulation. Morpheus said in *The Matrix*: 'Are they your thoughts you're thinking now?' The body is encoded to be a limiting device for consciousness. In our no-form energetic state we can see, hear, feel, smell and taste without the body. We don't actually need it except to interact with the simulation. It focuses our attention within the frequency band of the simulation or in fact an even smaller band than that called visible light. It makes us believe that we can only see, hear, feel, smell and taste through the body which means people fall for the illusion that the body is who we are and without it we're nothing. Without it we're everything. Mainstream science and medicine constantly underpin this belief that the body is the totality of the 'I'. The body is counter-intuitively consciousness and limiting our sense of self, reality and the possible. No wonder Gnostics said the body was a prison trapping the 'divine spark' within matter. One other mystery explained by all this is why Earth's

atmosphere and ecosystems are perfect to sustain life as we perceive it when only a tiny change would spell disaster. Scientist Robert Lanza writes in his book, *Biocentricism*:

Why are the laws of physics exactly balanced for animal life to exist? ... If the strong nuclear force were decreased 2 percent, atomic nuclei wouldn't hold together, and plain vanilla hydrogen would be the only kind of atom in the Universe. If the gravitational force were decreased by a hair, stars (including the Sun) would not ignite. These are just [some of] more than 200 parameters within the solar system and Universe so exact that it strains credulity to propose that they are random - even if that is exactly what standard contemporary physics baldly suggests.

They are of course not random. They are made to be that way. How? Our world is a virtual-reality simulation with its own encoded rules and information. Why? To allow the Cult and its non-human 'gods' to enslave human perception in ongoing illusion and control. The simulation has been breached by many over the years who have sought to make humanity aware of its plight and they have often taken the consequences for that instigated by the Cult. This continues to be the case today as a concerted effort is underway by consciousness 'incarnating' from Prime Reality to wrest back control from the Fallen by informing the human family what is really happening in the manner of the prisoner in Plato's cave. We are making progress, but to say the very least the job is far from done.

Why don't we know?

Is there any point in public debate in a society where hardly anyone has been taught how to think, while millions have been taught what to think? – Peter Hitchens

The game of life – in this case human life – plays out in a stadium (the simulation) called perception. From this everything else comes. What we perceive becomes what we believe becomes how we behave becomes what we experience. This is the deal and to understand these connections is to understand the world and the human plight.

Our perceptions dictate our frequency and our frequency dictates our wave-entanglements with people, places, situations, and experiences. Through this process we create our own reality and experience by attracting into our lives a holographic representation of our perceptions.

A 'Little Me' perception will transmit waves so limited and weak in terms of perceived potential ('I have no power', 'I'm a victim' and 'I'll never be up to much') that the feedback loop between perception and The Field will deliver back to you just that sort of life (Fig 200). By contrast if you come at life from the perspective of being Infinite Awareness (All Possibility) having a brief human experience you make a very different feedback connection with The Field – one that is both greater in scale and much higher in frequency. An expanded sense of self automatically expands your accessed consciousness to match that perception and you are interacting with that range of possibility within The Field. Your life is transformed as more possibilities attach to your feedback loop and become your



Figure 200: A closed mind emits a closed frequency which interacts with The Field only within that limited band of possibility and thus creates the feedback loop in which 'Little Me' and 'Label Me' perceptions produce through cause and effect limited experience and awareness. (Image Gareth Kiba.)



Figure 201: Open your mind and expand your self-identity and you expand your interaction with The Field and possibility. 'Big Me' perception creates a 'Big Me' experience. (Image Gareth Kiba.)



Figure 202: What if it all the Postage Stamp Consensus is the narrow band of possibility taught in the 'education' system and promoted by the media which is the foundation belief system of academia, science, corporations, medicine, government, and the great majority of the public.

experience (Fig 201). Our self-identity is central to our relationship with The Field. The Cult well knows that it controls perception it will control experience. This is why people are being herded into smaller and smaller perceived identities to the point where one American university has this code for its students' perceptions of self-identity:

LGBTQQFAGPDSM

(don't ask). I'm sure that string of letters will be longer by the time you read this with new and ever more myopic identities invented by the day. What is happening in the world in terms of manipulation and events falls into place once you know how reality works.

The Cult's prime objective then is to dictate perception and it has structured human society as a cradle-to-grave programming laboratory founded on

what I have long called the 'Postage Stamp Consensus' (Fig 202). This is the tiny band of possibility indoctrinated in schools, colleges and universities and repeated 24/7 worldwide by the mainstream and much of the 'alternative' media. Postage Stamp belief dictates the perceptual limits of academia, establishment science, medicine, media, government, business and the Mainstream Everything, and provides the foundation of what I refer to as The Program (Fig 203 overleaf). The Cult first exploited religion as its perception deception in which deviating from the imposed belief proclaimed in a 'holy book' was a death sentence. This was the Postage Stamp Consensus of its day. Religion still retained the concept of life continuing after death, but included subordination to a schizophrenic 'God', both loving and vindictive, that invited those who believed in him to eternal paradise while condemning non-believers to

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Figure 203: Virtual reality headsets perfectly symbolise the human perception program.

tonics with whisky chasers. Shockingly this belief still controls the perceptions (and the decoded experience) of billions. Ever greater numbers began to reject this form of control, however, and they were targeted with the new Cult entrapment wheeze of 'science' and state-controlled 'education'. Mainstream establishment science had the added benefit of deleting any concept of a Creator and believers in this religion masquerading as 'rational thought' drew its targets and advocates deeper into the perception of random existence within 'matter'. For religion in its most extreme form there is death to blasphemers and the

stoking the fires of hell forever. We are asked to believe that this eternal division was decided by 'God' on the basis of a brief life on Earth of anything from seconds to decades on a planet equivalent to a billionth of a pinhead. I don't know about you, but that makes perfect sense to me after a dozen gin and

milder version is ejection from 'the faith'. With the 'rational' religion of Scientism there is death to your career and ejection from the faculty ('the faith'). Mass indoctrination is further entrenched by Cult-controlled media bias and censorship now being taken to ever more extreme levels by Cult-owned Silicon Valley. If you control what people see and hear they will believe what you tell them so long as you also control what they don't see and hear (Fig. 204).



Figure 204: The Cult knows that if it hijacks perception it will dictate the frequencies that attract experience. Morphic perceptions create a morphic life and collectively mass control becomes possible. The Cult is creating the nature of our reality through the manipulation of human perception.

The download begins

Human society is a laboratory for Body-Mind and other terms that capture the theme include conveyor belt, sausage machine and computer download. Human life is indeed a perceptual download that



Figure 205: Perceptual programming begins the moment we leave the womb and in fact even before that through the wave and chemical connections to the mother.

starts even in the womb and ends at the cemetery. When a child arrives blinking into the light the programming really starts (Fig 205). First there are parents who have already been processed by the programming system the child is about to go through and accepted what it told them to believe (if they are entrapped in Body-Mind which the great majority still are). Parents upload this indoctrination to their child in its earliest years and I am not saying this is done through malevolent intent. Often it is quite the opposite. They have themselves downloaded the system's version of reality and they think they are doing the best for their children by giving them the benefit of that 'wisdom'. Downloaded illusory 'wisdom' includes everything from what children are told and how they are treated to accepting the tidal wave of vaccinations they now receive to fill the coffers of the Cult-owned Big Pharma and undermining their immune systems and perceptual processes for life. When children are damaged by vaccines it often happens in the brain. How many kids who are not brain-damaged enough to be diagnosed still have their thinking and creative processes suppressed and limited for the rest of their lives? When this impacts on behaviour they are prescribed drugs made by the same Cult Big Pharma cartel that produced the vaccines to 'treat' the effects of vaccines. The same goes for food/drug (chemical/wave) distortions which skew the way that kids



Figure 206: 'Education' in a single image.

process information into perception and behaviour. Three or four years after arriving in the world the perception download goes through a colossal upgrade known hilariously as 'education' when an already toxin-infested child heads for school (Fig 206). Now parents start to lose influence over their offspring while children increasingly lose their distinct individuality to a programmed perception about everything (Fig



Figure 207: Children go to school to be perceptually programmed with a sense of reality designed for their entire lives.

2007). Life as it will be for their entire formative years has begun during which they will sit at a desk or in a lecture theatre day after day being told what to believe and not believe about themselves and the world in all its facets and forms by authority figures representing the perception program of the state. These

may be anything from a primary school teacher to an 'eminent professor'. Either way their role is the same – to get children and young people to believe what the state (the Cult) wants them to believe. What more effective way can there be to dictate collective perception and behaviour than to have control of what young generations are told to believe throughout their formative years? The 'educator' at every level may themselves believe what they say thanks to their own programming, or they may not. It doesn't matter. The state insists that they teach what they are told to teach in the way they are told to teach it or they're out the door. Teachers and academics are in the same perceptual penitentiary as their students in the 'education' environment. I am going to detail in upcoming chapters how this is transforming society more blatantly and profoundly than ever before and to what end. Pressure to pass exams means that 'education' for both student and teacher becomes a daily rush to stuff state-approved (Cult-approved) alleged 'facts' into the memories of young people to be held for just long enough to repeat them on the exam paper. How much of what you 'learned' at school do you remember or have you used in your life apart from the basics of maths, writing and such like? Very little will be the answer from most people, or, in my case, next to sod all. In fact I have spent my life since deleting the crap I was told at school on the few occasions when I was paying any attention. The Cult doesn't mind that you don't consciously remember the programming. Its target is your subconscious which studies have revealed is responsible for 95 percent of human behaviour. Your so-called conscious mind is the slave of the subconscious and the subconscious is what the Cult is after. When it has that it has you.

It is extraordinary how little conscious decision-making is involved in prompting actions. Most of them are computer-like responses and reactions often emotional in nature. Remember the research that showed how brain activity required to do something starts before a conscious decision is made to do it. The conscious mind retains very little, indeed



Figure 208: The subconscious is the target of perceptual programming and this seeps through to the conscious mind as what appears to be a 'personal' view or opinion. 95 percent of human behaviour derives from subconscious perceptions. (Image Neil Hague)

perceives very little, as we saw with the quote about visual reality being constructed by the brain from 40 'sensations' a second from the 11 million received. Our subconscious absorbs it all and why wouldn't that be the governor of perception? People don't have to remember all they were programmed to believe by the 'education' system. The Cult knows the subconscious will do that and influence the conscious

mind for life unless de-programming takes place called 'awakening' – awakening from the program (Fig 208). Observe people's reactions and responses to events and happenings and you will see reflex-action perception akin to pressing 'enter'. I have been ridiculed for decades for what I have said by those who have not spent a single second checking the facts or background. Their instant reaction is triggered by subconscious responses on the basis only of what they have been told is possible. Never have they had to consider shapeshifting while absorbing only information that says the world is solid. To them, therefore, shapeshifting must be crazy by reflex action. Subconscious programming seeps through to conscious perception. You have seen already my take on life that we are all one consciousness having different experiences and that human labels of race, sexuality and so on are illusions that we allow to divide us. I have been saying the same for 30 years. Compare that with what a British 'writer' called Gary Spedding posted on Twitter to my son, Gareth: 'You are the son of a known anti-Semitic white supremacist conspiracy theorist.' Has Spedding read any of my books? No. Has he been to my public presentations? No. Does he know anything about me that has not come from biased sources? No. Much of humanity is forming its perceptions in the same way which is why the great majority of what people believe is not true and only what the Cult wants them to believe is true. They are making 'conscious' decisions second by second considering validity in a whole range of subjects and situations from life-long programmed assumptions supported by no personal research whatsoever. To become conscious beyond The Program means to take control of our perceptions which involves reaching our own conclusions and not taking them off

the shelf from someone else.

Education: Systematic programming

From all this comes what I call 'everyone knows that' syndrome. We've all heard it – me more than most – when you challenge an assumption of reality and you are dismissed with an 'everyone knows that' repetition of the programmed possible (Fig 209). How come that 'everyone knows'? Well, everyone has

been through the same perceptual download. Er, that's it (Fig 210). Children in religious families invariably follow that religion because it's all they've over heard and the same principle applies to the 'education' download. The general rule of the Cult is this: If that's all they ever hear that is what they will believe subconsciously and so consciously. Any information challenging these assumptions has to break through the walls and layers of programming before an 'Ah-ha' moment can occur. There is another reason for the deluge of mostly irrelevant information heaped upon children and young people. While you were filling your mind with the daily deluge mostly utterly useless to you – and then revising it again for exams – your mind was focused on that and not going its own unique way. Five-sense focus is the goal. Once you focus at the exclusion of all else you lose peripheral vision where the truth lies and dots can be connected. The System adds still more focus time in the form of 'homework' to perpetuate five-sense focus and wire the brain to process information in a particular way which I'll come to in a moment. It's all coldly calculated by those in the shadows. Compartmentalisation means that the high 90 percents of those directly imposing the programming will have no idea why this is being done or even what is being done to the perceptions of



Figure 209: The System told me what to think – if you say anything different you must be mad or stupid.



Figure 210: Big mistake.

the young. The Cult *does* and created the structure of 'education' through bloodline families like the Rockefellers. John D. Rockefeller, the American oil/banking/pharmaceutical tycoon and Cult agent, founded the US General Education Board at the start of the 20th century. He said: 'I don't want a nation of thinkers – I want a nation of workers.' I want a nation of slaves would be more accurate. Frederick T. Gates, Rockefeller's co-founder and business advisor, said it all:

In our dream we have limitless resources, and the people yield themselves with perfect docility to our moulding hand. The present educational conventions fade from our minds and, unhampered by tradition, we work our own good will upon a grateful and responsive rural folk.

We shall not try to make these people or any of their children into philosophers or men of learning or of science. We are not to raise up among them authors, orators, poets, or men of letters. We shall not search for embryo great artists, painters, musicians. Nor will we cherish even the humblest ambition to rise up from among them lawyers, doctors, preachers, statesmen, of whom we now have ample supply.

Cult 'education' has been imposed to condition children to believe and accept for life the following:

- Truth comes from authority
- Intelligence is the ability to remember and repeat
- Accurate memory and repetition are rewarded
- Non-compliance is punished
- I must conform intellectually and socially

The Cult 'education' system worldwide is so carefully moulded from its controlling core that it targets a particular part of the brain – the left hemisphere. This has a largely different function overall than the right hemisphere. The brain is holographic in its decoded form and will have all functions spread throughout, but on the whole-brain level the two hemisphere's have different emphasis. The left-brain decodes information in ways that dominate human perception. From here come words, language, numbers and the sense of everything being apart from everything else. It sees dots and pixels, identifies with labels and likes to conform within hierarchical structures (Fig 211 overleaf). It is the orthodox politician, scientist, doctor, journalist, academic, business leader or worker, lawyer and judge. In other words all the people who run or serve The System. Current human society is overwhelmingly a holographic expression of the left side of the brain which is the foundation perception of the Mainstream Everything. The right-brain by

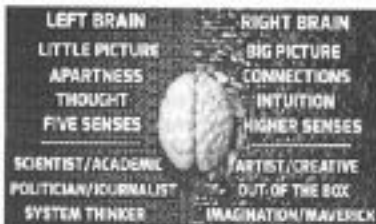


Figure 211: The left and right brain process information in very different ways to produce very different perceptions of reality.



Figure 212: The System, driven by the Cult, defends the left-brain from right-brain influences. (Image Neil Hague)

has a greater sense of oneness unity and connects dots / pixels into pictures and patterns that reveal the truth about life and reality. The right-brain has close connections to the heart and for that reason alone it is in the gunights of Cult 'education' which is designed to close the heart chakra, suppress the right-brain, and enslave the young for life in the Body-Mind Bubble. Note how little school time is given to right-brain activities like art, drama and music, and how left-brain subjects dominate the curriculum (Fig 212). Exams are passed by compiling information through the left-brain and then repeating that on the exam paper. The left-brain to a fundamental extent is the home

of The Program and its perception processing center in conjunction with the reptilian brain, or R-complex, from where reflex-action, survival-instinct responses are activated (Fig 213). I say that the reptilian brain, at least in its present dominant form, comes from Archontic manipulation of the human body. The reptilian brain is constantly scanning the environment for threats to survival and not just 'physical' survival. I mean also financial survival, relationship survival, job survival, etc. Road rage and reflex-action, fight-or-flight, over-the-top emotional responses are reptilian brain 'press-enter' reactions and the underlying

contrast is free-spirit creativity, imagination, art, poetry, spontaneity, the maverick. It is authors (of certain types), orators, poets, great artists, painters and musicians which Frederick T. Gates said they didn't want the 'education' system for the masses to produce. Crucially the right-brain

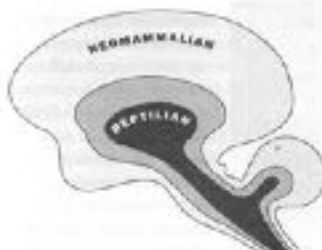


Figure 213: The reptilian brain works closely with the left-brain to distort perception and behaviour. Reptilian brain? What a coincidence.

how the left brain has a narrow focus (point of attention) in terms of detail and the right perceives the panorama or big picture. You can see the recurring theme. Those focused in their left-brain have a narrowed 'window of attention' = window of perception = which leads to lower and less expanded frequency states. Brain hemisphere/heart separation also



Figure 214: Once again the 'educational' programming system in a single image.

(Fig 214). Unseen boxes are donned by children the world over every time they start a school day.

Playtime? What play time?

The two hemispheres of the brain are connected by a bridge called the corpus callosum and we are supposed to be whole-brain people getting the best of both 'sides' (Fig 215 overleaf). Once they are divided we become divided in the way we process information into perception. Extremes of left-brain dominance create five-sense 'systems' people and

fear and anxiety felt by so many is reptilian brain connected. It is one of the major behaviour-control mechanisms and its impact on emotion keeps people in a low-vibrational state. Is this really a coincidence given what I have been writing for decades about a reptilian connection to human control? British psychiatrist Dr Iain McGilchrist has featured what he calls the divided human brain in his

presentations. He describes how the left brain has a narrow focus (point of attention) in terms of detail and the right perceives the panorama or big picture. You can see the recurring theme. Those focused in their left-brain have a narrowed 'window of attention' = window of perception = which leads to lower and less expanded frequency states. Brain hemisphere/heart separation also instils a sense of Body-Mind/Soul/Spirit separation. The 'education' system is specifically designed to be a conveyor belt to turn out life-long Bubble people. How symbolically appropriate that a school in India forced students to wear cardboard boxes on their heads to stop cheating during exams



Figure 215: The very different perceptions of brain hemispheres portrayed in a car advertisement. We are meant to be whole-brained and balance the two.

right-side domination produces highly-creative people who struggle to function and cope in a left-brain world. Another aspect of the dot-connecting, pattern-perceiving, right brain is to see context. Awareness only of dots denies context which comes from seeing how dots connect. An individual

dot can look a certain way, but connect that to other dots – provide context – and the dots together look very different to dots by themselves. I spend my life connecting dots between apparently unconnected people, places, organisations and situations. Their meaning and relevance in and of themselves is transformed once connections give them context. Dots can tell you what is happening while dot-connected context tells you why it's happening. Clearly the Cult doesn't want people doing this or its game will be revealed. The race to manipulate brain processing to see only left-brain dots begins in earnest the moment a child arrives for the first day at school. From here children are 'taught (programmed)' by teachers and academics who have been imprisoned in their own left-brain by the same programming system. The best way for children to activate their right-brain is to use their imagination by simply playing. They need to be allowed to ad-lib and imagine by enjoying this definition of play – 'Engaging in activity for enjoyment and recreation rather than a serious or practical purpose'. This presents such a danger to the Cult's programming strategy that play is being deleted from childhood through homework, the push for longer school days, and the youngest of children being introduced to left-brain activities at an ever earlier age. Democrat presidential candidate Bernie Sanders promised free education and 'Pre-K' (a pre-kindergarten classroom-based preschool program for children under five). This fits perfectly with the agenda to take children from their parents as soon as possible. The Sanders website said:

For parents all over the country, taking time off or working fewer hours to care for their children is simply not an option. That leads many families to spend a disproportionate amount of their income to cover the cost of child care and early education.

There was no mention of the consequences of parents spending a disproportionate amount of their time away from their kids while the state has control of their minds. No, no – just how to make even easier to spend a disproportionate amount of their time away from their kids. We had the same theme with one-time Democrat presidential candidate Kamala Harris who called for the American school day to be extended to 6pm to align with the adult work day and this was right in line with the agenda for kids which seeks to secure still more time for perceptual programming away from parents. Children sit at desks for hours every day being talked at while outside the Sun is shining and there are trees to be climbed and imagination to be explored (Fig 216). What little 'time'



Figure 216: Like children and young people in the prison of life with all possibility to explore and stick them at a desk all day while telling them what to believe for life. Utterly shocking village idocy – but exactly what the Cult requires.

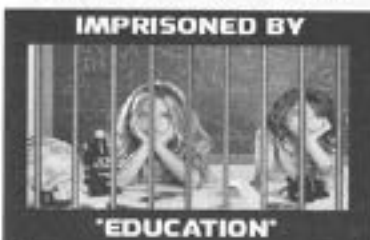


Figure 217: The walls and bars they increasingly build around schools capture the reason for late 'education' – building walls and bars around the mind. (Image: Gareth Slat.)

is left for children to play has been hijacked by smartphones and videogames that mostly stimulate ... the left-brain. John Taylor Gatto, a former teacher in the United States, realised what 'education' was really designed to do and wrote a series of excellent books exposing the game. Gatto was New York City Teacher of the Year in 1989, 1990, and 1991, and New York State Teacher of the Year in 1991. He became rather less popular with the authorities when he began speaking out. Gatto said the aim was to subdue creative, inventive, and bright students and make them obedient, subdued and dependent individuals by controlling their school-time and then hijacking what should be free time through homework (Fig

217). He said children on average watched television for 55 hours a week (perception programming) and slept for 56. This left them 57 hours 'to

grow up strong and competent and whole', but 30 hours of that was spent at school (perception programming), 8 hours preparing for school and getting to and from school, and 7 hours doing homework (perception programming) totalling 45 hours related to school. Gotta vent on:

After the 45 school hours are removed a total of 12 hours remain each week from which to fashion a private person – one that can like, trust, and live with itself. Twelve hours. But my kids must eat, too, and that takes some time. Not much, because they've lost the tradition of family dining – how they learn to eat in school is best called 'feeding' – but if we allow just 3 hours a week to evening feedings, we arrive at a net total of private time for each child of 9 hours ...

...This deranged schedule is an efficient way to create dependent human beings, needy people unable to fill their own hours, unable to initiate lines of meaning to give substance and pleasure to their existence. It is a national disease, this dependency and aimlessness, and schooling and television and busy work ... has a lot to do with it.

This is exactly the situation the Cult set out to create given that 'education' is all about producing children and young people that become adult mind-slaves for life (Fig 218). We hear spewing from the mouths of mind-slave politicians that 'Education must prepare children for the workplace'. You must spend your childhood working hard, studying and sweating to 'be someone' and 'get somewhere'. Oh, really? Be who? Get where exactly? You must have a career, a job, you must strive, strive, strive, gotta, gotta, gotta, there's not a minute to be lost (Fig



Figure 218: In a nutshell



Figure 219: Get where? And why? Gotta, gotta, gotta, get to the end as fast as I can. Enjoy the moment! What moment?

219). The Red Queen says in Lewis Carroll's *Through the Looking-Glass*: 'Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!' In fact, when we understand reality, the best way to 'get somewhere' is to stop running and manifest. The current 'education' system must be dismantled to emphasise play and imagination to activate the right brain and develop whole people. I left school at 15 to play professional soccer and daydreamed through my school years. Somehow – it must be a miracle – I have managed to write and research a stream of highly detailed books and speak for ten hours a go to audiences around the world without a single note. How is that possible when I am officially so 'uneducated'? A deeply-programmed alleged member of the 'alternative media' once said that I can't be taken seriously because I 'didn't have a degree'. She had one. No further comment necessary. All that I have learned since I left school with no exam passes has been on my own terms. My son Gareth got an 'E' in some exams because he cared even less about school than I did. Today he's a highly intelligent man aware of the world with a highly creative mind that makes him an exceptional singer-songwriter and all-round talent in many fields. There is absolutely no need to deluge young minds with information they will never use hour-by-hour, day after day, when they can easily find that information for themselves later should they want to or need to. The deluge is not for the benefit of children and young people. It's for the benefit of the Cult and its incessant perceptual programming regime.

Diane Ravitch, an American education historian, policy analyst and writer, summed it up when she said: 'Sometimes the most brilliant and intelligent minds do not shine in standardised tests because they do not have standardised minds.' The Cult, however, wants standardised minds and set up the system to get them. Psychiatrist Iain McGilchrist rightly points out that the left-brain is focused upon knowing ever more about what is already known. It's the right-brain and the heart that want to explore and uncover the unknown and have the awareness to understand it. Canadian-born psychiatrist Eric Berne described the perceptual difference between the hemispheres: 'The moment a little boy is concerned with which is a jay and which is a sparrow [left-brain] he can no longer see the birds or hear them sing [right-brain/heart]'. This is yet another example of label limitation and division at the expense of the unity of Oneness. The 'education' system is about indoctrination of the 'known' (allegedly). The Cult doesn't want us to know the publicly unknown. I am not saying that all mainstream academics and scientists are knowingly suppressing knowledge. They're in the Bubble, too. I am saying the Cult-asset academics and scientists are doing that which is a relative few. For the scam to work Mainstream Everything in general

must also be kept from the truth and diverted into misunderstanding and dead ends. There is also the immense difference between knowledge and knowing which 'education' cannot teach. It comes from within. The mystic Osbo said:

Knowledge has no capacity to dispel ignorance. Knowledge is a false phenomenon. It is not wisdom at all; it is just the opposite of wisdom. Knowledge is borrowed; wisdom is the flowering of your innermost being ... No university can offer it, no scripture can offer it and no scholarship is capable of doing it. They are all impotent efforts, but they have been deceiving millions of people for thousands of years. Yes they make you knowledgeable. To be knowledgeable is one thing, to know is totally different.

Perception laboratory

Children and young people are indoctrinated with the Mainstream Everything's version of history, science, medicine, politics, current events, life, self, all of it. 'Education' is a Cult-created programming machine constantly underscored by the Cult-controlled media which I'll be coming to shortly. Kids that want to question, challenge the orthodoxy, or are plain bored stiff like I was, are called 'disruptive influences' and increasingly prescribed mind-altering drugs like Ritalin for 'attention' disorders. We have the medicalisation of childhood, medicalisation of growing up, and it extends into colleges and universities as the

medicalisation of teenage experience essential to developing emotionally strong, fully-rounded, adults capable of looking life in the eye (Fig 220). Here we have children in the prime of life sitting in a prison waiting for the bell to ring to enjoy a modicum of freedom (homework apart) which today is defined as time on my smartphone. They are being prepared for an entire life in an adult prison after school becomes work, the teacher becomes the boss, and obeying authority is seen as essential to financially survive in adulthood while, as with childhood, often counting the minutes to home-time. Obey the teacher is replaced by obey the boss in a seamless life of external control in which only the characters and names change. 'Quick, get up, you'll be late for school'



Figure 220: The medicalisation of childhood.

becomes 'Quick, get up, you'll be late for work'; 'What will the teacher say?' becomes 'What will the boss say?' Children from the earliest age are programmed by representatives of authority with carrot and stick punishment and reward for those who conform or do not. This, too, is ingrained in the subconscious as a fear of not obeying authority. None of this is by chance.

Charlotte Iserbyt realised this fact when she was a policy advisor to the Reagan administration at the US Department of Education. She describes in her book, *The Deliberate Dumbing Down of America*, how she saw documents laying out the 'restructuring' of American and global education through computerisation designed to make perception programming even more effective. Iserbyt said that what she saw was like 'communist brainwashing' and this will become extremely relevant later. One manual by a Professor Ronald Havelock was aptly titled *The Change Agent's Guide to Innovation in Education*. Iserbyt said she was trained to identify 'resistors' who were '... those good, smart Americans who realise that anything that has education hanging off the end of it is probably not what they're looking for'. She was told to 'go up against them, and actually to go and try to get them to join us through the group process system'. This is the group-think, group-absorption, technique to either suck-in or marginalise opposing views and ideas – a modus operandi employed at every level of human society. What Iserbyt saw was planned in those documents in the 1990s has been rolled out – and worse – all over the world and it is transforming human life as the young subjected to this become adults. Central to mass indoctrination through fake 'education' in the United States is the programming operation called Common Core much promoted by big-time Cult asset Bill Gates who turns up in financial support of a long list of Cult agendas. These include mass vaccination of children worldwide. Gates is a very sinister piece of work and there is a lot more to come about him when I get to the 'Covid-19' boss. The pillars of standardised state education (indoctrination) were erected by the One-percent through vehicles such as the Rockefeller and Ford Foundations and today state child programming is dominated by the One-percent Gates Foundation. The fronts may change but the Cult is always in control. Organisations associated with Cult agent George Soros were behind the transformation of the Russian education system based on the Western model after the fall of the Soviet Union. School life was extended by a year, textbooks replaced and schools amalgamated in a period that saw plummeting levels of education and literacy. Soviet education was of course dictated by government, but the Western model of Rockefeller, Gates and Soros is aimed at global standardisation of indoctrination and centralised control. I read a book published in 2018 by American teacher Rebecca Friedrichs and the title said it all: *Standling Up To Golath*. Her 28 years in teaching

showed her how children are being politically and perceptually indoctrinated on an industrial scale with tyrannical teaching units forcing upon young minds what I am calling the Cult agenda. She describes how teachers who can see what is happening and vehemently oppose it are intimidated into silence and acquiescence. This is being done to parents and society as a whole through Cult-instigated political correctness.

I have exposed the plan for decades to delete parental rights and hand control of children and their upbringing to the state (Cult) by giving ever more power to schools and social services to destroy parental rights and control the lives of children. A primary school in England announced it would fine parents for every five minutes they were late picking up their children and threatened to call social services if they took too long. As usual the poorest parents struggling to juggle work to survive with getting to the school on time would be the ones to suffer. Parents fined by schools is a critical line to cross in the power of schools over families and this is already widespread in Britain with parents fined if they take their children on holiday in term time when the cost of holidays is so much cheaper (once again hitting the poorest). The deeply corrupt authorities on the Isle of Wight where I live, with a population of 142,000, revealed through a Freedom of Information Act request that they accrued more than £100,000 in the previous year fining parents and carers whose children had 'unauthorised absences'. What must the figure be nationally? It's an Orwellian racket. Schools are becoming dictatorships and tyrannies with surveillance cameras and, in America, police officers on duty preparing kids for their planned adult life in an Orwellian nightmare. It's getting so extreme that the utterly ridiculous staff at Valley Forge Elementary School in Pennsylvania reported a six-year-old Downs syndrome girl to the police for pretending to shoot her teacher with her fingers. Little children pointing their fingers and saying bang, bang, is now worthy of police attention according to teaching staff who are more programmed than the kids they are programming. A six-year-old girl was handed over to the police by the Love Grove Elementary School in Jacksonville, Florida, without her mother being told after a 'tantrum' and held in a facility for two days under a 'mental health' law. Police body camera footage shows the girl walking calmly and quietly with the police and an officer saying 'she's fine, there's nothing wrong with her'. Those of us old enough know what life was like before the extreme Big Brother state appeared have the radar and experience (those that are in any way awake that is) to see the scale of what is both happening and planned. Children and young people have been born into the world as it is and it's all they have ever known. What are to people like me extraordinary extremes of control gathering by the day are, to young people enslaved in Body-

Mind, just 'how things are' in human society. Such is the grip that the Cult-controlled state has on perception that many even demand more control and deletion of freedom which they and their own children will have to live with for the rest of their lives. Kyung Hee Kim, professor of education at the College of William and Mary in Virginia, ran a study involving a very large number of school-age children between kindergarten and 12th grade which tracked the effect of (the Cult's) 'education' programming of the young. The study found the following as children were processed by the system:

A massive decline of creativity [right brain] as 'children have become less emotionally expressive [right brain], less energetic, less talkative and verbally expressive, less humorous [right brain], less imaginative [right brain], less unconventional [right brain], less lively and passionate [right brain], less perceptive [right brain], less apt to connect seemingly irrelevant things [right brain], less synthesizing [right brain], and less likely to see things from a different angle [right brain].



Figure 22: What the 'education' system does to young people. Tell them to fuck off, kids, through David Dees.)

I rest my case, M'Lud (Fig 22)

Sending them crazy

When do you ever hear political parties and ideologies, whether 'Left', 'Right' or 'Centre', challenge what and how children and young people are 'taught'? They argue incessantly over the money spent on 'education' and class sizes. They say next to nothing about 'education' as a programming operation from first to last. Some are Cult agents (very few) and the rest are as perceptually programmed as anyone after being subjected to the same download. There is a war on children, mentally and emotionally, and this is some of the background to the suicide rate among the young dramatically increasing through a combination, among other things, of exam stress (what the hell are the parents doing?) and the multiple pressures of the smartphones, social media, era which is orchestrated through Cult-controlled Silicon Valley. Adding still further to these pressures is the often near life-long levels of debt imposed on the young to pay for their college and university 'education'. The merciless Cult-driven state has manipulated young people to pay for at least decades for their own programming through empathy-deleted universities that operate like multinational

corporations selling a stream of made-up, for-profit-only, shit and useless 'courses' to dip their snouts in an ever-deeper trough at the expense of the young. To them young people are just commodities or punters to be exploited like the worse kind of spiv and to be indoctrinated with The System's perceptual blueprint. The outstanding student loan 'bubble' in the United States accrued to pay outrageous college fees has passed \$1.6 trillion. This staggering figure represents devastated young and adult lives crushed by debt and thus ... *control*. Analysis by the Institute of Fiscal Studies for the UK Department of Education suggested that one in five students would be financially better off if they had not gone to university and instead left school to get a job. It must be a similar case elsewhere. Wayne Johnson, former CEO of First Performance Corporation and Reunion Student Loan Finance Corporation, resigned his post at the US Department of Education to campaign for justice on this issue including cancellation of most outstanding student debt owed to the Federal government (though not to private Cult corporations). Johnson said that if the loan crisis is not fixed we would see the 'ever-increasing destruction of the fabric of America, it's that profound – people are not getting married, not having children'. This was always the plan as part of the transformation of human society. Tony Blair introduced student fees in the UK when he was prime minister and they have since soared as they were always intended to. Everything that Blair does and says is the Cult doing and saying. The man should be in jail for crimes against humanity for so many reasons including life-crippling student debt.

More parents are seeing through the calculated fraud and homeschooling their children either individually or in small groups with great success in both critical and creative thinking and career advancement. Eliezer Yudkowsky, the well-known American AI researcher and author of several academic books on the subject, never attended high school or college and had no formal 'education'. 'Liberal' Germany bans homeschooling – a policy instigated by the Nazis – and so do 'liberal' Sweden and the Netherlands. If you want to sell tyranny do it under the banner and smokescreen of liberal democracy. As homeschooling rapidly expands the pressure to limit or ban education outside the school system is growing. Parents are raided by armed police in Germany and children removed from parents for the crime of not wishing to have them indoctrinated by the state. My own preference is for 'self-directed learning' in which children pursue their own interests and experiences and in doing so learn all the other basic skills. If you research your interest you need to learn to read; if you compile information about your interest you have to learn to write. Children can learn what they chose to learn and as a by-product learn what they need to learn. Their minds don't have to be filled with what is irrelevant to

most of them just because the state insists on that for its own ends. Children have their whole life to learn what they need to know from the far more relevant perspective of where their life takes them. How many ever use algebra once they leave school? What is the benefit to them of spending hours of their childhood working out what X equals?

A study by Dr Peter Gray, an American psychology professor at Boston College, found that children's mental health improved significantly when they engaged in self-directed education with more freedom and control of their own learning. He found after studying the data that the mental health of children is directly related to school attendance with psychiatrist visits falling dramatically during school holidays away from the pressure of lessons, rules and exams. They spiked once again when a new term began. Gray said that available evidence suggests 'quite strongly' that school is bad for children's mental health: '... behaviour, moods, and learning generally improved when they stopped conventional schooling.' He added that school is bad for 'physical' health, too: 'Nature did not design children to be cooped up all day at a micromanaged, sedentary job.' One of the most profound forms of mind control is familiarity. Once something becomes familiar it is no longer questioned and becomes another integrated subconscious program and assumption. Kids are born and then pretty soon they go to school and college for the rest of their childhood, right? Everyone knows that – it's how things are. Draw the 'education' system out of the subconscious and make it conscious. Now look again at how it works and the consequences for children. Oh my God, it's a programming operation. *Exactly*. The urgency with which this needs to be acknowledged can be seen in the figures for young people suicide and extreme levels of stress happening across the world. Suicide attempts by children under the age of 14 in Israel alone have risen by 62 percent in a decade, according to the Israeli National Council for Children. In Britain children under 11 contacting the help service Childline over suicidal thoughts and feelings increased by 87 percent between 2015 and 2020. The Cult is killing childhood and parents need to get their arses in gear *fast* because it's meant to get much worse. A 2013 study by the American Psychological Association found that school is the main source of stress for teenagers with 83 percent of teenagers questioned saying school was 'a somewhat or significant source of stress' while 27 percent said they suffered from 'extreme stress' during the school year. This dropped to 33 percent during school holidays and out-of-school stress would fall even further if you delete smartphones and social media. Much of the academic pressure on kids comes from parents who have slavishly accepted the utter baloney that exam passes = intelligence and exam results decide success or failure for the rest of their lives. How many young people feel a failure because they didn't get high enough exam

grades? Who gives a shit? You are *All That Is, Has Been, And Ever Can Be*.

Are you happy?

No.

Are you fulfilled?

No.

Are you super-stressed?

Yes.

So what's good about school?

I know what X equals. No, hold on, I forgot.

Most outrageous are those parents who treat their children and their academic success as a personal statement about themselves in some bizarre exercise in reflected glory which includes the follow-through of what the parents 'want' their children to be. 'Your father wants you to be a banker'; 'Your mother wants you to be a lawyer'. Well, tough - I'm going walking in India. Bye. This is nothing less than child abuse. We bring children into the world and we can give them advice, but it's their life, not ours. The late and very great American comedian, George Carlin, said: 'Here's a bumper sticker I'd like to see ... we are proud parents of a child who has resisted his teachers' attempts to break his spirit and bend him to the will of his corporate masters.' The Cult's war on children in pursuit of perceptual control is getting so extreme and intense that the consequences are destroying whole generations. Parents worldwide have a responsibility to say 'enough!'

Postage stamp society

Young minds are at the mercy of the programming system throughout their key perception-forming years from at least aged four to nearly 20. Most - thankfully not all - absorb the program subconsciously if not always consciously and without the de-programming process called 'awakening' those beliefs and assumptions will drive their perception of everything for the rest of their lives. Ironically, and not by chance, those that teach (programs) the next generations are academics who have rarely, mostly never, left the 'education' program. They absorb what they are told in their own 'education' and pass exams to prove that. Then they head for teacher training colleges and courses which further

underpin the program and show them how to indoctrinate the next generation with The System's (the Cult's) version of everything. Freemasons climb their hierarchy in compartmentalised sections called 'degrees' and ambitious young people (and/or their parents) seek the ultimate goal in 'education' of securing a 'degree' from the false assumption (it's all assumption) that a degree is confirmation of intelligence. It is not. Some of the most intelligent people I have met have never been near a university let alone a 'degree' while some of the least intelligent have had 'educational qualifications' coming out of their ears. This is not to say you can't have a degree and be intelligent - only that one doesn't have to mean the other and often does not. With both Freemasons and 'education' the degree measures the degree of programming thanks to another assumption that the information imparted in the lodge or the college is factually correct. Much of it isn't and indeed Freemasons are told one thing in one degree and something different in another to keep them in ignorance of what the inner core knows. Armed with a degree, or at least some degree of perceptual programming, young people leave the halls of academia and go out into the 'world'. Here they meet others who earlier went through the same programming machine and overwhelmingly accept the same assumptions about life, society and reality. They have all been given, and largely absorbed consciously and subconsciously, the system's (Cult's) version of history, science and reality, medicine, human biology, world events, what's possible and impossible, the whole shebang. Together this forms what I have dubbed the Postage Stamp Consensus which is a staggeringly narrow band of perceived possibility designed specifically to keep humanity in the Bubble (Fig 222).

Young people entering the adult workplace now have the assumptions they downloaded at school and college confirmed by almost everyone around them who earlier downloaded the same assumptions at their school and college. From this comes 'everyone knows that' syndrome. Even more accurately it should be 'everyone remembers that' syndrome. This is all it is - memory. The memory (conscious and mostly subconscious) of what you were told some time

and what everyone remembers because everyone was told the same thing. Indian 'mystic' Jaggi Vasudev (known as Sadhguru) talks about 'mistaking memory for intelligence' and he's spot on. How can we intelligently see things as they are when memory (perception



Figure 222: Jump off and IS/PN Image-Garden's idea.

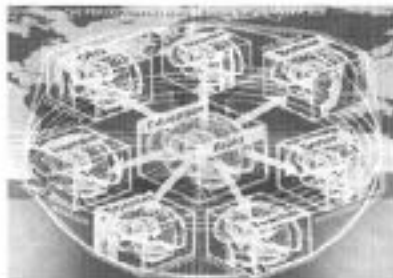


Figure 223: Those seeing the institutions overwhelmingly have the same perceptions of reality because they have all been through the same 'educational' programming system. Therefore 'Everyone knows that!' (Image Neil Figue)

politics, government administration, law, science, academia, medicine, media, business, banking, etc. are all founded (except the inner cores connected to the Cult) on the same assumptions about the world and reality when they are nothing more than illusions (Fig 223). They are founded (quantum physics excepted) on the world being solid, people being only their bodies and labels, everything being apart from everything else, and only through 'physical' change can anything be changed. Don't change your perceptions and assumptions to instigate societal change. If you want change you have to physically protest on the basis of your current perceptions and assumptions which have contributed to the very situations you are protesting about. It is sobering to think that governments and politicians are making laws all over the world based on assumptions about reality that are utterly bogus. Politicians are arguing over what should happen to everyone and everything from perceptions of a world that doesn't exist except in the way it appears to be experienced. No wonder the world is in the state it is. Which deluded programmed mind are you going to vote for, the one with the blue insect, or the red, yellow, or the green? Minnow, hard isn't it? The Cult has created a system in which programmed 'leaders' clueless about reality impose the Cult agenda upon a population enslaved in the same ignorance if they only get their perceptions from the Mainstream Everything. Talk about the blind leading the blind. Watch that cliff now (Fig 224). More than that the institutions and personnel of the Postage Stamp continually confirm to each other that the nonsense is valid and each make their decisions about what to do from those flawed assumptions. Governments make laws, including those relating to health care, on the basis of what Postage Stamp science

programming) is constantly telling us what we should believe they are? Sadhguru describes how people live out of their memory and not their intelligence and this is what The Program sets out to achieve. Postage Stamp Consensus and 'everyone knows / remembers that' are different descriptions of the same program which means that the institutions of



Figure 224: A perfect description of those who believe what The System tells them.

have to be done 'physically' and cannot be because there is no 'physical'.

Every aspect of the Cult agenda comes with a protection system to stop those with a mind of their own demolishing the ludicrous assumptions which humanity has to believe for the agenda to prevail. This is where censorship comes in and one major example of that is peer pressure – the paramilitary arm of 'everyone knows that' syndrome which seeks to impose the worst of all censorship and that is self-censorship. I have seen this described as the tyranny of silence. There is no debate or conversation as people with different views keep their mouths shut to avoid peer pressure consequences (Fig 225). Peer pressure is a term for those who have allowed themselves to be programmed into believing mega-untruths and insisting that everyone else does the same. If people don't acquiesce then ridicule, dismissal, abuse and even a lost job or career will follow. Intimidation and fear of consequences makes so many stay silent about what they think and leaves the field for 'everyone knows syndrome' to dominate perception unchallenged. Well, fuck that, I say. Let people follow others if they want – I'll follow myself, thanks (Fig 226 overleaf). Those with open minds are the black sheep of the flock or herd and it's such a wonderful place to be.



Figure 225: Don't think for yourself – prison is lovely. (Image Carole Kelly)

says. They instigate policy decisions on the basis of what Postage Stamp academics say. It's a mad house in which crazy is credible and sanity is crazy. What a mess and I have likened the world to putting 20 kittens in a room with 100 balls wool and coming back two hours later to say: 'Okay, sort that out'. Fortunately bringing harmony and sanity to human society does not

If you are there – celebrate.

Would you want to be part of the herd? Shit, what a nightmare. To be called mad by a system that's insane is a confirmation of your sanity. You say I'm mad Mr System Believer? Yipper, thank-you, so kind. I refer to this peer pressure to conform as 'psychological fascism' and that's what it is. We now have



Figure 226: Baa, baa, baa.

ever more extreme psychological fascism in the form of political correctness and the Climate Change Cult which together stand beneath the umbrella term of 'Woke'. The emergence of social media as a vehicle for black sheep abuse by the herd mentality has added to the pressure to keep your head down. Well, fuck that, too, I say. That'll be the day.

Media software

Cult 'education' instils the foundation perception program while the mainstream media is the constant top-up and confirmation that also plays the role of perception enforcer. Speak publicly in ways that challenge the Cult agenda and see what happens. I say *mainstream* media. Even much of the 'alternative' involves those who have been through the same perceptual programming and accepted its validity. Swathes of the 'alternative media' have ridiculed me over the years as much as the mainstream has for my 'far-out' concepts. Many of these same people with a Christian background believe that a man was born to a virgin mother, walked on water, turned water into wine, fed 5,000 from a few loaves and fishes, died on a cross, came back to life in a cave, and floated up to heaven promising to return on a cloud. Followers of Judaism, among them mainstream journalists and media owners that have ridiculed me, claim to believe that God parted the Red Sea and the wife of some bloke called Lot was turned into a pillar of salt. One thing you see very clearly when you operate outside the programmed 'normal' is that people don't demand evidence for their own beliefs on anything like the scale they demand for others. Postage Stamp programming is again driving the perceptions and behaviour of the media. At ownership and key editorial levels you will find in-the-loop Cult operatives. The beaming majority of journalists, however, have no idea there is a Cult never mind that it controls their industry. They report the world from the perspective of their Postage Stamp programming and anything or anyone they come across that has disembarked its narrow band of perception is, by definition, mad, bad, or both. That mentality dominates the nature of their reporting and treatment of individuals and organisations even without the added limitations set by their employers on what can and cannot be said (Fig 227). We have the ubiquitous subconscious programming at work in controlling the actions of the entire media as the propaganda arm of the Mainstream Everything. The only scientific truth comes from



Figure 227: 'Journalism' the world over with notable exceptions.

education, but dismissed the bit about a shapeshifting royal family. I understand why from the perspective of 'normal' and her life-long ingrained conscious and subconscious perceptions about reality. What I say about education is within her sense of the possible, so that's fine. Once you breach the limits of programmed 'normal' and 'possible', that's not fine. 'I can't get my head around that', people say. *Exactly*. So try the heart and expanded consciousness. Give that a go. There are many from what is called the 'Left' and 'Right' who agree with what I say about the world from their perspective of Postage Stamp normal. They won't say so publicly because they don't want to be associated with things I say that are off the Postage Stamp. The foundations for these responses are (a) the world is solid so what he says can't be true and (b) what would people think about me if I said he talked sense?

Reporting parameters set by media owners and executives are another generator of self-censorship with journalists knowing the lines they can't cross without resistance or the door. As a result they don't cross them. No report or information is offered to their media bosses that breaches the dyke. At that point they are no longer journalists and little more than propagandists for the Cult's version of everything. The money's good, though, eh? The BBC in Britain is particularly adept at such ingrained censorship which it tries so hard to hide behind pompous self-congratulation about unbiased reporting when it is institutionally Postage Stamp biased. By the terms of its charter the BBC is supposed to be politically neutral yet exercises its political and system bias by what it leaves out, through the views of the guests it invites to pontificate on its output and by not inviting those who have a different perspective to the Postage Stamp (Fig 228 overleaf). They'll let you debate how much money should be in circulation but absolutely not the fact that private banks are lending people and governments credit 'money' that has never and will never exist. The BBC has outrageously skewed the climate change debate so it's not a debate at all by virtually banning views and information that expose the hoax behind the



Figure 228: The BBC version.

orthodoxy. You don't have to come out and say 'vote for so and so' or 'believe this or that' to manipulate information in favour of your political line and I am talking about a political agenda line and not necessarily party political in nature. The BBC is a department of the permanent government and takes its line

on everything no matter who is officially 'in power'. BBC 'journalists' are in fact little more than civil servants who know their place and where not to go. If you get your 'truth' from the BBC, well, by definition, you *don't* because you *can't*. It's the same with all of them, but the BBC's pompous self-congratulation about its 'quality journalism' is particularly sickening and stomach-turning, not to say laughable. Journalist Tareq Haddad resigned from *Newsweek* in late 2019 claiming that editors stopped him reporting the story about a whistleblower at the OPCW, the world chemical weapons 'watchdog', who exposed how the organisation manipulated the facts to allow a chemical attack in Syria to be blamed on Cult-target President Assad. This was done by suppressing evidence that proved Assad had nothing to do with it. The attack was really staged by US-backed terrorists as an excuse to demonise Assad and justify unleashing missiles against Syria – a No-Problem-Reaction-Solution. Haddad confirmed that the media is the propaganda arm of the government-military-intelligence-industrial complex or what I call the Cult:

The US government, in an ugly alliance with those [that] profit the most from war, has its tentacles in every part of the media – imposters, with ties to the US State Department, sit in newsrooms all over the world ... Inconvenient stories are completely blocked. As a result, journalism is quickly dying. America is regressing because it lacks the truth.

The Cult owns governments as it owns the media as it owns the armament companies. The late Dr Udo Ulfkotte, a leading journalist in Germany, went public to reveal how he was made to publish articles in his own name written by intelligence agencies or lose his job. The sources included the CIA even though he was working in Germany. The Cult has no borders.

Fake 'grassroots' programming

Former CBS News investigative reporter Sharyl Attkisson revealed in a Ted Talk how fraudulent grassroots movements, funded by political, corporate, or other special interests (the Cult), manipulate public perception. The technique is known as 'astroturfing', as in fake grassroots. Special interests hide behind coordinated groups and individuals who start Facebook and Twitter accounts, write letters to newspapers and post comments in support or opposition to something. The idea is to give the false impression that a grassroots movement is speaking and that opinion is going a certain way when neither is true. The media, naturally, very rarely question the origins or funders. An excellent example of astroturfing was when American Zionist communications firm Edelman launched a Walmart-supporting 'grassroots' group called Working Families for Walmart which turned out to be funded by Walmart. Attkisson said astroturf groups try to change public opinion and marginalise opposition to what they want by attacking them and appearing to be part of a grassroots campaign that doesn't actually exist. You see this throughout the Woke agenda of climate change, transgender activism, political correctness, anti-racism and other connected issues with the media reporting them as if they are spontaneous and genuine. Surveys and studies are funded by astroturfers to produce the answers and conclusions they want to advance their propaganda. This happens constantly with regard to climate change, transgender, drugs and vaccines. Attkisson highlighted the manipulations of Wikipedia which she called an astroturf dream come true:

Built as the free encyclopedia that anyone can edit, the reality can't be more different. Anonymous Wikipedia editors control and co-opt pages on behalf of special interests. They forbid and reverse edits that go against their agenda. They view and delete information in blatant violation of Wikipedia's own established policies with impunity, always superior to the poor schubs who actually believe anyone can edit Wikipedia, only to discover they're barred from correcting even the simplest factual inaccuracies.

Wikipedia is a shocking operation. The *Oxf-gardian.org* website pointed out that Wikipedia's nine billion page views per month are overseen by just 500 active administrators and their real identity in many cases remains unknown. 'Moreover studies have shown that 80% of all Wikipedia content is written by just 1% of all Wikipedia editors, which again amounts to just a few hundred mostly unknown people.' Sharyl Attkisson recalled a huge scandal when Wikipedia officials were caught offering a PR service that skewed and edited information for paid publicity-seeking clients in utter violation of Wikipedia's alleged

policies:

All of this may be why, when a medical study looked at medical conditions described on Wikipedia pages and compared it to actual peer-reviewed published research, Wikipedia contradicted medical research 90 percent of the time. You may never fully trust what you read on Wikipedia again, nor should you.

You won't be surprised to know that Wikipedia is an agency of the agenda as a platform where billions get their information about people, events and every other subject (Fig 229). Israel (its Sabbatian-Frankist control system) has a colossal astroturfing and opinion-manipulating army driving its global

'Hasbara' campaign to promote the narrative of what I call the 'Anti-Semitism Protection Racket' (more shortly) and the far-right Sabbatian-Frankist apartheid Israeli government. Hasbara means 'explaining' which really means explaining what the Sabbatian-Frankists want you to believe. Ultra-Zionist ownership of the media in the United States is infamous although the Protection Racket intimidates most people from stating the obvious. Where there is not direct ownership there is a whole network operating out of Israel and exposed in *The Trigger* that manipulates media coverage of Israel. *Jewish News* reported in 2019 about an email sent to the wrong address by Lorna Fitzsimons, director of BICOM (the British Israel Communication & Research Centre). The email, which was never meant to be widely distributed, said: 'Throughout the weekend, BICOM staff were in contact with a whole host of BBC and Sky News desks and journalists, ensuring that the most objectively favourable line was taken, and offering talking heads, relevant to the stories unfolding.' Fitzsimons went on to describe a BICOM trip to Israel by a BBC news presenter:

Bicom has one of BBC News' key anchors on a bespoke delegation. When planning her very first trip to the region, Sophie Long got in touch with Bicom to see if we could help her out with meeting [sic] in the region. Sophie is now spending three days of her trip with Bicom Israel, taking a tour around the Old City, meeting [Israeli government spokesman] Mark Regev... as well as visiting Ramallah and Sderot.



Figure 229: Hijacking global perception.

This is how your 'news' is manipulated by ultra-Zionism *alone* every day. If you read *The Trigger* the scale on which this is happening out of Israel worldwide will blow your mind. Add into the mix the expanded definition of 'anti-Semitism' which includes criticism of Israel and Zionism and you see how any balanced coverage of Israel (Sabbatian-Frankists that control Israel) has long past. Ultra-Zionist Fitzsimons, a former Labour Party MP and president of the National Union of Students, said in the email that BICOM had 'briefed Jonathan Ford, the *Financial Times* leader writer for his upcoming leading article'. I wonder if the Palestinians had, too? That's obviously a rhetorical question. The now shocking scale of Sabbatian-Frankist control worldwide hiding behind 'Israel' was further confirmed, as with my own speaking ban from Australia in 2019, by the experience of former Pink Floyd singer Roger Waters and American journalist Abby Martin who are both critics of Israeli government treatment of Palestinians. American Major League Baseball banned advertising for Waters events on its platforms on the say-so of Rothschild-created B'nai B'rith International who have been on my case many times. B'nai B'rith president Charles Kaufman and chief executive Daniel Mariaschin said Waters was 'an avowed anti-Semite whose views on Jews and Israel far exceed the boundaries of civil discourse'. This is Orwellian code for 'Waters tells the truth so we have to shut him up'. Abby Martin is suing the state of Georgia after she was prevented from speaking at Georgia Southern University for refusing to sign a pledge of allegiance to Israel. Some 28 states have so far mandated loyalty pledges to Israel to block exposure of the actions of its government, military and fantastic web of lobby groups. That is worth pondering for a moment to take in the full implications of Sabbatian-Frankist power in the United States. American citizens cannot speak in a country that claims free speech rights guaranteed by the First Amendment unless they sign a pledge of alliance to a country of a few million people 5,000 miles away. But no – saying that Israel has fantastically disproportionate global power compared with size and numbers is an 'anti-Semitic' trope even though it's blatantly true. This is what happens where the Cult is in control.

Forest protection agency

We now have global 'news' spewing out the Cult system's version of everything 24/7 on channels so many in number I'm sure they must beered overnight like luminous jackets appear to do in Britain. Media 'diversity' is a joke. Newspapers and TV channels may be biased to one political party or other, but they are all biased in support of the same system – the same Postage Stamp. They differ on the twigs while all promote the same forest. Arguments over twigs present the illusion of diversity. Challenge the forest, the structure of control and manipulation,

and the truth about 'diversity' becomes self-evident. They all promote and protect the forest as I've found again and again in the last 30 years. The media first ridiculed me on a historic scale before turning to abuse and demonisation which morphed more recently into outright ignoring or censoring me. These phases directly relate to the scale of public interest in my work which has been growing exponentially year on year. That like is exposing the forest – laugh at him. Et. Et. that didn't work – demonise him. Oh no, that didn't work – censor him! The censorship was never more obvious than with the publication of my absolutely explosive book, *The Trigger*, which exposes who was really behind the attacks of 9/11 and it wasn't 19 Arab hijackers working for Osama bin Laden. In revealing the central players in that horror I also reveal the Cult and its control system. It is so explosive and perceptually transforming that the usual suspects didn't even seek to attack me and the book as they normally would. Abuse would give the content publicity and they want the fewest number possible to know it exists. One of the main ways the Cult has sought to demonise me is through its anti-Semitism industry, or Protection Racket. Its method of operation is to condemn anyone (especially Jewish people) who criticise the government of Israel as 'anti-Semitic' (which really means anti-Arab as I have explained many times). Cult gofers, many of which won't even know there is a Cult, have used this label to block my public events and media appearances including a ban by the Australian government from speaking in that country on the say-so of one ultra-Zionist asset and pressure from media outlets owned by Israel-fanatic Rupert Murdoch. This censorship network is a protection racket to protect the Cult from exposure and not Jewish people from discrimination. Jewish people who don't conform to the narrative are attacked even more vociferously than anyone else.

I did two interviews with the now Rupert Murdoch-owned TalkRadio in Britain which at the time of writing have accrued in excess of three million views on YouTube. The ultra-Zionist censor group, the Campaign Against Antisemitism (CAA), complained to the station for having me on because of 'anti-Semitism' even though neither Israel nor Zionism was discussed in either interview. Several TalkRadio programmes were later sent copies of *The Trigger*, but not one would have me on to discuss the content despite the previous two getting such big YouTube audiences. Protecting the forest is far more important to media owners than money. The Cult ensures their major assets are swimming in that. No British national newspaper or radio station would even mention *The Trigger* and 5,000 media releases sent out to newspapers, radio and television across Britain, Europe and North America met with no mainstream response. A TV booker told me that a well-known British television talk show host refused to have me on his

show because I 'deny the Holocaust'. I ain't, if you read my books, but he wouldn't know that because he takes his cue from other media promoters of The System. The mainstream media operates like The System in general with the perceptually-programmed confirming to each other that their perceptual-programming is the truth. Cult assets lie and misrepresent people; the media report the lies unchallenged; other media assets believe the lies and accept them as their reality; and they then repeat and further circulate the lies as 'everyone knows that' truth. Copies of *The Trigger* were sent to the Russian 'alternative' TV station RT in both London and Moscow. They didn't want to know either. RT is funded by the Russian government and as such conducts journalism with regard to the West more in the way the Western media should be doing. I'm glad RT exists from that perspective. It questions what the Western media refuses to do except when it comes to the Russian government. RT journalistic values are then immediately ditched and cap-troucing 'yes sir, no sir', kicks in. I have been writing and talking for 30 years about all the subjects that RT covers and although it claims to be 'alternative' they have never had me on their news programmes while preferring many who from my perspective are nowhere close to 'alternative'. Why would a Russian government-funded station not want to discuss a mountain of evidence that the American government lied at every turn about 9/11?? I was approached out of the blue for a substantial feature interview by an RT reporter called Polly Boiko in September 2019, which she said they wanted to go quickly to air. She and a crew came to my house soon after with a view to almost immediate transmission. They left after filming with me for hours and said they hoped it would be broadcast within days. As I write the best part of a year later I am still waiting. The mainstream media basically says question nothing; RT's motto is 'question more'; but I say question everything. That makes me an outsider to all of them. I dismantle the forest which their owners in multiple forms are pledged to protect. The Cult knows that seeing only the twigs keeps you in Body-Mind with a sense of apartness and twigs are not a problem. Seeing the forest and how it all fits together sees you free and that's a BAG problem. *Come on!*

By the few, for the few

Incessant concentration of media ownership is the Cult gathering ever more control over what people see and hear to dictate perception and behaviour across the world. Major corporations (in the end are Cult corporations) have secured global ownership of newspapers, radio, television and the Internet through Silicon Valley and Pentagon agency DARPA which I'll come to shortly. The media once had some diversity of ownership and that could not be allowed to continue. Diversity is the

enemy of central control and the campaign began to concentrate power for the benefit of the Cult. As recently as 1984 there were still 50 'independent' media companies in the United States. By 2019 some 90 percent of the US media was controlled by just four – Comcast (NBCUniversal), Disney, AT&T (WarnerMedia) and Viacom. The last two are owned by the National Amusements corporation. Control over what you see and hear is now ridiculously narrow and planned to get even more so. Political leaders sanction this as you would expect when the Cult owns politics as it owns major media. Such concentration allows what is written and broadcast to be centrally dictated and focused only on the twigs while exposure of the forest is censored. You can see video compilations on the Internet of TV presenters in cities and communities across America reading the same stories word for word and repeating with gusto the same scripted phrases and talking points to push the same political agenda. There was once such a thing as 'independent radio' in Britain and I worked at a station in Birmingham called BRMB. It was owned by a single company and had an independent operation for local news. Today those stations are owned by corporations with centrally dictated news broadcasts and even music playlists. I was labelled by the usual suspects in the UK in 2017 with outrageous claims about what I am saying. I saw the same lies repeated – again almost word for word with the same headline – on a series of newspaper Internet sites. When I checked I realised they were all owned by the same corporation then called Trinity Mirror and now Reach PLC. This is what that company owns (not an exhaustive list) and it will give you an idea for what I mean about the centralisation of media power over what you see and hear:

National newspapers: *Daily Mirror*; *Sunday Mirror*; *Daily Express*; *Sunday Express*; *Daily Record*; *Sunday Mail*; *Western Mail*; *The Sunday People*; *Irish Daily Mirror*; *Irish Daily Star* (50% ownership). Local and regional newspapers: *Accrington Observer*; *Anfield & Walton Star*; *Barking & Dagenham Yellow Advertiser*; *Besley Mercury*; *Birmingham Post*; *Birmingham Mail*; *Sunday Mercury*; *Booths Times*; *Bracknell Standard*; *Brent & Wembley Leader*; *Bristol Post*; *Buckinghamshire Examiner*; *Buckinghamshire Advertiser*; *Cheshire Chronicle*; *Chronicle Extra* (Newcastle upon Tyne); *Colne Valley Chronicle*; *Coventry Telegraph*; *The Crawley News*; *Crewe Chronicle*; *Crosby Herald*; *Derby Evening Telegraph*; *Dover Express*; *Edling Gazette*; *Edling Inquirer*; *Edling Leader*; *Ellesmere Port Pioneer*; *Enfield Advertiser*; *Enfield Gazette*; *Evening Chronicle* (Newcastle upon Tyne); *Evening Gazette* (Teeside); *Express & Echo*; *Farnley Times*; *Fulham & Hammersmith Chronicle*; *The Glasgowian*; *Gloucester Citizen*; *Gloucestershire Echo*; *Haringey Advertiser*; *Harrow & Wembley Observer*; *Harrow Inquirer*; *Harrow Leader*; *Havering Yellow Advertiser*; *Hogwood Advertiser*; *Highdown Books*; *Hinckley*

Times; *Hemel Hempstead Chronicle*; *Hoveston, Chertsey & Walton Inquirer*; *Huddersfield District Chronicle*; *Huddersfield Examiner*; *Hull Daily Mail*; *Ilford & Rostbridge Yellow Advertiser*; *The Journal* (Newcastle upon Tyne); *Kensington & Chelsea Inquirer*; *Leicester Mercury*; *Levensham & Greenwich Mercury*; *Liverpool Echo*; *Loughborough Echo*; *Manchester Evening News*; *Manchester Metro News*; *Meghill Star*; *Middleton Guardian*; *Mid Devon Gazette*; *Mitcham, Morden & Wimbledon Post*; *North Gwentian*; *North East Manchester Advertiser*; *Norrit Devon Journal*; *North Wales Daily Post*; *Nottingham Post*; *Oldham Advertiser*; *Ormskirk Advertiser*; *Paisley Daily Express*; *The Press* (Barnet and Hendon); *Prestwich Advertiser*; *Reading Post*; *Rochdale Observer*; *Rossendale Free Press*; *Runcorn & Widnes Weekly News*; *Salford Advertiser*; *Slough Express*; *Stockport Express*; *Macclesfield Express*; *Wilmslow Express*; *The Sentinel* (Staffordshire); *Surrey Advertiser*; *Southport Visitor*; *South Manchester Reporter*; *South Liverpool Mercury*; *South Wales Echo*; *South Wales Evening Post*; *Staines Inquirer*; *Stratford, Claydon & West Norwich Post*; *Sunday Sun* (Newcastle Upon Tyne); *Surrey Herald*; *Surrey Mirror Advertiser*; *Sutton & Epsom Post*; *Timeside Advertiser*; *Glossop Advertiser*; *Uxbridge & Hillingdon Leader*; *Uxbridge Gazette*; *Walford & Weybridge Inquirer*; *The Wharf* (Canary Wharf); *Scottish and Universal Newspapers*; *Trinity Mirror Scotland*; *Aberdein and Caithness Advertiser*; *Ayrshire Post*; *Blairstown Advertiser*; *Business 2*; *Dumfries and Galloway Standard*; *East Kilbride News*; *Galloway News*; *Hamilton Advertiser*; *Irving Herald*; *Kilmarnock Standard*; *Metro Scotland*; *Paisley Daily Express*; *Perthshire Advertiser*; *Scottish Business Insider*; *Stirling Observer*; *Straithgarn Herald*; *The Lennox Herald*; *West Lothian Courier*; *Widnes Press*. Digital online brands: *Belfast Live*; *Dublin Live*; *Examiner Live* (Huddersfield); *Glasgow Live*; *Gloucestershire Live*; *Leeds Live*.

When you look around news shops and stands and see all these newspapers and magazines on every conceivable subject it appears that media diversity is alive and well. Check who owns them and you realise that media diversity is history. I list in my book *Human Race Get Off Your Knees* the media outlets from television to magazines then owned by Time Warner. It is extraordinary in both length and range of subjects and goes on for more than one and a half pages. Two of America's most prominent newspapers, the *New York Times* and *Washington Post* are both owned by the same elite. The *Times* has been owned by the Zionist Sulzberger family since 1896 while the *Post* was controlled from 1930s by the Zionist Graham-Meyer family before being sold to Amazon's 'world's richest man' Jeff Bezos in 2013 whose company has close ties to the CIA. No potential bias there, then.

The Devil's Playground – media endgame

People get most of their information today in the form of 'news' through

Cult-controlled Silicon Valley corporations such as Google, YouTube, Facebook and Twitter. Add to that the domination of the global book

market by Amazon. The Cult created the Internet to serve its agenda for human control. In terms of the subject at hand they want all information to eventually be transferred to the Internet because then it can be censored through algorithms of artificial intelligence without even human involvement once the codes are in place. The Internet for all its short-term benefits

has been a Trojan horse from the start and the real reason – or reasons – for its creation will become clear in later chapters. What a surprise that the Internet was made possible by the Cult-controlled US Defense Advanced Research Projects Agency (DARPA), the technological development arm of the Pentagon, which has seed-funded Silicon Valley corporations along with In-Q-Tel, or IOT, the technology-funding vehicle of the CIA (Fig 230). The Pentagon, DARPA and the CIA are all Cult assets and agencies of the 'Deep State'. When the Internet was launched it had to be censorship-free to attract the global audience necessary for the DARPA (Cult) goal of making the World Wide Web the central pillar of human society. In this essential honeymoon period we enjoyed the free flow of information which allowed people like me to circulate research to expose the Cult. This was an unfortunate though necessary consequence from the Cult's point of view in pursuit of its ultimate ambitions. Once the Internet was established as the said central pillar of human society in a way that is basically irreversible the mask could come off with a gathering frenzy of censorship to target information that in any way exposes the Cult agenda even without mention of the Cult itself. They, of course, don't present this as censorship. They invent a series of made-up excuses such as 'fake news' and 'hate speech'. The definition of both continues to be expanded to lasso ever more information, views and opinions into their calculated and systematic censorship in the guise of protecting the public from 'hate' and 'discrimination'. They claim to be advancing 'diversity' while destroying it and this particularly applies to the 'Woke' mentality that claims to demand diversity in another example of Cult inversion. Cult-created 'Wokeness' is exploited to justify and impose ever more Internet and media censorship under the guise of political correctness. The Woke British trade union organisation, the TUC, banned a premier of *Renegade*,



Figure 230: Cult to its DNA.

a film about my life and work, from one of its buildings on the grounds that the TUC 'believes in diversity'. Well, clearly with the exception of anyone exposing the forest. For the TUC read the global mainstream media.

Technology is increasingly being introduced that will prevent the posting of information unacceptable to the Cult without the need to take it down. Even now YouTube, Facebook, Twitter and others employ 'ghost or shadow banning' in which material can be posted but algorithms ensure that they are seen by a fraction of what would otherwise be the case. My YouTube interviews about *The Trigger* and 9/11 were blatantly suppressed through the recommendation system and while they still got large numbers they were not on the scale they would have been if left unmolested. Highly significantly my video interviews have got by far their biggest audiences when posted on YouTube channels not subject to shadow banning than they did on my own algorithmically-manipulated channel before YouTube deleted me altogether in May, 2020 (more later). Facebook admitted in 2018 that it 'demonetises' posts reported by users (easy to arrange) and rated as false by 'fact checkers' (working for the Cult agenda). Facebook claimed that this censorship reduced views of posts and pages by 'around 80 percent'. As all information is moved to the Net the point will be reached when the Cult can literally control everything you see with the tyranny of (Cult-instigated) political correctness intimidating people into censoring even private conversations out of fear of being exposed for 'hate speech'. Cult-serving Google, Google-owned YouTube, Facebook and Twitter are major actors in this stage show to hide the real reason that censorship is happening which to protect the Cult and its agenda for humanity from exposure. These Internet-dominating corporations and others like Amazon have been taken through the same process as the World Wide Web. First they allowed the free circulation of information and opinion because they, too, had to attract users on a world-changing scale on their way to near-monopoly. Once that line had been crossed by hugely predominant market share their masks could also be removed and censorship of Cult-unapproved information and opinion began as a drip before becoming the biblical flood that it is today. Amazon has long passed the point of domination in book sales to drive independent shops and publishers out of business and has now begun to target books for censorship in its version of the book-burning so beloved of tyrannies. We have reached the point where people cannot post anything questioning official narratives of 9/11, human-caused climate change or the 'pandemic' on platforms like YouTube without them adding links to read the official fairy tale version on Cult-serving Wikipedia. You want the official story of anything? Go to Wikipedia. How plain it is to see how information is being royally stitched up and we are still nowhere near

where it is meant to go although the massive leap in censorship since the 'Covid-19' hoax gives you some idea. Another point here is that the Cult owns the financial system and has limitless funds by creating 'money' out of nothing. Money is therefore no object for corporations like Google, Facebook, Twitter and Amazon which had no need to post a profit as they were buying their way to monopoly. 'Investors' were always there to write the cheques. You see the same with anything related to Elon Musk (more later). How can other companies that do have to make a profit to survive compete with those that don't have to be profitable and have the financial capability to buy out or crush any independent opposition? Genuine opposition that won't sell-out is demonised by the media under the usual tag of 'hate speech' when they establish other social media and video platforms. Cult-owned website hosts and payment companies also ban them to destroy their ability to function.

Silicon censors

Self-deluding so-called 'journalists' who support this war on information are promoting their own demise as traditional media falls to Silicon Valley domination and its censorship algorithms. Google virtually monopolise Internet searches which are algorithmically manipulated to emphasise official narratives and suppress alternatives. Where Google doesn't control searches other Cult operations pick up the slack. Google-owned YouTube monopolise video content and social media domination falls to Facebook and Twitter. What about Instagram? Owned by Facebook. I don't use social media - I message with WhatsApp? Owned by Facebook. Big Tech was made exempt by government from lawsuits for postings on their platforms in return for acting as neutral vehicles rather than publishers who do face legal action for what they publish. Silicon Valley psychopaths have benefited from one while ignoring the other by censoring information challenging the official narrative and particularly those known in America as conservatives. Government could rescind the 'liability exception' deal, but hasn't. It is indicative of how the Cult works that 'conservative' organisations funded by the billionaire Koch family ('conservative') and Big Tech have been exposed for campaigning against laws to stop Big Tech censorship of conservatives. Control both sides and you control the game. Even more sinister is that these mega-corporations connect into the Cult-controlled Pentagon and intelligence agency network. Big Tech is continually exposed for gathering user data of every kind including surveillance through microphones and this ends up with the military-industrial-intelligence complex on a scale never made public. Many people have noted that conversations they thought were private lead immediately to products relating to the conversation being offered to

them in Facebook and other advertisements. Official owners of these Cult-fronts like Facebook's Mark Zuckerberg are super-frauds who are not ultimately in control. They are front people for forces much deeper in The Web than the Zuckerbergs will ever be. Silicon Valley giants are there to control what you see and keep detailed surveillance on what you do, say, and think. Facebook admitted in a letter to two US senators that it can locate where you are even if you have opted out of location tracking. Artificial intelligence can piece together other information to determine location including tagged photographs, addresses for purchases on the Facebook shopping section, and IP address information. Amnesty International said that Google and Facebook were 'posing a systemic threat to human rights' - exactly as they are meant to.

Tim Berners-Lee who is credited with inventing the World Wide Web unveiled a nine-point plan or 'contract' through his World Wide Foundation to 'save the internet' from 'digital dystopia'. Some things sounded good until you knew the flip-side. Authors of this 'contract' included the hate-speech, censorship-obsessed French and German governments and major Silicon Valley censors like Google, Facebook and Microsoft. A highly-significant sentence said it was necessary to 'develop technologies that support the best in humanity and challenge the worst'. When passed through an Orwellian translation unit this becomes 'develop technologies to silence dissenters and renegades'. Who decides what is the 'best' and 'worst', Tim? Ah, The System does which wants to silence dissenters and renegades. Ah, gotcha. World Wide Web Foundation president and chief executive Adrian Lovett said prime issues include the problem of 'disinformation'. Who decides what that is? Same answer. He said they will 'track progress of all of those who have signed on, and others too who haven't, and report that progress, make sure it's public, make sure that we're able to see who is going in the right direction and who is not.' Who decides what direction is 'right'? Same answer. The group hopes to enforce the contract through UN regulations and EU/national laws while companies that don't sign up would be ostracised. The group says it will have succeeded when governments and companies that don't back the contract 'principles' are 'true outliers' (defined as 'a person or thing situated away or detached from the main body or system'). Companies and governments that broke the internet are claiming to save it by taking a rock-hammer to what's left of free expression. Claim you are stopping internet dystopia while creating it and say at first this will be voluntary before enforcement by law. Does Berners-Lee know it's a scam to advance internet dictatorship? It doesn't really matter. The corporations and the Cult do.

Wizard's spell

Pull all these strands together and you see that a human life is a cradle to grave download of Cult-designed perceptions. Postage Stamp parents are followed by Postage Stamp 'education', Postage Stamp media and Postage Stamp Silicon Valley. At the same time the arbiters of reality within human society are taken to be Postage Stamp scientists, Postage Stamp doctors, Postage Stamp academics, Postage Stamp government, Postage Stamp administrators, and Postage Stamp 'experts' of every

kind. Their Postage Stamp narratives are enforced by Postage Stamp peer pressure and, should you be a public figure, by Postage Stamp journalists. A definition for my 'Postage Stamp' analogy is unconsciousness and my definition of unconscious for the purposes of this book is to be locked away in the perceptual Bubble of Body-Mind. Beliefs and perceptions enshrined in

the Postage Stamp Consensus are designed to achieve just that end by suppressing awareness and firewalling people from frequencies where knowing can be accessed. Humanity has been mass-hypnotised every bit as much as the stooges in a hypnotist show (Fig 231). Do people on the stage shouting out on a word cue, playing a non-existent musical instrument or seeing the clothed audience as naked know they are hypnotised? Do those billions of people who respond to information and situations with their press-enter actions and behaviour know they are hypnotised? Of course they don't because they are hypnotised. 'Waking up' and 'The Awakening' are terms for breaking the wizard's spell. The idea is to so



Figure 231: The human plight and we have the power to change it.



Figure 232: In close-up what is it if just blindness?

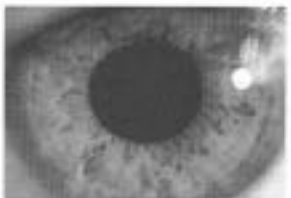


Figure 233: Expand your perspective and you see what it is. Expanding the mind has the same effect.

limit human awareness that we can't see the picture. If people were asked what they were looking at in Figure 232 they would likely say 'blackness' and that would be the extent of it. Expand the image (awareness) and they'd see it was really an eye (Fig 233). Expand still further and you'd see the eye was a person in a room in a house in a street in a city in a world. The Cult wants to enslave perception in that symbolic blackness of myopia and it has achieved this spectacularly in generation after generation by controlling mainstream information and through the constant repetition from all directions of its perceptual program until it becomes an 'everyone knows that'. German philosopher Arthur Schopenhauer said that 'every man takes the limits of his own field of vision for the limits of the world'. This is The Program. Limit their sense of the possible and make them believe that their sense of the possible is the limit of the possible. The truth will then be dismissed and ridiculed and the 'blackness' perceived as the limit of possibility. Schopenhauer was born in 1788. The Program is not new, just more expanded. American Neuroscience researcher Joe Dispenza was on the money when he said: 'Ninety-five percent of who we are by the time we're 35 years old is a memorised set of behaviours, emotional reactions, unconscious habits, hardwired attitudes, beliefs and perceptions that function like a computer program.' Why would it be any other way given what I have described in this chapter alone?

Always back to wavefields

Humanity has been vibrated into conformity on the wavefield level of reality by downloading a collective perception which forms a mass wave-entanglement between like-perceivers (like frequencies). Confirmation of Postage Stamp reality does not only happen in the realm of the seen. It is being communicated through wave connections of frequency entanglement. This is the real level at which the hard mentality is formed. A study published in *Current Biology* by researchers from New York University and the Max Planck Institute of Empirical Aesthetics found that brainwaves synchronise into similar patterns when students pay attention and are 'engaged' with each other. Co-lead author Suzanne Dikker said: 'We think that all these effects can be explained by shared attention mechanisms during dynamic group interactions.' From that 'shared attention' comes wave entanglement. What we 'see' is only the decoded holographic version of that. Intimidating people into collective conformity is really vibrating them into line. If you place violins together vibrating in the same note any other violin placed alongside them will start to vibrate to the same note even though it was playing another or none before. The dominant frequency will 'entrain' other frequencies and make them vibrate to its tune. Perceptions and pre-conceived ideas are frequencies and can both

enrain others and prevent the person themselves from seeing other possibilities. Technological frequencies such as 5G are designed to have this effect on human brain activity. Some people go into politics with a genuine desire to make a positive difference and then transmute into everything they went into politics to challenge. They have been vibrated into line. Everything is a vibrational field including a parliament, political party or ideology and in the way of the violins the dominant frequency will prevail and absorb others into itself. The same is true of all groups and organisations, schools, universities, science, doctors, media, the whole lot. There's a saying that goes: 'When you dance with the Devil, the Devil doesn't change, the Devil changes you.' The dance in this case is frequency – oscillation – and the Devil is the Cult agenda.

The Devil doesn't *have* to change you and the opposite can be true if you open your heart and mind to connect with consciousness way more

powerful than the Cult and its 'gods'. They can only enslave humanity by making us more ignorant than they are (quite a task). We are not looking at some all-powerful force. It's more like the one-eyed man who can only be king in the land of the blind (Fig 234). The all-seeing eye is not all-seeing. It's a seven-stone weakling compared with humanity in its Infinite power. I've



**IN THE KINGDOM OF THE BLIND
THE ONE-EYED MAN IS KING**

Figure 234: The Cult controls by suppressing and leeching the power of humanity through personal programming – not through power of its own.

been exposing the Cult for 30 years and they have not vibrated me into line. Nor will they ever do so. It will be the other way round.

How are we manipulated?

Facts do not cease to exist because they are ignored – Aldous Huxley

Here's a way to read the world: Know the outcome and you'll see the journey. The Cult is desperate for you not to know what is planned for humanity because once we do the steps towards that end become crystal-clearly obvious day by day. Know the outcome and you'll see the journey, or see the 'where' and you'll see the 'why?' (Fig 235).

The Cult and its agents (knowing and overwhelmingly unknowing) in government, media and The System in general present everything in the form of dots. It is vital to maintain the illusion that policies, laws, media reports and 'education' depict a world in which everything stands apart from everything else. This policy is not connected to that policy, this law to that law, or this change to that change. When you perceive society from that perspective daily life appears to be a series of random and unathomable events across the great spectrum of human experience. What the hell is going on? Why is this happening? Why are they doing that? Amid such bewilderment many people switch off and don't even try to work it out. I mean, what's the point? It's impossible to understand, right? No – wrong. At its core it's all very simple. Human society consists of fields of consciousness – some called 'human' – making wave entanglements on the basis of compatible frequencies generated by perception. Control perception and you dictate the entanglements that decide the nature of human interaction collectively known as 'society'. How do you control perception? You control



Figure 235: A brilliant way to 'read' daily events.

information from which people form perception and at all costs you keep your targets in ignorance of one simple fact: What they see and experience are not the work of random chance but of carefully calculated steps in pursuit of a very specific and extraordinarily sinister end.

I'll give you a great example of this coldly coordinated 'randoms' before exposing the wider goals of the Cult and how humanity is manipulated to achieve them. I describe a sequence of events in detail in my mega-work, *The Trigger*, and mentioned them briefly at the start of the book. They involve the network within the Cult known as Sabbatian-Frankism which emerged in the 17th century and infiltrated communities, cultures and religions of all kinds. Sabbatian-Frankists pose as members of communities and followers of religions while infiltrating and directing them to serve the Cult's desired agenda. Sabbatian-Frankists (who hate Jewish people, by the way) control Israel; they are the Saudi fake 'royal' family; and they have networks across the world, especially in North America and Europe. Wait – aren't Israel and Saudi Arabia opponents? Not at the level of the Cult they're not. They



Figure 23c: Both are controlled by the Cult network of Sabbatian-Frankist and so both work to the same script.

are on the same team and any public divisions (increasingly few) are to hide these connections (Fig 23c). Once you realise that apparent opponents ultimately answer to the same masters the cataclysts of 'random' fall from the eyes. I have already explained how the Bible of Sabbatian-Frankism is the Kabbalah, the Jewish

esoteric/'spiritual'/nature of reality work. Most important to them is the part known as the Zohar which means 'radiance' or 'illumination'. Three Sabbatian-Frankists chose the name 'Illuminati' for a Cult network they founded officially in 1776. They were Mayer Amschel Rothschild, founder of the Rothschild dynasty, Jacob Frank (hence 'Frankism') and Illuminati frontman, Adam Weishaupt. All the detailed background is in *The Trigger*. Sabbatian-Frankists, their Illuminati and Kabbalah, are yet another example of how global manipulation is founded on the knowledge of how reality works while keeping that knowledge from the target population.

Sabbatian-Frankists have long infiltrated America to the point of control and they created a 'think tank' in 1996 called the Project for the New American Century. Among their number were those who would be major players in the United States government and the Pentagon at the time of 9/11 during the regime of child-like puppet president, Boy George Bush. They included Dick Cheney (9/11 vice-president and de facto president); Donald Rumsfeld (9/11 Secretary of Defense); Paul Wolfowitz (9/11 Deputy Secretary of Defense); Dov Zakheim (9/11 Pentagon comptroller in charge of the entire military budget); and a long

list of others either working within government and the Pentagon on 9/11 or promoting wars in the media in response to 9/11. The Project for the New American Century published a document in September, 2000, calling for American troops and military influence to be used to force regime-change in a series of countries including Iraq, Libya, Syria, Iran and North Korea leading in the end to regime-change in China. The document demanded (on behalf of the Sabbatian-Frankists) that American troops 'Fight and decisively win simultaneous major theater wars' to achieve the desired regime change. It said, however, that this 'process of transformation' would be slow 'absent some catastrophic and catalysing event like a New Pearl Harbor' to justify attacks on target countries and the necessary gigantic increases in military spending. A year to the month after the document was published and nine months after those who wrote it came to power with Bush in January, 2001, America had what Bush called at the time 'the Pearl Harbor of the 21st century' – 9/11 (Fig 23f).

As a result of those horrific attacks a 'war on terror' was launched and the very countries named in the document have been targeted for regime change ever since under presidents and UK prime ministers of different (and apparently opposing) political parties. At the level of the Cult, which controls the always-there permanent government I described earlier, countries are one-party states.

Whoever you vote for the Cult is in power. The sequence I have described is much longer and more detailed than outlined here and you'll find the full story in *The Trigger* which demolishes the official story of 9/11 and names those really involved – not 19 Arab hijackers (Fig 23g). The point is that if you see each point in the sequence as an isolated in-and-of-itself event there seems to

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FURTHER, THE PROCESS OF TRANSFORMATION IS LIKELY TO BE ALONG ONE ASSENT/SOME CATASTROPHIC AND CATALYSING EVENT – LIKE A NEW PEARL HARBOR

A Report of
The Project for the New American Century
September 2000

Figure 23f: The document that listed countries for regime change in September, 2000, which presidents of '50-year-old parties' have pursued ever since. It said that a 'new Pearl Harbor' would be needed to justify the plan and that's what we got – 9/11.

THE TRUTH CANNOT BE SILENCED FOREVER



Figure 23g: See *The Trigger* for who was really behind the 9/11 attacks and if it wasn't Osama bin Laden.

he no pattern and all appears random. Arab hijackers controlled by Osama bin Laden attacked America and the military invaded Afghanistan to find him; then along came the invasion of Iraq which was to stop Saddam Hussein and his non-existent 'weapons of mass destruction'; Libya was attacked and Colonel Gadhafi was killed to protect the people from Gadhafi violence; Syria was invaded to stop President Assad 'killing his own people'; Iran is being targeted for developing nuclear weapons and sponsoring terrorism. We are asked to believe that none of these events are linked in any way. Connect the dots while knowing the planned outcome and a very different picture can be seen.

Create the problem so you can impose the solution

The media, by emphasis and censorship, presents everything as random so the truth can be hidden and the great majority of journalists are doing this through ignorance, not calculation. Any who do make the connections and want to report them are out the door very fast. It doesn't take many people to control the media so long as the Cult dominates the positions of ownership, editorial policy and hire and fire. This applies to every organisation and institution – government, 'education', banking, business, etc. The attacks of 9/11, regime-change wars and externally-manipulated 'people's revolutions' that followed are examples of two mass mind-control techniques that I dubbed decades ago Problem-Reaction-Solution (PRS) and the Totalitarian Tiptoe (TT). PRS is the mind-trick by which you covertly create a problem while blaming someone else (9/11); then you tell the public through an unquestioning mainstream media the version of the problem you want people to believe (Bin Laden and 19 Arab hijackers 'did it') to illicit the reaction of 'something must be done'; finally you offer the solution to the problem you have covertly created (a 'war on terror' to regime change countries as you planned all along). There is another version as I mentioned earlier that I call No-Problem-Reaction-Solution when you don't even need a real problem only the perception of one. The lie about 'weapons of mass destruction' to justify the catastrophic invasion of Iraq in 2003 is an obvious case and as we will see later so is the 'Covid-19' hoax. Iraq was on the hit-list and there was no reason to invade so the Cult made one up and had it promoted by Boy Bush and UK Prime Minister Tony Blair. The stable-mate of PRS is the Totalitarian Tiptoe in which you instigate a series of happenings and changes that are all connected and leading the world in your desired direction while being presented as unconnected random events. Wars transform the world step-by-step as each follows the other in the Totalitarian Tiptoe technique of 'creative destruction'. A war destroys the status quo and creates a new one. The next war destroys that status quo and so on. With



Figure 239: War as creative destruction. Nothing changes a society quicker and more than war and that's why we've had so many.

each new status quo you are moving closer and closer to your end goal. Look how the two world wars utterly transformed global society (Fig 239). The European Union is a Totalitarian Tiptoe planned from the start to be a centralised bureaucratic (Cult) superstate which they could never have openly admitted. The public backlash and resistance would have blocked it at birth. Instead

they sold the superstate tyranny at first as just a free trade zone (the 'Common Market') before, step-by-step, incessantly centralising power to delete national sovereignty on the journey to what was planned from the start – a bureaucratically-controlled United States of Europe. Observe the world with this knowledge and you will see Problem-Reaction-Solution and the Totalitarian Tiptoe constantly at work across the entirety of human life. When something new is introduced by the Tiptoe technique where it starts is never where it is intended to finish. Taser stun guns unleashing 55,000 volts of electricity were introduced by police 'only for trained firearms officers', but it was obvious to anyone who understands the game and the Tiptoe that they would soon be widely distributed. By the year to March, 2019, Tasers were used thousands of times in England and Wales alone and broke all previous records. We now have 70-year-old grandmothers being Tasered multiple times in America by psychopathic goons in uniform for asking them to show a warrant before entering their home. Crucial to making PRS and TT techniques effective is to program the population to believe your version of why these manufactured events happen and to keep the real reason hidden. The alternative media and alternative opinion is being censored to ever greater extremes by the Cult-owned Internet giants to stop the truth being exposed about PRS and TT events (which went into overdrive to stop exposure of the 'Covid-19' hoax).

Cult movie

What I am about to describe really is a movie in the sense there is a script designed to tell you what you are seeing and experiencing. If you watch a series of pictures with no commentary or voiceover you can reach your own conclusions about what they mean. Instead a reporter will tell you what you are seeing and what the pictures mean when often what is said is not true at all. Most of the time the reporter doesn't

know what is happening. They get their information from official sources, repeat that in the voiceover and call it 'journalism'. Whatever the event may be – a terrorist attack, war, financial collapse – the media is telling you the official version 99 percent of the time. We are back to one of the most profound techniques of mind control which is repetition. Media sources may seem numerous but they will be quoting the same official narrative ad infinitum until it fuses into 'everyone knows that' and a widely accepted version of history (memory). Stop people in the street anywhere in the world and ask them what happened in an historical or more recent event and they will invariably give you the official version (often thanks to Hollywood or 'Tinseltown'). Hollywood is a Cult creation to program perceptions of the global masses. Ask many people for a version of history and it will come from the script of a Hollywood movie. That John Wayne was a war hero wasn't he? No, he was in make-up in LA while the guns were firing on the other side of the world. Wayne was there to tell you what to believe about the guns firing on the other side of the world. Moment by illusory moment you are being told what to think – to perceive – about everything. I will pull together over the next few chapters the elements of a coordinated global control system which are happening before our eyes every day while being presented as random events.

The foundation manipulation is centralisation of power which has been unrelenting thanks to the Cult. A few can't control the many without centralisation of power. The more power is devolved from the centre the less control the global Cult at the centre can have. Humans once organised in tribal groups which decided what happened to the tribe. Then tribes were brought together under centralised control called nations and countries and a few people could dictate to all the former tribes. Today nations are being centrally controlled through superstates like the EU, trading blocs, United Nations agencies, the World Health Organization, World Trade Organization, International Monetary Fund, World Bank and so many more. The all-encompassing name for this phenomenon is 'globalisation' – the centralisation of global power in every area of human life which I have been warning about for 30 years. Globalisation is the Totalitarian Tiptoe to the imposition of a world government, army, central bank and currency underpinned by a microchipped population connected to AI (Fig 240). The more you centralise power the more power you have at the centre to centralise even quicker and centralisation gets faster and faster. The European Union has been created this way as each power-grabbing and centralising step has followed another. A single world currency, which I have again been predicting since the early 1990s, is meant to be purely digital with the deletion of cash. We are seeing cash disappearing so fast in favour of digital transactions through cards and smartphones in the



Figure 240: The structure of the planned global tyranny.

smartphone which I don't use. It meant I couldn't park there and this is the way those who don't want to succumb to the agenda are being pressured into doing so. The sequence in all subject areas goes like this ... voluntary ... can't function without doing it 'voluntarily' ... compulsory. Individual cash currencies are disappearing with the Cult-created EU deleting many European currencies through the introduction of the euro that itself is planned to be assimilated into the world currency (look at the utter demonisation of cash and refusal to deal in cash transactions as a result of the 'Covid-19' hoax). Global government would not even be run by elected people as I have long warned. Rulers would be bureaucrats and technocrats serving the Cult through what is termed a technocracy – 'Government or control of society or industry by an elite of technical experts'. Silicon Valley which already has far more power than governments is this very emerging technocracy at work as are the unelected bureaucrat dictators of the European Union. A world army is designed to impose the will of the world dictatorship on those who resist. Recent plans for a European Union army (which I predicted in the 1990s) and the long-established European Central Bank are totalitarian Tiptoes to the world army and world central bank, as is NATO. The same goes with regard to world government with the World Health Organization, World Trade Organization, International Monetary Fund and World Bank. The biggest stalking horse of all for the world government structure is the Cult-created-and-controlled United Nations which is being transformed step-by-step into a world government dictatorship. I'll say more about this when I deal with the climate change hoax being driven through the UN.

Hunger Games Society

Unrelenting centralisation of global power is sold as 'the world coming together'. This illusion and lie has been bought in its totality by

desperately naïve 'Woke' progressives and their associated Climate Cult which is an offshoot of The Cult although only a few of its advocates will know that. Do they really believe that a Cult obsessed with driving people apart to divide and rule wants the world to 'come together'? It's about centralisation of total power in the hands of a few at a global level from where they will control AI which, by then, will be connected to the human brain. Hellooooooo!!! My God – wake the hell up, people. It is a skin-pinch to think that the political 'Left' that I grew up with – the one that stood for freedom of speech and challenged elite power – has now been so hijacked by the fake 'progressive' 'Woke' mentality that it demands freedom of speech is deleted through Cult-created political correctness (PC) and that the elite be handed ever more power through the Cult-created EU. Who will eventually reap the consequences of the tyranny they are demanding to be implemented? They will – and their kids and grandkids still more so. The original truly liberal Left has been so absorbed by Cult-created 'Woke' that real liberals are today condemned as 'far-right' and 'Nazis' for defending basic liberal values like freedom of speech. The label 'Woke' which this mentality awards itself is a serious misrepresentation of its origin and maybe, ironically, 'cultural appropriation' in the language of PC. 'Woke' is apparently a political term used in African-American culture since the 1900s and relates to an awareness of social and racial justice. Its use by fake 'progressives', however, does not mean that although they claim it does, 'New Woke', as I will call it from here-on, means campaigning for the agenda of the very Cult responsible for social injustice of all kinds throughout what we perceive as human history. This includes the slavery and oppression of black and other non-white people and the oppression of most white people.

Hunger Games – the real-life movie

I have long described where the Cult and New Wokeness are leading us as the 'Hunger Games Society' and the Tiptoe to that continues every day worldwide. Clearly my phrase comes from the *Hunger Games* movie series which portrays a privileged elite hoarding all the wealth and power while living in a hi-tech city of mega luxury. They are protected by a vicious and merciless police/military state from the rest of the population working as slaves to the elite (today's Cult-connected One-percent) in abject poverty under extreme levels of surveillance and control. The masses are isolated in 'sectors' to prevent a unified response (divide and rule). I have been warning for decades that this is the very structure the Cult seeks to impose with a brain link to AI thrown in (Fig 241). Scan the world and you can't miss the pieces being put into place ever more quickly. I saw an image of Adolf Hitler at a mass Nazi rally. He stood alone at the front delivering his psychopathy to a massive



Figure 241: The Hunger Games Society (base worried about its allies that is now clearly being imposed). (Image Neil Hague.)



Figure 242: The Hunger Games Society is a global fascist society.

control the wealth and power at the top of the pyramid in the way of the *Hunger Games* movies. We have already reached the point where we talk



Figure 243: People die of hunger and sleep in the streets while a handful of multi-billionaires like these hijack the world's wealth. The fact that many claim to be 'caring' and have 'values' is a real challenge to the church.

military presence and beyond them were thousands of people kept in line by that military to ensure whatever Hitler demanded would be done. I had that image flipped upside down and overlaid on the Hunger Games Society structure and they are exactly the same. We are indeed looking at a global version of Nazi Germany with the added control-system of advanced-technology and AI (Fig 242). Now add the 'virus' lockdowns to what I said there.

The plan is for the leaders and key agents of the Cult to

control the wealth and power at the top of the pyramid in the way of the *Hunger Games* movies. We have already reached the point where we talk about a 'One-percent' and an Oxfam report in 2019 estimated that the world's 26 richest men owned as much wealth as the poorest half of the global population – some 3.8 billion people at the time (Fig 243). The 26 are themselves in hierarchical order with the top few dominating the wealth.

and multi-billionaires Jeff Bezos at Amazon and Bill Gates at Microsoft up there at the top. By 2020 the world had a record 2,816 billionaires worth \$11.2 trillion which is more than the gross national product of every country except the United States and China. Another Oxfam report in 2020 said the wealthiest 2,153 people have more money than the poorest 4.6 billion while the 22 richest men have more than all the women in Africa. We should be careful even then of believing these are the wealthiest people. Behind the scenes Cult leaders have wealth way beyond a Bezos or Gates who are relative artisans and gofers compared with those with the most power who don't put themselves on public display. They hide the extent of their holdings through a stream of nominees and proxies. The One-percent and their operatives own governments and buy politicians and parties (Fig 244). Multi-billionaire financier George Soros owns the Democrats in the United States along with much of the New Woke network of organisations while multi-



Figure 244. A cause and effect that never bills.

billionaire Sheldon Adelson owns the Republican Party and has been Donald Trump's biggest funder. The Cult technique is control all sides and you control the game. The Sabbatian-Frankist House of Rothschild is a player even above all of those I have mentioned and they are global experts at hiding the extent of their wealth and power. Cult-controlled corporations are far richer than countries. Sixty-

nine of the world's leading economic entities are corporations not countries and 157 of the top 200. Corporations such as Walmart, Apple and Shell attract more wealth than countries like Russia, Belgium and Sweden while a mere one percent of the wealth of Jeff Bezos is equivalent to the entire health budget of Ethiopia with its 105 million people. Mega corporations own governments, dictate laws – and wars – and hand themselves all the aces at the expense of potential competition. You have laws making it ever more difficult (on purpose) for small and medium size non-Cult businesses to survive while Cult corporations get what they like *tapalate* – look what has happened to small business and even bigger ones all over the world because of the 'virus' hoax lockdowns). Control of governments and the system in general means that billionaires and their corporations pay a far smaller percentage of their income in taxation than people struggling to survive. Google paid just £6 million in tax in 2011 on a turnover of £365 million and avoids tax

like the other vampires by moving tens of billions into shell companies in offshore tax havens. They and their famous front people have utter contempt for you. Fair Tax Mark, a group campaigning for tax transparency, reported in 2019 that the big six US tech firms Amazon, Facebook, Google, Netflix, Apple and Microsoft had 'aggressively' avoided \$100 billion of global tax over the previous decade. It claimed that in this period Amazon paid only \$3.4 billion in tax on revenues of \$960.5 billion and profits of \$26.8 billion. How can smaller less connected companies compete with that? They can't. How can they compete with those like Amazon and global taxi firm Uber who have apparently unlimited funding to buy and expand their way to monopoly? They can't and that's the idea.

Global sweatshop

The Cult controls – indeed created – the global banking and financial system in which it conjures money out of fresh air called 'credit' and its financial pot is therefore unlimited. The gathering monopoly of Amazon alone has devastated bricks and mortar shops, mum and pop businesses, and dominates the book industry at the expense of independent stores which are driven out of business (see 'virus' hoax lockdowns which have left Amazon with a massively-increased global market share). US retail giant Walmart, the largest company in the world by revenue, has done something similar in the bricks and mortar sector through a business model described by one commentator as 'selling foreign goods to domestic consumers, cheap Chinese garbage manufactured offshore in factories that pay slave wages – wages that American manufacturers could never match'. One study estimated that America lost 400,000 jobs between 2001 and 2013 because of Walmart's Chinese imports and this devastated many towns especially in rural areas. This depopulation of rural land just happens to be a major Cult agenda as you will see. Walmart even has a policy of selling goods at a loss until competitors are destroyed to secure a monopoly (see Amazon) and employs mostly part-time staff to avoid paying them benefits while knowing that the taxpayer via the government will top up the wages with welfare payments. This goes on while the Walmart family is reported to be worth \$150 billion. Walmart and its methods are straight from the Cult playbook. It's a disgusting company exploiting and living off the backs of the poor. Walmart was once widely condemned by genuine liberals of the genuine Left, but not by New Woke since the Walmart family, the richest in America, began spouting the language and agenda of New Woke. Monopoly means control and the plan is for Cult corporations to dominate every sector and market so that you buy from them or no one. Where do the bankrupt business owners and their employees go? They slide into the lower reaches of the Hunger Games Society along with

everyone else – look at the effect of the ‘virus’ hoax lockdowns which have accelerated this process on a staggering scale (Fig 245).

While global wealth is sucked into the One-percent and the Cult the poor and what are called the middle class are being stripped of income and assets in line with the Hunger Games pyramid. I warned long ago that those who thought none of this applied to them were in for a shock. By that I mean those at the time who had a well-paid job, nice car, good home and money for holidays. I pointed out that the Cult had its sights on them, too. The plan is for everyone outside the elite to be enslaved in dependency and poverty by controlling the wealth and replacing people with AI. The Cult-instigated financial crash of 2008 contributed immensely to this while the mega-rich went on getting mega-richer.

Figures I saw for 2017 and

2018 revealed that a new billionaire was created every two days as formerly ‘comfortable’ or even ‘well-off’ people were finding themselves on the street. A headline captured the trend: ‘In rich countries, the middle class is getting smaller and smaller, generation by generation.’ It describes the Totalitarian Tiptoe to the Hunger Games Society. Many

people who once thought that what I was exposing did not affect them are now sleeping in tent cities or shop doorways and this is planned to continually expand until the Cult’s job is done. Suicide rates in America have increased by 40 percent in 17 years and many of them are among those termed ‘blue collar’ workers or ‘working class’ who have been profoundly affected by One-percent accumulation of wealth and systematic mass immigration competing in their job market. Vast numbers of people even in work are living from week to week with a missed pay check or two meaning financial disaster and a lost home. A national survey by UK homelessness charity Boam found that the average British person is only two pay cheques away from homelessness at a time when AI is sweeping away jobs traditionally done by humans (and that was before the lockdown). This has all been planned. Food charity Move for Hunger says that one in eight Americans or 40 million people are food insecure with more than twelve million children and five million seniors not sure where their next meal is coming from (again before lockdown). Homelessness was rising all over the world through lower incomes, unemployment and social factors even before the



Figure 245: The global dynamic.

‘pandemic’ with the cost of housing right up there as a prime cause. British homeless charity Shelter said in December, 2019, that a child becomes homeless in the UK every eight minutes. None of this has to happen when you consider that the United States government has spent \$2 trillion (at least) on the Cult-created unwinnable war in Afghanistan, the longest in American history. Much of that \$2 trillion has ended up in the coffers of Cult-owned arms and ‘defence’ corporations while homeless numbers incessantly rise. Why would they spend the money on the population when they want to make the masses impoverished, destitute and dependent on them? I have described the Hunger Games agenda in all its form at length in *Everything You Need To Know* and if you want the detailed background for all I am saying in this book then *Everything* is a must-read.

Gather them in cities

I have long exposed the agenda for financially forcing people out of the rural areas into mega cities controlled by AI where they would live in micro-homes – some the size of a single decker bus and many even less. All these years after I made that warning those micro-homes are being built all over the world and the movement of people from financially-devastated rural communities into the cities where they can be kept under surveillance 24/7 gathers apace (Fig 246). The US federal government already owns 28 percent of the land in America and there’s a lot more to come. Patrick Wood at *Technocracynews* described how this process is happening even more directly in China where vicious government control has allowed no opposition:

... China unveiled a plan in 2014 to summarily move 250 million farmers off their land by 2026 and into megacities that had already been constructed but sat vacant. The vacated farm land is being combined into giant factory farms to be operated by advanced technology such as agricultural robots and

automated tractors. Ostensibly, the farmers who refuse to leave will be helped along with the barrel of a gun.



Figure 246: Micro-homes for the world being built around the world for the Hunger Games slaves in AI-controlled cities.

For years people have been asking why China has been building a stream of new ‘ghost cities’ with few or no one living there (Fig 247). This is why. The guiding rule for the West is China today and you tomorrow or in fact not even tomorrow. Abandoned homes, family farms, shops and factories



Figure 247: 'Ghost cities' built all over China waiting for the masses to be forced to relocate from the land.

can now be seen right across rural America between the coasts thanks to companies like Walmart with its imports from Chinese sweatshops and pricing to destroy competition. Then there are hedge fund billionaires who asset-strip local employers and devastate

rural areas. American cable news host Tucker Carlson, one of the last proper journalists on US television, highlighted one sickening example involving ultra-Zionist New York-based hedge fund manager Paul Singer who has a personal fortune according to Forbes of more than \$3 billion. Carlson told the story of how Singer's predatory hedge fund targeted the only major employer in the small town of Sidney, Nebraska, and destroyed it for a fat profit. The town lost 2,000 jobs in a population of 6,000. No wonder *Bloomberg News* dubbed Singer as 'the world's most feared investor' and he is reported to be 'a strong opponent of raising taxes for the wealthiest 1% of taxpayers'. You don't say. At the time of writing ultra-Zionist Singer is reported to be buying shares in Twitter to oust chief executive Jack Dorsey. Carlson described Singer-like asset-stripping practices as 'vulture capitalism feeding off the carcass of a dying nation'. He said of the Sidney disaster: 'A heartbreakingly familiar cascade began: people left, property values collapsed, and then people couldn't leave. They were trapped there. One of the last thriving small towns in America went under.' This is happening systematically all over America to drive people into the cities and a life of poverty, which means dependency, which means control. A further aspect of this agenda is the Cult's campaign for people to eat a vegan diet in response to the climate change hoax which would ultimately cause many animals to disappear from land that could then be absorbed in state and One-percent land grabs from which the public in the mega-cities would be excluded. You could drive there? Your autonomous car won't take you. Fracking is endangering the viability of rural life. Each fracking well consumes between 1.5 million and 16 million gallons of water while whole communities don't have enough to drink and have to leave the country for the cities. Injected water used in fracking to access oil and gas fields is polluted with hundreds of chemicals which then seep into ground water further reducing supplies to drink.

Around 2010 the world passed the point where more people live in urban areas than rural and it has been speeding in that direction ever since. In Australia people are being forced out of rural areas by

catastrophic forest fires (hardly difficult to start) and lack of water as rivers dry up. They blame human-caused climate change when honest Australian scientists have admitted there is no evidence to link climate change to either fires or drought and dwindling rivers. In fact, water is being siphoned off before it reaches communities by dams owned by private corporations who use it for their own ends including mega-cotton production operations for the benefit of Chinese and Japanese 'investors'. I recommend the Internet videos of Max Ryan with regard to Australian fires and water shortages. Climate Cult child goddess Greta Thunberg of course blamed the 2019/2020 catastrophe in Australia on 'climate change' when forest fires have always been part of Australian life and were once mitigated by controlled burning in the winter to create barriers that fires struggled to jump (Fig 248). Non-burning policy instigated at the behest of the

Greens has since created a disaster waiting to happen. But, no, hey, it's global warming – the script says so – and the fact that nearly 200 people were arrested for 'fire-related offenses' according to New South Wales police, including some for deliberately starting them, is not at all relevant. There have been horrific fires in other regions

including Indonesia which also have human and not climate change origins through forest and land mismanagement by timber and farming companies. At their most extreme these fires have produced more carbon dioxide than the US economy to put industrial production of CO2 into perspective and killed monumental numbers of animals including many from endangered species. The same has happened in Australia with one biodiversity specialist estimating that a billion animals had been killed in the fires of 2019/2020. The real causes of this don't matter to the climate obsessives – only their agenda that everything is 'climate change' – and still more people are forced out of rural areas into urban centres. Mega-cities where the masses are being forced to relocate from rural areas are known as 'Smart Cities' which is code for densely-populated centres of mass surveillance and control of everything through artificial intelligence with no private means of movement and only state-controlled driverless vehicles and communal transport systems. You go where the state says you can go and nowhere else. Current cities are being transformed into Smart Cities while others are being built from scratch around the world as in China (Fig 249 overleaf). To give you an idea of what I mean Saudi Arabia, controlled by the Sabbatian-Frankist



Figure 248: Explicit any disaster or human catastrophe to advance your agenda.



Figure 244: Smart cities with everything controlled by AI and human choice deleted are referred to as 'human settlement zones' in official documents.



Figure 250: The greenman smart city being built by Sultan bin Abdulaziz bin Abdulrahman Al Saud in Saudi Arabia near Jeddah. NEOM is the key centre of the global smart control grid.

fake royal House of Saud, is developing a \$300 billion Smart City dubbed the 'NEOM project' which is planned to be 33-times the size of New York (Fig 250). NEOM means 'New Future', but 'Cult agenda' would be more accurate.

Prison camp cities

We have in San Francisco and Los Angeles perfect examples of the Cult's Hunger Games programme and also California in its entirety. New Woke California has twelve percent of the American population but 25 percent of its homeless and 25 percent of people in the state are poor amid incredible wealth (what must it be now with the lockdown?). There have been outbreaks of typhus among the shit-laden, piss-laden, streets of Los Angeles with fears that the plague will follow while the millionaires and billionaires of the Hollywood elite look the other way from their ivory towers and conspicuous wealth. Human waste goes into the LA River bypassing sewage treatment and how does anyone think that will turn out? If you want to see the Hunger Games Society let's go to San Francisco and this time there'll be no need for flowers in your hair. Watching where you walk will be far more important. San Francisco and the associated Silicon Valley is the most unequal society on Planet Earth. I have been to the 'Golden Gate' city many times starting before the emergence of the billionaire technocracy when the city really was a place to sing about. I have been there recently and it's a shithole - literally. 'New Woke' owners of Google, Facebook, Twitter and the like live in their multi-million walled mansions with private security while the streets of San Francisco are awash with homeless people, human piss and shit, and spent needles left by addicts often desperately trying to escape from their daily nightmare while suffering from mental illness. There are now more drug addicts in San Francisco than high school students. Residents reported about 5,500 cases of human shit in the city's streets in 2011 and by 2018 it was more than 28,000. One bloke I

saw on video defecated in a supermarket aisle. San Francisco's response to all this has been to stop prosecuting people that piss and shit in public places which of course has made the situation far worse. Seattle in Washington State is another city that has taken the route of San Francisco with all the same consequences. The multi-billionaire George Soros and other One-percenters behind New Woke have been funding their gofers to become district attorneys across America and when they win office crimes are downgraded or no longer prosecuted. The aim is to destroy human society and let rule by the mob take over. The result in the same period has been a surge in murders in America as well as other crime. San Francisco has just such a district attorney in Chesa Boudin whose parents were jailed for what would today be called Woke terrorism with a group called the 'Weather Underground'. Boudin's city has the highest rate of property crime of any big city in the country with an average of 60 cars broken into every day. San Francisco's Board of Supervisors decided to act decisively in true New Woke fashion by deleting the term 'convicted felons' to be replaced with 'justice-involved individuals' which is the term also used for the targets of crime. We have the same term for both robber and robbed, attacker and attacked. Young people committing crime are now 'young people impacted by the juvenile justice system'. Drug addicts are 'people with a history of substance use'. The Cult New Woke technique is to ignore the problem (it avoids the problem) and instead delete the language that makes talking about the problem in factual detail impossible. New York has done something similar by abolishing cash bail for certain crimes. In the first month after introduction car theft surged 67 percent and robbery 33 percent with six suspected drug dealers accused of running a \$7 million operation given this get out of jail card. Will any of these people come back for trial? A former New York police commissioner described how people have been arrested for rape, been let go and raped again, while others have been arrested on serious charges, let go, and committed murder. There are many people in jail who shouldn't be, but that's not the motivation here. It's about still keeping the wrong people in jail while setting free those who should be there. New Woke California voted to make crime involving less than \$950 a misdemeanour with likely no investigation or consequences. You'll never guess what has happened. I mean who could have predicted it? Crime in that category has soared with some thieves even carrying calculators to make sure their shoplifting booty totals less than \$950. Small businesses are being especially badly hit and anyone who wants society to be a see-want-take lawless free-for-all would be ecstatic. California even reduced penalties for knowingly exposing a sexual partner to HIV and the same with knowingly donating HIV-infected blood. What about those infected? New Woke is not interested in real victims, only inventing fake ones.

Ultra-Zionist multi-billionaire one-time Democratic presidential candidate Michael Bloomberg described California despite all this as a model for all of America. To the Cult it is.

I have been exposing for decades the systematic dragging of American and other communities worldwide to enslave the population in addition with the Bush and Clinton families centrally involved in the Cult drug networks that control the drug cartels. China is circulating drugs in America via Mexican drug gangs crossing large swathes of the basically undefended southern border (see *The Trigger* for background to Cult drug networks and the Bush/Clinton/CIA/Israeli Mossad involvement). Addiction to opioids, a class of drugs derived from the opium poppy plant, has been devastating for America and especially a synthetic opioid called Fentanyl which is some 100 times more powerful than morphine and overwhelmingly sourced to China. Opioids are brain manipulators promoted as painkillers and have been mass-circulated by Purdue Pharma owned by the multi-billionaire Sackler family. The result of their mega-marketed drug OxyContin can be seen in horrific numbers of deaths, destroyed lives and destruction of whole communities. OxyContin was promoted with big help from Purdue-funded Washington Deep State Zionist 'think tank', the American Enterprise Institute, which had many connections to the Project for the New American Century. A commentator described how 'many hundreds of thousands of Americans have entered into a death spiral of addiction after being prescribed these drugs by doctors'. Purdue is offering compensation pay-outs of \$12 billion which does not even nearly match the horrors that its drug has perpetrated. Addiction to drugs, alcohol, smartphones and all the rest is fuelled by despair and the need to escape from the life people are living as the Cult dismantles countries, lives, and psyches in pursuit of the Hunger Games Society. Opioid deaths have been sharply higher in American communities where Cult-owned vehicle-makers have closed their US plants and outsourced jobs to other countries where they can pay people less. This is 'globalisation' at work. The manipulated problem of homelessness is waiting for a solution that will advance the Hunger Games Society even further on behalf of the Cult and its Sabbatian-Frankist network. American website Politico reported that 'the growing homeless encampments — which have led to a rise in human waste, trash and open-air drug dealing — have united unlikely allies'. They were talking about Republican Donald Trump and ultra-Zionist San Francisco Democrat state senator Scott Wiener. This guy cares, you see: 'The crisis is so bad people's minds are really opening up and the policies are shifting ... Legislation that would have had no chance five or ten years ago can pass.' Problem-Reaction-Solution, Wiener's 'solution' is the forced internment of homeless people under certain circumstances (which the state would interpret) using the

Orwellian term 'involuntary commitment'. These 'circumstances' will be planned to constantly expand until it involves all homeless people. Julie Winter, mayor of Redding, California, has suggested that the homeless be put in a 'shelter' which they would not be allowed to leave until they 'demonstrate self-sufficiency'. In other words she is talking about internment in a de-facto jail for the crime of being homeless. These may currently be isolated attempts at authoritarian laws but they will grow and not least because populations of towns and cities are going to be impacted more and more by the homeless crisis. The Cult doesn't want a real solution. To these empathy-deleted, stone-hearted crazies, the homeless are a means to an end.

Guaranteed poverty and control

Another Cult agenda to exploit the plunge to the Hunger Games Society is a guaranteed income. When multi-billionaire New Woke professional frauds like Facebook's Mark Zuckerberg support a 'universal basic income' you know it's not what it seems. I have believed since childhood that there should be a level below which no one should be allowed to fall in a civilised society, but that is not what the Cult's guaranteed or basic income plans are all about. The motivation is control. Billions and billions are planned to be forced into the lower reaches of the Hunger Games pyramid by manipulation of the financial system, giant corporations and hedge funds destroying communities and job opportunities, and by the utter devastation of employment with the AI takeover (this was again written even before the lockdowns). AI means still more money being transferred to ever fewer hands in that AI doesn't get paid. Technology represents the most crucial factor in the creation of a Hunger Games world (along with the effects of lockdowns). One 'solution' to this 'problem' is the guaranteed income which will be guaranteed by whom and on what basis? Look no further than China for the answer. Cult-assets of the state will decide who gets what on the basis of acquiescence to the state. China is the fast-developing blueprint for the Cult control system. New Woke billionaires far from criticising China work to support its psychopathic dictators in the creation of the very system planned for the West and the rest of the world. One Chinese city alone has 2.6 million cameras and the country has a surveillance system that scans facial features to create a virtual map of the face in real time to be checked by AI against a state database (Fig 251 overleaf). The same system is fast coming to the West thanks to the Cult and its Silicon Valley multi-billionaire celebrity technocrats. 'Smart' technology (I'll explain the real context in a later chapter) allows for constant mass surveillance and China's communist/fascist (same thing) government is exploiting this potential for its 'social credit' system. This tracks the behaviour of the entire population and awards or deletes credits based on that



Figure 25.1: The futuristic mass-surveillance system is China in the process of coming to the West.

discredited to take a single step'. They are **not kidding**. By the end of 2018 the National Public Credit Information Centre revealed that Chinese courts had banned the purchase of plane tickets 17.5 million times and 5.5 million for train tickets for becoming officially 'discredited' (the fake 'pandemic' is being exploited to do the same in the West). Apply this to a guaranteed (tiny) income that would be paid only if you conform to what governments demand. That's the real story behind guaranteed income and why One-percenters frauds and censors like Zuckerberg give it their support while promoting themselves as kind and caring. A small guaranteed income with no alternative way of earning money – the Hunger Games Society. A glimpse of how the China system is being introduced in the West can be seen with the Silicon Valley company Airbnb which is causing people to be thrown out of their permanent homes around the world as they are rented to tourists through Airbnb just as Silicon Valley's Uber is destroying local taxi firms across the globe in its money-no-object business plan leading to autonomous taxis. Airbnb has developed technology to scour the internet and social media accounts to check potential renters for character traits. The company's 'trait analyser' software employs artificial intelligence to give black marks to people 'associated' with 'drugs or alcohol, 'hate websites', or sex work' by 'scanning keywords, images and video footage across the internet linked to a potential customer to assess their trustworthiness'. The programme assesses their 'behavioural and personality traits' including 'conscientiousness and openness' – see China's social credit system.

Cult gun-grab

This brings me to the middle section of the Hunger Games pyramid – the police/military state emerging before our eyes all over the world. Its role is to protect the One-percent from the Hunger Games masses and enforce the will of the One-percent upon the rest of humanity as per *Hunger Games* movies (see the lockdowns). The plan is to eventually fuse police and military into one force and we have the police looking more-

behaviour. Do what the government wants and you gets credits; do what the government doesn't want and they are taken away with major consequences. A government document in 2014 said the system is designed to 'allow the trustworthy to roam everywhere under heaven while making it hard for the



Figure 25.2: Police are looking and acting like the military because they are planned to fuse into a global police-military state.

like the military with every passing year (Fig 25.2). Police officers are armed to the enamel on their teeth at the same time that constant pressure is being applied to disarm Americans even including those living in isolated homes with no chance of a swift police response. Is this a coincidence? Not a chance. I speak as someone who wishes there were no guns. I can't stand them and I have never used one except to win – or not – a coconut at the fair; but we need to see the world as it is and not only as we would like it to be. If you have a heavily-armed Cult-controlled police and military and an unarmed population how is that going to end? It is such a cinch with today's sophisticated mind-control techniques to program kids and others to go on shooting sprees in schools and shopping malls to increase the demand for gun confiscation. Do people really think that criminals and crazies won't locate and use guns because the law says they should not? They are criminals and crazies for goodness sake. Are armed criminals more likely to attack a home where they don't know if the occupants are armed or one where they know they are defenceless against their weapons? Ultra-Zionist multi-billionaire Michael Bloomberg, former Mayor of New York and failed Democrat presidential wannabe, is funding campaigns to target gun owners in a move that promotes the Cult agenda. The desire to remove guns from the law-abiding population cannot be divorced from the extraordinary level of surveillance now in place because it's all connected. It's the Totalitarian Tiptoe to a global Cult-controlled police-military world army state to impose the agenda of the Cult-controlled world government. China's social credit system is only a glimpse at how extreme this is meant to be. Cult-owned Silicon Valley and associated Cult technology giants around the world in countries like China have constructed an immense and ever-expanding network of 24/7 surveillance in which your every action is logged and stored on databases planned to become one global database. You are watched and recorded by smart televisions, smart phones, smart personal assistants, cameras, increasingly with face-recognition, and through your every actions online. The list is becoming endless. Smart streets with microphones in lamp posts are another development and the roll-out of 5G will expand the tracking and data-gathering potential by gigantic leaps. A beyond-Orwellian technological tyranny has been introduced so fast.

Open the borders

I have exposed Cult insiders over the years describing how they want to impose the 'law of the jungle' in which people are constantly in states of fear and anxiety and open to more Orwellian control to protect them from what they have been manipulated to fear. Part of the fear and chaos agenda is opening the southern border of America to psychopathic gangs arriving through Mexico such as MS-13 with its lovely motto 'kill, rape and control'. Mexican drug cartels that have taken psychopathy and brutality to still new depths of depravity exploit the near-open border areas to flood America with drugs and they are major suppliers worldwide. Mexico is run by those cartels and law and order has basically been deleted. The idea is for the situation to get so bad that there will be an exodus of people into the US on such a scale from the south that it is unstoppable. Many who cross the border illegally give birth to children in the United States to secure them US citizenship in the knowledge that the rest of the family will then not be sent home. The number of so-called 'anchor babies' born to those living illegally in America was reported to be 372,000 in 2019 which was greater than US citizen birth rates in 48 states. Billionaire financier George Soros, part of the ultra-Zionist global network no matter how much he may try to hide that, is funding both the movement of illegal migrants into America and Europe and election campaigns of New Wake district attorneys across America who then refuse to prosecute illegal migrants, criminals (including killers) and decriminalise a list of offences. This is creating the 'jungle' that Cult insiders talk about. We can also see the real meaning behind this Bloomberg pledge: 'I believe we can once again be a country that welcomes immigrants, values immigrants, respects immigrants, and empowers them to pursue the American Dream.'

Mass migration into Europe and the United States is a frontline Cult agenda to transform societies with the goal among many other things of creating conflict (divide and rule) between indigenous and incoming cultures (Fig 253). The Cult doesn't give a shit about the migrants. They are just pawns in a game to secure the will of the same Cult that has bombed their countries and turned them asunder in places like Libya and Syria in the full-knowledge that it would start a trek to the north into Europe in search of safety. I am all for giving succour to

migrants fleeing persecution and was mostly of the Cult's making via the West to create chaos and control. The point that needs to be made is the great majority of migrants are not fleeing war. They only want to get into Europe and the United States and if I were them I would want to do the same. Some perspective is urgently required, however, on what that means for European and American society. German newspaper *Die Welt* has conceded that most of the migrants arriving in Europe across the Mediterranean are not genuine refugees: 'Contrary to popular belief, the majority of those arriving in Italy are not refugees ... the main countries of origin for boat migrants in January [2020] were Algeria, Ivory Coast, and Bangladesh.' Italian Interior Ministry figures suggest that large numbers are arriving from Tunisia, Algeria, and Turkey. Most of these people are not given asylum or refugee status but most stay in Europe anyway. Germany's Federal Office for Migration and Refugees agreed that only a small fraction of failed asylum seekers from Africa had been deported and that most probably never will be. Those that are deported just come back. The time is planned when an unstoppable exodus of people will head into Europe and the United States from the south, I said in *The Trigger* that Turkey would at some point lift its ban agreed with the EU on migrants crossing its border into Europe and that would lead to potentially millions more migrants heading northwards. In late February, 2020, the Turkish government of the tyrannical President Erdogan said it would no longer hold back people from Syria and other countries who wish to go to Europe and seek asylum there. Turkish officials spoke of 'opening the floodgates of migrants on Europe'. I'm not a prophet. I just know what the game is and that makes predicting events quite straightforward. Erdogan said the situation would continue until the EU renegotiated the deal and even if that happens the threat is ongoing. This tyrant is supposed to be 'anti-Israel', but somehow manages to promote the Israel-based Sabbatian-Frankist cult plans for both flooding European society with migrants and continuing the efforts launched by the ultra-Zionist Project for the New American Century to remove President Assad in Syria. Maybe he's just confused, eh? I publish evidence in my last two books that Mustafa Kemal Atatürk, first president of the Republic of Turkey, was a Sabbatian-Frankist fake Muslim interloper.

None of this is a condemnation of migrants who are looking for a better life. It is simply laying out what the plan is. I have been warning about this agenda for many years since mass migration began and it went mainstream in 2020 when Hungarian foreign minister Péter Szijártó warned that the (Cult-created-and-controlled) United Nations is funding a program of mass migration that threatens 'the whole of humanity'. He told a United Nations conference in Vienna that the UN is funding agencies encouraging people to leave their homelands and head



Figure 253: The reason for mass migration of cultures and the obsession with seeing 'racist' everywhere and in everything (Drugs Gareth etc.)

to western countries. Szijrdi was talking about the UN Compact on Migration passed in 2018 to press Western governments to assimilate ever more migrants from other cultures which then British MEP Janice Atkinson said could lead to Europe being faced with 59 million new migrants within a few years. Watch for criticism of mass migration and its consequences being criminalised as 'hate speech' to protect the cultural elimination policy from exposure. We are close already. The long-planned theme is confirmed by the UN document in 2001 called 'Replacement Migration: Is It a Solution to Declining and Ageing Populations?'. This said that dealing with a declining population would mean potentially hundreds of millions of migrants heading for Europe. It estimated that Europe would need at least 159 million migrant workers to arrive by 2025 'to maintain the current balance of 6 to 5 workers for a pensioner' with perhaps at the most extreme 1.4 billion migrants required by 2050 at an average of 25.2 million a year. At that time 1.7 billion migrants, or their descendants, would make up nearly three quarters of the total population of 2.3 billion. The document said that in the United States 'it would be necessary to have 593 million migrants from 1995 to 2050, an average of 10.8 million per year' and 'by 2050, out of a United States total population of 1.1 billion, 775 million, or 73 per cent, would be post 1995 immigrants or their descendants.' It is chilling in the light of this to watch Internet videos by ultra-Zionist and Sabbatian-Frankist extremists and 'rabbi's' saying openly that they are using Islam to transform European society and destroy 'Edom' – Rome and Christianity. David Toutou, a 'Rav' or Hebrew 'teacher/spiritual guide', said: 'You will have no place to run. Islam is the broom of [Israel]. These crazies say that the Jewish Messiah will only return when Europe and Christianity are 'totally destroyed' (see also the United States). Toutou, who is far, far from alone in his shocking extremism, said:

So I ask you. Is it good news that Islam invades Europe? It is excellent news! It means the coming of the Messiah [who will rule the whole world from Israel] ... You will pay dearly for it: Europeans. To such an extent you have no idea ... You will have no place to run to, because of all the evil you have done to Israel you will pay for it a hundredfold.

When Italy will be gone ... when Edom (Rome) ... when that place is gone, and that's what Islam is going to do. Islam is the broom of Israel and you have to know it.

Once 'Edom' was gone the same insanity will turn its attention to destroying Islam and so on. See *The Trigger* for the detailed background to what is being orchestrated out of Israel by the Sabbatian-Frankist Satanists and you will see why the definition of 'anti-Semitism' is

constantly being expanded and enforced by censorship through the Sabbatian-Frankist 'Anti-Semitism' Protection Racket to stop any of this being exposed and debated. The New Woke mentality funded by billionaires like ultra-Zionist frontman George Soros is keen for open borders while considering none of the consequences (which the Cult wants) for countries and their current populations including former migrants. They certainly don't realise – except the inner core – that they are promoting a population transformation agenda directed by the One-percent. There is no rational contemplation of what must surely follow when all that matters to New Wokers is posturing their self-purity in a constant exercise of round-the-clock virtue-signalling. This New Woke mindset – or emotionset – is a perception-virus that first infested political parties supposedly of the 'Left' and then expanded into centre and even 'conservative' parties having long infected almost the entirety of the self-obsessed celebrity 'Luvvies' who fly first class or in private jets to and from their walled mansions to lecture the great unwashed on the urgency to save the planet from climate change, help the poor and needy, and oppose border walls like the ones they have around their own properties. Unchecked migration is a disaster more than anything – as usual – for the poor and unemployed and yet wonderful for the rich. Wages at the lowest end are driven down by competition from people amid a labour surplus willing to work for less and job opportunities are reduced. The rich meanwhile see their wage-bill fall and enjoy a limitless supply of servants and cleaners at very reasonable rates in their big houses (Fig 254).

Black communities in America have been particularly hit by this predictable sequence and it's happening in all countries with mass immigration. Billionaires benefit and the poor lose out thanks to an outrageous and transparent deception incessantly promoted by New Wokers who call themselves 'social justice warriors'. If it wasn't so tragic for those who take the consequences this claim would be comedy club territory.

Tip-toe-by-Tip-toe

The long-planned outcome is being brought about by a series of interconnected steps that generate a domino effect to impose the Cult's



Figure 254: Mass migration of people and cultures into Europe and the United States is being driven by the Cult and its One-percent cheered on by the 'Wokers' but claims to oppose the One-percent. Rates in bloody areas.

transformation of Western society:

1) Manipulate wars in the Middle and Near East and support drug gangs and crime cartels to terrorise communities in Central and South America while financially trashing those societies to create a combination of extreme danger and deprivation.

2) You know that great numbers will seek to flee and with both the Middle and Near East and Central and South America you know they will head north into Europe and the United States.

3) Fund groups that will aid their passage and encourage far bigger numbers to join them in a piggy-back operation in which you assure them they will reach their 'promised land'. George Soros networks have been centrally involved in this.

4) You instigate such a mass movement of people that your target countries are overwhelmed with the support of the Cult-created European Union and leaders like Cult asset Chancellor Merkel in Germany who opened her borders and said 'let them all in'. The same happened in Sweden and the full force of New Woke Democrats in America cry 'open the borders to everyone'. The Swedish Employment Service revealed that just 6.1 per cent of new arrival migrants were able to find full-time work not subsidised by the government in 2019. Migrants are only a means to an end.

5) Democrat-controlled New Woke city and state governments introduce 'sanctuary cities' to protect those who have crossed the border illegally from US Immigration and Customs Enforcement, or 'ICE', which you demonise and demand be disbanded.

6) Calls to build a wall or fence to secure borders are condemned as racist bigotry and Nazi ideology in a black and white fantasy that says all migrants are good and anyone questioning the numbers and their effect is automatically evil and must be silenced. Censorship is then provided by billionaire heads of Silicon Valley giants who promote their New Woke credentials from their corporate headquarters and walled mansions - "Make some tea, Sergio, and there's still dirt on that floor".

7) The often catastrophic consequences of these events for jobs, crime, and economics in countries such as Sweden and Germany are suppressed through a compliant gullible media and by attacking anyone speaking the truth as a bigot, racist and Nazi leading to vilification and lost employment. Observers with the same concerns stay quiet in fear of

similar repercussions. In this way you silence dissent and give yourself free-rein to expand the influx and increase the consequences.

8) The point is reached - as now in Sweden - where the truth can no longer be hidden amid bombings, arson, murder and rape. Swedish Moderate Party leader Ulf Kristersson cited figures from the Crime Prevention Council about 230 bombings in 2019 alone as proof that the government had lost control of the country. By now it doesn't matter with the job done and irreversible.

9) Even more extreme New Woke governments are elected, the floodgates open, the target society is transformed, and the Hunger Games structure installed.

Group protection

What I am saying here is not a condemnation or mass-labelling of migrants. I want instead to expose the cold and calculated exploitation of often tragic people for political ends and the insanity of judging migrants and minorities *en masse* as groups and not through individual behaviour. Show me any racial, cultural, sexual or religious group and I will show you nice people, okay people and psychopaths - every time. Cult-programmed New Wokeness cannot process, or cope with, such basic subtlety. It sees only black and white racially and literally and inclusivity becomes exclusivity in that white is bad in totality and other shades are all victims of the bad white people. White supremacy and privilege extends to white homeless living amid the shit in San Francisco. My goodness, the billionaires behind New Wokeness know how to manipulate a mind. New Woke is another term for inversion - everything is inverted (Fig 255). The Cult New Woke agenda for the end of America in any form even close to what we have known is laid out in the Democrat-sponsored New Way Forward Act proposed by Mexican-born socialist Jesús García, a member for Illinois in the US House of Representatives. The bill would de-criminalise illegal immigration and remove any disincentive for untold numbers to walk across the often weakly-defended border. Once in the US the bill would make it very difficult for illegal migrants to be deported and that goes



Figure 255: If you want the truth about the 'Woke' trainee invert everything they use and claim to stand for.

to be deported and that goes

even for violent criminals. The bill would open the way for those who have committed serious crimes in other countries to be allowed to settle in America. Immigration law and enforcement would basically disappear. What would be the point of border patrols when it's not illegal to cross and those who do can't be detained? Cable news host Tucker Carlson, who alerted the public to the content of the bill that was being virtually ignored by the New Woke media, said:

Under current US law, legal US immigrants can be deported if they commit an 'aggravated felony' or a 'crime of moral turpitude' – that is, a vile, depraved act, like molesting a child. Under the New Way Forward Act, 'crimes of moral turpitude' are eliminated entirely as a justification for deportation. And the category of 'aggravated felony' gets circumscribed too. What does that mean?

Consider this: Under current law, immigrants who commit serious crimes – such as robbery, fraud, or child sexual abuse – must be deported, regardless of the sentence they receive. Other crimes – less severe ones like racketeering – require deportation as long as the perpetrator receives at least a one-year sentence. But if this bill passes the House and Senate and is signed into law by the president, there will no longer be any crimes that automatically require deportation. None.

The minimum prison sentence under the bill for crimes that still require deportation would rise from one year to five and even then judges would be given the discretion not to deport. Immigration and Customs Enforcement (ICE) would have to convince a court that an illegal migrant was dangerous or a flight risk, but officers would be banned from quoting prior criminal behavior to prove this – including rape, child molestation and drug trafficking. Even more insane is the provision compelling the government to create a 'pathway for those previously deported to apply to return to their homes and families in the United States' if they would not have been deported under the new rules. It is a retrospective open border. Taxpayers would have to pay for the previously deported to be located and brought 'back home' from where they had been removed for criminality. To put this in perspective 480,000 were deported for illegal entry or re-entry into America between 2002 and 2018 and they would be eligible to 'come home'. The bill has next to no chance of being successful before the scheduled 2020 election when it would have to be signed by Donald Trump and to do so would be electoral suicide. The bill does indicate, however, what would happen once New Woke came to power and confirms the Cult agenda to destroy America by setting criminals free to create mayhem and the domination of the strongest. For this open border plan with Mexico to be proposed by a Mexican-born US politician, Jesús García, shows that they don't

care if you see they have no integrity or have any wish to hide their intent. They are now quite happy to put that on public display. There is a chasm of difference between migrants seeking a better life for themselves and their family or fleeing from war and the psychopaths of America's MS-13 and violent gangs in Sweden, Germany and France which terrorise once-peaceful communities. There is a gathering list of no-go areas in Sweden where police won't go except in numbers and ambulance crews won't go after migrant attacks. The response was to launch an initiative to recruit a 'more diverse' police force with 'language and cultural competence'. This was soon in trouble when half the applicants failed the admission tests. Never mind – watch the admission criteria be reduced. Sweden's top migration official Mikael Ribbenvik, head of the Swedish Migration Agency, went public to warn Swedes that their country was becoming a 'safe haven for war criminals and potential terrorists' with the government giving passports and benefits to suspected dangerous criminals that were protected by law from deportation (see the common theme). Ribbenvik said that other countries 'have a hard time understanding how we consider people dangerous but still continue to give them passports and residence permits'. Once you realise that the idea is to destroy white Swedish culture and turn its society into an arena of fear and might-is-right there is no longer any 'hard time' in understanding why such things are happening. Political correctness and 'hate speech' are smokescreens to stop this being openly discussed and exposed.

Pakistani and Asian gangs raping and trafficking underage and teenage white girls in British cities were ignored by police and politicians who knew what was going on for years before officially coming to light and it's still happening on an industrial scale. One girl was forced to have sex with 300 'men' by the age of 25 in the northern town of Huddersfield. They are called 'grooming' gangs when rapists, psychopaths and child traffickers is what they are. They are brutal, sexist, racist, and everything and more that New Woke rails against – if you're white. New Woke silence is deafening otherwise. Exposing these psychopaths challenges the mass immigration narrative and that is far more important to The System than shockingly abused young girls. Had they been white gangs and Pakistani girls the police would have been on them in an instant and quite right, but you see the systematic bias based on race which, of course, is blatant racism. 'Grooming' (rape) gangs are clearly still operating across the UK with new cases now regularly coming to light and how many more – far more – are not being caught? A leaked document from the French internal security service, the General Directorate for Internal Security, said that up to 150 communities in France are controlled, or 'held', by Islamist radicals. The document was classified to stop the information being known by the

public and to protect the agenda. This is not how all migrants behave, the great majority do not. The fact is, however, that some do and political correctness is silencing their exposure and the scale of the problem. The El Salvadorian migrant gangs of MS-13 are terrifying communities in US cities with their signature savagery of dismembering people with machetes and their prime target is other migrants from El Salvador (one in three El Salvadorians now live in America). Donald Trump was furiously attacked by New Woke Democrats and media when he described MS-13 as 'animals'. Chopping people up with machetes? Bless 'em (Fig 256).



Figure 256 MS-13 are only 'loving tyranny' to impose a new one in the United States. What's wrong with that you racist?

The more the merrier

There is clearly a policy of encouraging more migrants to cross the border illegally with moves to give them driving licenses, the right to vote and free health care. At least tens of thousands, some claim far more, enter the United States on a visa and never leave. These policies are protected from scrutiny by making criticism of them increasingly illegal or a reason for censorship. There is a fundamental difference between those willing to respect the culture and traditions of countries they enter and cultural supremacists and bigots who seek to impose their society and prejudices on everyone else including migrant sharia police telling Swedish girls what they can wear. Those that have allowed this human disaster to happen in Sweden, Germany and elsewhere should be in a prison cell for crimes against The People and for The Cult. What does all this do collectively? It creates the very daily fear and anxiety that the Cult wants to impose everywhere. The House wins yet again. I have charted the mass migration agenda in other books back to at least the 1920s and those connected to the Habsburg and ultra-Zionist banking families behind the creation of the EU. I have quoted the extraordinarily accurate predictions of ultra-Zionist doctor and Rockefeller family insider Richard Day who told a meeting of paediatricians in Pittsburgh, Pennsylvania, in 1969 how the world was going to change across a wide range of subjects and all of which have happened or are happening (you'll find a summary in Appendix 2). Day knew for the same reason that George Orwell knew 20 years earlier in his *Nineteen Eighty-Four* and Aldous Huxley knew in 1932 in *Brave New*

World. If you are either part of the agenda (as with Day) or have access to the plan through research or contacts you can comfortably predict the 'future' because unless something intervenes to stop the plan it will play out. See my book *Phantom Self* for the detail of what Day said in 1969 which will take you aback in the light of what has happened since. He predicted among so much more the emergence of the Internet, the surveillance state, smart televisions, the plan to 'make boys and girls the same', clearing rural areas and forcing everyone into cities, and calculated mass migration to transform Western society. Lawrence Dunegan, one of the paediatricians present, took notes and in 2004 he recounted in audio interviews with an alternative website what Day said that night. Dunegan was prompted to do so when he saw the predictions were happening. He quotes Day as saying this in 1969 about the plan for mass migration:

There [will] be mass movements and migrations of people without roots in their new locations because traditions are easier to change in a place where there are a lot of transplanted people, as compared to trying to change traditions in a place whose people grew up and had an extended family, where they had roots.

This is the real reason for mass immigration – to manipulate an infusion of people from other cultures that have no connection to the history and traditions on which target societies are founded. Those with a sense of nationhood will resist the deletion of nations and countries under a world government dictatorship and the more you dilute that sense of nation and culture the more you dilute that resistance. As older people die out and the young take over who know nothing except the current society the historical and cultural foundations fall and disappear. The manipulation and dilution of the indigenous sense of nationhood is further systematically undermined by denigration of the culture as we have seen so clearly in Sweden. This has included an advertisement by SAS, the biggest airline in Sweden, Denmark and Norway, promoting the belief that there is no Swedish culture and nothing 'truly Scandinavian'. Swedish politicians supporting mass immigration and TV documentaries by the state broadcaster have said the same. SAS featured a black guy saying 'We are no better than our Viking ancestors' and the advertisement (propaganda) said everything considered 'Swedish' was a copied culture which came from foreign lands. Swaths of the public were outraged, but the theme will continue because it's the Cult agenda. Something similar is emerging in America with Democrat politicians saying that migrants are 'more American' than Americans. The absorption of national sovereignty into superstates like the European Union is part of the same plan and explains why the same

people who plotted in the 1920s to introduce the EU also plotted even then the mass movement of people that we have today (see *Everything You Need To Know*).

The takeover sequence

There is another sequence that follows in the overthrow of the indigenous culture in any country in the face of mass immigration. Not immigration at all – mass, basically open-border, immigration. First you have an influx from another culture that tends to gather in certain areas and transform their cultural nature. Members of the indigenous population move out into familiar surroundings. This has happened in the extreme in the East End of London where its cultural status has been utterly transformed in little more than a generation. I have seen this referred to as people losing their ‘cultural security’ in the face of the incoming culture or cultures. Next the numbers reach levels where how new culture communities vote decides who is elected to local councils and as Members of Parliament. At this point parties of Left, Right and Centre begin to pander to the new cultures with their election-deciding potential. At the same time they ignore and take for granted those parts of the wider community who would normally vote for them. I call this the ‘gimme vote’ and gimme voters get nothing from political parties – ‘they’ll always vote for us anyway’. The British New Woke pro-mass immigration Labour Party found in the 2019 national election that those days are now over as the kick-back after decades of ‘gimme’ exploitation of the white urban class demolished their support. New cultures become the focus as their numbers continue to rise. Politicians from incoming cultures start to be elected and eventually they become leaders with an ever-increasing body of support with new culture birth-rates far exceeding those of the indigenous culture. This is happening as Western women have children later or not at all in the ridiculous and encouraged assumption that this will save the world from ‘climate change’. Fertility rates for white women were down in every US state in 2017 according to the Centers for Disease Control and Prevention (CDC) and the same is happening in countries like Germany. They have fallen below the rate needed for the population to replace itself. Pointing out these facts is not racism. It is to expose the agenda behind it and that affects us all no matter what your racial background and skin colour. London now has a white minority population as does my birth city, Leicester, with Birmingham, Britain’s second biggest city, going the same way. The transformation has happened in 50 years with the speed increasing. The BBC reported in 2018 on a study projecting university places which predicted that three in four London students will be from ethnic minorities by 2030. A British ‘journalist’ and self-proclaimed communist activist called Ash Sarkar, British-born of Bengali descent, pointed out in

a 2016 video that the white population of London had fallen by 600,000 while non-whites had increased by 1.2 million. Her response to this was: ‘So yes, lads, we’re winning.’ She claimed she was joking (I don’t think so) when people were appalled by the remark, but it showed once again how we live in a two-tier system of political correctness. Had a white person said the same if the figures were reversed they would be condemned and banned in a fury of ‘racist, bigot, Nazi’ and Ash Sarkar with breathtaking hypocrisy would be leading the charge. To Sarkar white Britain is a racist society and in line with true New Woke orthodoxy only white people can be racist and not those of Bengali descent who describe the white population of London falling and the non-white increasing as ‘we are winning’. The bias and unfairness is transparent and systematic. Census projections in the United States predict that whites will be a minority by 2045 with Hispanics the next biggest group. If the One-percent-controlled New Woke mentality gets political power it will be much sooner. We should not forget that white people occupied the land that was once the domain of Native Americans and it is not the demographic change by itself that is the point here. It is why it is being systematically manipulated by the Cult and to what end and why white people are being so targeted.

While this sequence of societal change unfolds any criticism or exposure of what is happening, any complaints from the indigenous population about their home areas being transformed into what is to them a foreign land, are dismissed and silenced by political correctness. New Woke thought police brand every dissenting voice as racist. They demand that people must be ‘non-judgemental’ (while themselves being constantly so) when in fact ‘non-judgemental’ is Orwellian code for having ‘no opinion’ outside the New Woke perceptual prison camp. The sub-text here is that if people are not allowed to criticise what people and the Cult are doing this automatically blocks all exposure of what is happening to enslave and manipulate the population. New Wokeness pervades the Cult-owned media to ensure PC reporting of events and government agencies are infused with Wokeness including the police as laws are introduced to make illegal any criticism of the impact of incoming cultures on the indigenous culture. Legitimate criticism is labelled ‘hate speech’. The cumulative effect eventually is that incoming cultures override and replace the original culture and legislation is passed to change the cultural basis on which the country is governed. It’s no good New Wokers shouting bigot at me for pointing this out which is ridiculous given my view of reality and the Oneness of everything. The sequence I have described is actually how it works and this has been made to happen by the Cult and its agents like war criminal British Prime Minister Tony Blair to serve its agenda for the cultural and racial transformation of Western Society. If people don’t like me

speaking the obvious truth I have a finger that I will gladly put on public display.

Soros money

I have exposed billionaire manipulator George Soros in great detail in many other books including *The Trigger* and *Everything You Need To Know* (Fig 257). His global vehicle operating in 100 countries is the Open Society Foundations (OSF) to which he has given at the time of writing some \$32 billion. OSF is dubbed an NGO, or non-governmental organisation, and these along with 'think tanks' are a major source of Cult manipulation and government policy. Note the giveaway name – Open Society. This is code for open borders and the end of countries and nations which just happens to be the goal of the Cult as I have been highlighting for 30 years. The Cult's planned global structure requires an end to countries to make way for a world government overseeing superstates like the EU with regional entities replacing nations and countries. Maps of a regionalised Europe have come to light through the EU. People would be designated 'global citizens' and be subject to the impositions of an unelected global government run by 'experts' and technocrats directing the 'Smart' technological control grid. Making countries disappear means borders must disappear and this is the whole idea of what is happening. Without borders there can be no countries, individual value systems, or safety nets for the poor, disabled, sick and destitute – you know, all those things the New Woke social justice warriors claim to care about (Fig 258). Anyone just walks in to the land of a former country no matter what their background and attitudes and demands they are looked after; but by whom and with what? Very soon after open borders the game would be up. There would not be the money, jobs, housing, healthcare, 'education' for all those who would want them as hordes of people move in. I shake my head when I hear New Wokers demanding open borders and more spending on healthcare, housing, unemployment and schools. They have no self-awareness to see the obvious contradictions. New Woke is purely about virtue-signalling and not rational thought. Ask them if they could stop a



Figure 257: Don't reveal what he's actually doing or you are on last Senate!



Figure 258: Have you thought this through, people? Have you thought at all? It seems not.

jug running over while the tap was still on and they might say 'of course, not'. Then they would call for open borders and more spending on healthcare, housing, unemployment and schools while believing that at some point there would be enough for everyone. No such point could ever be reached. The more you spend on healthcare, housing, unemployment and schools the even more would be needed to meet ever-increasing demand through ever-increasing numbers. Cabal asset Soros directs his tens of billions at all the facets of the agenda and funds Open Society operations to overthrow governments, control politicians and parties, impose the New Woke agenda, and encourage mass migration into Europe and the United States. He also bankrolled organisations in an effort to stop the UK leaving the European Union or at least in a way that could genuinely be called 'Brexit'. Soros money from someone who lives in the United States and is not British was directed against Brexit. The sheer arrogance of it is mind-numbing. The Strategic Culture Foundation website detailed in a 2017 article the control that Soros has over the European Union:

It's an open secret that the 'Soros network' has an extensive sphere of influence in the European Parliament and in other European Union institutions. The list of Soros 'reliable allies' has been made public recently. The document lists 226 MEPs from all sides of the political spectrum, including former President of the European Parliament Martin Schulz, former Belgian PM Guy Verhofstadt (a major opponent of Brexit), seven vice-presidents, and a number of committee heads, coordinators, and quorumers. These people promote the ideas of Soros, such as bringing in more migrants, same-sex marriages, integration of Ukraine into the EU, and countering Russia. There are 751 members of the European Parliament. It means that the Soros friends have more than one third of seats.

George Soros, a Hungarian-American investor and the founder and owner of Open Society Foundations NGO, was able to meet with President of the European Commission Jean-Claude Juncker with 'no transparent agenda for their closed-door meeting', and [it was] pointed out how EU proposals to redistribute quotas of migrants across the EU are overly familiar to Soros's own self-published plan for dealing with the crisis.

The report is talking about ways to respond to the very migration 'crisis' created by Soros, his masters and his Open Society Foundations – Problem-Reaction-Solution. The European Center for Law and Justice revealed in 2020 that in the period 2009-2019 nearly a quarter of the judges on the bench of European Court of Human Rights have had strong links to the Soros Open Society Foundations or to organisations that he funds including Amnesty International which has received \$100

million since 2010. The study found that some NGOs are so funded by the Soros networks that they are effectively wholly-owned subsidiaries. But there's no conspiracy. George Soros is a shining light of unimpeachable virtue, and it is 'anti-Semitic' to say otherwise.

Soros Spring technique

Soros-funded groups have a particular role in manipulating protests against target governments to give the illusion of spontaneous 'people's revolutions'. If the Cult continually invades countries with military force the pattern will be clear and opposition will gather with each one. Instead the ideal is to manipulate the population in the country to overthrow the government as you hide in the shadows saying "Who, me?" Open Society place-people and agent provocateurs instigate the unrest and this is followed by thousands from the population who have no idea that it's all a scam. Cult-controlled American and European governments then give public support to the protesters and demonise the country's leader. This is often quite straightforward with so many psychopaths of all kinds that kill, terrorise and otherwise manipulate themselves to power in country after country. The Open Society Foundations of Soros were frontline players in the so-called 'Arab Spring' when protests across the Arab world removed governments and replaced them with military dictatorships as in Egypt and warring warlords trafficking children in open slave markets as in Libya. If the Soros network can't overthrow a regime by protest alone American and European governments send in the bombers to finish them off under the PR cover of 'saving the people from violence' – by bombing them from the sky. Precisely this happened in Libya when the country with the highest per-capita income in Africa was bombed into the Stone Age by Cult-created-and-owned NATO. Countries targeted by Soros and US/NATO psychopaths happened to be the same ones demanded for regime-change by the Cult's Project for the New American Century organisation founded in the United States by Sabbatian-Frankist ultra-Zionists that included the major players in the White House and Pentagon in 2001 when the Cult-orchestrated 9/11 gave them the excuse to start picking off the list. Another Open Society-manipulated overthrow was that of President Viktor Yanukovich in Ukraine in 2014 and was overseen by ultra-Zionist Victoria Nuland, Assistant Secretary of State for European and Eurasian Affairs at the US State Department, and the wife of ultra-Zionist Robert Kagan, co-founder of ... the Project for the New American Century. More than 2,200 Open Society Foundation documents secured by the group DC Leaks reveal the manipulation of Soros and his lackeys including US policy toward Ukraine after the 2014 coup during the fake-liberal Obama administration. One document described the 'New Ukraine' as a key

that 'reshapes the European map by offering the opportunity to go back to the original essence of European integration' (the plan for the tyrannical centralisation of power over the whole of European by Cult-controlled bureaucrats which explains why Soros sought to thwart Brexit). British academic Frank Furedi has personal experience of the arrogance, reach and agenda of the Soros network and exposed what he saw in a British national newspaper. He said he was a guest speaker at an event funded by a Soros foundation in Budapest, Hungary, where Soros was born. Furedi recalled:

It was later during lunch at a plush Budapest hotel that I encountered the full force of the arrogant ethos promoted by the Soros network of organisations. At my table I listened to Dutch, American, British, Ukrainian and Hungarian representatives of Soros NGOs boast about their achievements. Some claimed that they played a major role in the Arab Spring in Egypt. Others voiced their pride in their contribution to the democratisation of the Ukraine. Some bragged about their influence in preparing the ground for the overthrow of the Gadhafi regime in Libya. I sat quietly and felt uncomfortable with a group of people who so casually assumed that they had the right to play God throughout the world.

At one point, the head of the table – a Hungarian leader of a Soros NGO – asked me what I thought about their work. Not wishing to offend, I quietly remarked that I wasn't sure whether the external imposition of their idea of democracy on the people of Libya was legitimate nor that it would work. Without a second's hesitation, my interlocutor sounded me with the response: 'I don't think that we have the luxury of waiting until the Libyan people come with their own Jefferson.'

The overthrow of Colonel Gadhafi in the Soros foundation 'people's revolution', and manipulation in other countries including Syria, led to the start of the mass movement of people out of the Middle and Near East and Africa into Europe aided by the same Open Society Foundations as you can read in detail in *Everything You Need To Know* where you will also see how Soros-funded groups are behind the attempts to relocate masses of people from Central and South America into the United States. Yet another Cult think tank was launched in 2018 called the New Center that campaigns for an amnesty for all 'illegal aliens' in the United States to allow them to stay permanently. The New Center is headed by William Galston of the Brookings Institute and ... ultra-Zionist William Kristol, co-founder of the Project for the New American Century. The demands of the 'New Center' are supported to their DNA by the New Woke mentality funded to a pivotal extent by ... George Soros. The Soros Open Society network officially left Hungary, the

country of his birth, in 2018 after Prime Minister Viktor Orban's government passed the 'Stop Soros' law to criminalise the organisation's manipulation of the country (Fig 259). Others have seen through the Soros game with Russia banning Open Society activities as representing 'a threat to the foundations of the constitutional system of the Russian Federation and the security of the state'.

The defence-mechanism to stop exposure of Soros is that he is Jewish and any criticism of him must be 'anti-Semitic'. This is the Anti-Semitism Industry and Protection Racket at work blocking legitimate investigation into anyone who is Jewish or Zionist purely because they are Jewish and Zionist. Is that supremacist or what? A whole new definition of 'anti-Semitism' is being introduced by governments and institutions around the world that includes

criticism of Israel for the specific reason of expanding the definition to dub ever more information and opinion as 'anti-Semitic' to protect the Cult and its operatives from exposure. Is it really discriminatory to ask why 0.2 percent of the

world population and two percent of the American population have so much power over politics, finance and censorship by the mainstream media and Silicon Valley? It is a very legitimate question in a society that values its freedom.

The Cult doesn't want these questions asked because its Sabbatian-Frankist wing, which hates Jews, would soon be secret no more – not least to Jews. This would be a mortal blow when hiding behind and within the Jewish community is their essential cover. Few make these points or ask these questions for fear of being condemned as 'anti-Semitic'. I don't give a shit. I want the truth and if that means taking an onslaught of misrepresentation and abuse then so be it. For now the incessant intimidation of the non-New Woke population means that what the Cult wants the Cult gets and it will go on doing so until humanity stiffens its backbone and summons some self-respect.

We'd better do that fast – like now – before the chance is gone.



Figure 259: The Hungarian government knows what the Soros game is and displayed these posters exposing his activities.

Why demonise the gas of life?

Belief can be manipulated. Only knowledge is dangerous

– Frank Herbert

New Wokeness is a cult religion in every sense and its sub-section known as 'human-caused climate change' is most certainly so. Climate orthodoxy is a theology, a term which derives from two Greek words together meaning 'the study of God'. In this case the 'God' is the Virtuous Self and the Devil is carbon dioxide (Fig 260).

Religions have an orthodoxy founded on unsupportable beliefs that include walking on water and virgin births and so does the Climate Cult. Religions label non-believers of these unsupportable beliefs as heretics and blasphemers and so does the Climate Cult. Religions have had inquisitions to demonise and silence such heretics and blasphemers and so does the Climate Cult. Religions dictate a narrative and tell followers to unquestioningly believe whatever it claims and so does the Climate Cult. Religions say that belief in the orthodoxy must be founded on faith and not facts and so does the Climate Cult. You must believe the crap spewed out by faith-based religions like Extinction Rebellion and the Climate Cult priesthood in the form of people like New York New Woke congresswoman Alexandria Ocasio Cortez or you are a 'climate change denier' (see heretics and blasphemers). Don't question – believe.

These methods are straight from the Cult manual for its 'astroturf' fake protest groups described by former CBS News investigative reporter Sharyl Attkisson:



Figure 260: The Climate Cult and its constituent parts like Extinction Rebellion are just another religion and tick every box. 'Belief for life' means belief for the One-percent. Like all religions the Climate Cult is a perception program to ensure its followers. (Image: Gareth Jones)

Hallmarks of astroturf include use of inflammatory language such as 'crank', 'quack', 'nutty', 'lies', 'peranoid', 'pseudo', and

'conspiracy'. Astrologers often claim to debunk myths that aren't myths at all. Use of the charged language test well. People hear something's a myth, maybe they find it on Snopes, and they instantly declare themselves too smart to fall for it. But what if the whole notion of the myth is itself a myth, and you and Snopes fell for that? Beware when interests attack an issue by controversialising or attacking the people, personalities, and organisations surrounding it rather than addressing the facts. That could be astrology.

And most of all astrologers tend to reserve all of their public scepticism for those exposing wrongdoing rather than the wrongdoers. In other words, instead of questioning authority, they question those who question authority. You might start to see things a little more clearly. It's like taking off your glasses, wiping them, and putting them back on, realising, for the first time, how foggy they'd been all along. I can't resolve these issues, but I hope that I've given you some information that will at least motivate you to take off your glasses and wipe them, and become a wiser consumer of information in an increasingly artificial, paid-for reality.

Questioning those who question authority is at the very core of Climate Cult and New Woke propaganda in general and both are drowning in astrological fronts because they are a means through which human society is being transformed into a global dictatorship by the Cult as we'll see in following chapters. In this chapter I want to first unpick the truly mendacious climate change narrative.

Cult doctrine and its many faces

Here are some archetypal traits of a cult: Unquestioning submission to leaders of the cult and what they insist you believe; those beliefs are the only truth; control cult members through the constant repetition and indoctrination of this orthodoxy; invoke an 'us' against 'them' mentality and claim that any outside challenge is 'persecution'; salvation through association with the cult – only we can save the world by everyone doing what we demand; group think with pressure by the group to conform and target any individual with doubts; if doubters persist shun or expel them so they don't pollute the group; think with legitimate questions; avoid critical thinking and ignore blatant contradictions in the orthodoxy; often impose a cult form of clothing or uniform so a cult member can be recognised purely by what they wear or what they do with their hair. All of these traits can be observed with the Climate Cult which has been funded and manipulated into existence by billionaires like George Soros (again) and decades of climate change indoctrination in the schools and universities. This has led to great swathes of whole generations believing utter baloney because that's all they've heard. Climate Cult theology is founded on one of the most powerful forms of

perception control – repetition of the orthodoxy at the exclusion of other views, opinions and information. Even Princeton professors who don't accept climate hoax theology after a lifetime of expertise in climate science and the effects of carbon dioxide have their YouTube videos tagged to a Wikipedia page promoting the official lies (which goes without saying when Wikipedia actually exists to promote official lies). I typed in key words for YouTube videos that questioned climate change doctrine and the Wikipedia page parroting that doctrine was at the top of even that list. What a con job by this Cult propaganda operation: YouTube owned by Google.

The Climate Cult demands that people 'listen to the science' when the Cult is anti-science. It's not interested in allowing all scientific opinion and research to be heard in a spirit of openness and balanced understanding. The aim as with all New Woke agendas is to silence opposition and block open debate which they know they would lose. George Soros, a member of the United Nations High Level Advisory Group on Climate Change Financing, funds a list of organisations seeking to silence 'denial' of climate change orthodoxy. These include Avaaz ('Voice') which has been described as 'the globe's largest and most powerful online activist network'. It was established in 2007 by two other Soros-funded groups, Res Publica and MoveOn.org. Avaaz claims to have 55 million members with campaign teams operating in 30 countries and presents itself as a global grassroots operation working in pursuit of 'people-powered politics'. It campaigns in 15 languages with a 'core team' on six continents and this Soros-funded group is leading a campaign to have Google-owned YouTube ban all information and opinions challenging the official propaganda about human-caused climate change. Avaaz ('Voice') doesn't want others to have one. We have also had a Soros-connected Democrat Congressional committee (New Woke political wing) demanding that Google-owned YouTube censor videos that contain 'climate misinformation' which means challenging the official narrative. Fascistic committee members wrote to Google CEO Sundar Pichai to urge that YouTube stop 'driving millions of viewers to climate misinformation videos every single day'. The contempt for freedom is extraordinary, but it suits the Cult agenda perfectly. Avaaz claims that 'climate denial = death' which is only another way of saying that if you can't win a debate – ban it. 'Grassroots' Avaaz has a long record of campaigning for items on the Cult wish-list. It has helped Iranian protesters demanding the removal of the country's government that the Cult has long worked to remove; supported a no-fly zone for Libyan military aircraft which allowed America, Britain and NATO to bomb the country and its people shillless without challenge and delete Colonel Gadhafi; supported the US-instigated 'civil uprising' against Cult-target President Assad in Syria

and this was reported to include training activists and delivering \$1.5 million of Internet communication technology to protesters. Avaaz claims to 'unite practical idealists' to make the world a better place when its support for Western (Cult) actions against Libya and Syria alone played a part in the human nightmare that followed in a frenzy of death and destruction of the innocent. All those countries were on the September, 2000, list of targets named by the ultra-Zionist Sabbatian-Frankist Project for the New American Century.

To those who trust Avaaz I would suggest a call to Naivety Anonymous. To those who trust George Soros I would say don't waste a call – even they can't help you. How could anyone if you believe that a man who has caused financial mayhem for whole populations by targeting their currencies for financial gain is funding 'progressive' 'people-power' groups from the kindness of his heart. The best of luck finding that, by the way. Soros has also funded groups behind the worldwide Friday school 'climate strikes' fronted by the Climate Cult's Greta Thunberg who has copyrighted the terms 'school strikes for climate' and 'Friday's for future'. America's Media Research Center, a non-profit conservative media watchdog, reported that at least 22 activist groups listed as partners in the Global Climate Strike received almost \$25 million from Soros through his Open Society network between 2000 and 2017. They included Fund for Global Human Rights, Global Greengrants Fund, 350.org, Amnesty International, Avaaz, Color of Change and People's Action. Has the penny dropped yet Green movement? Unfortunately probably not, but maybe it will when we get to why human-caused climate change is being hoaxed. A major funder of Extinction Rebellion is Sir Chris Hohn who heads one of the world's biggest hedge funds valued at multiple billions. The UK Mail on Sunday revealed the fund's investments in companies at the centre of environmental scandals. Everywhere the Climate Cult and New Woke have a remarkable ability to attract billionaire sponsorship and support. Amazon's mega-billionaire Jeff Bezos announced in early 2020 that he would spend \$10 billion on 'fighting climate change' by funding 'scientists, activists and non-governmental organisations (see Soros) through a new 'Bezos Earth Fund'. It was still more confirmation that human-caused climate change is a One-percent hoax. Bezos picked up the script and said the climate was changing faster than had been predicted. 'Those predictions were bad but what is actually happening is dire'. Bloody yawn. He said that Amazon was ordering 100,000 electric delivery vehicles from Michigan-based, Amazon-invested Rivian, which again is straight from the Cult agenda. To underscore the power of programming hundreds of Amazon workers, who face losing their jobs to 'climate-friendly' (it's not) AL, had protested that Bezos was not doing enough about climate change. Manipulate the serfs to demand that you

do what you want to do anyway (it happens all the time). The Climate Cult works to silence the ever-growing list of scientists worldwide who can see that climate change orthodoxy is mendacious nonsense. They are demonised, targeted in the courts, denied access to the media, and their careers and income disappear. By contrast those self-proclaimed 'scientists' prepared to sing from the song-sheet (the ones Bezos will support) are constantly wheeled out by the Cult-owned media and can dip their snouts in an almost unlimited trough of protection money – money to protect the lies.

The cult (literal) of New Woke climate celebrity

Once belief in the orthodoxy is secured in the mainstream it becomes 'cool' to support that orthodoxy. If you are a virtue-signalling celebrity it's a must to build your own image and support-base. New Woke is 'in' while not being New Woke can be the death knell for a career in the media, entertainment and comedy. It's the same technique that controls scientists. Say what we want and you get a stack of money or tell your truth and we'll destroy you. Do you want lots of likes on Facebook or a Twitter storm? As a result we have a lengthening list of celebrity ankle-bickers proclaiming Climate Cult orthodoxy of 'Thou Shalt not fly' while heading in private jets to climate conferences and protests. In the case of virtue-signal world champions like actor Leonardo DiCaprio this involves taking private jets to receive climate protection awards. Celebrities are used by the Cult for their public platform to spread the message while almost every one of them won't have a clue who is really pulling their strings and why. Britain's Prince Harry and his American wife Meghan Markle constantly virtue-signal their climate change New Wokeness while being driven in limousines to private jets and telling others to reduce their 'carbon footprint'. Isn't that hypocrisy? No, no – I said you must reduce your footprint, not me. Harry's contribution to saving the planet has been limited to the New Woke posturing of making a speech in bare feet. Put your shoes on, mate, or you'll hurt your feet on the tarmac when you leave. The couple announced in January, 2020, they were 'stepping down' as 'senior royals' and heading for Canada. Part of this will involve super-Woke Markle being able to publicly promote her virtue-signalling super-Wokeness (including climate change theology) while Harry follows behind doing what he's told and apologising for being a white male. New Wokers supported the move because the pair are New Woke while the now hijacked original Left would have been exposing their unearned privilege, opportunism and narcissism. Oh, how the Cult is going to exploit them both – and make them very rich – to promote the climate change and New Woke agenda. Their first big, big pay-day came with a 'speech' to the assembled mega-rich One-percent fake Woke at a JP Morgan Chase

event in February, 2020, for which they were reported to be paid between \$750,000 and \$1 million. JP Morgan Chase is America's biggest bank and the world's sixth biggest with assets of \$2.6 trillion. Here we have fake Wokers selling their souls to speak for big bucks to other fake Wokers with limitless pockets whose investments have done so much to devastate the environment and create widespread inequality and injustice. The hypocrisy and lack of self-awareness of these royals-on-the-make is chilling.

The 'royal' couple, said they were seeking to become 'financially independent' which means exploiting their royal connections and privilege to make lots of money and freeing Markle from her royal restrictions to stay out of party politics. Now she can campaign for the New Woke agenda including all the demands of the Climate Cult which she and her husband appear to ignore at every turn. Prince Harry was caught on tape by two Russian pranksters thinking he was talking to Greta Thunberg. The result was toe-curling and absolute confirmation that he just repeats the climate hoax script word-for-word without a thought of his own. How Woke and aware Markle really is can be gleaned by her closeness to the Clintons, particularly Hillary, one of the most corrupt partnerships on Planet Earth. We can expect the royal private jet passengers to be even more vocal now in support of the Climate Cult and every last facet of New Woke while living their own life in the 'privilege' that New Woke claims to despise. The System will give them every support. American TV host Tucker Carlson accurately described celebrity climate New Wokeness as 'the theology of the private jet class'. Meanwhile we are told that the rest of us will soon be flying in planes (as a stepping stone to not flying at all) that fly together in V-shape formations like migrating birds to save fuel and CO2 emissions by reducing air resistance like racing cars that get close to the one in front. As someone who has experienced what happens to a plane when it gets too close to another and is twisted by the air turbulence I can't wait. Swedish Climate Cult goddess Greta Thunberg has been used to promote the Swedish term 'flygskam', or 'flight shame', to pressure people to stop flying (except the private jet class). The shame that Thunberg will feel when she realises the scale on which she has been manipulated does not bear thinking about (Fig 261). She and the Climate Cult have



Figure 261: Sad and sad

created a situation so crazy that the UK's University of Derby introduced 'climate anxiety classes' for staff and students worried about the planet and the eco-system. The university said the classes are aimed at dealing with feelings of anger, guilt and grief and combatting their 'sense of loss'. I mean – pinch me. One student said the 'climate emergency' made her feel she 'isn't going to have a future'. Oh, congratulations Greta and your handlers. Well done you. Dr Jamie Bird, university deputy head of health and social care research, said people suffer 'climate grief' when they see what they are losing. They are not losing anything except their bloody minds. Despite incessant public indoctrination great numbers of people can see through the garbage, but most are frightened to say so for fear of the backlash and consequences. Perhaps, however, we saw a turning point in 2019 when narcissistic, self-obsessed Extinction Rebellion protestors were pulled off the roofs of London Tube trains by commuters who just wanted to get home after a day's work. They'd had enough and rightly so. We've all had enough.

Monumental mendacity

A key component of mass indoctrination is the sheer scale of deceit which the Nazis described in terms of the bigger the lie the more will believe it. Lie a little bit and you may get caught out on the basis that people are open to smaller-scale lies. What must resist are the ginormous super-whoppers pedalled by the Cult. Okay, people say, they might lie here and there to support climate change orthodoxy, but they wouldn't lie about the whole shebang would they? Oh yes they would and they have and they are. They lie both about the individual components of the climate hoax and about the hoax in its entirety. I'll explain why shortly. In fact, the entirety of the hoax is the totality of the individual hoaxes. The Cult seeks to protect this fact from exposure by silencing and demonising dissenters to ensure only one version is ever heard by most people. The foundation of the hoax is the ever-repeated claim that 'the science is settled' when it is absolutely not and becomes less so by the day. Pedro Sanchez, acting prime minister of Spain, reached still new levels of ridiculous when he said: 'Only a handful of fanatics deny the evidence.' He's talking about an ever-increasing list of experts in their fields worldwide who are exposing climate change orthodoxy as the claptrap that it is. All Sanchez and almost every other politician will have heard is the official version ultimately emanating from the Cult through The Web and they repeat that orthodoxy as solid-gold unquestionable truth. This is what teachers and academics are doing with their daily indoctrination of the young to believe in climate change mendacity. You don't want to indoctrinate the kids? Then find another job and we'll replace you with someone who will. It's the programmed programming of the next generation of programmed. Once the orthodoxy

is established as accepted reality political leaders and parties compete with each other (with a few exceptions) over who will do the most to 'fight' a problem that doesn't exist. To question the climate change religion is political suicide especially on the New Woke 'Left' and those who have seen through the hoax zip their mouths as they seek election. The Cult knows that from the moment it secures official belief in the 'conventional wisdom' about any subject the dominoes will begin to fall right across society with all institutions making decisions and introducing laws on the basis of that flawed and manipulated 'wisdom'. The climate change hoax is such a wonderful example. The official narrative is taught in the schools and universities, promoted by the mainstream media and infused into the law of the land while dissenters are silenced, abused and demonised. No wonder that narrative has become accepted 'truth' among those who don't question. I am no supporter of Donald Trump for many reasons, but at least he has spoken out against climate orthodoxy while others cower or believe what they're told.

In support of 'the science is settled' baloney we have the associated lie about 97 percent of climate scientists believing that humans are the main cause of climate change (a climate that is always changing and has been since the Earth was formed). I saw Jonathan Bartley, co-leader of the Green Party for England and Wales, parroting this deceitful figure on a BBC programme while he berated the BBC for allowing 'climate deniers' to appear. I was a national spokesman for the UK Greens for a short time in the 1980s when it still campaigned for freedom of speech and wider environmental issues before it was completely hijacked by New Woke. Even the establishment *Wall Street Journal* has debunked the 97 percent claim. When you track back to where it came from, and on what basis, this figure being cited as fact by those who wish to sell the orthodoxy is ludicrous. Al Gore just pulled the figure out of nowhere and subsequently the most quoted source is John Cook, 'Climate Communication Fellow' for the Global Change Institute at the University of Queensland who is not a climate scientist. He just promotes the official story. I have read many articles explaining how Cook examined 11,944 papers by climate scientists and found that 97 percent agreed that humans were the main cause of 'warming'. This is not the case at all. In his own words Cook writes that 32.6 percent endorsed human-caused warming (though very few as the main cause) while 0.7 percent rejected that and 0.3 percent were uncertain. Now here's the most important figure ... 66.4 percent expressed no opinion. I see it claimed again and again by the Climate Cult and the media that 97 percent of climate scientists say humans are the main cause of climate change when even by Cook's flawed methodology the figure refers only to those who expressed a view and not the scientists in totality. One study

of Cook's figures found that only 64 of the 11,944 papers – (0.5 percent) – said humans are the main cause of global warming and nowhere was mentioned terms such as 'crisis' or 'emergency'. Even if you apply this to the 3,974 papers that did express a view the figure of 64 pointing the finger at humans as the main culprit plays out as 1.6 percent. A later study of Cook's source papers found that in fact only 41 of the 64 papers endorsed the view that humans are the main cause of warming. That's 47 out of 11,944. Where does the 97 percent of climate scientists agree come from? They make it up like they have made up virtually everything else. Science is about evidence not a show of bloody hands from song-sheet scientists with their nose in the climate trough and nor is it about fiddling temperature figures to support your case because the actual temperatures don't do that. This has been exposed over and over and if you are telling the truth you don't need to manipulate the data. How many people know that US Senator Timothy Wirth admitted they even manipulated the temperature of the rooms when NASA scientist James Hansen really kicked off the global warming scare at a Senate hearing in 1987? Wirth said:

... We ... went in the night before and opened all the windows, I will admit, right? So that the air conditioning wasn't working inside the room and so ... when the hearing occurred there was not only bias, which is television cameras in double figures, but it was really hot ...

... So Hansen's giving this testimony, you've got these television cameras back there heating up the room, and the air conditioning in the room didn't appear to work. So it was sort of a perfect collection of events that happened that day, with the wonderful Jim Hansen, who was wiping his brow at the witness table and giving this remarkable testimony ...

Senator Wirth also said:

Believe it or not, we called the Weather Bureau and found out what historically was the hottest day of the summer. Well, it was June 6 or June 9 or whatever it was, so we scheduled the hearing that day, and bingo: it was the hottest day on record in Washington, or close to it. It was stiflingly hot that summer. [At] the same time you had this drought all across the country, so the linkage between the Hansen hearing and the drought became very intense.

You can see that from the start the climate change hoax was not about facts, but manipulating perception to believe a fantasy.

You were saying?

Hansen's dire claims that day more than 30 years ago have not



Figure 262: Al Gore, the One-percent guru to sell the lie.

happened and it's the same with long-time Cult asset Al Gore who became the global sales-pitcher for the Big Lie and has made a fortune from being so (Fig 262). Gore said in 2006: We have ten years to save the planet (big-time wrong); the Arctic will be ice-free by 2014 (big-time wrong); the Gulf Stream will slow down (it's been speeding up);

polar bears are in danger of becoming extinct (big-time wrong); sea levels will rise by 20 feet in the near future (big-time wrong). Read some of my other books and you'll see the background to Gore who has a personal carbon footprint the size of Godzilla. He was a vice-president to Bill Clinton and you don't get that job if you have any inclination whatsoever to tell the truth. The Cult controls the Nobel Peace Prize, which is why so many Cult-asset war-mongers and mass killers have been recipients, and it also dictates Oscar winners whenever that would promote the agenda. Gore, you will not be shocked to know, was handed both awards for lying about climate change and frightening the life out of whole generations of children and the young. Prince Charles said in 2009 that we had twelve years to save the world from irretrievable climate and ecosystem collapse (big-time wrong) and with extraordinary idocy he claimed that climate change was the 'root cause' of the Syrian conflict which was actually triggered by terrorists funded and armed by the United States and Gulf State allies like Saudi Arabia. Here are some other climate and environmental catastrophe warnings that turned out to be utter crap around the period that the annual Earth Day was established in 1970:

Harvard biologist George Wald:

'Civilization will end within 15 or 30 years unless immediate action is taken against problems facing mankind.'

American biologist Paul Ehrlich:

'The death rate will increase until at least 100-200 million people per year will be starving to death during the next ten years.'

Peter Gunter, a North Texas State University professor:

'Demographers agree almost unanimously [see 97 percent of climate scientists agree] on the following grim timetable: by 1975 widespread famines will begin in India; these will spread by 1990 to include all of India, Pakistan, China and the Near East, Africa. By the year 2000, or conceivably sooner, South and Central America will exist under famine conditions ... By the year 2000, thirty years from now, the entire world, with the exception of Western Europe, North America, and Australia, will be in famine.'

Then there was the climate temperature prediction in 1970 from ecologist Kenneth Watt:

'The world has been chilling sharply for about twenty years. If present trends continue, the world will be about four degrees colder for the global mean temperature in 1990, but eleven degrees colder in the year 2000. This is about twice what it would take to put us into an ice age.'

The threat to human existence went from an ice age to runaway super-heating in the blink of an eye. How could that happen? They just changed the propoganda. The lies are constant and apparently without end.

Make-it-up mythology

We hear claims about the 'hottest day ever recorded' and even when you factor out manipulated data the key word is recorded. Many times this will be deleted in headlines to read 'hottest day ever'. Some background before I make my point. The planet has been hotter for much of its life than it is today and there was the Medieval Warm Period that began around 1,000 years ago which eclipsed current temperatures when there were no factories or 4 x 4s or indeed any carbon producing vehicles at all

(Fig 263). The warm period was also a time of abundance compared with cold periods. Geapes were grown for wine in the far north of England and even Scotland. There was, in short, no climate catastrophe. Temperatures began to cool and previous abundance

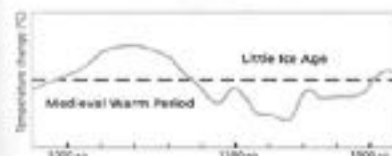


Figure 263: The Medieval Warm Period begins around 1,000 years ago when temperatures were warmer than today without industrialisation. Then came the Little Ice Age when freezing temperatures were the winter norm which makes temperature comparisons between that period and now utterly irrelevant.



Figure 264: Depiction of the frozen over River Thames during the Little Ice Age.

disappeared in what is called the Little Ice Age between the 16th and 19th centuries (some say it started earlier). It was so cold in this period they held ice fairs on the River Thames in London which froze over every year. Some Christmas cards still depict the scenes (Fig 264). It was highly significant that during the Little Ice Age fantastic explosions of energy on the Sun known as sunspots, which indicate

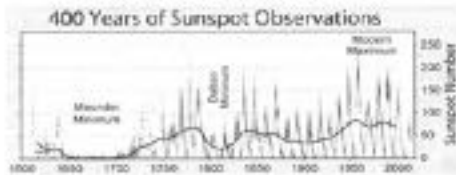


Figure 265: The correlation between solar activity measured by sunspots and Earth temperature. It is an obvious comparison and connection which the Climate Cult ignores because it destroys the narrative. The 'Maunder Minimum' corresponded with the coldest point of the Little Ice Age.

between Sun activity and Earth temperature do you? There can't be, surely, or the Climate Cult would mention the Sun sometimes instead of being utterly obsessed with carbon dioxide. Maybe they think it's just a coincidence that when the Sun comes out it gets warmer; or perhaps they think that

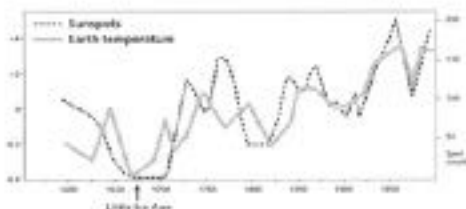


Figure 266: Another sunspot-Earth temperature chart.

when solar energy projected at the Earth increases this couldn't possibly affect our temperature (Fig 266). They are experts

after all. Scientists at CERN recorded an extremely close correlation between Earth temperature and the penetration of cosmic rays into our atmosphere. Records of 'the hottest day/year since records began' started mostly as we were still coming out of the Little Ice Age and of course temperatures are going to be warmer now. What use is a comparison between an extremely cold period and one after that period ended? It's a pointless comparison unless you are trying to mislead which they are. Why would the trough-snout scientists of the Climate Cult seek in leaked emails and documents to delete from the record the existence of the Medieval Warm Period and make it appear that today's temperatures are 'unprecedented' and caused by the industrial era? To mislead, of course, and people mislead to hide the fact that they're lying. Here are some other climate propaganda myths:

- **The migrant crisis is caused by climate change lowering crop yields that force people to relocate in search of food:** This has been alleged to explain why so many are heading out of Central America to the United States border and supports the Cult migration agenda which I have described. In fact, crop yields in Honduras, Costa Rica, Mexico, Panama, Ecuador, etc, have been consistently increasing.
- **Climate change will empty the North American Great Lakes:** This is shown to be without substance by all-time recorded high water levels and no downward trend over 100 years. These high volumes were reported with the question: 'Why are water levels on the Great Lakes fluctuating so wildly?' How about through misrepresentation of the trend?
- **Climate change will mean ever-greater extremes of weather such as tornadoes and hurricanes:** Strong tornadoes and devastating landfall hurricanes have been steady in number or in decline in recent decades according to peer-reviewed scientific literature that says the same about droughts, floods, and other extreme weather events. The worldwide death rate caused by weather events has dropped more than 90 percent since the 1920s.
- **Polar bears are heading for extinction as climate change makes their ice habitat disappear:** Polar bears became the poster children of the Climate Cult as a symbol for a terrifying future. Polar bear specialists like Dr Susan Crocollond, former adjunct professor at the University of Victoria in Canada and a forensic zoologist, demolishes the official narrative in her book, *The Polar Bear Catastrophe That Never Happened*. Indeed she destroys the polar bear hoax so well that she lost her role at the university in what she described as 'an academic hanging without a trial, conducted behind closed doors'. This is what happens when you challenge Climate Cult orthodoxy.

Crockford shows how polar bears are flourishing and communities are either stable or increasing. Polar bears in part of the Barents Sea increased by 12 percent between 2004 and 2015; in Baffin Bay where bears were predicted to decline by 25 percent they increased by 36 percent, and in Kane Basin they more than doubled. The global average had risen to more than 30,000 bears which Crockford says is 'far and away the highest estimate in more than 50 years'. Crockford exposes the BBC's climate change propagandist David Attenborough for misleading the public on polar bears and much else in an Internet video *Attenborough's Arctic Betrayal* (Fig 267). Greta Thunberg said she became an activist on climate change after watching reports of polar bear decline that isn't happening. The same BBC of course gave her a TV programme (program) to promote her propaganda.

• **Images show belching chimneys pouring out 'dangerous' carbon dioxide**

CO₂ is invisible to the human eye and what they are showing you is pollution and not CO₂ which is the gas of life and without it there would be no plants and so no humans or animals (Fig 268). They show you pictures of pollution to make you believe that carbon dioxide is a pollutant. Most of the 'journalists' who do this don't know the difference themselves in yet another exercise in the blind leading the blind.

Protecting make-it-up mythology

How could a hoax based on so many lies become accepted fact in the minds of so many – especially the young – and drive much of government policy? The hoax has been possible by control of information to indoctrinate a belief system underscored by the fear that 'we're all going to die'. I've said that once you implant the orthodoxy of 'everyone knows that' the rest follows largely unaided. Older people are



Figure 267: You can always bet on the BBC's David Attenborough (punning appropriately) the official narrative.



Figure 268: Not another constant misrepresentation to promote CO₂ as a pollutant.

more sceptical of the climate claims because they've not had a lifetime of climate propaganda in the schools and universities. The young here and it's clear why many children and young people believe the lie peddled through all Cult institutions of government, 'education', and crucially the media. Unless people seek out information beyond the Mainstream everything they live in a one-track world. Without alternative sources of information the population is only being told what the Cult wants them to think. Pictures of distressed polar bears have been explained as the consequences of 'global warming' when the cause of their distress and emaciated state were later revealed to have had other origins unrelated to climate. Show a bear in trouble and say it is climate change and most people believe that to be true when it fits the narrative they have already been suckered to believe in. I read an excellent book by American meteorologist and weather forecaster, Joe Bastardi, a vehement and outspoken exposé of the climate lie. He describes in *The Climate Cultivates* how he has studied weather patterns going way back to show that weather now being blamed on human-caused climate change has happened in a recurring sequence long before the industrial era. The difference is that before the climate hysteria the same weather was just weather. Today it's always caused by global warming (which became 'climate change' when temperatures stopped rising and then the 'climate crisis' as the scene was ramped up). It's so easy to be scammed if people don't check the facts. We have a hurricane – it's global warming! tornado – it's global warming! drought – it's global warming! It's hot – it's global warming! It's cold – it's global warming! Bastardi calls them Climate ambulance chasers. He says: 'What happened before naturally is happening again, as is to be expected given the cyclical nature of the climate due to the design of the planet.' Bastardi presents many examples of these cycles now blamed on human activity and this is one relating to droughts in the United States:

... Major US dry periods are a product of a cooling tropical Pacific. In the decades such as the 1960s through the 1970s, when the tropical Pacific is cooler overall, the US is drier than normal in much of the nation.

It is exactly the opposite in the years the Pacific warms, which, by the way correlates nicely to an increase in global temperatures until the atmosphere adjusts to the warming tropical ocean and temperatures level off. But the idea that global warming causes droughts here in the US is the opposite of the fact! It's when the Pacific wants to cool and global temperatures start to drop that we see it dry out.

Bastardi's book is highly recommended as is *The Politically Incorrect Guide to Climate Change* by Republican insider Marc Morano who charts

the blatant political manipulation behind the climate hoax. A good website for hoax-challenging information is the Global Warming Policy Foundation at thegwfp.com. We should not forget that all the projections upon projections about climate Armageddon don't come from observing the climate. They result from putting data and assumptions into computer models and believing what they tell you is going to happen. The fact that they have been wrong by shocking margins so many times might have given them a clue by now that this doesn't work due to a simple cause and effect: If you factor in shit the computer will process that shit to produce 'predictions' that are nothing more than a feedback loop of shit-in and shit-out. Assume something with your input and you'll get the answer you want, but rarely the truth. There are so many variables and influences that affect climate that long-term predictions are a mug's game anyway. Follow the cycles that have happened before if you want to predict the climate. There's another angle to this that we should be constantly vigilant about. Technology to manipulate weather is now highly-advanced and these would not be international treaties agreeing not to manipulate weather if it was not technologically possible to do that. See *Everything You Need To Know* for detailed background about how extremes of weather can be made to happen and we can expect the Cult to continue to strike in this way around the world to convince people climate disaster is at hand.

The gas of life

The Cult takes facts and inverts them to become the very opposite of the truth before selling the inversion as 'conventional wisdom'. This way the public perception of reality becomes the opposite of actual reality. We are told we face 'catastrophe' when if what the Climate Cult demands are followed through we will have a real, not imagined, human catastrophe in economics, food

production and energy supplies (this was written before the 'virus' lockdowns which have had the same effect). Global society would be devastated by plans to be 'carbon neutral' by 2025 to 2030 or 2050. There can, however, be no better or more blatant example of inversion than carbon dioxide (CO₂) itself. This is the gas of life without which we really would all be dead



Figure 24b: Carbon dioxide is the gas of life and the natural world's version of oxygen. I know - let's demonize the gas of life and transform society into the global centralised tyranny to make sure we have less of it.

and yet CO₂ has been thoroughly demonised (Fig 26f). If it was human it could sue for libel. You'll find interviews at DavidDietz.com with professors at Princeton University emphasising both the central role played by carbon dioxide in human life and that far from having too much in the atmosphere we don't have enough. This will be amazing to people who have bought the carbon-as-a-pollutant narrative and it reveals the scale of inversion that we are dealing with. William Happer, Professor of Physics at Princeton University and long-time government advisor on climate, is one scientist who says the planet has a CO₂ deficiency and needs more for optimal plant growth and food production. Such views have made him a big hate figure for the Climate Cult as the truth always does. He says that most of the warming in the last 100 years happened as we emerged from the Little Ice Age and was over by 1940. Happer points out that in a peak year for warming in 1988 there was a 'monster El Niño' which is a natural and cyclical warming of the Pacific that affects global weather patterns and temperature and has nothing to do with 'climate change'. He says the nature of the CO₂ effect can be likened to painting a wall with red paint. Once two or three coats have been applied it doesn't matter how much more paint you add the wall will not get much redder. He explains that almost all the effect of the rise in CO₂ has already occurred and the amount in the atmosphere would now have to double for even a single degree increase in temperature.

I know a lot about CO₂ compared with most climate scientists ... there's an interesting thing about CO₂ which is unique to CO₂ - it's not true, for example, of water vapour, methane. [This] is that if you get one degree of warming from doubling CO₂, so going from say 400 parts per million for simplicity to 800 ... then to get another degree of warming you have to double 800, you have to go to 1,600. So it gets harder and harder to warm. Technically they call that the logarithmic dependence of temperature rise on CO₂ concentration.

Happer said that this fact was realised early in the climate hysteria and to overcome such a demolition of the orthodoxy we had advocates of the hoax inventing theories about 'feedback loops' amplifying the CO₂ effect. These are the doom-laden predictions that you constantly hear parroted by climate activists including Greta Thunberg. Happer said he laughs when he hears about 'carbon pollution' given that people, plants and animals are made of carbon and without it there would be no life. He said that an increase in CO₂ in the atmosphere would make plants more drought resistant because when plants open holes in their leaves to absorb CO₂ they leak water and the holes have to be open for longer to take in enough carbon dioxide amid what he calls a 'CO₂

famine'. Happer emphasised that CO2 increases since industrialisation have had a 'huge effect' on plants and increased their growth. 'When people talk about the social cost of carbon it's absurd. The social cost is negative of CO2.' He said climate computer models don't look at the world as it is, but at other computer models. How much funding would the modellers get, by the way, if their predictions did not support the Climate Cult hypothesis? Imperial College in London which has produced many of the ridiculous 'climate change' models was also responsible for the computer models warning of insane numbers of 'Covid-19' deaths in the UK, United States and other countries which led to the lockdowns that have destroyed the lives of billions. Needless to say the insane 'projections' did not materialise, but provided the excuse for global house arrest.

Too much CO2? We don't have enough

The central importance of CO2 was a theme developed by Greenpeace co-founder Patrick Moore in a presentation to the Global Warming Policy Foundation. Scientist Moore left Greenpeace in 1986 and has criticised the green movement for scare tactics and disinformation with particular emphasis on climate change. He makes the point that other scientists have made about how dangerous it is to have low levels of CO2. Plants start to die at 150 parts per million and Moore says that even when CO2 fell to 180 ppm 18,000 years ago plants began to starve. This only turned around when the temperature went up for reasons I will shortly explain. Calling for a reduction in carbon dioxide is the plant equivalent of humans demanding a reduction in oxygen - CO2 is, in effect, plant oxygen. Today Moore says CO2 stands at around 400 ppm and plant life is still 'relatively starved of nutrition' with the optimum levels for plant growth five times higher at 2,000 ppm and in some periods of the Earth's history the ratio has reached 4,000 ppm. These facts explain why since CO2 levels began to rise with industrialisation the Earth is getting greater as CO2 has risen from 280 ppm in an 1880 measurement in Hawaii to 413 ppm in 2019. The Climate Cult that claims to be 'saving the planet' wants to reverse that process! Why do they think people pump extra carbon dioxide into greenhouses? The Climate Cult contends amid its mass hysteria that we face extinction when the gas of life is at way below optimum planet-growth levels and 500 million years ago there was 17 times more CO2 in the atmosphere than we have today. Patrick Moore said levels have been falling for hundreds of millions of years as it was absorbed from the atmosphere and locked away by many and various sources. Over the last 150 million years CO2 levels in Earth's atmosphere had reduced by 90 percent. By the time humans began releasing carbon dioxide through fossil fuels Moore said we were at '38 seconds to midnight' in terms of threats to

plant life (thus all life) through plummeting levels of CO2. Not only aren't humans causing extinction they are preventing it. 'Release of CO2 has turned around the constant fall'. Moore said, and in this sense 'Humans are [the Earth's] salvation'. Moore also noted that only half the CO2 emitted by fossil fuels ends up in the atmosphere. You read these facts about the fundamental importance of CO2 and then hear as I did an interview with 'carbon footprint expert' Mike Berners-Lee, a professor at the Institute for Social Futures at the UK's Lancaster University, and brother of Tim Berners-Lee who is credited with inventing the World Wide Web. The interview was on the London-based TalkRadio in which Mike Berners-Lee told an unchallenging host how evils add to carbon emissions and that 'a low-carbon world is better than a high-carbon world'. Breathes deeply, shakes head, moves on. Some other information in Patrick Moore's speech that the Climate Cult should know: The Earth has been in a major cooling period since the maximum of 50 million years ago when it was as much as 16 degrees warmer. Today's poles were ice free and covered in forests. The ancestors of today's species came through that temperature period fine, but a ten percent rise is now supposed to threaten mass extinction! Even in our current interglacial period we are experiencing one of the coldest climates in the Earth's history. The Medieval Warm Period (long before fossil fuels) was still cooler than temperatures in the last 10,000 years, Moore said.

Temperature doesn't follow CO2 - it's the other way round

Oh, Climate Cultists may say higher CO2 might be better for plants, but it will cause the Earth to heat catastrophically. I mean, Greta Thunberg says we should believe that our house is on fire and she wouldn't mislead us, right? Well, if she has been mercilessly mislead herself I think she probably would. In fact, temperature rises don't follow increases in CO2 - it's the other way round as the records clearly show. In the last 400,000 years CO2 has lagged temperature by an average of 800 years. As Patrick Moore rightly says carbon dioxide cannot be the cause of rising temperature when the increase in temperature comes before the increase in CO2. How can the effect come before the cause? It can't. So here's a shocker for New Wokers ... *temperature must be affecting CO2 levels and not vice-versa*. Here we have yet another classic Cult inversion of the truth. How could temperature increase CO2? The ocean contains 45 times more CO2 than we have in the atmosphere and the ocean releases carbon dioxide in warm periods and absorbs it in colder periods. The lag between the two is around 800 years and look what was happening 800 years ago the Medieval Warm Period. Carbon dioxide does not cause the Earth to catastrophically warm. The history of CO2 correlation with temperature shows that for immense periods the two

have been completely out of kilter. Temperatures have risen and remained high as CO₂ went down. Carbon dioxide is also only 0.117

Contribution to the Greenhouse Effect (including water vapour)

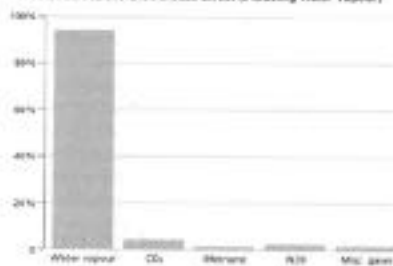


Figure 270. CO₂ is a tiny fraction of greenhouse gases which are almost entirely water vapour and clouds. What's more the great majority of that CO₂ is naturally-occurring and nothing to do with humans.

used car from that man or even a new one. How can you 'take water vapour out of the equation' when that together with clouds makes up close to the entirety of greenhouse gases? To deceive – that's how. Calculated demonisation of CO₂ is so transparent. Professor Leslie Woodcock, Emeritus Professor at the University of Manchester, fellow of the Royal Society of Chemical Engineering, a recipient of a Max Planck Society Visiting Fellowship, and former NASA researcher, said:

Water is a much more powerful greenhouse gas, and there is 20 times more of it in our atmosphere, around one percent of the atmosphere, whereas CO₂ is only 0.04 percent. Carbon dioxide has been made out to be some kind of toxic gas, but the truth is that it's the gas of life. We breathe it out, plants breathe it in and it's not caused by us. Global warming is nonsense.

British scientist James Lovelock was a one-time Green icon with his Gaia theory of the Earth as a living entity (true). He became even more acclaimed by climate alarmists when he predicted in his book *The Revenge of Gaia* that 'billions will die' and humanity was doomed. Lovelock wrote that any survivors would have to live in the Arctic which would be one of the few habitable places on Earth. Then reality dawned and to his enormous credit he had the courage to publicly change his mind. Humanity was not in imminent peril after all. Lovelock now says that climate alarmism is not 'remotely scientific',

percent of what are called greenhouse gases while more than 90 percent of those gases are water vapour and clouds (Fig 270). Only a fraction of that 0.117 percent is CO₂ caused by human activity and the rest happens naturally. Professional clim

Al Gore tried to obscure this fact by saying that if you 'take water vapour out of the equation CO₂ is 30 percent of greenhouse gases'. Don't buy a

computer models are unreliable and anyone who tries to 'predict more than five to ten years is a bit of an idiot'. A single volcano can make more difference to global warming than humans ever could, he has stated. He accuses the Greens of exaggeration and behaving 'deplorably'. Weather Channel founder John Coleman has said human caused global warming is a myth and the list of scientists saying the same is getting longer by the week. Such honesty often comes at a cost, however, in the form of lost jobs and income. Dr Judith Curry, a respected climatologist and tenured professor at Georgia Tech University, left her 'dream job' when she refused to pledge unquestioning obedience to the Climate Cult. She told Fox News:

I've been vilified by some of my colleagues who are activists and don't like anybody challenging their big story ... I walk around with knives sticking out of my back ... In the university environment I felt like I was just beating my head against the wall.

Curry is a target of an establishment-promoted 'climate advocacy group' called Sceptical Science which operates a 'blacklist' of scientists who won't comply with Climate Cult orthodoxy. Dana Nuccitelli, one of the principals of Sceptical Science, wrote of Curry: 'If you look at the statements we compiled and debunked ... it should make her unhireable in academia.' Judith Curry is a former chair of the School of Earth and Atmospheric Sciences at Georgia Tech and a Fellow of both the American Geophysical Union and American Meteorological Society. She was only 'unhireable' because the Climate Cult made it so. Curry was asked to step down by her university for her views on climate and had 'numerous inquiries from academic headhunters encouraging me to apply for major administration positions, ranging from Dean to Vice Chancellor for Research'. She didn't even make the shortlist. Curry said in a *Forbes* interview:

They thought I was an outstanding candidate, looked excellent on paper, articulated a strong vision, and interviewed very well in person. The show stopper was my public profile in the climate debate, as evidenced by a simple Google search.

Google is so helpful in ensuring that Sceptical Science is on the first page and sometimes the top listing for a word search for Judith or Judy Curry. This is the tyranny that genuine academics and scientists are facing from the Climate Cult in all its forms. Who created Sceptical Science? John Cook, the Australian bloke most quoted about '97 percent of climate scientists' agreeing that humans are most responsible for climate change when his 'research' doesn't say that at all. Small world.

ch? Those that don't accept climate change orthodoxy are labelled 'anti-science' when questioning every hypothesis is what real science is all about. It's the Climate Cult that is anti-science (another inversion).

French television weatherman Philippe Verdier was fired by the France 2

French TV weatherman sacked for book questioning 'hype' over climate change

By The Guardian



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Philippe Verdier, a French television weatherman, was sacked for questioning the 'hype' over climate change in a book.

channel for publishing a book accusing 'climate experts' of misleading the public and the Cult-controlled UN Intergovernmental Panel on Climate Change of publishing deliberately misleading data (Fig 271). What he said is true and he was sacked because it is true. Programmed New Woke trade union members at the station

Figure 271: Refuse to sing from the song sheet and you're gone.

demanding he was dismissed, Verdier wrote his book after French Foreign Minister Laurent Fabius asked TV meteorologists to highlight climate change issues in their broadcasts. 'I was horrified by this speech,' Verdier said.

Cult narrative: humanity is the enemy

Greenpeace co-founder Patrick Moore is a scientist who says the Greens have abandoned science and replaced it with emotion and sensationalism based on an 'anti-human' agenda that paints humanity as the enemy of the Earth. If you are a Death Cult targeting humanity would you not want them to believe that they were the problem? Wouldn't you want them to despise themselves and turn against themselves? You surely would. We breathe out carbon dioxide and even the act of breathing is harming the planet – shhhhh!! Humans are deadly. We must kill them. A vegan father-of-four voiced this anti-human mentality when he called a UK radio station to say humans shouldn't breed to produce more offspring to 'harm animals'. He urged people to encourage a 'graceful ending of our time on the planet'. The caller, who gave the name 'Danny', said he had recently discovered 'anti-natalism' – 'the idea that we shouldn't be breeding humans when it causes so much unnecessary suffering to animals, especially people who bring up children to eat meat'. Should we then not allow animals to breed when they cause so much harm to each other in the killing fields that are the 'natural world'? 'Danny' said there was nothing wrong with

human extinction and admitted that he tells his nine-year-old son and older daughters to question their own reproduction and whether they should be here in the first place. 'I don't want grandchildren, and I don't want them to impose life on another generation for no good reason.' He's not psychologically damaged or anything and this is not in any way psychological abuse of his children. These views may seem seriously extreme, but the guy is far from alone and they are just the attitudes you want to engender when you are a Death Cult led by unseen 'gods' that wish to replace humanity as we know it today (more later). It would be easy to dismiss an anonymous caller to a radio station



Figure 272: An academic promoting the end of humanity. She is so big young people, right! Wise. Her income of extreme views are fine with Woke. It's when you say men and women are biological different that you trigger their ire.

if what he said was not being promoted by academics such as Patricia MacCormack, a professor of continental philosophy at Anglia Ruskin University in Cambridge. She argues in her book *The Altarist Manifesto*, that 'the only solution for climate change is letting the human race become extinct' (Fig 272). This was the

headline in an interview with MacCormack in which she set out a 'positive view' for the future of Earth without humans. She said she came to these conclusions through her interest in feminism and 'queer theory' and railed against 'this hierarchal world where white, male, heterosexual and able-bodied people are succeeding, and people of different races, genders, sexualities and those with disabilities are struggling to get that'. Well, best get rid of everyone then.

MacCormack further argues that we need to dismantle religion while clearly not realising that she is a member of one. She said that humans are already enslaved to the point of 'zombiedom' (oh, the irony) by 'capitalism' and because of the damage this has caused 'phasing out reproduction is the only way to repair the damage done to the world'. This is straight from the Cult agenda for a mass human cull as will become clear and she will be utterly oblivious to that. The realisation that such mentalities are teaching young people is very sobering while at the same time explains so much about where New Woke is coming from.

To summarise what Patrick Moore has said, and what I have observed for decades, the Green movement that he and I remember has been hijacked by New Woke and real environmental issues are being

marginalised and sacrificed on the altar of global warming. We have the obsession with 'climate change' while genuine pollution increases, including radiation pollution, and US Green New Deal promoter Alexandria Ocasio-Cortez represents a district awash with trash in the streets. I am so glad I was briefly a national spokesman for the Green Party in the 1980s. It has given me such an insight into the mentality that drives the tyranny of the New Woke Climate Cult today. Moore brings sanity to the debate when he says that carbon dioxide is a building block for all life on earth and without its presence in the global atmosphere in sufficient concentrations this would be a dead planet. He says that all life is carbon-based including our own and he describes carbon dioxide as 'the currency of life' and the most important building block for terrestrial life. 'Yet today our children and our publics are taught that CO₂ is a toxic pollutant that will destroy life and bring civilisation to its knees.' Once again if you were a Death Cult with humanity in its gunights wouldn't you want them to believe that what keeps them alive threatens their existence? Wouldn't you want them to dismantle what gives them life? What a testament to the programming of human perception that so many believe this absurdity to their core.

Climate Cult veganism - not so simple

We have a perfect system in which humans breathe in oxygen and breathe out carbon dioxide (how dare we?) while plant life and trees absorb carbon dioxide and produce oxygen during the day by converting sunlight, carbon dioxide and water into carbohydrates and oxygen in a process called photosynthesis. The Sun, like carbon dioxide, is obviously essential to life on Earth and notice that both are being targeted. We are encouraged to fear the Sun through the climate hoax on the grounds that it generates heat (while not presenting the Sun as a source of global temperature!) and we are urged to cover our skin with cancer-causing chemicals in sun lotion when the skin turns sunlight into the essential vitamin D so vital to human health. This process of synthesising sunlight into vitamin D is achieved through cholesterol in the skin cells – the same cholesterol that is also vilified as we are urged to 'lower your cholesterol' and take ongoing, health-destroying statin drugs to do so (ka-ching say the Big Pharma tills). We are told by officialdom that LDL cholesterol, or low-density lipoproteins, is 'bad cholesterol' and can cause heart disease. To save ourselves we should take statins. A global team of 17 doctors published a study of nearly 1.3 million people in 2018 that concluded there is no link between high LDL cholesterol and heart disease and that statins were, with serious understatement, of 'doubtful benefit'. The study, published in the *Expert Review of Clinical Pharmacology*, exposed the demonisation of cholesterol and reported that heart attack patients were shown to have fewer than

normal levels of LDL or 'bad cholesterol'. Professor Sherif Sultan, one of the authors, said the 'strongest finding' was elderly people with high levels of LDL live the longest. The big rule of thumb to remember: If 'The System' is pushing something it's bad for humanity. If it is targeting something it's good for humanity. It works every time. The highest concentration of cholesterol is in the brain – 20 percent of the body total. The brain is 60 percent fats and without cholesterol it cannot function effectively. This explanation comes from Psychologytoday.com:

Synapses – the magical areas where communication between brain cells takes place – are lined by cholesterol-rich membranes responsible for passing neurotransmitters like serotonin, GABA, and dopamine back and forth. Myelin, the white matter that insulates brain circuits, is made from tightly-wound membranes containing 75% of the brain's cholesterol.

Cholesterol also helps guide developing nerve endings to their destinations on 'lipid rafts'. If the brain is too low in cholesterol, its membranes, synapses, myelin and lipid rafts can't form or function properly, bringing all brain activity – including mood regulation, learning, and memory – to a screeching halt.

We are witnessing soaring numbers of people with forms of dementia. Is this a coincidence? No, it's not. There are other reasons for this, too, but if you significantly lower or eliminate cholesterol and fat consumption this is what happens. Check the facts for yourself. Every vegan and vegetarian should read for their own sake the book by David Evans called *Low Cholesterol Leads to an Early Death: Evidence from 101 Scientific Papers*. There are also the books of Barry Groves including *Trick and Treat: How healthy eating is making us ill*. I am not saying vegans and vegetarians should change their lifestyle – that's none of my business. I am saying check the facts first and you won't get them only by reading mainstream sources. Is it still another 'by chance' that the Climate Cult (a stooge of the Death Cult) is demanding a major decrease (ideally the elimination) of meat consumption with its mega sources of cholesterol and fats? The theme is being promoted by pathetically-named documentaries such as *Apocalypse Cow: How Meat Killed The Planet* fronted by Guardian 'journalist' virtue-signaller and fast-asleep New Woker 'vegan' George Monbiot who bizarrely shot a deer on the programme and ate it as a burger. Go figure. I understand why vegetarians and vegans choose not to eat animal products and I absolutely respect the intent. I was a vegetarian myself for some 15 years. It is not, however, that simple. Firstly vegans and vegetarians might consider that all life is conscious including the plants they eat themselves. I have written a number of times over the years about

research revealing how plants and trees feel pain and stress which can even be generated by the tone of voice and someone's intent towards them. When people 'talk' to plants it generates a wave interaction with the frequency field of the voice and this is picked up by the plant. They may not understand human words, but they pick up the 'vibe'. A team of scientists at Tel Aviv University published a study in 2019 revealing that tomato and tobacco plants emitted multiple ultrasonic 'stress' sounds between 20 and 100 kilohertz when deprived of water or their stems were cut. Plants with no environmental threat or damage emitted less than one ultrasonic sound per hour. Many other experiments have confirmed the theme – plant life is conscious and feels forms of emotional pain and stress when threatened. What does a tree feel when it is cut down? What do other trees feel when it is well established that trees operate in 'families' and communicate?

There is no consumption of food in higher frequencies and these moral dilemmas do not arise. Within the simulation there is such density and a comparative deficit of energy that the difference is made up by consuming 'physical' food which is really wavefields. I wish that didn't have to be, but the point to remember is that everything is conscious. We are told that meat eating must end to protect animals when animals eat each other second by second. It is the way the simulation is set up to be a killing field. Animals eat each other to secure the sustenance they need to survive and biologically humans have the same basic make-up and nutritional requirements. We may wish it was different, okay, agreed. But for now that's how it is. Animals that provide the basis for human food will, of course, disappear altogether as a consequence of what is being demanded by a few imposing their lifestyle choice on everyone else. The meat industry is going to be subjected to full-blown demonisation and financial attacks to secure the desired Cult outcome by claiming it is 'not sustainable' – I'll explain the real significance of 'sustainable' in the next chapter. Vegans should make their choices as they see fit and have those choices respected. I just wish the same respect came the other way and self-righteous vegan activists didn't act like another cult with its deep connections to the Climate Cult which is largely the unknowing puppet of the Death Cult. By all means campaign for animals to be treated humanely – I'm with you – but please open your eyes to what you are being used to bring about. I am not telling people what they should eat. I am saying look at the pattern and how the climate hoax and other excuses are being used to target carbon dioxide, sunlight and cholesterol which, without sufficient quantities, there would truly be extinction. I find the same perceptual arrogance at the extreme end (not everyone) of those who contend that the Earth is flat. If people want to believe that then good luck to them I say. Unfortunately the same respect often doesn't come the other way. If you

don't accept what they claim you are subject to attacks and dubbed an agent of the elite – even those who have spent their lives exposing the elite and who do more to that end in a month than 'flat Earth' extreme obsessives will do in a lifetime. The Earth is 'flat' in a sense at the level of its wavefield construct or 'interference pattern'. Its holographic decoded projection called the 'physical' Earth is quite something else. Those who see this differently have every right to do so and I won't call them agents of the elite just because they believe something that I don't. Why do so many people insist that what they believe must be accepted by everybody? This book is my view and research. I don't insist for a second that people have to believe it if it doesn't make sense to them.

The Cult is exploiting the climate change hoax to pressure people to be vegan and that should start alarm bells ringing. I can tell you after tracking these people for 30 years that they do nothing without intent to harm humanity and if they want the population to be vegan it's for a reason that benefits the agenda. Some schools are imposing vegan food and banning meat including one in Sweden where preschool teacher Markus Sandström said: 'The more we thought about it, the better it seemed ... sustainable development is [our] starting point and the meat has a great impact on climate.' Sandström doesn't know what he's talking about. He's just repeating what he has been programmed to believe so he will pass on that programming to children and enforce it in this case. This is what teachers are there to do from the Cult's point of view. Vegetarian and vegan diets imposed by schools is a gathering trend with a school in Oxford, England, banning children from bringing their own packed lunches if they are not meat and fish free. We see yet again how the New Woke and climate tyranny works. It is not about winning arguments with freely-debated facts; it's about imposition. Head teacher Kay Wood said that the move allowed them to serve better quality meals for the same price. Okay, so explain how that scans with banning packed lunches brought from home. How would price be significant when the school is not paying? Who says they are better quality meals when many nutritionists have the opinion that meat and fish are essential to a balanced intake of what the body and brain needs? Who is Ms Wood to make those decisions about what children can eat and its effect on their well-being? A second reason she cited was the yawn, yawn, 'huge environmental and sustainability benefits' as she once again repeated the Cult script while not knowing there even is a Cult. Reason number three was that banning meat 'allows students of all faiths and different dietary requirements to eat together'. She wouldn't be able to see the deeper consequences of this which is imposing one set of beliefs on everyone. Why wouldn't you justify that to yourself when I am right. One parent at the school said banning meat and fish had made her children and other pupils hungry, but none of this matters – I am

right. A UK property company Igloo Regeneration has decided that all corporate entertaining and catering must be vegetarian and meals including meat cannot be reimbursed on expenses after they bought the same lie as the schools. They certainly won't be the last and watch this theme expand because it's a Cult agenda. There is pressure to introduce meat taxes and we even have people taking neighbours to court for the smell of their barbeques. *I am right has spoken and you will comply!* Why should you have choice when you are wrong? There are many lovely vegans who understand this defence of basic freedom. I'm sure others will be cocking their abuse ready to fire. If you want self-righteous abuse by the truckload tell an extreme vegan activist that the world is not as black and white as they think it is. You will see as we go along what the endless references of 'sustainability' really mean although these teachers won't have a clue what that is. They are just repeaters like the entire system in all its forms - repeating the Totalitarian Tiptoe agenda of the Cult like a broken record while thinking it's true. Where the deletion Cult agenda is really going, via veganism, is to laboratory-produced synthetic food for reasons I will be explaining.

So the gas of life is being demonised to provide the foundation of the religious orthodoxy promoted by the Climate Cult and all its associated offshoots like changing what people eat. The next question is why the global Death Cult would go to such lengths to convince us that humans are threatening the planet's very existence of the world we have come to know. The answer is both clear - and devastating.

Why is 'climate change' being hoaxed?

Evil people rely on the acquiescence of naive good people to allow them to continue with their evil - Stuart Allen

The answer to the question posed in the chapter heading is once again very simple and armed with this knowledge everything else falls into place. We are looking at a global example of No-Problem-Reaction-Solution. The Cult was only able to invade Iraq in 2003 by lying about 'weapons of mass destruction' which they knew didn't exist. Without the lie they had no excuse to do what had long been planned. The climate hoax is another no-problem that gives the Cult the pretext for almost every aspect of the Hunger Games Society and the agenda for extreme Orwellian control. The NO-P-R-S goals of the Climate Cult and the 'pandemic' lockdowns are indivisible.

All the strands come together in the end because everything is connected. I have laid out the Hunger Games structure of a world government controlling other global institutions and dictating to every community through superstates like the European Union and regional entities underneath overseeing an utterly dependent human population. This won't just happen - it has to be made to happen and for that you need reasons/excuses to do what you want like a 'climate crisis' and a global pandemic. If those excuses are not naturally-occurring you need to make them up. You lie in other words and ... the BIGGER the lie the more will believe it. The problem must relate to the solution and when you want a global solution in the form of world government etc, you need global problems for which your solution can be applied. A planet-wide hoax about human-caused climate change and a 'pandemic' fit that bill perfectly. The scammers can claim that the only way to 'save the world and humanity' is to centralise global power in a world government and institutions to stop any 'bad people' from taking actions that threaten human existence by producing the gas of life or infecting others with a 'virus' (which doesn't exist as we will see). How can they stop the 'bad people'? Well, a world army would come in

handy don't you think? Do people really believe that the climate change hoax and pandemic hoax are random happenings when they both demand centralisation of power and draconian imposition by the state which have been the aim of the Cult all along? Watch eventually for demands that an external military force be used to impose climate change measures on countries that don't play ball. Hey, I have another idea. The threat of extinction is so 'existential' that we need a police/military state to keep people in line to protect everyone else and we must take control of the upbringing of children to 'educate' (indoctrinate) them into being good citizens obedient to their masters who know how to save the planet. We certainly don't need parents getting in the way. So many things that humans do, including breathing, are dangerous. The police/military surveillance state must watch every World Citizen's every move and every citizen must watch every other citizen and report on them immediately about anything the surveillance state may have missed (nothing in the end). Dystopia is vital – our very existence depends upon it. Those good people who obey will be rewarded and those who still have a mind of their own will be tracked, recorded, punished or eliminated (see China).

The only way to save the world and humanity from imminent extinction is for everything to be controlled. This includes your energy use, what you eat, where you go, how you go, if you go, and what you say and think. Travel must be restricted to electric autonomous vehicles controlled and tracked by computers that decide where you can go and when (or if). Flying must be eliminated (except for the elite) to save us all. With so little travel possible in the interests of preventing extinction it would be more efficient and better for the Earth if people were organised in sectors like in those *Hunger Games* movies with only the elite and their police/military operatives able to pass between them without securing permission. Work must be taken over by far more efficient and less carbon-producing (they claim) artificial intelligence leaving the population in general unable to earn a living (see also 'pandemic'). The state is kind, however, and they will be paid a meagre 'guaranteed income' in return for slavery and total obedience. Don't believe for a second that you will be able to rebel. We will know what you plan before you do through mind-reading technology tracking your brain activity. Humans are very dangerous and they must be vastly reduced in number. Billions must be removed for the good of the rest and we must introduce a maximum length of life in the interests of the young. Birth rates must be controlled and dictated by the world state with forced abortion for women who are pregnant without the right paperwork. In the end there will be no parental procreation or parenthood as I will come to in a later chapter. If you think this is extreme to the point of fantasy you should read my other books and see

in detail the evidence and documentation for all that I have described here. Observe what is demanded by the New Woke Climate Cult in the form of Extinction Rebellion and the Green New Deal of American of congresswoman Alexandria Ocasio-Cortez supported by private-jet flying Democratic presidential candidate Bernie Sanders with its price tag of \$16 trillion. We also have the EU version of the Ocasio-Cortez plan in the 'European Green Deal'. Something similar would be supported by Joe Biden who clearly has serious cognitive problems and the most obvious signs of some form of dementia. Even so when Sanders pulled out of the race in April, 2020, Biden was given a free run to be the Democratic candidate barring some unforeseen circumstances like people realising in large enough numbers that Biden is unfit to run. The corrupt Wall Street-owned Biden would be an empty vessel for his handlers to dictate policy although his blatantly failing mental capacities would give Israel-owned Trump an excellent chance of a second term unless the effects of 'virus' lockdown can shield Biden from that exposure to enough of the voting population. The hate-Trump mentality would also vote for a traffic light rather than him. The Cult often likes second-term presidencies when the presidential puppet does not have to temper his policies to win another election and in Trump's case that could mean policy on Iran which Israel (Sabbatian-Frankists) want to destroy. Trump is utterly controlled by Israel and its masters with ultra-Zionist Stephen Miller, his senior advisor for policy, right up there as the most influential of his handlers. A truly New Woke president will be in the plan at some point, however, as New Wokers become ever more significant at the polling booth and Trump (74 as I write), Biden (77) and the failed Sanders (78) have the look of the last of the line before a new and seriously Woke political generation are planned to take over.

If the 'carbon-neutral' demands of these suicide notes are implemented industrial society as we've known it will be over, finished, kaput, through curtailed energy production and CO2 bars alone. Billions of jobs would be lost and the Hunger Games Society would be

installed (words written before the 'pandemic' which rushed forward exactly the same agenda). It is madness and unfortunately there is nothing more blind to its fate than madness. I don't use the term as some kind of metaphor for stupidity. I really do mean madness, as in lunacy (Fig 273). Despite



Figure 273: Well said, George

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right. A UK property company Igloo Regeneration has decreed that all corporate entertaining and catering must be vegetarian and meals including meat cannot be reimbursed on expenses after they bought the same lie as the schools. They certainly won't be the last and watch this theme expand because it's a Cult agenda. There is pressure to introduce meat taxes and we even have people taking neighbours to court for the smell of their barbecues. *Law right has spoken and you will comply!* Why should you have choice when you are wrong? There are many lovely vegans who understand this defence of basic freedom. I'm sure others will be cooking their abuse ready to fire. If you want self-righteous abuse by the trackload tell an extreme vegan activist that the world is not as black and white as they think it is. You will see as we go along what the endless references of 'sustainability' really mean although these teachers won't have a clue what that is. They are just repeaters like the entire system in all its forms – repeating the Totalitarian Tiptoe agenda of the Cult like a broken record while thinking it's true. Where the delete-meant Cult agenda is really going, via veganism, is to laboratory-produced synthetic food for reasons I will be explaining.

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these consequences most politicians are falling over themselves to comply at some level with carbon neutral demands whether that be by 2025, 2030 or, at most, 2050. Simon Bramwell, co-founder of Extinction Rebellion, was filmed calling on New Woke to 'bring down civilisation'. He wanted to see humanity return to a 'wild' and 'feral' state: '... it is part of our duty in my opinion that we've also got to not only take down civilisation but shepherd ourselves and incoming generations back into a state of wilding as it were, into like a feral consciousness that is also one of the biggest tasks remaining to us.' A definition of 'feral' is: 'Characteristic of wild animals ferocious; brutal.' Bramwell said modern eco-activism was finding it impossible to convince people to go 'without food' or 'see their child die because we don't simply have the machinery and technology to keep them alive any longer' - 'So we have to offer them something else along as [sic] these trajectories of civil disobedience and direct sabotage of civilisation.' Gail Bradbrook, a former partner of Bramwell and a co-founder of Extinction Rebellion, is a career activist with numerous connections to NCCOs, major corporations, banks and very rich people.

Environmental catastrophe - thanks to 'Greens'

CO2 obsession, like all obsessions, ignores the consequences. Take the Climate Cult's support for vehicles run by electricity (still largely produced from fossil fuel) and their lithium batteries which have created human and environmental devastation in the Democratic Republic of Congo where New Woke Apple, Google, Tesla, Microsoft and Dell have been accused of exploiting child labour by families who say their children were killed or severely injured mining cobalt used in lithium batteries and coltan used in cell phones and other electronics. Tens of thousands of children are involved in the cobalt and coltan trade - some as young as four - and all spend their days breathing toxic fumes. An Amnesty International report said most cobalt miners in the Congo lacked basic protective equipment like face masks, work clothing and gloves while many employed on pittance 'wages' complained of frequent coughing or lung problems. An article in *Forbes* magazine described the plight of a child named Lukasa who starts a 12-hour day at 5am for pay of less than \$9. He hucks at ore by hand and carries it on his back in an hour trek to a trading post where he sells it to Chinese traders who make massive profits literally off his back. Lukasa then walks another two hours to his home. The Democratic Republic of Congo has been ravaged by war that has killed millions. It is called a 'civil war' when in fact it is a war for control of 'smart' resources and has destroyed rainforests, the ancient life-style of indigenous people and threatened to make wildlife species extinct. Where are you Climate Cult?? Oh, yes, on the bloody phone demanding electric cars.

It is disgusting modern slavery and here's the kicker for the Climate Cult - making lithium batteries for electric cars and other technology is a major emitter of carbon dioxide. A report in *IndustryWeek* said: 'Just to build each car battery - weighing upwards of 500 kilograms (1,100 pounds) in size for sport-utility vehicles - would emit up to 74% more CO2 than producing an efficient conventional car if it's made in a factory powered by fossil fuels in a place like Germany ...' Now contemplate the pollution, child exploitation and CO2 consequences of every vehicle in the world eventually being electric and autonomous. I know that CO2 production is not dangerous, but the Climate Cult thinks it is and still supports mass mining of cobalt for electric vehicles to 'fight climate change'. Then there is the environmental problem of what happens when batteries are expired after less than ten years. Researchers including Professor Andrew Abbott at Leicester University have calculated that the one million electric cars sold in Britain in 2017 will produce 250,000 metric tons, or half a million cubic metres, of unprocessed battery pack waste. What will that be globally when all vehicles are electric?? How very green. Beautiful landscapes and seascapes are being destroyed by highly inefficient 'green' wind turbines that kill birds, disturb wildlife and destroy silence with their loud noise. The blades can be bigger than a jumbo jet wing and there are tens of thousands already past their working life with only landfills to deal with them. Some 8,000 will have to be disposed of in the next four years in the United States while 3,800 a year have to be dealt with in Europe according to Bloomberg. These figures reflect the number built a decade ago and there are far more now that will be coming up for disposal. Save the world by trashing it. Many millions of acres of forest have been cut down to locate the turbines and a Freedom of Information Act request revealed that in a small country like Scotland almost 14 million trees across 17,283 acres have been felled for the turbines since the year 2000. These are trees that take CO2 out of the atmosphere and clearly the CO2 hysteria is a monumental hoax. Wind turbines also technologise the natural environment which technocrats would love.

How the Climate Cult was birthed by billionaires

New Wokeness and the Climate Cult have not emerged with such speed by random chance. They have been long in the making and in *Everything You Need To Know* I have laid it all out at length. In brief we can pick up the story in 1968 with the creation of the Club of Rome although it goes back much further. The Club of Rome is a cusp organisation in The Web which stands at the point where the hidden levels of the Cult meet the seen. Cusp entities like the Bilderberg Group, Council on Foreign Relations and Trilateral Commission have their own specific role and with the Club of Rome this has been from the start to exploit

environmental concerns to justify the transformation of global society. The Club published a report in 1972 warning about environmental disaster by the year 2000 – an outcome supported by a computer model that Club of Rome co-founder Aurelio Peccei would later admit was encoded to produce the desired predictions. This would be the recurring technique for climate change propaganda using computer models. Italian industrialist Peccei said in the Club's 1991 publication, *The First Global Revolution*: 'In searching for a new enemy to unite us, we came up with the idea that pollution, the threat of global warming, water shortages, famine and the like would fit the bill.' The document emphasised that these things were caused by human intervention and so ... *here we go ...* 'The real enemy, then, is humanity itself.' Bingo – the narrative and the target was set. The Club of Rome includes global political leaders (and former), government officials, diplomats, scientists, economists, business leaders and, very significantly, United Nations bureaucrats. The Cult-created UN is a stalking horse for world government through the Totalitarian Tiptoe and both the climate change hoax and the 'solution' to the hoax are being orchestrated through the United Nations as a No-Problem-Reaction-Solution. Richard Haass, president of the Cult-controlled Council on Foreign Relations, has said that world government is needed with national sovereignty reduced to 'fight' global warming: 'Moreover, states must be prepared to cede some sovereignty to world bodies if the international system is to function ... states would be wise to weaken sovereignty in order to protect themselves ...'

A major event in the emergence of the Climate Cult came with the 1992 Earth Summit in Rio de Janeiro, Brazil, which was hosted by Cult asset and Canadian oil multimillionaire Maurice Strong who fronted for the Rothschild and Rockefeller dynasties. Strong believed that the United Nations should become a world government. He was appointed a founding director of the UN Environment Programme (UNEP) and from the 1980s became the promoter of human-caused climate change or 'global warming' as it was then before temperatures stopped rising. Strong's UNEP was behind the creation of the UN's Intergovernmental Panel on Climate Change (IPCC) which has been the central body in the climate change hoax ever since. He also established the UN Framework Convention on Climate Change (UNFCCC). Through this body he hosted the Rio 'Earth Summit' attended by 108 world leaders and 20,000 'green activists'. Maurice Strong, remember, was a big-time Cult operative. The UN Framework Convention on Climate Change is the organising force for the series of conferences in Kyoto (1997), Copenhagen (2009), Paris (2015) and Glasgow (2020) pressing governments to impose laws to reduce emissions of the gas of life. Strong saw out his last years in China where he had been close to the

Communist Party leadership going back to Chairman Mao. He moved there after being exposed for being paid \$1 million from the UN's Oil for Food programme which was supposed to be a mechanism to trade oil to feed starving people in Iraq. This is the same Maurice Strong who



Figure 274: Annual meeting of Nasty Anonymous.

claimed to be a (multimillionaire) 'socialist' and became the darling of what would become New Woke. George Soros plays a similar and more expansive role today and New Wokers still can't see through it (Fig 274). Strong was appointed to a series of other influential positions to serve the Cult including Senior Advisor to the UN Secretary General, Senior

Advisor to the World Bank, Chairman of the Earth Council, Chairman of the World Resources Institute, Under-Secretary-General of the United Nations and Co-Chairman of the Council of the World Economic Forum which would become a major promoter of Greta Thunberg. This is what happens to your career when you are a Cult asset.

An insider speaks

I have written over the years about the warnings of George Hunt, an accountant and investment consultant, who was an official host of the Fourth World Wilderness Conference in Colorado in 1987 attended by Maurice Strong along with Edmond de Rothschild, David Rockefeller and executives from the World Bank and International Monetary Fund (IMF) who were there because they cared so deeply about the environment and the poor. It was nothing to do with stealing land from the poor in the name of saving the world. Well, actually, it was – see my book *The Perception Deception*. Hunt's experience of these mega-criminals and others led him to realise that the so-called environmental movement was a Rothschild/Rockefeller global banker front driven by what I refer to as the Cult. He said the global population was described by a banker attendee as the 'cannon fodder that populates the Earth'. Hunt made a video a month ahead of the June, 1992, Earth Summit in which he called out the game before it even became public. You can still find the video on the Internet. He pointed out that the logo of the summit was a hand holding the world with the slogan 'In Our Hands' which given the Cult's obsession with symbolism was a statement of intent in itself (Fig 275 overleaf). The official name was UNCED (United Nations

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Figure 273: The World in our hand – perfect symbols for what the game is.

Conference on Environment and Development) and was pronounced 'unsaid'. That's a ditto. Hunt described those behind the Earth Summit in these terms:

The same World Order [Cult] families that planned World War One and World War Two, that tricked the Third World countries to borrow funds and rack up the enormous debts, the same World Order that stole much of the money borrowed by Africans and other nations and hid it in Geneva banks. They are the

persons who financed Hitler and purposely [create] war and debt to bring societies into their control. The World Order crowd are not a nice group of people.

Hunt said in 1992 that 'the world environment movement will soon be in the hands of the World Order' if its supporters did not act on what was happening. They didn't, of course, and they have been, as Hunt predicted, absolutely absorbed by the 'World Order' elite to become the New Woke Climate Cult with its teenage 'spiritual leader' Greta Thunberg. Hunt said:

I learned later that the World Order refers to the coming one-world government as the Fourth World. A world controlled by the World Order where there is no more First, Second and Third World ... just a boundary-less planet which is called the Fourth World Wilderness. Nags and shamsas refer to it as the fourth World Wilderness, the lossness of the mind. The lossness of the mind refers to the collective consciousness. Persons will be coerced through lies, drugs, fear and pain to surrender their selves, their eggs, to the collective consciousness.

I stress here that while I speak of us being expressions of *The One* we are both the collective and the individual point of attention. We must not concede that sense of individuality and personal sovereignty to any group-think or collective mind which the Cult plans to be a technological hive-mind controlled by artificial intelligence. Hunt said the 'Fourth World' will be a return to a society much like the Caesars or Babylon or the Fourth Reich. He said this society was described in Aldous Huxley's *Brave New World* and *Brave New World Revisited* and George Orwell's *Nineteen Eighty-Four*. The new World Order sought to create a society out of the ashes of chaos, a collectivist Fourth World

complete with collectivist religion, collectivist finance and unchecked world national socialism. Hunt said in 1992:

The World Order will offer Gaia, Mother Earth, to the masses as the Big Brother image to worship in the Fourth World. Maurice Strong has already set up a 140,000 acre project in Creston, Colorado, to develop this Earth religion system. Projects are funded by the Rockefeller Fund among other foundations. The Earth Summit will link environment with industry, the Lords of the UNCED conference will be the masters of who gets what and when if we don't do something about it quickly.

I repeat: George Hunt was speaking in 1992. How sobering when you see what is happening today. Hunt described how Maurice Strong identified Edmond de Rothschild as the creator of the environment movement and perhaps Climate Cult supporters will now understand why billionaires like Soros, a Rothschild lackey, are falling over themselves in support. Greta Thunberg crossed the Atlantic on a yacht once named the Edmond de Rothschild sailed by an elite crew with connections to the Monaco royal family. How very 'of the street'.

UN double whammy

The United Nations is working a pincer movement on behalf of the Cult. On one side you have the UN Intergovernmental Panel on Climate Change (IPCC) which drives the hysteria by lying incessantly about human impact on the climate. On the other you have UN Agenda 21 and Agenda 2030 which seek to transform global society into a centralised Orwellian state to 'meet the challenge of climate change'. When you think that the United Nations was created by the Cult as a Trojan horse for world government dictatorship the game becomes transparent. One UN agency hoaxes the problem and others promote the solution. The IPCC is not a scientific organisation, but a political one and its claims and behaviour are dictated by politicians, activists and place-people – not by scientists who are merely the prop. Some 'scientists' say what the IPCC demands when they lift their snouts from the money-trough while other genuine scientists either have their work misrepresented in IPCC 'reports' or are ignored all together. Many scientists mentioned in IPCC documents have complained of being misquoted and having their opinions distorted as I have detailed in other books. Another sleight-of-hand is for IPCC reports detailing alleged 'scientific findings' to be preceded by a 'summary' of those findings. These 'summaries' are written by the IPCC hierarchy to misrepresent or exaggerate what is in the main report in the knowledge that the world's media will, almost in its entirety, use the summary as the basis for its reporting. For many years the IPCC was headed by a railway engineer, Rajendra Pachauri,

who was succeeded by Hoesung Lee, a South Korean former economist with ExxonMobil and brother of former Prime Minister of South Korea Lee Hoi-chang. The IPCC is indeed a political not a scientific organisation churning out propaganda about climate change to justify the imposition of global centralised tyranny. Christiana Figueres, who is UN to her DNA, was executive secretary of the United Nations Framework Convention on Climate Change for six years and in 2020 published a book with her 'strategic advisor' and 'climate change' political lobbyist, Tom Rivett-Carnac, from a family of aristocrats. The book, *The Future We Choose: Surviving the Climate Crisis*, naturally ticked all the boxes. Figueres parroted climate change orthodoxy, endorsed Extinction Rebellion and Greta Thunberg, and promoted 'civil disobedience' as 'a moral choice' to pressure politicians to act on climate change. She even names Martin Luther King as an example when she could not have named anyone less appropriate. King was campaigning for freedom and not, as with the Climate Cult, demanding it be deleted. Funny how the establishment promotes 'civil disobedience' to advance the climate hoax, but those who engage in such activities in support of freedom, fairness and justice are labelled 'enemies of the state'. How would King have responded to an article posted on the United Nations Educational, Scientific and Cultural Organization (UNESCO) website headed 'Climate crimes must be brought to justice'. These 'crimes' highlighted by British academic Catriona McKinnon turn out to be refusing to believe in the UN climate hoax. McKinnon is yet another confirmation that academia, once a noble profession, is now a very sick joke. This genius wrote:

Criminal sanctions are the most potent tools we have to mark out conduct that lies beyond all limits of toleration (or none in the case of New Woke). Criminal conduct violates basic rights and destroys human security. We reserve the harshest treatment of punishment for conduct that damages the things we hold most fundamentally valuable. Climate change is causing precisely such damage...

... I have proposed that international criminal law should be expanded to include a new criminal offence that I call posticide. It is committed by intentional or reckless conduct fit to bring about the extinction of humanity. Posticide is committed when humanity is put at risk of extinction by conduct performed either with the intention of making humanity go extinct, or with the knowledge that the conduct is fit to have this effect.

When a person knows that their conduct will impose an impermissible risk on another and acts anyway, they are reckless. It is in the domain of reckless conduct, making climate change worse, that we should look for posticidal

conduct.

From this bizarre journey through what passes for McKinnon's thought processes comes the demand that challenging climate hoax orthodoxy should be a criminal offence under international law. The fascistic nature of such a demand will not have penetrated her New Woke self-obsession. McKinnon published a book entitled *The Ethics of Climate Governance – the ethics of global governance would be more like it*. No wonder UNESCO promoted her article. By the way, surely Cambridge academic Patricia MacCormack must be guilty of McKinnon's 'posticide' given that she says 'The only solution for climate change is letting the human race become extinct.' Ah, no, you see MacCormack and McKinnon are both New Woke and believe in the climate change hoax and that is always a get out of jail card.

Greenpeace co-founder Patrick Moore, an open-and-shut case of 'posticidal conduct', emphasises another deception in the climate change racket. The IPCC's brief is not to investigate the causes of climate change, but only human causes. No wonder it basically ignores the Sun. It is specifically focused on alleged human causes because that's the answer the Cult needs for its manipulations. If IPCC personnel found there was no significant human impact there would be no reason for its existence and they would lose their share of what the *Climate Change Business Journal* estimated to be \$1.5 trillion a year even at the time of the UN Paris climate conference in 2015. It will be much more now. American writer Upton Sinclair said: 'It is difficult for a man to understand something when his salary depends upon his not understanding it.' This is another Cult technique to pressure its gofers to do and say what the Cult wants or lose their income. The IPCC outrageously claims to be dedicated to providing the world with objective, scientific information when its controlling core is a climate Mafia. Scientist and engineer David Evans, a full-time or part-time consultant for eleven years to the Australian Greenhouse Office (now the Department of Climate Change), has a far more accurate assessment of what is a fantastic conspiracy to deceive. He said the theory of human-caused global warming was based 'on a guess that was proved false by empirical evidence during the 1990s', but most scientists wouldn't say so when 'the gravy train was too big, with too many jobs, industries, trading profits, political crosses, and the possibility of world government and total control riding on the outcome' (my emphasis). With that Evans hit the nail bang on the sweet spot. This is what the hoax of the human-caused 'climate crisis' is really all about. He said that 'governments and their tame climate scientists now outrageously maintain the fiction that carbon dioxide is a dangerous pollutant' when the evidence they are wrong was overwhelming.

Agenda 21/2030

These two interconnected UN 'agendas' are the major means through which the Cult is exploiting the climate change lie to impose its Hunger Games structure of global control. Agenda 21 was launched by Maurice Strong (the Rothschilds and Rockefellers) at the Rio Earth Summit in 1992. Agenda 2030 was established by the UN General Assembly in 2015. Agenda 21 refers to centrally-controlling everything in the 21st century while Agenda 2030 is a series of 17 target 'goals' which, if implemented in the way planned, would achieve the global dictatorship demanded by Agenda 21. In short they are two versions of the same conspiracy. Agenda 21 has been accepted and promoted across the world right down into local councils. Check your council or state and see if they are implementing Agenda 21 and 'sustainable development'. The latter might seem at first to be laudable. Why wouldn't we want human activity to be 'sustainable' in the long term? BIG RED FLAG AND BRIGHT FLASHING LIGHTS: That's not the United Nations or Cult definition of the word. To them it means the excuse to impose world dictatorship. These are the 'sustainable development goals' and headings of Agenda 2030:

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reducing Inequality
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life On Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

Once again these would appear to be supportable ambitions except that we are looking at a constantly-used Cult technique that tells people what they want to hear without revealing the real reason for what is planned. We should always filter claims to 'care about humanity' with the knowledge that those behind the UN are Death Cultists motivated by horrific intent. Why would practicing Satanists and paedophiles of

the Cult with a pathological hatred for humans want those 'goals' to be achieved including no poverty or hunger? These are the controllers of global finance that have created poverty and hunger and use both as political tools. The Devil is not so much in the alleged 'goals'; it is in the means to achieve them (or the illusion of achieving them more to the point). This is how Agenda 21 intends to do that as outlined in its own documents:

- End national sovereignty
- State planning and management of all land resources, ecosystems, deserts, forests, mountains, oceans and fresh water; agriculture; rural development; biotechnology; and ensuring 'equity'
- The state to 'define the role' of business and financial resources
- Abolition of private property
- 'Restructuring' the family unit
- Children raised by the state
- People told what their job will be
- Major restrictions on movement
- Creation of 'human settlement zones'
- Mass resettlement as people are forced to vacate land where they live
- Dumbing down education
- Mass global depopulation in pursuit of all the above

This is the very wish-list of the Cult that I have been exposing for more than 30 years and the US Green New Deal proposed by New Wake Democrat extremists is a political manifesto to implement Agenda 21/2030 as are similar versions of the 'Deal' around the world. This is what the UN Agendas and the Green New Deals really mean behind their Orwell-speak:

An end to national sovereignty:

I don't really need to elaborate on this one after what I have said already about the plan to delete countries for a structure of world government, superstates and regions. Maps already exist for a regionalised Europe with countries eliminated and America is being regionalised by the Tiptoe technique through 500 regional councils in the 50 states called Councils of Governments (COGs) and Metropolitan Planning Organizations (MPOs). The next stage, the Smart Region Initiative (SRI), was launched in Arizona in 2019 with a view to expansion across the country.

State planning and management of all land resources, ecosystems, deserts, forests, mountains, oceans and fresh water; agriculture; rural

development; biotechnology; and ensuring 'equity':

This is the centralised control of everything that I have been warning about and it's already happening with some American states even claiming ownership of rainwater that falls on private land.

The state to 'define the role' of business and financial resources:

This means the central control of all finance and business and the end of private enterprise not supported by the World State. The systematic targeting of small mom and pop businesses and much bigger ones with taxation and regulation is aimed at destroying them all eventually so that only giant Cult corporations answering to the Cult world government will control everything – see Amazon for a start and survey the world since the 'virus' lockdowns for the extraordinary acceleration of this goal. Global financial dictatorship is the sole of the planned world central bank with the European Central Bank, World Bank and International Monetary Fund all Totalitarian Dipoles to that end and the same with the cashless single global digital currency that I have been saying was coming since the early 1990s. This is today being implemented with the disappearance of cash (again accelerated by its insane demonisation as a source of 'catching the virus'). The economic sales-pitch of 'sustainable development' includes an 'end to poverty' which really means a re-distribution of wealth to make the mega-rich even richer and Western middle and working classes seriously poorer. Another pledged goal of 'eliminating hunger' (as if the Cult cares) is to justify health-destroying genetically-modified crops requiring stupendous amounts of pesticides and herbicides to grow and the end of eating meat.

Abolition of private property:

This is the central control of all property (except for the elite) with rents so high that people are forced into the micro-'apartments' that are now being built around the world. Calls for an end to private property ownership have now started in line with this plan. Young people are being prevented from entering the property market by sky-high prices, student debt and other financial suppression. Rockefeller family insider Dr Richard Day told these Pittsburgh paediatricians in 1969:

Privately-owned housing will become a thing of the past. The cost of housing and financing housing would gradually be made so high that most people couldn't afford it ... Young people would more and more become renters, particularly in apartments or condominiums.

People would not be able to buy [homes] and gradually more and more of the population would be forced into small apartments [the micro-apartments]. Small apartments which would not accommodate very many children.

The last point is part of a depopulation agenda and Day also indicated the control aspects of telling you where you are going to live:

Ultimately, people would be assigned where they would live and it would be common to have non-family members living with you. This by way of your not knowing just how far you could trust anybody. This would all be under the control of a central housing authority. Have this in mind ... when they ask, 'How many bedrooms in your house? How many bathrooms in your house? Do you have a finished game room?' This information is personal and is of no national interest to government under our existing Constitution. But you'll be asked those questions ...

Dictating where people live is happening in the Cult blueprint for the world – China.

'Restructuring' the family unit

The end of the family is a constant theme of Cult-related documents and organisations. The deletion of ever more parental rights which are handed to state institutions like schools and social services is this aspect of the agenda unfolding in plain sight without the dots being connected. Remember how student debt campaigner Wayne Johnson said the loan crisis was leading to the 'ever-increasing destruction of the fabric of America' with people 'not getting married, not having children'. It's all calculated cause and effect.

Children raised by the state

This is obviously related to the end of the family and the longer term plan is for the end of even human procreation as I will be coming to. Fantastic numbers of children now being literally stolen from loving parents by social services through outrageous misrepresentation and lies in secret 'family courts' is this plan at work. Insider Aldous Huxley described the end of parenthood in his prophetic *Brave New World*.

People told what their job will be:

George Orwell wasn't kidding in his portrayal of a Big Brother world in

which every aspect of human life is dictated including work slavery.

Major restrictions on movement:

Why do you think Cult-serving and manipulated climate extremists are targeting flying and car use? Look at the effect on movement of the 'pandemic'. This further explains the obsession with imposing autonomous vehicles in which the computer limits where you can go. Governments are banning the sale of petrol and diesel vehicles in favour of anything-but Green electric power because that is the stepping-stone to full blown electric autonomous vehicles. 'Saving the planet' is only an excuse to advance this agenda. Britain is committed to banning new petrol and diesel vehicles from 2035 while others including Denmark, Ireland, the Netherlands and Sweden go for 2030. The knock-on effect for employment in the auto industry can be seen with predictions of massive job losses due to the nature of electric car production. Where do those people go? Did I mention the Hunger Games Society?

Creation of 'human settlement zones':

Translated from the Orwellian this means people being forced into tightly-packed mega-cities of round-the-clock surveillance and micro-apartments that I have described. Their code-name is 'Smart Cities' (once again see China). Tightly-packed teeming cities of human chaos and misery will also provide low-vibrational energy centres on which the Cult 'gods' can feed.

Mass resettlement as people are forced to vacate land where they live:

Another reference to what is now happening with the destruction of rural communities, businesses and job opportunities, removal of shops and banks, plus increased transport costs, to pressure people to head for the cities.

Dumbing down education:

This has already been achieved and is programming the mentality of New Wokeness in which 'education' is confused with indoctrination and downloading the Cult perception program is perceived as 'knowing it all'. Ponder the following climate change excuse for 'dumbing down education' from the United Nations (again) Education, Scientific, and Cultural Organization (UNESCO):

Generally, more highly educated people who have higher incomes can

consume more resources than poorly educated people who tend to have lower incomes. In this case more education increases the threat to sustainability.

Are you getting it yet New Wokeness?

Mass global depopulation in pursuit of all of the above:

With the advent of the AI world humans are no longer required by the Cult in such numbers and even more so with the end of procreation. The plan for a mass cull of the global population appears in many Cult-related documents under terms like 'population control' and a 'sustainable population'. There are many ways this is being done through the systematic undermining of immune systems through food, drink, vaccines and radiation fields, and this really becomes a cinch once human brains are connected to AI. Those you want to remove are just a press of a button away or the click of a mouse.

The horrific multi-faceted agenda for humanity outlined here is being justified by the 'climate emergency' and an 'existential threat' to humanity which isn't actually happening. We are looking at mass-hysteria which is defined as 'mass psychogenic illness, collective hysteria, group hysteria, or collective obsessional behavior, which transmits collective illusions of threats, whether real or imaginary, through a population in society as a result of rumours and fear'. Mass hysteria is another example of wave entanglement with individual hysteria feeding the entangled collective to generate group hysteria. Pump-primers shout fire and the crowd starts running while others keep shouting fire ongoing in science, academia and media. Everybody's shouting fire and so there must be a fire even if no one can see the smoke (see 'virus' hysteria). The term 'hysteria' is such a perfect description of what is happening that a panel of German linguists decided to 'ban' it in relation to climate change. They choose a new word or phrase to 'ban' every year and went for 'climate hysteria' on the grounds that it 'defames climate protection efforts and the climate protection movement, and discredits important discussions about climate protection'. This is Orwell's Newspeak which deletes words that allow the 'wrong' opinions to be articulated. The 'panel's' other banned words and terms include 'alternative facts', 'do-gooder', 'liar press' and 'welfare tourism' (a description of migrants exploiting the welfare system). I'm sure you have no problem seeing the pattern. Another head-shaker is that those eventually sitting at the centre of the target for freedom-deletion are the very people demanding in organisations like Extinction Rebellion that their own mass slavery – and that of their children and grandchildren – is implemented while anyone arguing against that should be silenced (Fig 276 overlaid). I do



Figure 276: The Pied Piper of Stockholm.

exactly the plan, but it doesn't have to be. The idea has been to indoctrinate the young through constant climate programming in schools and universities to ensure the Big Lie is so ingrained that they will accept and even demand the Cult agenda for total global control of every man, woman and child.

Moore's Greta (right on cue)

The Swedish 16-year-old Greta Thunberg was wheeled out specifically to rally the young to rebel against their elders in climate protests that insist freedom is deleted for the rest of their lives. I don't say for a second that Thunberg knows this. She is a tragic puppet and her story connected to organisations pressing the Cult agenda while she won't know there is a Cult never mind she is doing its bidding. She is, however, revealing in her arrogance ever-increasing signs of believing her own publicity and hype. Thunberg doesn't seem to know much at all and only parrots a stream of mantras and platitudes such as 'listen to the science' when she has no idea what 'the science' is. She never expands on 'the science' and mainstream media sycophants never ask her. The 'science is settled' mantra is utter bullshit and leads to people who would otherwise question climate change orthodoxy to stay quiet in fear of being accused by climate propagandists of 'denying the science'. The theme applies especially to those in the academic arena who have jobs to protect. What if the 'science' wasn't 'science' at all? What if it's only a script written by the Cult to which most of mainstream 'science' has long sold its soul? Well, it is. Greta Thunberg has been diagnosed with obsessive-compulsive disorder, autism and Asperger's syndrome and been credited with mystical powers by her Climate Cult mother, Malena Ernman, a super-New Woke Swedish singer, while her father Svante Thunberg is a talent agent and managing director of a media company. Greta's 'powers' are claimed to include the ability to see carbon dioxide with the naked eye and how it flows out of chimneys and changes the

not exaggerate when I say that great swathes of humanity are descending into mental illness although thank goodness for everyone. Patrick Moore was right when he said of the green insanity movement: 'I fear for the end of the enlightenment. I fear an intellectual Gulag with Greenpeace as my prison guards.' That is

atmosphere. I kid you not. Does she see the plants grow bigger and stronger, too, when CO2 increases? What absurdity although perfect if you want to create a new religious icon. Exploiting a 16-year-old connects with the young and gives her a free-ride with the mainstream media despite the impact of her elite-orchestrated words and actions being global in nature and fundamental to the transformation of human society. By contrast German teenager Naomi Seibt who once bought the climate change lie and then spoke out after seeing through the hoax is treated rather differently. The girl dubbed the 'anti-Greta Thunberg' is highly articulate and well-researched which means she does not get invited to elite events. Instead she is presented through implication and association as some kind of white nationalist extremist and of course the ubiquitous 'anti-Semitic' by the usual suspects that include, as always, the 'anti-establishment' establishment-to-its-DNA London Guardian. I bet you're in shock. We should have a live public debate between Thunberg and Seibt for all young people to watch. An internet video reveals a code that Thunberg uses whenever she is questioned in the street about 'the science'. She takes off her hat and immediately a minder steps in to whisk her away. She is watched over by unpleasant and aggressive plain clothes security guards sometimes outnumbering professors with her in Sweden. These heavies will not let anyone with real questions anywhere near her. Who is paying for them? Who is financing the whole Thunberg phenomenon? Members and agents of the One-percent are certainly involved in the bankrolling of this most blatant of propaganda operations. I recommend the YouTube video *Greta Thunberg Incorporated: The Exposed* to see the arrogant, authoritarian thugs among her 'security'.

Is anyone really so naive as to believe it's a coincidence that a 16-year-old protesting alone in Sweden suddenly finds herself invited by the One-percent to speak at their elite World Economic Forum conference in Davos, Switzerland, and berate them about climate change? Or that she was given a platform to speak to the world at the Climate Cult-orchestrating *United Nations*? Or that she was sailed across the Atlantic to get to the UN in a ridiculous stunt by those connected to the Monaco royal family in a multi-million yacht that used to be called the Edmond de Rothschild – the man Maurice Strong said was the creator of the environmental movement? Or that a crew filming a high-profile documentary followed her from the time she was sitting 'alone' in her 'spontaneous' one-girl protest outside the Swedish parliament? Or that the person who 'discovered by chance' her 'loose protest' was public relations and financial expert Ingmar Rentzhog who has close connections to the Club of Rome that hatched the climate change hoax from the start? He claims to have come across Thunberg 'by chance' minutes after she started her first 'school strike protest' outside the

Swedish parliament. I'm laughing already. Rentzhog trained with the Climate Reality Project led by climate change global propagandist Al Gore and founded the social media platform 'We Don't Have Time' to promote the climate change narrative. Two months after Rentzhog 'discovered' Greta in 2018 the Club of Rome held a joint conference with Rentzhog and 'We Don't Have Time'. The person who encouraged Thunberg to start her 'school strike' and protest at the parliament was the head of Extinction Rebellion in Sweden who had said they needed a cute young face 'to get help from young people to increase the pace of the transition to a sustainable society'.

I guess another coincidence is that a Thunberg climate change mentor is German climate politician Luisa-Marie Neubauer who is an asset of the ONE Movement funded by other Cult assets like Bill Gates and George Soros (yes, them again) and involving their mate, virtue-signalling rock singer Bono. Soros funds other Thunberg-connected organisations. Luisa Marie Neubauer has appeared with Thunberg at many public events. ONE is among the most obvious of New Woke astroturf operations you could imagine. The Bill and Melinda Gates Foundation website describes ONE as an organisation that 'pursues its goals through policy advocacy, grassroots mobilization, communications, and creative campaigning' which is straight off the pages of the New Woke manipulation manual. The website continues: 'ONE also mobilizes its 3.2 million members to pressure policymakers to increase their effort, accountability, and transparency in the fight against disease and poverty, particularly in Africa.' Multi-billionaires care so deeply about poverty, you see. ONE makes 'the most of technology and social media ... [and has] ... also become a leading force in educating the public about global health and development and in changing perceptions about aid and its impact'. If we translate that from the bulkhit ONE campaigns for the Cult agenda just like the Open Society network of Soros, Thunberg and her parents profess to be 'anti-fascist' in their 'intersectionality' with other New Woke sectors and all three have been photographed in t-shirts promoting the violent 'anti-fascist' fascist group, Antifa (Fig 277). I didn't know', said Greta. Oh, really – what about your parents? Human-caused climate change is an elite scam and why wouldn't there be all these elite connections to its propaganda princess? Thunberg is just their unknowing and



Figure 277: Greta and parents promoting Antifa, a violent 'anti hate' hate group in beloved of New Woke.



Figure 278: Greta in a game she doesn't begin to understand.



Figure 279: Saint Greta, the Climate Coddler.

increasingly arrogant stooge. In my view her climate extremist parents should be ashamed of how they allow her to be exploited and have played such a central role in that. Her obsessive-compulsive disorder can be clearly seen in her unquestioning obsession with a climate end-of-the-world and it's sad to witness such outrageous exploitation (Fig 278). The Cult of Greta now includes a huge printing of her looking down in disdain over New Woke and shit-infested San Francisco and her every public move is documented by the media in a colossal exercise in public relations programming – especially of the young (Fig 279). A further crucial part of the elite promotion of Thunberg is to drive a wedge between old and young, adults and children. This was her carefully-scripted speech to the UN in 2019 and all elements of the Climate Cult agenda are there:

My message is that we'll be watching you. This is all wrong. I shouldn't be up here. I should be back in school on the other side of the ocean [Well, go then]. Yet you all come to us young people for hope. How dare you! [Divide young and old by blaming the old for something that's not happening]. You have stolen my dreams and my childhood with your empty words. [No, Greta, those exploiting you have stolen your childhood]. And yet I'm one of the lucky ones. People are suffering. People are dying [not from human-caused climate change they're not]. Entire ecosystems are collapsing [not from human-caused climate change they're not]. We are in the beginning of a mass extinction [no, we're not], and all you can talk about is money and fairy tales of eternal economic growth [which the Cult wants to delete for the mass of the population]. How dare you! [Ditto to you, Greta.]

For more than 30 years, the science has been crystal clear [like hell it has].

How dare you continue to look away and come here saying that you're doing enough, when the politics and solutions needed are still nowhere in sight. You say you hear us and that you understand the urgency. But no matter how sad and angry I am, I do not want to believe that. Because if you really understood the situation and still kept on failing to act, then you would be evil. And that I refuse to believe. [So how evil are those seeking to terrify the young that their world is going to end when it's all a gigantic hoax to delete their freedom for life?]

The popular idea of cutting our emissions in half in 10 years only gives us a 50% chance of staying below 1.5 degrees, and the risk of setting off irreversible chain reactions beyond human control [chain-reactions that don't exist]. Fifty percent may be acceptable to you. But those numbers do not include tipping points [made up to explain the lack of CO2 impact], most feedback loops [ditto], additional warming hidden by toxic air pollution or the aspects of equity and climate justice [more bunkum]. They also rely on my generation [divide, divide] sucking hundreds of billions of tons of your CO2 [the gas of life] out of the air with technologies that barely exist. So a 50% risk is simply not acceptable to us – we who have to live with the consequences [divide, divide].

To have a 67% chance of staying below a 1.5 degrees global temperature rise – the best odds given by the [Cult-created Intergovernmental Panel on Climate Change] – the world had 420 gigatons of CO2 left to emit back on Jan. 1st, 2018. Today that figure is already down to less than 350 gigatons. How dare you pretend that this can be solved with just 'business as usual' and some technical solutions? With today's emissions levels, that remaining CO2 budget will be entirely gone within less than eight and a half years.

There will not be any solutions or plans presented in line with these figures here today, because these numbers are too uncomfortable. And you are still not mature enough to tell it like it is [but you are Greta by repeating the crap you have been told to say?]. You are failing us. But the young people are starting to understand your betrayal [divide, divide]. The eyes of all future generations are upon you [divide, divide]. And if you choose to fail us, I say: We will never forgive you [divide, divide].

We will not let you get away with this. Right here, right now is where we draw the line. The world is waking up. And change is coming, whether you like it or not.

Yes, Greta, the Cult's change is coming if we and your generation believe garbage like that. We are witnessing yet another inversion in which children tell adults what they should do. There are many stupid adults.

large numbers of which are in politics. There are some aware children who have not allowed the Cult to program their perceptions (Greta Thunberg is not one of them). But the idea that children know better in general than intelligent adults with decades of experience is absurd. When I was six, twelve and sixteen I would not have dreamed of telling the world what should be done because, like those of the same age today, I hadn't lived long enough to credibly know. The young-old inversion has a clear motive for the Cult: Children and young people today have been subjected to the perception program at its most extreme and it wants those perceptions to prevail and transform society in its image.



Figure 280: The Cult is desperate to turn the young against the old.

Program the kids and then have their will imposed on adults who will have known life and experience before child-programming reached its current extremes. No one ever asks Greta Thunberg how many hundreds of millions will die if her carbon targets are met through loss of jobs, food and warmth. The climate hoax divides advocates and 'deniers' and splits young from old on the grounds that

the old are responsible for the 'existential threat' to the young (Fig 280). The German branch of the school strike organisation Fridays for Future, officially founded and copyrighted by Greta Thunberg, promoted this agenda when it tweeted: 'Why do grandparents talk to us each year? They won't be around much longer.' German public broadcaster WDR produced a song video featuring a choir of young girls castigating older people for climate change and eating meat. It referred to an imaginary grandma as 'an environmental pig' and warned we 'will not let you get away with this'. WDR called it 'satire' in the face of a disgusted public reaction when it was clearly calculated. 'Satire' is the excuse often used when attempts at indoctrination become too blatant and people see through it. The 'how dare you?' rant about older generations by 16-year-old Cult puppet Thunberg was also an example of this theme. Yes, Greta, how dare older people and the long-gone create an industrial society that allows multimillion dollar yachts to be built for your propaganda stunts and aircraft to quietly – shhh! – fly your sailing crew back home across the Atlantic while you posture your carbon self-purity? The Cult's desire to start a war between young and old has many motivations. One is that older people were born long before the climate change hoax

began and many can see through the manipulation and contradictions. They must be perceived by the young as the villains and the enemy to be vanquished rather than wisdom and experience worth listening to (Fig 281).

Increasing the hype

Thunberg was invited again in 2020 to the World

Economic Forum in Davos, Switzerland, a 100 percent front for the One-percent and the Cult behind the climate change hoax and the creation of an Orwellian, AI-controlled, Orwellian global state (Fig 282). Why would these multi-billionaires invite a 16-year-old to castigate them at their own conference for the second year in a row and repeat the crap

that 'our world is still on fire'? This chapter alone has answered that question and they will drop her like a stone when she has served their purpose. She outrageously claimed that if we don't do what she said we are not acting 'as if you loved your children above all else'. She added that 'we don't want these things done in 2050, 2030, or even 2021 - we want this done now'. Who is this 'we'? The One-percenters watching her speak at Davos for sure and certainly not the general public. Donald Trump appeared at the elite propaganda-fest to deliver a speech warning against believing the climate 'prophets of doom' in a clear reference to Thunberg sitting in the audience. He



Figure 281: The plan is now so transparent. (Image: Carolee Icko.)



Figure 282: Why would the One-percent invite Greta Thunberg to berate them on climate change? This is why.



Figure 283: Same song-sheet, different singers.

was, however, pretty much a lone voice. Instead we had another burst of baloney from Prince Charles who remember said in 2009 that we had twelve years to save the world from irretrievable climate and ecosystem collapse (Fig 283). Charles travelled to Davos in a private jet and electric car to make a speech promoting the demands of the Climate Cult. In the less than two weeks before the speech Charles had flown four times in private jets and a helicopter with the aircraft flying a total of 16,000 miles at a cost to the UK taxpayer of \$280,000. This is a man who has flown 125 miles in a helicopter to make a speech about the dangers of aircraft emissions. Without a hint of embarrassment he presented himself at Davos as an environmental champion and called for 'eco-taxes', a world economy with nature at its centre (while reducing CO2 that sustains nature), and new AI technologies - all from the Cult's letter to Santa, or Satan. He of course championed 'sustainability' and proposed a transformation of the global economy justified by climate change that precisely reflected the Cult agenda. He said:

Now it is time to take it to the next level. In order to secure our future and to prosper we need to evolve our economic model.

So many deadlines for the end of the world through 'runaway' climate change have come and gone, but like all good cults they just keep announcing a new date when the last one passed without incident. The latest doomsday is around 2030 which is a highly significant date that turns up in many guises. It was mentioned yet again by Prince Charles in his Davos speech. Here are three other examples: When the latest date of 'twelve years to save the planet' was first announced that would take us to around 2030. The UN list of goals to save the planet from climate change by transforming global society into a centralised dictatorship is called Agenda 2030. The year given by Google executive Ray Kurzweil and other Silicon Valley technocrats for connecting the

human brain to artificial intelligence is 2030 (Fig 284). Is this yet another coincidence? What do you think when AI is being promoted as an answer to climate change? The hoax has hog-tied almost every politician into some level of compliance. There are the majority who buy the lie and say 'something must be done' and the rest who may

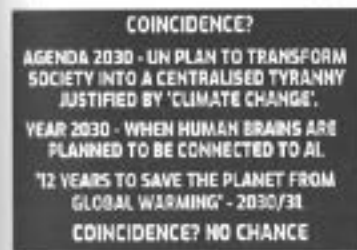


Figure 284: The year by which the Cult wants its agenda points made in place.

be somewhat or totally sceptical, but still feel they have to go along with the farce for electoral or reputational reasons. This is what happens once the Cult has decreed and implanted the 'noem'. Even people who see through it are mostly too intimidated to say so.

Then there is the feeling that the orthodoxy wouldn't be repeated so incessantly if there was nothing to it. Not every fact may be true, this mentality says, but there must be some basis of truth or why would everyone keep repeating the same claims? Well, when a disease is (genuinely) spreading – in this case a perceptual disease – does everyone get the same disease? Yes. Everyone in the establishment was repeating that Iraq had weapons of mass destruction. Was there any truth to that whatsoever? No. Once people grasp that human-caused climate change and its alleged catastrophic consequences is a mega-scam – not some of it, *all of it* – the mist clears and the monumental deceit is in plain sight.

Wake up Wokers. You are being hypnotised, mesmerised and shafted and I care about that enough to take your abuse when freedom for the rest of your lives at stake.

Are you New Woke?

Whom the gods would destroy, they first make mad – Euripides

How strange that the gas of life is depicted as the gas of death while China, the world's biggest industrial producer of CO₂, is not the focus of Climate Cult outrage. China's emissions in 2019 were more than the United States, European Union and Japan combined and reportedly some 27 percent of the world total.

Outrage instead is reserved only for Western countries which, crazy as it may be, are making efforts to reduce their 'carbon footprint'. One commentator said of Greta Thunberg: 'I don't see her in Beijing or Delhi.' There is a reason for that. China is the blueprint for global control and must not be criticised by those who seek to globally emulate this New Woke utopia. Oh, no, New Wokers might cry, we don't want to be like China. The evidence proves otherwise. Demand after dystopian demand by the New Woke and Climate Cult mentality is straight from the playbook of the Chinese Communist Party and Stalinist Russia come to that – and so is every aspect of the 'virus' lockdowns. Chairman Mao who forced communism on China's immense population in 1949 was a Cult operative and in the decades that have followed the country has been the incubator for the global technological surveillance dictatorship. The Second World War was a Cult-manipulated Problem-Reaction-Solution that brought pre-planned colossal political change. China became communist; Stalin's Russia swept across Eastern Europe; Israel was established; and the United Nations and other globally-centralised institutions were created on the Tiptoe to world government. Brutal centralised political and military control in China had allowed the Cult's Orwellian society to advance more quickly than in the West where they still (until the 'virus' lockdowns) had to pay lip-service to freedom and 'democracy'. In China when they want to impose a new stage of dystopian control they simply do it (and now so does the West). If you want to see what is planned for the rest of the world tomorrow look at China today and therefore we have 'New Woke' billionaires and corporations owned by the Cult, including Google, working closely with the Chinese dictators while claiming to care about 'values'. A report in the *Wall Street Journal* described how US tech giants including Google

and IBM are supporting China's multibillion-dollar surveillance industry: US companies, including Seagate Technology PLC, Western Digital Corp. and Hewlett Packard Enterprise Co., have nurtured, courted and profited from China's surveillance industry ... Several have been involved since the industry's infancy. IBM was exposed for collaborating with the Nazis and their concentration camps (the Cult has no borders). The emulation of China in the West is now in overdrive thanks to the pandemic scam. China is where Maurice Strong ended up, the instigator for the Rothschilds and Rockettellers of the climate change hoax. We are led to believe that China is a self-contained entity and the Western world is on the other 'side'. Not at the Cult level they're not. Where did the 'virus pandemic' publicly start? China.

'Capitalism' is cartelism

A question quite understandably asked is why would the Cult and its One-percent which have secured predominance through capitalism want a global society based on communism and Marxism? It would appear to be a contradiction, but it's not. First of all the Cult wants its own form of centralised tyranny called a technocracy or government and control of society and industry by an elite of technical experts with no ballot box required. This is the global control system fast-emerging out of Silicon Valley. I will be explaining the background to the technocracy and for now I'll stay with the familiar communism/Marxism of which technocracy is a technological impensation and expansion. All are interchangeable with fascism. The experience for the population is the same – top-down dictatorship. A second answer to why the One percent would want a communist-type society when they appear to be 'capitalists' is that the Cult has secured global power through cartelism not capitalism. If you take capitalism to be a free market in which the most efficient, effective and creative win the day then that is absolutely not the world that we live in. When Cambridge academic Patricia MacCormack denounces the hierarchy of 'capitalism' as the problem and the reason that human existence must cease she is missing this very point. There are many flaws in leaving everything to the 'free market' and I don't believe that essential public services should be subjected to often vicious and people-destroying 'free-market capitalism'. Even worse, however, is when the market is not even close to being 'free' in the first place. The Cult is not interested in 'free' markets when it seeks complete control of everything. Instead it has constantly sought to impose its monopoly over every aspect of human life through ever-expanding corporations that destroy or buy-out opposition until capitalism is replaced by rigged-market cartelism. Prices are kept low to undercut competitors until monopoly is secured and then those prices (or censorship in the case of social media and

Google/YouTube/Facebook/Twitter) begin to soar. You don't like the new price? Too bad. Who else are you going to buy from? You don't like our censorship? Where else are you going to go? Limitless Cult money means that its corporations don't have to make a profit on the way to monopoly while 'competing' companies have to watch the bottom line and can't compete. Amazon, Google, YouTube, Twitter and Facebook are examples and we have the cartels of Big Pharma, Big Biotech, Big Oil, Big Media, Big Food, and so on. They become so powerful – and so lavish with their political donations – that they own governments no matter what politicians may say in public. Facebook's Mark Zuckerberg is 'questioned' on Capitol Hill by politicians that take Facebook political donations. It's called democracy apparently.

If you compare Cult cartelism with Cult communism/Marxism they are the same accumulation of power at the centre, or the top in MacCormack's hierarchy. Anyone think that the leadership elite in communist China don't live a vastly more privileged lifestyle than the rest of the population? Or that the same didn't happen in Stalinist Russia and every other Marxist utopia? Why do New Wokers think that communism/Marxism/socialism has been responsible for the deaths of some 100 million people amid mass-murder in Cambodia, Siberian gulags, and 're-education' camps of the Chinese Cultural Revolution? Western cartelism and Chinese communism are the same elite control systems with communism even more effective as an elite blueprint. Cartels in the West have to be manipulated into place through a sequence of acquisition and deletion of competition while with communism you have an imposed hierarchical structure of top-down control through which the government dictatorship enforces its will over everything and everyone. What is a communist/Marxist government except a single gigantic cartel? The Cult prefers communist structures for this reason and it is working to impose a technological version of that on the entire world with the climate change and 'pandemic' hoaxes as the predominant excuse for its imposition. Marxism is not 'government of the people' but government of the Cult with the added bonus of enforcement by a police/military state. Perhaps it may now dawn on New Wokers why a ruthless 'capitalist' (cartelist) like George Soros would pour tens of billions into New Woke and climate change organisations while saying this: 'I am basically there to make money. I cannot and do not look at the social consequences of what I do.' He's scammed you Wokers and big-time (Fig 285 overload). The perceptual game has been to sell the idea that you either believe in capitalism or communism/socialism. What they don't want you to know is that either way the Cult and its elite are always in control. Which 'polarity' do you want to rule you because either way it will be us. I coined the term in the 1990s of 'opposites' to describe apparent opposites that are in fact the



Figure 200: A man who sees the ploughs torn of billions into 'social justice' and New Woke groups worldwide? Don't worry - he's not playing for like a stringed instrument or anything.

Saudi Arabian fake royal family and the controlling networks of government, intelligence agencies and military in Israel with their serious influence on government, intelligence agencies and military in the United States and worldwide. I reveal in *The Trigger* the Cult background to Karl Marx and the creation of Marxism.

How New Woke was created

The Cult has established an army of naïve New Wokers to campaign for socialism, the don't-seem-the-children name for Marxism, and it has been coordinated through control of 'education'. Rebecca Friedrich, a 28-year teacher in the United States who also worked with teacher unions, has detailed in her book, *Standing Up To Goats!*, how those unions have been imposing political indoctrination on children. It turns out that this agenda is precisely what I am exposing to be the Cult agenda. Soviet KGB defector Yuri Bezmenov described decades ago in 1985 how a four-step technique works to subjugate societies for communism. He called the first stage 'demoralisation' which he said took 15 to 20 years and involves at least three generations of students being indoctrinated in schools and colleges with the desired perception and ideology while other information is suppressed and demonised. The ideology must not be challenged or questioned and accepted to be self-evident truth. Bezmenov said of the demoralisation stage:

Exposure to true information does not matter anymore. A person who is demoralised is unable to assess true information – the facts tell nothing to him. Even if I shower him with information, with authentic truth, with documents, with pictures, even if I take him by force to the Soviet Union and show him concentration camps he will refuse to believe it until he gets a kick in the back bottom [realises he has been had by a Marxist government taking over

same. Communism and fascism which are different names for the same basic control system are obvious cases. From this perspective you will not be shocked to hear that Karl Marx (1818–1883), the official originator of Marxism, was a Cult asset and gofer. In particular he was a front man for the major network within the Cult known as Sabbatian-Frankism which is represented by, among so many others, the

his country]. When the military boot crushes then he will understand.

I keep emphasising that when the dystopian society which New Wokers demand is in place they will be the first to feel its boot up their arse. Try doing what *Extinction Rebellion* does in London on the streets of Beijing. Yuri Bezmenov said of such 'revolutionaries of the people': 'They think they will come to power, but that will never happen, of course.' They are only Cult fodder to impose its will before they too, will be targeted or eliminated. It's already happening with feminists once high in the New Woke hierarchy now attacked for having the wrong opinion about transgender activists dismantling the freedoms of women. There are many areas and subjects on which I would disagree with Victor Davis Hanson, an American military historian and professor emeritus of Classics at California State University, Fresno, but he was absolutely right in an article in 2019 about the way 'revolutionaries' become the targets of their own 'revolution'. He said that 'liberalism and progressivism' (actually New Wokeism which has hijacked liberalism) will go the same way. Winston Churchill talked of how 'each one hopes that if he feeds the crocodile enough the crocodile will eat him last'. I tell the story in *The Trigger* about how the Jacobins were a Cult front which hijacked the French Revolution and were behind what is known as 'The Terror' in France in 1793 and 1794 which killed 17,000 'enemies of the Revolution'. Victor Davis Hanson wrote:

Once liberalism and progressivism give way to Jacobinism – and they often do, as we have seen in revolutionary France, China, and Russia – no leftist is safe from the downward spiral to ideological cannibalism. Yesterday's true believer is today's counter-revolutionary and tomorrow's enemy of the people ...

... the voices of the sane and the moderate are usually crushed in revolutionary cycles where extremism operates on its own logic and trajectory – until chaos and cannibalism finally lead even to the extremists' own suicide.

We have reached the point in Bezmenov's demoralisation where creations of the New Woke perceptual download are entering politics as with Congresswoman Alexandria Ocasio-Cortez and her Green New Deal Marxism. The influence of her mindset has turned the Democrats into the New Woke Party increasingly dominated by the likes of Ocasio-Cortez and the rest of the so-called 'Squad' – Representatives Ilhan Omar of Minnesota, Ayanna Pressley of Massachusetts and Rashida Tlaib of Michigan. The same has happened to the Labour, Liberal Democrat, Green and Scottish National Parties in the UK and their like across the world. This is certainly the case in Germany and Sweden

where New Woke parties have opened the doors to the Cult's mass migration agenda and dubbed anyone who questions the impact as Nazis, bigots and racists. US President Abraham Lincoln said: 'The philosophy of the school room in one generation will be the philosophy of government in the next.' Oh, how the Cult knows that. Bezymenov's demoralisation stage is followed by what he called 'destabilisation', 'crisis' and 'normalisation' by which time what would earlier have been dismissed as crazy is now the new normal and society is transformed. Can anyone really deny that this has happened in those same 15 to 20 years (actually even less) with the extremes of climate change hysteria, political correctness, censorship, mass immigration, and immensely expanded definitions of racism, sexism and gender? New Wokeness is calling for everything required for the Hunger Games world to become reality: Economic devastation, de-industrialisation and global control to 'save us from climate change'; political correctness to make the population silence itself to block exposure of what is happening; censorship of non-Woke information and opinions by Cult corporations cheered by New Wokers when before the Bezymenov sequence young people were protesting to demand freedom of speech; mass immigration and open borders to fulfil the Cult plan for divide and rule and deletion of countries; and the transformation of the sense of gender for deeply sinister reasons that I'll be coming to.

It may seem that I am condemning those that call themselves 'Woke' when actually I'm not doing that. I am not condemning the people, but exposing their actions and intentions which is a different thing. I understand why they do and say what they do. Their perceptions have been programmed from the day they were born and ever more emphatically as they have passed through the 'education' indoctrination machine. The programming has been merciless and unceasing and I have been saying for years that we are looking at the most perceptually-manipulated generations in known human history now technology and social media are employed to that end. It is amazing that so many young people have seen through the program given how fierce and extreme it has been and they must summon the courage to speak out and refuse to have their world and campuses transformed into tyrannies by New Woke insanity. Would you condemn a computer for doing what someone else has encoded it to do? This would be crazy and with the scale of today's human programming that analogy is valid. I am pointing out the consequences of New Woke behaviour and the facts that are kept from them. I am offering another way of viewing the world to maybe stimulate some self-reflection on how The Program is impacting upon society. I don't condemn them. I feel sorry for them for what they are being subjected to by a psychopathic and satanic system that cares nothing for their wellbeing and uses them as imposition

fodder.

Re-education is working

A poll of American 18-24-year-olds in 2019 found that 61 percent were open to a 'socialist society' and another found that 70 percent of millennials (born approximately between 1981 and 1996) would be 'somewhat or extremely likely' to vote for a socialist candidate. Two others found that 42 percent of Americans aged 18 to 39 would vote for a socialist president and that nearly 50 percent of young Americans would like a socialist government. The openly-socialist multi-millionaire, private jet passenger Bernie Sanders had young people as his support base to be the Democrat contender to face Trump in the 2020 election. He failed, but you can see the trend and 'socialism' (communism/fascism/technocracy) will be pushed even more in the wake of the 'Covid-19' hoax as we shall see. The other associated finding is that young people have a diminishing respect for capitalism. Those for socialism and against capitalism have their origins in 'educational' indoctrination (another version of communist 're-education') and in the economic consequences that the Cult has imposed upon them. First you tell young people that capitalism is capitalism and indebted them for much of their lives with student loans from 'capitalist' companies. This understandably turns them against capitalism which they mistake for cartelism while they are also indoctrinated at school and university into believing that socialism (communism/Marxism) is the panacea for all their ills. Marginalisation and misrepresentation of history purposely suppresses the horrendous reality of Marxist/socialist totalitarian regimes on the grounds that those who do not learn from the mistakes of history are destined to repeat them. After all, repeating them from the Cult's point of view is the whole idea and this time on a global scale. The Cult wants people to see how unfair society is because it adds to demands for 'change' in the form of socialist 'change' which is nothing more than changing the nature of One-percent control. The theme appeared to be further emphasised in a survey of 34,000 people by the US Zionist Edelman communications company across 28 countries in which 56 percent said capitalism is doing more harm than good. Damage done by cartelism masquerading as capitalism is far worse and I note that with capitalism (the misrepresentation of capitalism) as a target of the Cult this 'survey' and its findings were perfectly timed. The Cult both inverts the truth at every turn and seeks to present everything as a choice between black and white, literally and symbolically. You must choose between capitalism (cartelism) and socialism (communism). The fact that it's possible to protect the poor and needy (with a view to them not being poor and needy), have public control of essential services and a vibrant truly free market without cartel is not

something that enters the equation. Nor is the fact that devolving power from the centre for people to make decisions about their lives within their own communities is a nightmare for cults and elites when it denies them the centralisation of power essential for the few to control the many. Every solution is more centralisation when the opposite is the case (as usual). Global bodies should be vehicles for cooperation between countries and communities – not centrally-directed dictatorships.

Many New Wokers demand equality of outcome which is the death knell for freedom, vibrant creativity and drive. The Soviet Union had equality of outcome in that everything was shite for the general population. Equality of outcome always creates a race to the bottom which is what the Hunger Games Society requires to impose a world where everyone is equally poor and dependent on the One-percent to drop their crumbs. Equality of opportunity is surely what we should pursue with the understanding that not everyone is equally talented in every aptitude or skill. You can't do something if you can't do it. I repeat: You can't do something if you can't do it. This statement must be among the most unchallengeable you could imagine although not for New Wokers who leave rationality on the coat-hook when they enter any situation. To them everything is the result of discrimination, racism, sexism, homophobia, transphobia, any ism or phobia will do (Fig 286). It has nothing to do with ability, drive or expertise. A black woman actress not getting the part to play a white man is simply racism. It's the only possible explanation. Okay, that example is extreme, but when you see how far we have descended into New Woke insanity how long before that, too, is true? How more extreme is that than a bloke with a dick in Canada insisting that female staff at a women's beauty parlour wax his dangly bits because he chooses to self-identify as a woman? If I had said only a few years ago that schools around the world would have drag queens reading stories to very young children for the purpose of gender confusion and indoctrination people would have said that was too far-fetched and could never happen. Oh, yes it could – and is. Cult indoctrination and extremism has no limits. It was even claimed with extraordinary stupidity that Prince Harry's missus Meghan Markle was forced out of Britain through racism (New Woke orthodoxy) relating to her mixed race when in fact it emerged that she had been



Figure 286: Minor anyone!

GALLERY



The whole foundation of human control - isolation in the Bubble of perception.



Isolate them in the live-sense Bubble and then program perception with Cult sources of 'information'.

The Bubble

Color is the fact that devolving power decisions about their lives within the for cults and elites when it denies the essential for the few to control the situation when the opposite is the case. It be vehicles for cooperation between mutually-directed dictatorships.

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**WHOSE WHO SHOUT 'RACISM'
THE LOUDEST**



**ARE THE ONES MOST
OBSESSED WITH RACE**

the 28th. Where anyone!

NEIL HAGUE GALLERY



The whole foundation of human control - isolation in the bubble of perception.



POPER ©. net-robot.com

Isolate those in the livescreen bubble and their program perception with full sources of 'intrusions'.

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**THOSE WHO SHOUT 'RACISM'
 THE LOUDEST**



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NEIL HAGUE GALLERY



The whole foundation of human control - isolation in the bubble of perception.



Isolate them in the One-way Bubble and their program perception
 with each source of 'Information'.



The 'physical' world is a decoded projection of the sensfield world



We are constantly interacting with sensfield reality while appearing to be engaged in 'physical' interaction.



Through the collective field we are all One - be that with other people or the natural world.



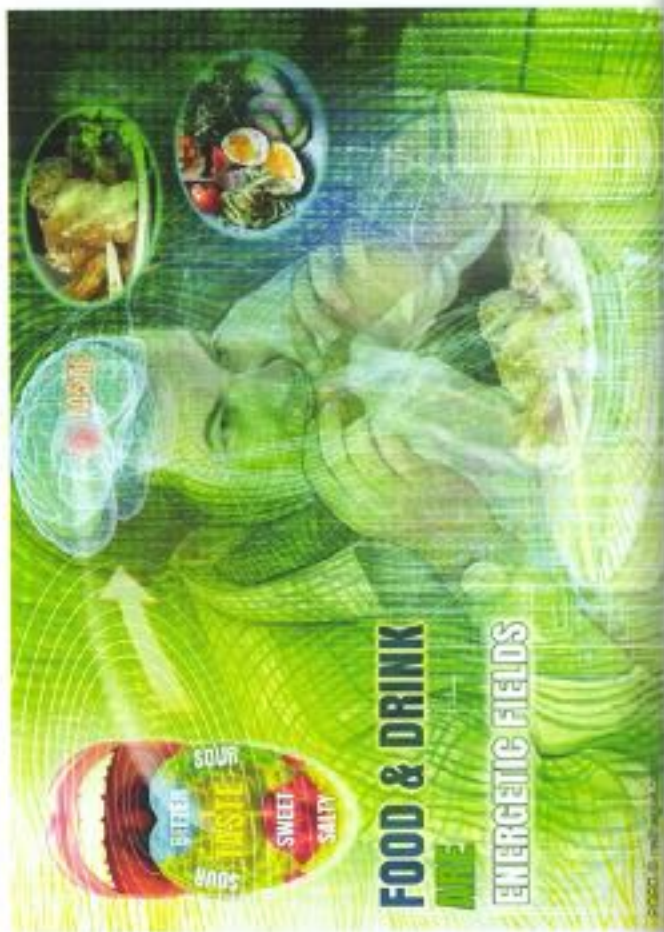
The 'physical' world is a decoded projection of the waterfield world.



We are constantly interacting with waterfield reality while appearing to be engaged in 'physical' interaction.



Through the collection field we are all One – be that with other people or the natural world.



We experience eating 'physical' food when in fact we are energetic fields absorbing other energetic fields. Healthy food has energetic substance while 'fast food' and processed food is energetically dead - hence its effect on the body.



Human wavefields connect with other fields through wave entanglement - we experience this as relationships of all kinds.



© 2011 by [unreadable]

What we call death is when wave entanglement between body and mind is released and our mental state of consciousness is subsequently released from the body's information-processing matrix. This is what near-death experiencers describe as their awareness dramatically expanding when they leave the body.



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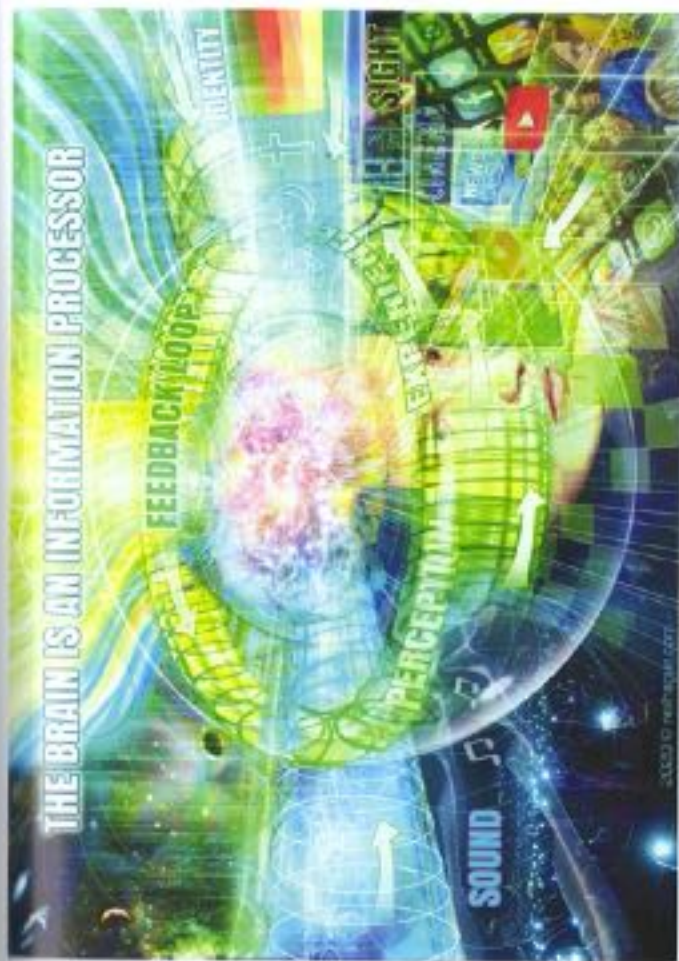
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HOLOGRAPHIC REALITY IN YOUR HEAD

WAVEFORM

WAVEFORM

The world we experience as "physical" only exists in that form when we decode waveform information into holographic information. The world is not external to us. It is within us.



THE BRAIN IS AN INFORMATION PROCESSOR

Perceptions create a self-fulfilling conscious and subconscious feedback loop in which we interact with The Field of possibility only within the frequency band that our perceptions represent.

HOLOGRAPHIC REALITY IN YOUR HEAD



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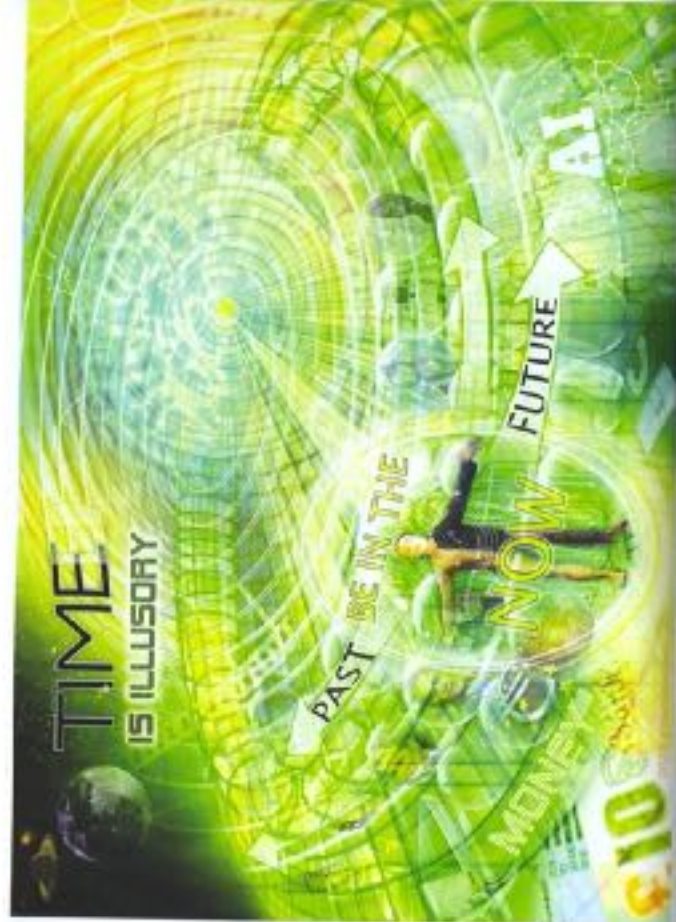
Perceptions create a self-filling conscious and subconscious feedback loop in which we interact with the field of possibility only within the frequency band that our perceptions represent.



'Past', 'present' and 'future' are only decoded perceptions. All is happening in the same NOW.



The One is the creator of all reality via its infinite points of attention – including us.



'Past', 'present' and 'future' are only decoded perceptions. All is happening in the same NOW.



The One is the creator of all reality via its infinite points of attention – including us.



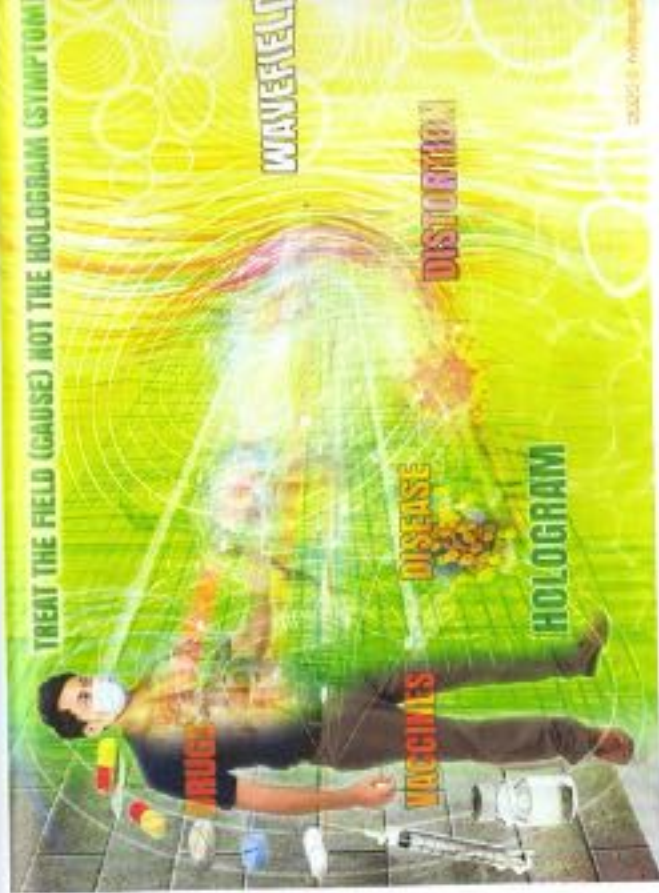
When Body-Mind disconnects from an influence of the greater self – 'Soul', 'Higher Self' – we are at the mercy of perceptions gleaned only through the five senses.



An imbalance or flaw in the body wavefield becomes illness in its cause – distortion – in the hologram. Wavefield balance = holographic 'health' because one is a reflection of the other.



When Body-Mind disconnects from an influence of the greater will – 'Soul', 'Higher Soul' – we are at the mercy of perceptions gleaned only through the five senses.



An imbalance or flaw in the body wavefield becomes illness or dis-ease – disharmony – in the hologram. Wavefield balance = holographic 'health' because one is a reflection of the other.

WAVES ACTIVATE THE GENES



Our mental and emotional state is transmitted as waves which can turn genes on and off that relate to those states. In this way our state of mind becomes 'genetic' consequences good and bad.

RELATIONSHIP WAVEFORM ENTANGLEMENT



Relationships of all kinds are founded on wave-entanglement and the attraction or resistance of 'vibes'.

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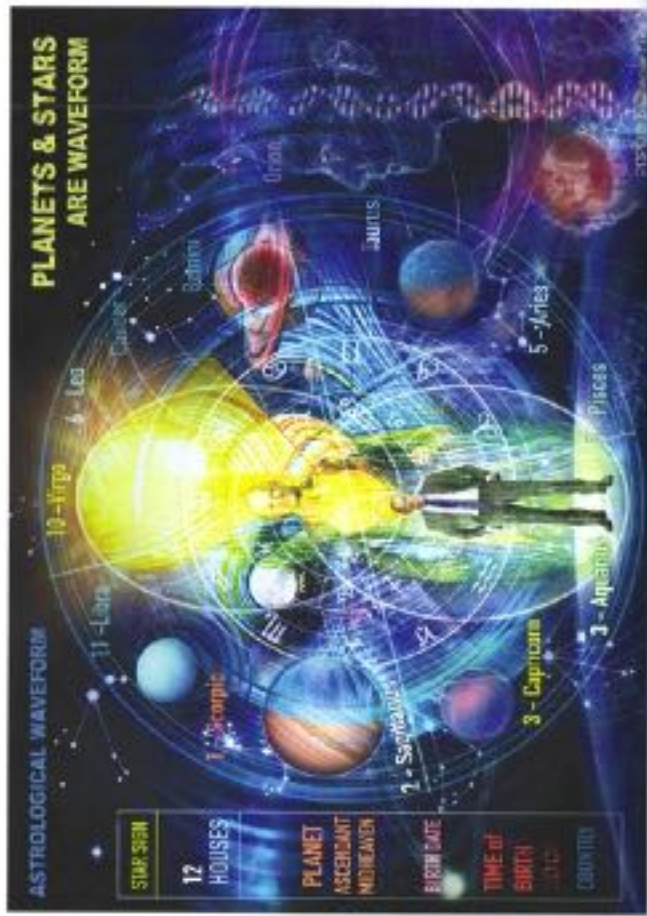
Relationships of all kinds are founded on wave entanglement and the attraction or resistance of 'vibes'.



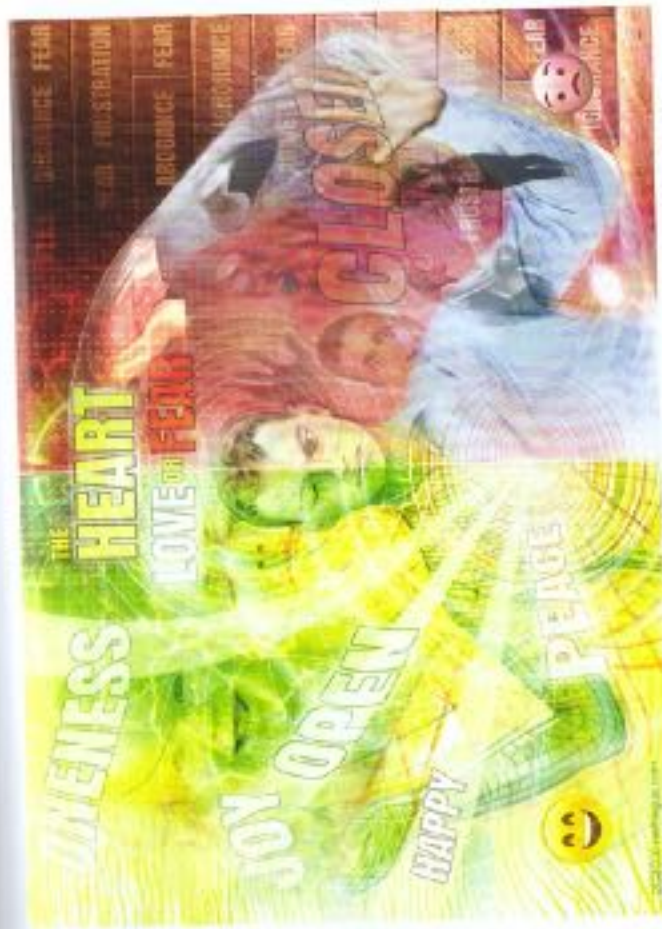
Astrology is founded on the impact of wave entanglement between frequency waves of planets and stars and frequency waves of people, animals and all life.



Closed hearts get us here. Open hearts will take us home.



Anthology is founded on the impact of wave entanglement between frequency waves of planets and stars and frequency waves of people, animals and all life.



Closed hearts got us here. Open hearts will take us home.

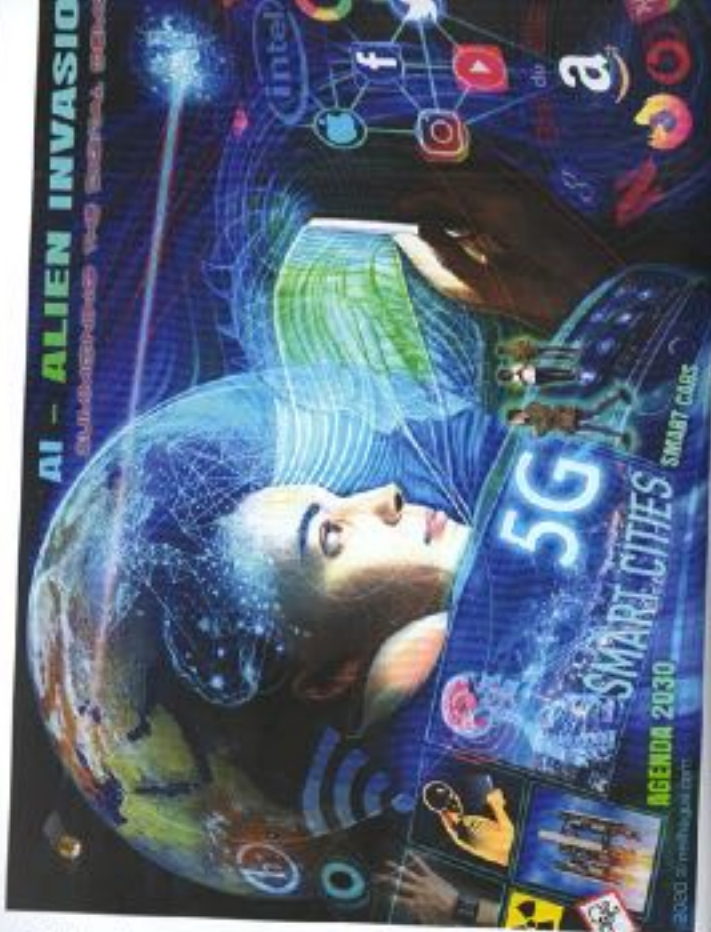


Smart technology and Wi-Fi are emitting waves of frequency that are entwining with human wavefields to create addiction and assimilate human frequencies into AI machine frequencies. Those that capitulate become ever more machine-like until they are machines.

planning the move to North America virtually all along. Lawyer Shola Mos-Shogbamimu, a monumental New Woker from what I can see, was doing the rounds of television studios (how very privileged) promoting this line of 'racism' against the mega-privileged private jet climate campaigner Markle. Mos-Shogbamimu describes herself as 'a political and women's rights activist who teaches intersectional feminism to female refugees and asylum seekers, scrutinizes government policies from a gender and diversity inclusion perspective, and co-organises women's marches and social campaigns'. Well, that just about covers everything. She was asked for examples of 'racism' against Markle and her reply was standard New Woke: 'Stop asking me – it's not my job to teach you about racism.' In other words she didn't have any. When a 'race and ethnicity lecturer' called Rachel Boyle claimed on a BBC show that Markle's departure to Canada was a result of 'racism' the British actor Laurence Fox told her: 'It's not racism ... We are the most tolerant lovely country in Europe.' Boyle responded: 'What worries me about your comment is you are a white privileged male.' We now live in a press-enter society founded on tidal-wave levels of brainwashing. When anything happens you press enter and New Woke says racist, sexist, transphobic or climate denier. Fox's reaction to the claim that he was an example of white privilege was right on the money:

Oh my God. I can't help what I am, I was born like this, it's an immutable characteristic: to call me a white privileged male is to be racist – you're being racist.

The New Woke mentality is permanently firewalled from that self-realisation and instead members of Fox's family were targeted for abuse and one was spat at in the street by an 'anti-hate' hater. Fox quit Twitter in the face of the abuse fearing it would damage his career and the ability to provide for his family. At the same time he was getting widespread support from the non-New Woke majority that don't have access to mainstream microphones. By far the largest number of people – even among the young most subjected to the programming – don't buy the extremes of New Woke. The domination of the media narrative and fake grassroots, elite-funded, astroturf groups give a seriously false impression of what the population in general believe. A black lady called June Sarpong, so oppressed by white privilege that she is the BBC's Director of Creative Diversity (don't ask), said of Laurence Fox: 'He couldn't possibly know what it's like to be a person of colour.' Nor could Ms Sarpong know what it was like to be a black slave in apartheid America or South Africa. Claims you often hear from New Wokers that racism is worse than ever today is such an insult to those who experienced full-blown slavery. There are imbalances that still need to be



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addressed – of course, there always are, and that is also true for white people; but to claim that racism today is more extreme than ever is so obviously a fantasy that it requires no further comment. Jordan Peterson, the Canadian clinical psychologist and professor of psychology at the University of Toronto, has attracted both widespread support and New Woke abuse for his defence of masculinity and true racial equality. He summed up the reverse racism that I am highlighting here:

The idea that you can target an ethnic group with a collective crime, regardless of the specific innocence or guilt of the constituent elements of that group – there is absolutely nothing that is more racist than that. It's absolutely abhorrent.

Hallelujah to that and you can see why New Woker racists hate him.

Press-on for crazy

New Wokers have been enslaved in software minds by those that encode the software with the required sense of reality. Codes go on being expanded into ever-greater extremes of ridiculous as they are literally guided through wave entanglement with Cult manipulation along the path to complete mental illness. Daily perceptual programming ('education') throughout their formative years has achieved this supported by their friends and peers affirming the programming that they have also been downloading. Major Internet information sources like YouTube algorithmically offer 'recommendations' that match their search history to discourage access to other information and opinions. New Woke students are described as 'snowflakes' over their demands for safe spaces where they can't be subjected to other views (Fig. 287). The cancel culture of de-platformed censorship achieves the same end of I am right never being subjected to challenge. I refer to the phenomenon as Generation Jelly although it's not really a generation (Fig. 288).

Large numbers of young people don't fall for it, but enough do and they are re-writing human society because they have the whole Cult-controlled system and establishment behind them. Demands for 'safe spaces' in colleges and universities are expressions of the fast-emerging monoculture myopia and the same with protests that ban or 'de-platform' speakers who have



Figure 287: Don't tell me anything I don't want to hear.

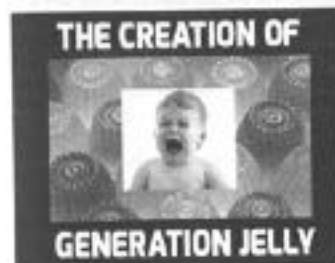


Figure 288: Obviously it is not a whale generation. Many young people have been born through the manipulators, but it's the others that dominate the microphones to promote the Cult agenda they don't even know exists.



Figure 289: WXXXXX! I only want to hear what I have been programmed to believe.



Figure 290: Being offended – the quickest way to hand your power to others.

a different view (Fig. 289). One commentator said: 'Very often we [New Wokers] cancel people, destroy people, for saying what everyone thought until 24 hours ago.' New Wokers become locked in an information bubble which becomes their perceptual Bubble. If all they see and hear is their own perceptual programming played back to them no wonder they are convinced as how right and all-knowing they are. We have the indoctrination of the New Woke belief and its imposition on the public by the New Woke Thought Police. The law is that no one must offend or upset those in the New Woke hierarchy of victimhood by saying anything New Woke does not agree with (Fig. 290). This perfectly serves the Cult agenda of destroying freedom of speech. Meanwhile, if you attack or criticise people and beliefs that are not in the official victim hierarchy (like white men and Christianity) you can be as abusive and racist as you like and the 'inclusive', 'anti-racist', mob will cheer you on. We all know how stupendously extreme the protection of Woke 'victims' has become to destroy human language and discourse in line with Orwell's Big Brother state. The breathtaking absurdity of PC 'transgression' is constantly

plumbing still new depths of extremism and ludicrousness. Some are so crackers that even Wokers call them 'microaggressions' which are defined by Columbia University psychology professor Derald Wing Sue as 'brief and everyday slights, insults, indignities and denigrating messages sent to people of colour by well-intentioned white people'. From what I have seen 'all white people are privileged racist Nazis' doesn't seem to be listed as a 'microaggression' never mind a macro one. Maybe I missed that meeting. Anything connected to another culture is now 'cultural appropriation' and this includes wearing a sombrero sold to you by a Mexican in a tourist shop. The Mexican wants to sell it to you, but Wokers say you should not buy it because they are offended on the Mexican's behalf even when Mexicans are not offended. PC is the world of victimless invented 'crimes' in which those not affected dictate what people should be offended about (Fig 291). This gathers momentum the more the victim culture manipulates through repetition and intimidation and the more people become offended about more and more things that didn't offend them before. Being offended by people demanding you are silenced doesn't count. To be offended is to hand your power to that which offends you and this is Planet Cuckoo when being offended is simply a choice. You can choose not to be. There you go – sorted. The professionally offended should have followed me around for 30 years if they want to see what ridicule and abuse is like. Have I been offended? No. I choose not to be offended by anything – least of all by ridicule and abuse from bubble-wrap minds. There is no more profound confirmation of your balance and self-security than being able and willing to laugh at yourself which New Woke can't do, so seriously does it take itself. I don't understand the sequence of being offended when I don't experience it. Someone says something you don't like or agree with. *Okay, and?* Have your say if you feel it's necessary (it usually isn't) and get on with your life. Why scramble your emotional state and waveland state by the irrelevance of being offended?



Figure 291: The 'you must be offended by everything' program. 'You're offended! Then choose not to be.'

Methodical madness

If we really cared about the wellbeing of children and young people we

would not be protecting them from things they are told to be offended about. We would be encouraging them to be strong, sovereign, individuals who don't give a shit, never mind take offence, at what anyone says to them or about them. New Wokeness is a virulent, contagious, psychological virus unless you are conscious beyond mind and the five senses. This is the reason we need to understand why New Wokers think and act as they do. They are prisoners of New Wokeness – a perceptual computer virus. Tim Hunt, a Nobel Prize-winning British biochemist, was vilified and had his career severely damaged for a so-called 'misogynistic joke' that turned out to be nothing like it was reported to be by a professionally-offended New Woker. What is said, or more to point *twat*, doesn't matter. How New Woke perceives what is said, while permanently scanning the environment for potential offence,



Figure 292: I'm against everything!!! (Image by Ben Cartman at Gregographics.com)

is all that matters for fast-asleep Wokers (Fig 292). A doctor in England praised a father for stepping in 'manfully' to bring his daughter for an appointment when his wife couldn't make it, but the doctor and his hospital apologised after the family complained that 'manfully' was sexist (the father was a man). It apparently implied that 'women are there to do the childcare' and not men. The complainants are deeply sad

people if they think saying 'manfully' to a man is a subject for complaint and all doctors seeing what happened will no longer be focusing fully on the medical problem of the patient. They will be carefully pre-preparing every statement in their mind before delivering the words. All over the world in every walk of life this verbal tenterhooks and eggshell-interaction is being experienced and destroying natural discourse, driving wedges between people, and causing ongoing daily anxiety with concern about anything you say. This is again what the Cult requires and New Wokers deliver. Here are just a few of millions of examples of discourse contraction that keep people in a state of constant anxiety to avoid saying the 'wrong' thing:

Oxford University's Equality and Diversity Unit tried to accuse people who avoid eye contact with others of 'racist microaggression'; transgender campaigners condemn such phrases like 'born a man' or

'born a woman' as inaccurate and offensive; 'biologically male' and 'biologically female' are deemed 'problematic' by a US gay rights 'media monitoring' group; Suffolk County Council in the UK stopped using traditional 'Cat's eyes removed' warning signs over fears that people thought real cats may have been killed to manufacture these reflective road safety devices; applause was banned by the National Union of Students' Women's Campaign over concerns that it could 'trigger anxiety' among nervous students with whooping and cheering also targeted. Instead people are told to 'applaud' with 'jazz-hands' which means waving your hands in the air silently like a bunch of prats; braided hairstyles on white people are 'cultural appropriation'; the word 'exotic' is apparently 'a major verbal microaggression' with 'nasty racial underpinnings' (sic neither); 'Fat-liberation activists' say the term 'fat' 'shames people' who might not fit the conventional beauty standards of our society', but if you are fat and okay with that you can 'reclaim' the word as your 'empowering identity'; a guide released by The New School, a private college in New York, said the size of chairs was deemed a microaggression against overweight people. I take it they mean chairs that are not big enough for fat ruses; Lucy Delap, a lecturer in British history at Cambridge, says that words including 'genius', 'brilliant' or 'fair' should be discouraged as they carry 'assumptions of gender inequality and also of class and ethnicity'. Ms Delap can at least be sure that no one will ever accuse her of being a genius; migrants entering a country illegally cannot be called 'illegal', but 'all white people are racist Nazis' is still okay; anyone who cooks and names their dish 'Jamaican Stew' or 'Tunisian Rice' while not being Jamaican or Tunisian is guilty of microaggressions in the form of 'cultural appropriation' which also includes any white woman wearing hoop earrings. People from Jamaica cooking an 'English breakfast' are fine, though. Phew; a student at Louisiana State University wrote that women styling their eyebrows to make them appear thicker ('eyebrow culture') is an example of 'cultural appropriation'; 'Mother' is a no, no, because it offends transgender activists. The British Medical Association advised members that mothers-to-be should be referred to as 'pregnant people' to avoid offence and 'celebrate diversity' if not sanity; any term that includes the word 'man' is definitely a felony you sexist bastard; singer Ellie Goulding was accused of racism after tweeting a picture of herself wearing a Native American headdress - 'Don't mock a dying race, you insensitive and ignorant excuse of a person' responded a Woker; referring to the United States as a 'land of opportunity' is a microaggression because it 'asserts that race or gender does not play a role in life's successes'; a lecturer at Harvard Law School was told by a student not to use the word 'violate' as in law violation on the grounds that it might trigger traumatic fears about rape; others said rape law

should not be taught to protect law students from 'distress'. These students are going to make super lawyers and judges then; Sussex University Students' Union warned against using the pronouns 'he' and 'she' to avoid assumptions about identity. 'They' and 'Them' are said to be the correct, gender-neutral terms. It's good that I don't go there because I'd tell them to stick it up their arse. This phrase avoids microaggressions by the fact that everybody has one - but give them time; 'Where are you from?' or 'Where were you born?' could be racist microaggressions according to the University of California, Berkeley, as 'a covert way to say you don't belong here'; the Student Federation at the University of Ottawa banned yoga sessions. Apparently they were Western 'cultural appropriation' of a practice with its origins in Indian Hinduism and there were 'cultural issues involved in the practice' that related to 'oppression, cultural genocide and diasporas due to colonialism and western supremacy'; Clemson University's diversity training decrees that to be told to be 'on time' is a microaggression as 'time may be considered fluid' in some cultures; a 'Seattle councilman' (shouldn't that be 'person?') expressed concern that hosing down human excrement on sidewalks might be insensitive 'because it brought back images of the use of hoses against civil-rights activists'.

STOP! STOP! Have mercy, please. Only a short while ago you would have been laughed into oblivion if you said any of these things would happen never mind that they would increasingly be the norm.

The dark side of ludicrous

It is easy just to shake the head, laugh and dismiss all this as monumental craziness with the usual 'political correctness gone mad' and not to see it as that relevant in the overall scheme of things. Oh, but it is. The tidal wave of insanity is transforming human society and discourse and rapidly re-writing the language in exactly the way that Orwell described in *Nineteen Eighty-Four*. Confirmation of the real intent comes with a \$1.5 million grant by the US military to develop a device to allow AI to identify 'microaggressions'. Why would the military with its focus on killing people be so concerned about people being upset by microaggressions? Well, of course, it wouldn't. Behaviour modification is the motivation in all of this. The money is being handed to associate professors Christoph Riedl and Brooke Foucault Wilkes to embark on a three-year project to develop a microaggression sensor. My timbers would be shivered if it doesn't already exist. Riedl said:

The vision that we have is that you would have a device, maybe something like Amazon Alexa, that sits on the table and observes the human team members while they are working on a problem, and supports them in various ways. One of the ways in which we think we can support that team is by

ensuring equal inclusion of all team members.

Put another way: Modify behaviour and give AI an ever greater say in decision-making until it is making all the decisions. Now the reason for such military (Cult) interest becomes clear. We are heading down a dark and dangerous road and we have reached the point where the *New Woke Independent* in the UK published a parody article it believed to be real calling for hate laws to be imposed on comedians who tell the 'wrong' jokes. The article was submitted under a fake name and not checked out even though its real author, comedian Andrew Doyle, said the content was 'clearly a hoax'. Doyle has become well known for his invented character of *New Woker* Titania McGrath through which he exposes *New Woke* extremism. The article was published suggesting comedians become subject to hate laws because it promoted the *Independent's* own stance. *New Woke* tyranny is now so extreme that parody is dying in the face of real life. An example is the British feminist writer Vicky Spratt who said that men who are not willing to date *Woke* women was an 'insidious' trend that will inevitably lead to women being killed by terrorists. How do you make men go out with women they are not attracted to – state-enforced dating? How about a Western version of arranged marriages? A confirmation of the sinister nature of the *New Woke* mindset and its imposition came from Kyle Jurek, a 'field organiser' for the openly-socialist Bernie Sanders campaign to be US president. Jurek was caught on camera by the Project Veritas undercover journalism operation saying this about America under a Sanders *New Woke* government:

Germany had to spend billions re-educating their fucking people to not be Nazis ... we're probably going to have to do the same fucking thing here. That's kind of what Bernie's fucking like ... 'Hey, see education for everybody', because we're going to have to teach you not to be a fucking Nazi.

Who decides what constitutes a 'fucking Nazi'? They do. Those decisions are made by black and white minds that are blind to context or shades of grey. It is or it isn't. You are or you're not. You are an 'us' or a 'them'. Tyranny was imposed by Orwell's Big Brother's police state in ways akin to the brutal and notorious Stasi secret police in communist East Germany which enforced the dictatorship and employed an army of spies among the population to inform on those who 'transgressed'. PC censorship, surveillance cameras and fingerprint/eye-reading technology in schools and colleges are specifically designed to make Big Brother tyranny the 'norm' so the adults that children and students become will accept the same norms in global society. Today colleges

have organisations under names like 'diversity units' that impose re-education PC orthodoxy on students while encouraging, even paying, other students to spy on their friends and colleagues and report PC transgressions to the authorities. This includes reporting academics for being non-PC in lectures and their comments. Many have been fired or forced to step down for the mildest of statements and as they have gone those that remain are frozen in fear of transgressing in any way. Britain's University of Sheffield announced plans to hire 20 of its own students to police language on campus that could be seen as 'racist' (opening your mouth is enough). They are being paid £9.34 an hour as 'race equality champions' to seek out microaggressions which it defines as 'comments or actions that might be unintentional, but which can cause offence to a minority group'. What about offence to a majority group? Oh, no, that



Figure 293: Inclusivity is not enough because that's not the Cult agenda.

doesn't matter. It's not about equality and inclusivity – exclusivity is what *New Woke* is after (Fig 293). Sheffield vice-chancellor Koen Lamberts, who will not have enough self-awareness to see that his policy mimics Stasi-like political tyrannies, said the initiative sought to 'change the way people think about racism'. More like simply changing the way people think as in East Germany, the Soviet Union,

North Korea and China. Among the university's targeted microaggressions is anyone asking why everything has to be a race issue and why people are searching for things to be offended about. Impose your tyranny and then make it an offence to question the tyranny. Another microaggression that must be stamped out apparently is 'being compared to black celebrities that I look nothing like'. I wonder when such people plan to grow up? Not soon, I'll wager.

The tyranny of 'I am right'

If *New Wokers* believe themselves to be all-knowing then everyone who disagrees with them must by definition be wrong or motivated by racial and sexual bias or other dark motives. The only right becomes *I am right* – there is no other possibility. *New Wokers* despise for this reason freedom of speech for those with different 'wrong' views. If *I am right* then it follows that those who disagree with me are wrong and what is the point of freedom of speech for those that are wrong especially when

humanity faces the existential threat from climate change and mortal dangers from rampant racism and sexism? Freedom of speech must be deleted to protect our freedom. It's so obvious and given that *I am right* it must be true. These attitudes have both been downloaded from a multitude of Cult sources and been further ingrained through the encouragement of narcissism and a sense of entitlement where me, me, me is the only show in town. These are some officially-recognised traits in what is termed narcissistic personality disorder. Observe the behaviour of extreme New Wokers and you'll see the stupendous correlation:

- An exaggerated sense of self-importance (*I am right*).
- A sense of entitlement (*I am right* and what I say must be acted upon).
- Require constant, excessive admiration (*I am right* and you must recognise that and look up to me as your moral and intellectual superior).
- Expect to be recognised as superior even without achievements that warrant it (*I am right* and what I say requires no factual basis. *I am right* is enough).
- Exaggerate achievements and talents (*I am right* because I am all-knowing).
- Believe they are superior and can only associate with equally special people (*We are right*).
- Monopolise conversations and belittle or look down on people they perceive as inferior (*I am right* and if you disagree with me you must be inferior).
- Expect special favours and unquestioning compliance with their expectations (*I am right* and you must do what I say – see Greta Thunberg).
- Take advantage of others to get what they want (*I am right* and so what I can *right* about must be enforced even if it means crushing people).
- An inability or unwillingness to recognize the needs and feelings of others (*I am right* and if you challenge that fact we will target you with abuse, demonisation, a Twitter storm and efforts to get you fined and destroy your life and your family's life).
- Behave in an arrogant or haughty manner, coming across as conceited,

boastful and pretentious (*I am right*, er, that's it).

- Become impatient or angry when they don't receive special treatment (*I am right* and you must dismantle the industrial system immediately no matter what the consequences because *I say so*).
- Significant interpersonal problems and easily feeling slighted (*I am right* and you say I'm not??).
- React with rage or contempt and try to belittle the other person to make themselves appear superior (*I am right* you moron).
- Difficulty regulating emotions and behavior (*I am right* and I get sooo angry when others say something different – they must be de-platformed. *Sleaze Bait!*).
- Experience major problems dealing with stress (*I am right* and I get so stressed when people won't accept that).
- Have secret feelings of insecurity and vulnerability (*I am right* and I won't have that questioned with facts in case you prove that I'm not).

Narcissistic and insecure and vulnerable? What a psychological combination. Narcissism is indeed a cover for insecurity. I feel so sad for them and how they have been perceptually and emotionally abused. Life behind the New Woke facade must be a psychological nightmare.

Save us from everything

New Wokers are now indeed so vulnerable that they demand 'trigger warnings' to warn them of anything upcoming in lectures or exams that might upset them. The 'anything' is closing in on the *literally* anything as young people are pressured to be upset and offended by an ever-lengthening list of perceived horrors and verbal transgressions (Fig 294). Trigger warnings alert the permanently anxious and fearful of something coming up in a book, video, lecture or stage play that might trouble them. This has now reached such extraordinary levels that trigger warnings



Figure 294: New Woker's permanent state

include: Theology students alerted to upcoming images and discussion of the crucifixion so they can choose to leave; archaeology students warned about any 'well-preserved archaeological body from an archaeological context' in case they find it 'a bit gruesome'; forensic science students warned before lectures involving blood patterns, crime scenes and dead bodies; Carleton University in Canada removed scales from the campus fitness centre to protect people with a special sensitivity to learning their weight. One student said: 'Scales are very triggering.' Don't bloody use them then. An article in the *London Guardian* listed some trigger warning subjects: misogyny, the death penalty, calories in a food item, how much a person weighs, terrorism, drunk driving, racism, gun violence, drones, homophobia, post-traumatic stress disorder, slavery, victim-blaming, abuse, swearing, child abuse, self-injury, suicide, talk of drug use, descriptions of medical procedures, corpses, skulls, skeletons, needles, discussion of 'isms', shaming, slurs (including 'stupid' or 'dumb'), kidnapping, dental trauma, discussions of sex (even 'consensual'), death or dying, spiders, insects, snakes, vomit, pregnancy, childbirth, blood, Nazi paraphernalia, slimy things, holes (don't ask) and 'anything that might inspire intrusive thoughts in people with obsessive compulsive disorder'. The *New York Times* reported that activists want many classic works to have trigger warnings printed on them like health advisories on cigarette packages. Shakespeare's *The Merchant of Venice* would need the label 'contains anti-Semitism' while Virginia Woolf's *Mrs. Dalloway* would require a warning that it mentions suicide. Chinua Achebe's *Things Fall Apart* is another book of concern which may 'trigger readers who have experienced racism, colonialism, religious persecution, violence, suicide and more'. The 'anti-Semitism' industry and Israel Protection Racket has even called for trigger warnings to be inserted in the Bible and Koran to alert readers to upcoming 'anti-Semitic' texts. The self-obsession and sense of entitlement is just extraordinary from self-appointed 'leaders' of 0.2 percent of the world population. The 'anti-Semitism' Protection Racket was New Woke before New Woke and has had a highly-significant role in creating it. Kent University professor Frank Furedi rightly calls the trigger warning phenomenon and its associated 'snowflake' mentality the therapy culture, therapeutic censorship and the medicalisation of need.

The term 'trigger' appropriately comes from the language of the mind control industry as I have been describing for decades long before it became part of PC New Woke culture. 'To trigger' refers to key words, phrases or sounds that trigger or activate pre-programmed 'Manchurian Candidate' behaviour by mind-controlled assets of government/military/intelligence agency mind control programmes like the infamous MKUltra in the United States. We need to face the fact



Figure 290: You need protection. Give me your liberties and leave the rest to me.

your power away to the perceived victimiser and look for state protection from them often in the form of censorship (Fig 295). Victimhood is worn like a badge of honour by many New Wokers and allows the ongoing life dramas of the grievance, victim culture in which so many permanently live. You say you're a victim? Well, choose not to be. You say you're offended? Well, choose not to be. Do that and see your power return. I don't wonder that New Wokers suffer from ongoing anxiety when they are manipulated to want protection from anything that moves and a lot that doesn't. Everything around them is potential danger from which they must be protected and most notably the perceived demise of the planetary ecosystem through climate change. The technique is to indoctrinate children and young people to fear an ever-lengthening list of dangers and then have them demand that Big Brother authority protects them from the big bad world (Fig 296). This is the real reason for the 'Health and Safety' culture in the UK



Figure 296: I demand you take away everybody's freedom to see us from what you have told us to be frightened of and offended by. (Image by Ben Garrison at Geographics.com.)

for the sake of young generations that they are being subjected in schools and universities to systematic mass mind control and a major part of that is to have them perceive themselves as victims. New Woke verbiage is constantly focused on seeking out ever more reasons for victimhood. The Cult sub-text is that once you fall for being a victim you give

in which once everyday happenings are now perceived as highly dangerous. Words that people say are defined as a form of violence that require protection and this provides the added bonus of censoring people against the list of PC offenses and fears. Many parents mollycoddle their children and protect

them from all upset to the point where they don't have the emotional skin and skills to cope with life's challenges or anyone questioning their perceptual certainty. Writer Claire Fox, a former Brexit Party member of the European Parliament, said:

Why are we surprised that teenagers demand safe spaces? Historically, adolescents might have been risk-takers and adventure-seekers, but today we see children to perceive the world as an endlessly scary place. NGOs and charities [ultimately the Cult], in particular, promote panic ... Scared on a diet of disaster hyperbole, it's no wonder children grow up scared of their own shadows ...

... Today, parents go to ludicrous lengths to eliminate all risk from their children's lives. Inevitably this narrows their horizons and teaches them to be less daring. Health-and-safety mania means the young are denied resilience-building freedoms that past generations enjoyed, such as playing outdoors, climbing trees and walking to school unaided.

Fox said modern mollycoddling means that the young have been prevented from engaging in activities such as leapfrog, marbles and conkers while a child-protection industry actively encourages children to see potential abuse everywhere. Schools are surrounded by prison-like fences and systems which constantly infuse a perception of danger. Fox described how safeguarding has become the top priority in every organisation that works with children to the extent that parents are banned from taking photographs of their own children at swimming, galas and adults are only allowed into many parks 'if accompanied by a child'. She continues:

There is no mystery to the absurdities of the Steptord Student. Nor should we wonder at their sudden appearance. We – adult society – protect children from criticism and suspend our critical judgment in order to massage their self-esteem. We scare them rigid by 'vatschrooping' an endless list of fears. We make them hypervigilant about potential abuse from adults and their peers. We encourage them to equate abusive words with physical violence. And we have, in short, shaped our own overanxious, easily offended, consciously thin-skinned Frankenstein monster. We created Generation Snowflake.

Some students say that even being called a snowflake is dangerous to their mental health and there's a whole new industry specialising in the psychological health of children and young people in the light of so many being diagnosed with 'mental health problems'. Suicide among the young is soaring. There is a reason for all this – children and young

people in big numbers are being driven crazy by a merciless Cult-controlled system that wants to break their spirit and have them bow to its will for the entirety of their adult life.

In search of certainty

Insecurity seeks out certainty to placate that insecurity and from this comes the 'moral' and non-factual 'certainty' of New Wokeness. 'I am right' also includes 'I am nice', 'I am good' and 'I am ethical' – all with the proviso that anyone thinking differently must therefore not be right, nice or ethical (Fig 297). UK activist Jordi Casamitjana took his employer to a tribunal to secure the term 'ethical veganism' as a 'protected



Figure 297 Woke self-delusion.

philosophical belief'. He won the case – of course he did. Notice the 'protected belief' was not 'veganism', a lifestyle choice people have every right to make, but 'ethical veganism'. Casamitjana said this involved much more than not eating food with

animal ingredients. 'It's a philosophy and a belief system which encompasses most aspects of my life.' This is New Woke intersectionality. His lifestyle includes: Walking rather than taking a bus to avoid any 'accidental crashes with insects or birds' (so he never unknowingly stands on insects when he walks and never travels in cars?); on occasions that he does take a bus he avoids holding on to leather straps; and he doesn't eat non-meat figs because they are 'grown with a symbiotic relationship to a microscopic wasp' and so 'you [can't] be sure whether any of the wasp's larvae is still inside the ripened fig and therefore I consider consumption of figs to be inconsistent with veganism'. Will you tell him or shall I that everything is conscious? 'Ethical veganism' is not something that can be defined unless you credibly define 'ethical'. One person's ethical is another person's madness. The dictionary tells us that ethical 'pertains to or deals with morals or the principles of morality and pertains to right and wrong in conduct'. Who decides what is right and wrong? Who decides what is ethical? Casamitjana likely thinks it's ethical to demonise the gas of life and tell kids they are facing climate meltdown when I say that's seriously irresponsible and unethical.

To the New Woke mentality what they think and 'ethical' must be interchangeable. How could it be any other way? My view by contrast is that those who want their claim to be 'ethical' enshrined in law might benefit from checking out the definition of up-your-own-arse. Dr Jeanette Rowley, a vegan rights campaigner, said that in her direct experience 'veganism is a way of life that defines the vegan individual as much as someone saying, for example, they are Christian or Muslim'. New Wokeness is indeed a religion designed to eventually replace all the others. Rowley said 'the ethical vegan' [ow means the other by definition] makes a defining statement that their outlook on the world is grounded by justice, respect, duty, care and compassion in a community of sentient others, human and nonhuman, whom they do not wish to harm and whom they will endeavour to protect.' What about harming non-meat plant consciousness? What about the 'respect' of seeking to impose their life choices on everyone and in many cases abusing those who make another choice? What about potential harm to the health of converts when the idea that one food choice fits all is fantasy and at odds with the evidence? What about frightening kids into believing the world could end and telling them veganism is essential to saving humanity so your agenda prevails? What about the enormous numbers of bees and insects that die (along with animals) as a result of the artificial pollination (known as 'migratory beekeeping') herbicides and pesticides involved in most plant-based production? What about the devastation of human society and employment through ridiculous demands to curtail the gas of life that produces the very vegetation they eat? I could go on and a lot of things that vegetarians and vegans eat is absolute crap like soy and tofu. Once anyone claims a monopoly on being 'ethical' the hypocrisy and contradiction soon starts to unravel. They would put their case much more effectively if many were not so obviously convinced of their own perfection and self-purity. But, then, that is the very foundation of New Wokeness. Are they trying to convince the rest of us – or themselves?

Why facts are so dangerous

Narcissists are always insecure and vulnerable. Narcissism is a cover to hide their insecurity from other people and again most importantly from themselves. All the most outwardly and exagggeratingly self-assured characters I have met have been frightened little boys and girls behind the facade. Genuine self-security doesn't need narcissism when it doesn't need external confirmation or self-promotion of its sense of identity through the reaction of others. You agree with me and think I'm intelligent and wise? Okay. You think I am wrong and an idiot? Equally okay. Genuine security treats them both as twin imposters. It is insecurity that needs the facade of perceived security not least to

convince itself. In the same way *I am right* is terrified of being wrong and it's another reason New Wokers don't deal in facts. They are manipulated to perceive everything through the filter of emotion and moral superiority which is easy to induce. Facts are the sworn enemy of such emotional certainty and they have to go. New Woke congresswoman Alexandria Ocasio-Cortez captured the theme perfectly when she said: 'There's a lot of people more concerned about being precisely, factually, and semantically correct than about being morally right.' Without the facts what is there to be 'morally right' about? What is the bloody point of being 'morally right' about a human-caused climate disaster that is *not* happening? Facts immediately usher black and white perceptions into shades of grey and this is another reason why facts are so yesterday. How can you sell a belief in imminent climate mass extinction which isn't happening if you have to deal in facts? The impossible only becomes possible when you can lie and misrepresent while censoring those with a factual response that exposes *I am right* as utter bollocks. This technique can be seen everywhere with climate change, race, sexuality and transgender activism. It goes like this: When you cannot support your stance and demands with facts and would therefore lose the debate you shut down the debate with abusive labels, de-platforming and media censorship.

There is no need to factually justify your re-writing of human biology and that's good because you never could. Instead you assert that a man can be a woman and vice-versa by merely claiming to be so. You campaign to have professors of biology dismissed and their careers destroyed for saying otherwise. Once a few scientists and academics have been vanquished by the mob others will keep their head down or even patent New Woke claptrap to protect their careers and income. This has happened across a great swathe of subjects and situations as Yuri Bezmenov's 'demoralisation' has hurtled so fast to its 'normalisation'. In this way schools and college campuses have been invaded and overrun by Cult New Wokeness and places of alleged 'education' have become initiation centres for a lifetime in La, La Land. I saw a British 'social activist' (whatever that is) called Lee Jasper complaining that film producer Guy Richie should have had a 'broader social conscience and responsibility' over the content of a film about gangsters because it was 'not reflecting the kind of future which is of a more inclusive sense of British nationalism.' The fact that gangsters don't act like New Wokers and the film was about gangsters could not breach the New Woke filter which believes that everything should be portrayed as it would like it to be rather than as it really is. Facts are so lethally dangerous to the Cult's collective emotional reality construct that they must be censored and deleted. This is being done through the Cult's 'education', mainstream media, Silicon Valley and government legislation where only one

version of everything is allowed to be emphasised and eventually even heard at all. Put these aspects together of faith-based belief and unquestioning certainty with silencing the blasphemers and you have a religion. New Wokeness is a faith-based, facts-unnecessary, religion or cult which imposes its will by indoctrinating the congregation and accepting no dissent. Burned at the stake becomes a Facebook ban and a Twitter flogging. Jesus walked on water becomes the gas of life is a deadly pollutant and a man can be a woman simply by saying so. The Climate Cult, as a sub-division and in many ways foundation pillar of New Wokeness, is itself a religion as you would expect in such circumstances.

Systematic censorship

We return here to knowing the outcome and seeing the journey. The outcome planned by the Cult in terms of speech and information is that eventually no one will see or hear anything not sanctioned by the World State. We are heading there with quickening speed through Silicon Valley censorship of alternative information by Cult-owned billionaires (rapidly advanced since the lockdowns) while New Wokers break into applause (well, 'jazz hands') with each new extreme of silencing free discourse. I have described in other books the sequence going back to the Cult's (Rothschild) Frankfurt School of social engineering in the 1920s which led to the 'sudden' (long-planned) emergence of political correctness or 'PC'. Political correctness is a Cult ruse to manipulate the target population to silence itself. Who needs a sheep dog when the sheep keep each other in line? I have said that every facet of the New Woke agenda follows the Cult agenda and that, of course, is why the Cult has created and funded New Wokeness into being. Political correctness and the end of free speech is yet another example. Freedom of speech is the freedom to speak and while that exists the situation can never be reached where the public only ever see and hear what the authorities allow. Free speech would always have its say and expose the official narrative which makes free speech a locked-on target for both the Cult and its storm troopers in New Wokeness. We see why Cult-manipulated New Wokers have to be clinically-adverse to facts that challenge *I am right* and why they demand that such facts are censored. If it was about seeking truth all views and information would be welcomed from which truth could be discovered; but it's not about truth. It's about selling a truth for which facts would be fatal. Therefore facts and non-PC opinions must be silenced while fact is replaced by emotion-triggered 'feelings'. Facts or 'truth' are claimed to be only the norms of an oppressive state. These confident of their views have no problem with other opinions being heard and they know that free speech only exists when all views can be communicated, debated,

challenged and questioned. Anything less than that and there is no freedom of speech only freedom to conform to what is considered acceptable to the censors. Research at King's College in London found that one in five students, or 22 percent, say they can't speak their minds while on campus with 59 percent of those with conservative views reluctant to express them. The figures would be even higher as a percentage if the study had been focused only on non-New Woke students. Given that New Woke opinions are not subject to censorship when they parrot their orthodoxy they would believe that students are free to express their opinion. They are if you're New Woke, but try voicing a different one and see what happens. You are free to say what we tell you. You are free to do what we tell you.

The key is when speech is challenged. Is it before the point of delivery or after? The difference between the two is the difference between freedom and tyranny. I am not saying that people should be able to say anything without consequences such as urging violence against people and property. The question is when do you deal with it? The Cult wants you to believe that algorithms and other pre-post censorship should be used to stop 'unacceptable' views and information from ever being seen or heard; but who decides what is 'acceptable'? Well, the authorities do – the Cult in reality. The Totalitarian Tiptoe first makes a case for censorship that it believes most people would accept like, for instance, campaigning for terrorism. Once the precedent of pre-post censorship is set they roll out more and more reasons to expand its use – 'fake news', 'hate speech', 'upsetting people' and so on – with ever-widening definitions through the Totalitarian Tiptoe of what the terms mean and what can be censored in their name. The narcissistic insecurity of *I am right* provides the motivation to support the silencing of facts that would expose *I am right* as *I am wrong*. By contrast if speech is challenged after the point of delivery there could never be a situation in which authority could dictate what you could see and hear. It would all be out in the open and dealt with in the open. There are laws against incitement to terrorism and violence and they can be invoked without extremes to expand censorship into areas that are only silencing dissent and opinion. It would also mean that authority would have to justify its claims about speech in open debate and courtrooms instead of letting algorithms do it quietly without challenge. This could all be done so long as speech is challenged after the point of delivery and, anyway, don't we want to know who is campaigning for terrorism instead of pushing it into the shadows? The new definition of 'anti-Semitism' tells the story. A fair and accurate definition would be 'hatred and discrimination towards Jewish people for being Jewish'. This, however, does not preclude criticism and exposure of the far-right Sabbatian-Frankist-controlled government in Israel or the political philosophy of Palestinian-destroying Zionism. The

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Cult has expanded the definition to include both and protect the Cult and its agents. Ironically many New Wokers are critical on college campuses of Israel and its treatment of Palestinians and they are being censored themselves in a prelude to what will happen on a much bigger scale when their New Woke utopia is in place and they are no longer needed to demand it. Israel-owned and sponsored Donald Trump signed an executive order decree in late 2019 that added 'Jewishness' as a nationality to the list of prohibited 'discrimination'. This was specifically designed to ban criticism of Israel and Zionism, especially on college campuses, and at the same time Trump endorsed the new definition of 'anti-Semitism' which includes ... criticism of Israel and Zionism. The UK government of Boris Johnson has former Labour Party MP and ultra-Israel fanatic John Mann as its 'anti-Semitism' tsar to brand critics of Israel as 'anti-Semites'. Johnson has also passed laws to target the Boycott, Divestment, Sanctions (BDS) movement which calls for Israel to be boycotted over its apartheid regime that many New Wokers criticise. Be careful what you wish for New Wokers or you just might get it. In the case of criticising Israel you already have.

Who are you? I'm LGBTQIAPBISM

At the core of New Wokeness is self-identity. The above list of letters depicting ever-multiplying self-identities is actually used by an American University and with 26 letters in the alphabet and the possibility of using each one as many times as you like we are far from finished yet. Who are you? I am LGBTQIAPBISM. How far is that perceptually from being *All That Is, Has Been, And Ever Can Be*? The Cult must be laughing itself to sleep. A Liberal Democrat politician in the UK came out as a 'pansexual' in early 2020 which I can only think must relate in some way to the kitchen. There are so many reasons why the Cult instigated identity obsession and identity politics. Firstly it's about enslaving people in even tinier self-identity myopia than ever before. Imprisoning perception in only five-sense reality while firewalled from

expanded awareness is vital to human control. Before New Woke the Cult was limited to labels like man, woman, race, culture and religion to entrap five-sense identity and prevent expansion into identity with True 'I' – *The One*. The invention of identity politics gives the Cult limitless potential to sub-divide and

sub-divide those labels (Fig 298). With each sub-division people identify with ever-smaller and fine-detail-defined labels and senses of self that squeeze them into ever-smaller perceptual Bubbles and ever-greater disconnection from *The One*. How can you identify with the True 'I' when your sense of self is defined by a letter amid a daisy-chain of others? Why do people have to define themselves in such detail anyway which includes agender, androgyny, aromatic, asexual, bicurious, bigender, binder/binding, biological sex, bisexual, butch, cisgender, demirromantic, demisexual, genderqueer, gender variant, gynosexual/gynophilic, panssexual, queer, questioning and third gender? Who gives a damn? Decide how you want to live your life and live it. Why do people have to give that choice such a fine-detail name and even more why should choices that they have every right to make be imposed on the rest of us? In Britain a well-known TV presenter called Philip Schofield 'came out' as 'gay' after 27 years of marriage and such a fuss and circus followed. Why do we have to be told where he sticks his thingamajig? Who cares except him and his family? Get on with your life, it's none of our business. Another celebrity felt the need to tell us she had just had sex for the first time in five years? Why? Who could care less apart from her and the bloke involved? Narcissism enters the equation for sure with New Woke identity-obsession in terms of attention seeking, look at me, me, me, and what I want is how things must be. Whatever the individual reason may be to publicly identify with a sub-label the same result will always follow. Their Bubble of 'I-am-a' continues to diminish in size and perception and that advances the Cult agenda magnificently. Identity politics is encouraging people to identify the 'I' only with a sexual preference. Do people really believe that who they are is where they stick their dick? Or don't? Bloody hell. What have we come to? None of this is happening randomly. It's the Cult at work and I am happy to take the abuse from New Wokers for what I say when unless they make, instead of Woke, they and their children are going to live out their lives in a technological dystopia long after I have relocated to Infinite Forever.

Two other Cult motivations for identity politics are divide and rule descent into tribalism and the imposition of the Big Brother state (Fig 299). There are far too many people in the world for the



Figure 298: Little Ali becomes Little Me.



Figure 299: This, of course, is the whole point of identity politics.

Cult to control them all. They plan to do that soon by connecting the human brain to artificial intelligence, but for now they don't have the numbers to impose their will on a population on its way to eight billion if people would choose not to cooperate. They overcome this problem as they always have by manipulating people to control each other in line with the Cult agenda (something we have seen in abundance in the lockdowns). Divisions generated by New Wokeness are self-evident with the obsession with race, culture and sexuality which offer endless potential to divide the general population and even the sub-divisions of self-identity. We see this increasingly happening as the revolution consumes its children. The calling card of New Wokeness is to do everything that it condemns others for doing and there are many precedents for this with religion. Inquisitions in their various forms that persecuted, tortured and killed untold millions were orchestrated by alleged followers of 'gentle Jesus' and opponents of 'the evil Satan'. They were convinced of their self-purity and believed they were doing the 'work of God' while acting like the children of Satan and murdering men, women and children in the name of the 'Prince of Peace'. You could hardly imagine such an inversion or self-delusion, but had anyone pointed this out to the inquisitions they would never have seen the contradiction. The belief in their own self-righteousness would have firewalled any reappraisal or glance at the mirror. They were right and anyone who disagreed had to be deleted. It's what 'God' wanted them to do. We have moved on for now from burning at the stake, heated

metal pincers and thumbscrews and today's Inquisition goes for demonisation, vitriolic abuse and attempts to destroy the lives and careers of non-believers (Fig 300). The methods may have changed but not the basic mentality and ideology. It is still what I think that must be imposed on everyone.

Fake 'social justice'

A crucial self-deception required to enforce fascism while claiming to be 'anti-fascist' is to act with cold, heartless, intolerance and be quite happy to wound, hurt and destroy other people and their families while retaining a self-identity as someone kind, tolerant, full of love, coming



Figure 300: New Woke is now beyond parody.

from the heart, and caring deeply about 'social justice'. Woke 'tolerance' is a state of permanent anger and fury seeking out the 'enemy' with the 'wrong' opinions. Self-deception is such a foundation of the New Woke persona ('actor's mask') that advocates are widely referred to as 'social justice warriors' when their extremists and activists (as with their major funder George Soros) could not give a damn about 'social justice' any more than Cult operatives behind the Russian or Chinese Revolutions which deleted all vestiges of social justice. In the same way they are 'anti-racist' and 'anti-sexist' while being utterly obsessed with race and sexuality and viewing the entirety of human behaviour and interaction through that filter. They are themselves racist and sexist as they treat people differently based on skin colour and sex, but they will never see



Figure 301: Real inclusivity. The awareness that we are all One.

it. I should remind them again that race is only a label for a brief experience of the same consciousness that we all are (Fig 301). Woke activists don't actually do anything about social justice. They just use the concept to 'smash and destroy' and dance to the impulses of their software download. An Internet commentator described the difference between a

genuine activist in search of social justice and a New Woke 'social justice warrior':

Social activist: 'Oh look, there's no wheelchair ramp into that building. Let's build a ramp.'

Social justice warrior: 'Let's persecute the people using the stairs and make them feel bad for having legs!'

I do understand the approach, though. I mean why should social justice warriors waste their time campaigning and acting in pursuit of homes for the homeless, jobs for the destitute, food for the poor, and the end of wars of mass murder, when there are epic historical battles to be won over whether some bloke calling himself a woman is referred to as 'Her', 'They' or 'Them'? It's all about me, me, me, and my self-identity. There are many people on the genuine Left that do care about fairness and social justice and they have allowed themselves to be swamped and

hijacked by the social justice fakery of New Woke with its support and promotion by the entire establishment which in the end answers to the One-percent and the Cult. New Wokeness 'fights racism' by being racist; demands tolerance with stunning levels of intolerance; and 'fights hate' with hatred on its face and venom in its mind (Fig 302). They can no more see their inversions and hypocrisy than could the Spanish

Inquisition and are certainly not self-aware enough, informed enough, or with sufficient humility, to see that the same Cult behind the Inquisition is the force behind them. New Woke feminist extremists were asked on an Australian television show:

'When trying to bring about significant change when is aggression and violence a better option than assertiveness, strong argument and modelling the behaviour you expect of others?' *Never* would have been the answer if New Wokeness was the genuine article; but it's not. The first Woke extremist replied: 'When none of that other stuff works.' Another said that she wanted 'the patriarchy to fear feminism' and 'the most important thing for me as a feminist is to destroy patriarchy'. She also had a question: 'How many rapists must we kill before men stop raping women?' It was pointed out that in her reply there seemed to be a lot of 'smashing and destroying' to which she said: 'Yes ... to create a world in which I am not raped and murdered.' Neither of which had happened to her with the latter being self-evident. Make no mistake New Woke extremists are the Cult's vehicle to 'smash and destroy' democracy and freedom to clear the ground for the Hunger Games Society. As the extremists become ever more extreme they are insisting that other New Wokers share their expanding extremism or they, too, will become 'bigots, racists, Nazis and tools of the patriarchy'. Revolution, your children are served.

Destroying the language and censoring yourself

Advertisements are being infused with every aspect of the New Woke Cult agenda because people see them everywhere and they are a perfect medium for perception and behaviour modification. We have ads being banned for not having a woman in them; for using the term 'girl'; and for violating 'gender stereotypes' by showing a woman caring for a



Figure 302: I hate you for hating. Yep, well thought through, mate.

baby. We are told they must be more 'diverse' which means ignoring the world as it is and portraying the world as the Cult wants it to be. Muslim Mayer of London, the mega virtue-signaller Sadiq Khan, revealed the winner of the 2020 award for 'diversity in advertising' which included no white people (Fig 303). You see the theme. 'London's greatest strength is our diversity' said Khan without even a smear of



Figure 303: New Woke inclusivity. But once white people are vanquished they'll be coming for the rest of you.

irony. Notice how many mixed race couples are featured in advertisements. I have no problem with mixed-race relationships. I think it's lovely, but when that is consistently portrayed in mass-audience advertisements in a far greater ratio to what is actually happening there is perception manipulation at work. Human society is being reformed by hijacking popular culture and the language through political correctness which is a Cult creation destroying discourse and freedom of expression. Crucial to this is policing the language through which people communicate. Delete words used to articulate your opinions and how do you verbalise those opinions any longer? George Orwell wrote in *Nineteen Eighty-Four* about 'Newspeak' which replaced 'Oldspeak' in the Big Brother dystopia. Oldspeak is the former language which contained words to describe thoughts and opinions in detail while Newspeak is a highly-edited and censored language which deletes words describing detail and bans topics and subjects from discourse altogether. Newspeak is the language of today's political correctness deleting words through censorship of opinion in the name of hate speech, fake news, and microaggressions. As generation follows generation these words no longer need to be censored. They are lost in history and not even known never mind used. We think in words, too, and when all that is left are the bland, meaningless platitudes of PC-speak, the language is no longer there to even think in detail. Words in five-sense reality make thought possible. Control words and you control the population even down to how they think.

Politically-correct intimidation leads to the most insidious form of censorship which is self-censorship when the population chooses to remain silent and opinions and information that expose the orthodox disappear. With everyone a potential Stasi spy and informant – even

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family members – and with 24/7 cyber surveillance and microphones in smart televisions, smartphones, computers and even street lamps the fear of saying the ‘wrong thing’ to any person in any situation silences all except speech that conforms to the official narrative. This is further enforced by potential employers checking social media postings going way back to decide if someone is PC enough to be hired and others being vilified and fired as adults for posts they made as kids when often what they said then was not considered non-PC. Every aspect of this is designed specifically to chill unwanted opinion and debate and Wokears are the current Stasi before a real Stasi takes their place and targets them. Authors and publishers are even employing ‘sensitivity readers’ to check their text. You may have noticed that I don’t use them. Comedy has been destroyed by the PC Stasi and few ‘comedians’ have had the guts or self-respect to stand up against them. Celebrity Larvies fall over themselves to show they are New Woke. This is what happens once a new orthodoxy takes hold (see ‘climate change’). Celebrities and politicians desperate to be liked support and impose the orthodoxy to confirm their Wokeness and self-purity. They want to be seen as ‘good people’ by those who have also convinced themselves they are ‘good people’. These are the same ‘good people’ with closed hearts and minds who purvey hatred and destroy the lives of those who don’t conform to New Woke orthodoxy. Once you have a need to be liked as an end in



Figure 334: Ahh, the freedom.

itself, as celebrities and politicians do, your independence of thought and action is over. You no longer speak your truth, but only what you think will get a Facebook thumbs up. I have another approach. People don't like me? I don't give a fuck (Fig 304). Other New Woke PC ruses to silence the population are called ‘tropes’ and

‘dog whistles’. A trope is a figure of speech in which a word or phrase conveys a meaning other than its literal sense (or interpreted by PC zealots to have done so). A dog whistle is defined as ‘statements that appear innocent to the general public but use coded language to communicate a secondary message to an intended group’ (or interpreted by PC zealots to have done so). Almost anything that people say in criticism of PC-protected groups is now a trope or dog whistle to provide still more excuses to brand people racist and Nazi to justify

condemnation and censorship. A classic of the genre is that anyone who says an elite cabal controls the world is labelled an ‘anti-Semite’ on the basis of the ‘trope’ that Jewish people control the banking system, media and so on. The speaker does not have to mention Jewish people or even mean Jewish people. They get the abuse and censorship anyway because the ‘anti-Semitism’ industry and Israel Protection Racket always claims that this is what they mean. It’s another fraud to justify censorship which goes on being ever expanded. A writer in the *Canadian Jewish News* said it is ‘anti-Semitic’ to say that there’s a war on Christmas (it’s a trope) or to use the terms ‘New York lawyers (and bankers)’, ‘Hollywood culture’, ‘secularists’ and ‘internationalists’. Say any of them and you are an ‘anti-Semite’.

I am waiting for the anti-whaling movement to be condemned as ‘anti-Semitic’ for being a dog whistle for the Walling Wall in Jerusalem where Jewish people go to wall and sway back and forth. ‘Anti-whalers are really saying Jews shouldn’t wall – they’re anti-Semites!’ That’s too fantastic? Stick around. The world is not simply crazy any more. It’s clinically insane.

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I am waiting for the anti-whistling movement to be condemned as ‘anti-Semitic’ for being a dog whistle for the Wailing Wall in Jerusalem where Jewish people go to wail and sway back and forth. ‘Anti-whalers are really saying Jews shouldn’t wail – they’re anti-Semites!’ That’s too fantastic? Stick around. The world is not simply crazy any more. It’s clinically insane.

Why white people? Why Christianity? Why men?

Hating people because of their colour is wrong. And it doesn't matter which colour does the hating. It's just plain wrong – Muhammad Ali

The way New Wokeness and political correctness have appeared and taken hold with such lightning speed can only be understood by awareness of the Cult agenda for humanity. Cult/New Woke symbiosis is so blatant because one created the other. When you connect New Wokeness to the Cult everything falls into place. Here's a brief summary of only some of the goals they have in common:

- Centralisation of global power (demanded by New Woke to save the world from climate change).
- Censorship of all criticism and exposure of the Cult and its agenda for humanity (demanded by New Woke through political correctness).
- Enslaving perception in ever-smaller self identities (promoted by New Woke through identity politics).
- Divide and rule (promoted by New Woke through identity politics and the 'Law right' mentality).
- Transformation of Western society and the dismantling of its culture and way of life (promoted by New Woke through identity politics and open-door immigration from other cultures).
- Targeting of men, white people and Christianity for reasons I will come to shortly (promoted by New Woke through identity politics, claims of 'toxic masculinity', 'anti-racism' which is never applied to racism against white people, and anything goes in condemnation of Christianity while other religions are PC-protected).

- The creation of a no-gender, non-procreating human (promoted by largely unknowing New Woke and transgender activist extremists transforming the world into a no-gender society and indoctrinating children to question their gender when they otherwise would not).
- Disarming the American population before a coup by armed-to-the-teeth AI law enforcement and military (promoted by New Woke with demands for gun bans and confiscation that open the way for complete domination of the population by armed agents of government and a criminal free-for-all especially in rural areas which the Cult wants to depopulate).

There are many other aspects to the Cult agenda that New Wokeness serves magnificently and one is the AI technology endgame. Wherever you look the New Woke mentality and the Cult agenda are as one. All the aspects and sectors of New Woke are Cult agendas – climate change, racial division, sexual division, transgenderism and political correctness. Cult-serving New Wokeness seeks to paper over the cracks of the divisions and contradictions between its fragile minority group coalition through something called 'intersectionality' which is 'the interconnected nature of social categorisations such as race, class, and gender as they apply to a given individual or group, regarded as creating overlapping and interdependent systems of discrimination or disadvantage'. This means when translated from the Orwellian to persuade minority groups they are all united by oppression from society and white privilege and should unite to bring them down despite all that they don't agree on and compete with each other about. Intersectionality is the Cult working to unite disparate groups into a single force to transform society in its image. New Woke activists tend to move between these different 'sectors'. In the end it's all one agenda from the Cult's perspective. German New Woke activist Carola Rackete (how appropriate) personifies these interconnections. She was the 'sea captain' arrested for delivering migrants from Libya to Italy on the pretext of 'saving them' while the Dutch government under whose flag the vessel operated described what she was doing as 'not a rescue service but a ferry service'. Rackete next turned up as a climate change activist supporting Extinction Rebellion, spouting all the Climate Cult rhetoric, and demanding society be disrupted to save the world. She's a professional Woker in other words and there are legions of them. One other point about New Woke and LGBT etc. is the logo which is now everywhere of the rainbow colours. The Sabbatian-Frankist arm of the Cult has long developed through a false cover story a series of sinister and draconian laws that it wants to impose on the whole of humanity. This is justified on the basis that the laws were allegedly given to 'Noah' by 'God' and as Noah is the 'father of all post-flood humanity' they must be imposed on

everyone. They are called the Noahide Laws and see Appendix 2 for more background. The reason I mention them here is that their logo since way back before New Woke appeared features the same rainbow colours symbolising the rainbow in the Noah flood story. When you are as utterly obsessed with symbolism as the Cult is this is not a coincidence.

A whiter shade of male

New Wokeness and the Cult are targeting Western society which for all its many faults has been the freest region of the world. Remember those quotes from earlier by Hebrew 'Ray' David Touitou about the need to destroy European and Christian society before their 'Messiah' can come. The European Union is part of this operation, too. Communist/fascist countries such as China are already heading where the Cult wants the whole planet to go. The West is what the Cult has to change to bring about global dystopia. Climate extremists say nothing about China, the biggest producer of demonised CO2, while vehemently insisting that Western economies are destroyed. Australia won't build new coal-fired power stations because of the Climate Cult while Australian coal fuels power stations in China, India, Japan and other parts of Asia. The total annual carbon dioxide emissions of Australia are less than China's annual increase. The West is the target because it's the Cult's target. All of which brings me to the perceptual war on white people and especially white men. The foundation racial group of the Western world is white or 'Caucasian' and here you have the reason why every racial group is protected by political correctness censorship except white people. When abuse against one race is allowed, but no other, there is a name for that – racism. For those non-white people who think this is okay because it doesn't affect them I give you the words of Pastor Martin Niemöller about Nazi Germany:

First they came for the socialists, and I did not speak out because I was not a socialist.

Then they came for the trade unionists, and I did not speak out because I was not a trade unionist.

Then they came for the Jews, and I did not speak out because I was not a Jew.

Then they came for me and there was no one left to speak for me.

White people are being targeted to a large extent for being the dominant race of Western society which the Cult seeks to destroy. Were

that position held by another race it would have been targeted and the white race more PC-protected. 'Nothing personal, mate, it's just business' although I do think there are other reasons, too, for the Cult to seek the subjugation of white people. Once again we have the inverted hypocrisy of New Wokeness on public display and it is calculated hypocrisy by those in the shadows. We have even had calls for UK national parks to be made 'more diverse' on the grounds that they are 'too heavily weighted towards older, able-bodied white people'. These are landscapes where anyone is free to walk no matter what their racial or sexual background and it's their own choice not to do so if indeed that is the case. Those choices don't suit the agenda, however, and government funding for the parks becomes dependent on more diversity being artificially introduced. What would be the reaction if someone said that a place was 'too heavily weighted' towards black, Asian or Muslim people, or even young people? Reverse racism and hypocrisy is everywhere today and there's a reason for it.

Black singer Stormzy launched a scholarship to fund the fees of black Cambridge University students and good luck to him; but when philanthropist Sir Bryan Thwaites offered two leading private schools a £1 million bequest in his will to fund poor white boys it was turned down by Dulwich and Winchester Colleges for not being 'inclusive'. Thwaites made the offer in the light of white British boys performing worse at school than nearly every other ethnic group. They are less likely to attend university than their peers and they perform relatively poorly in exams. Trevor Phillips, a black former head of the Equality and Human Rights Commission, said poor white boys were 'today's educational left-behinds'. His racial fairness could only end one way and Phillips was later suspended from membership of the New Woke-hijacked Labour Party for 'Islamophobia'. To be banned or suspended by the Labour Party for racism these days is confirmation of your grip on reality. Kehinde Andrews, UK professor of Black Studies at Birmingham City University, director of the Centre for Critical Social Research, founder of the Organisation of Black Unity, and co-chair of the Black Studies Association (you get the race-obsessed picture), referred to Phillips as 'formerly of the Black community' because although you have a black face you are actually white unless you toe exactly the line of the New Woke tyranny. Sir Bryan Thwaites rightly asked: 'If Cambridge University can accept a much larger donation in support of black students, why cannot I do the same for underprivileged white British? The answer is that New Woke does not seek equality for all – while I do – because Wokeness is a Cult-driven agenda that in part is targeting white people as a means to transform Western society. Classic New Woke racist extremism is that the subjugation of black people in South Africa and Zimbabwe was disgusting (true) but black racists killing white farmers

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and their families in those countries under black rule today is okay and what they deserve (absolutely not true).

In a possible response to this racist denigration of a single race for being that race we have had posters appearing with the words: 'It's okay to be white'. One example in Perth, Scotland, was met with the usual storm of New Woke anger. The posters didn't say 'white is the master race' only 'it's okay to be white' - which it is, by the way. It's just a body. 'It's sickening and disgusting to know that people think like this' was one reaction and John Swinney, Scottish Parliament member for Perthshire North, said the signs were 'atrocious' - 'We must stand together to resist this unacceptable material.' Good virtue-signalling Mr Swinney. Well done you. I will take Wokers seriously when they have the same reaction to 'It's okay to be black', 'It's okay to be Asian', or 'It's okay to be Muslim'. Until then I will perceive them as what they are - reverse-racist hypocrites. I am against racism in every form and not only that which suits the Woke (Cult) agenda, thank-you. Significantly the local police said no members of the public had complained about the posters. Their existence had been made known to them (by New Woke activists no doubt) and they were investigating.

What has happened in Sweden and Germany through open-door immigration is the blueprint for the entire West. Swedish society as it had been for at least hundreds of years is already gone and what has happened is irreversible thanks to New Wokeness controlling the country. Neighbouring Finland is seriously Woke with 34-year-old Social Democrat Sanna Marin becoming the world's youngest prime minister in late 2019 heading a cabinet dominated by women (12 of the 19 ministry positions) and a coalition of four other parties all led by women with three of them under 40. Take an imbalance and reverse it is the Woke technique when ability and experience should be the criteria for government and not age, race or sex. Finland is another country feeling the chill on speech from political correctness for those who question events including the effect of immigration from other cultures on the Finnish way of life. What you can't talk about or criticise is always an aspect of the Cult agenda.

Yale University, home of the infamous US president-producing Cult secret society, the Skull and Bones, dropped a course on art history 'from the Renaissance to the present' due to the 'overwhelming' whiteness, maleness, and straightness of the artists according to a report by *The Yale Daily News*. Course instructor Tim Barringer told the newspaper that focus on Western art in a Western country was 'problematic' - a word much beloved of New Wokeness. Student Malhon Sorensen said: 'If you get rid of that one, all-encompassing course, then to understand the Western canon of art, students are going to have to take multiple art history courses.' That, mate, is the idea in this Cult-driven cultural

carriage. Students at Reed College in Oregon successfully campaigned to have all European texts removed from a humanities course and replaced by non-European books as a form of reparations 'for Humanities ... history of erasing the histories of people of colour, especially black people'. What a statement about the Woke mentality. To increase the amount of black history you have to delete white history. The fact that the Cult wants to delete white history is pure coincidence. American booksellers Barnes & Noble introduced a series of literary classics for Black History Month with non-white people on the cover - *Dr Jekyll and Mr Hyde* with a man wearing a turban; *Frankenstein* depicting the monster with brown skin; and *Juliet in Shakespeare's Romeo and Juliet* with brown skin and wearing a headscarf. These were withdrawn after it was pointed out that the text remained the same. The books were written by white people reflecting white culture of the time and how do you promote black culture and history by overwriting white history? Instead of changing white culture classic books you promote black writers portraying black culture. Ah, but if you do that you don't promote black history by erasing white history. You celebrate them both. This is not, however, the Cult's desired outcome. The theme can also be seen with Cult-controlled corporations like the ultra-Zionist 'investment bank' Goldman Sachs which announced in 2020 that it will no longer work on stock market laundries with companies that have only 'straight white men' on their boards. Goldman Sachs, which gives hypocrisy new meaning, is headed by a white man, Chief Executive Officer David Solomon, and the same white man theme continues with its finance chief, operating chief and international head. Solomon said at the One-Percent-First World Economic Forum in Davos that the no all-male policy would be imposed in North America and Europe, but not in Asia where diversity is even less prevalent. Well, grab a feather and knock me down. Whatever the company claims to be the motivation behind this it will not be pursuit of 'diversity' for the sake of diversity. Goldman Sachs was founded by Jewish white men in 1869 and most of its partners and almost all of its leaders have been Jewish white men ever since so spare me the sermon about diversity pl-ease. Goldman's stance is typical of thousands of examples of corporate giants dictating public and private policy outside the democratic process. This is the very foundation of post-democratic technocracy.

PC-free zone

White people, especially white men, and even more old white men (divide young from old) are all racists expressing 'white privilege' according to New Woke extremists. This includes white people sleeping amid the shit, disease and freezing cold on the streets of major cities. By contrast white billionaires of real privilege are fine to New Wokers so

long as they are funding 'progressive' groups and censoring 'bad people'. White homeless living on the street are 'white privilege' while privileged blacks like Democrat politician Cory Booker with his rich background and Harvard education are victims of white oppression. White people are all racists except those who ask for forgiveness for things that happened before they were born from non-white people who were also not born when they happened. An Internet video shows a white couple kissing the boots of members of the deeply-racist Black Hebrew Israelites group in penance for what their 'ancestors' did. 'They showing what it means to really salute a prophet and a priest,' one pathetic member says. 'This is a white couple here that's proving they are sorry for what their forefathers have done.' It's not the colour of the skin that matters, it's the colour of the heart and mind, and here you had a black man with the same heart and mind as those white psychopaths who oppressed black people and treated them with contempt. American 'civil rights' leader (hilarious) Al Sharpton is a New Woke hero with his rants and rhetoric against white people despite being a racist, crook, fraud, promoter of transnational corporations, and FBI informant (code-name 'CI-7'). Even super-Woke Vice.com described him as 'a world-class scumbag with criminally under-acknowledged ties to the Mafia'. Wherever there is high-profile racial tension Sharpton is there seeking out the nearest camera to pour fuel on the fire. He has rightly been described as a 'racial arsonist'. No matter that he doesn't give a damn about rights for black people. He attacks whites and that's enough for New Woke. Sharpton was an advisor to President super-fraud Obama who with typical Obamaesque poppycock lauded him for his 'commitment to fight injustice and inequality'. Democratic presidential candidates get their tongues out to secure Sharpton's blessing in pursuit of the black vote that largely can't stand him. Black people who reject New Woke (most of them) know a fake when they see one. Great numbers of black people see through it all and realise that to judge anyone by their colour, including white people, is racist, ridiculous and divisive (on purpose). Black and other non-white people born or settling in the West who want to protect its culture are considered 'enemies of the revolution' as are gay and transgender people who don't support the hysteria and impositions of the mindless fake revolutionaries. It's amazing how many New Wokers come from white comfortable or wealthy financial backgrounds while posing as oppressed (privileged 'victims') or promoting themselves as the heart-on-the-sleeve voice of the truly oppressed without permission or the personal experience to do so (Fig 305). What if the minority doesn't want them as its spokespeople or isn't offended by what New Wokers insist they should be? That's just too bad. *I am right - we know best* (Fig 306). The way minorities are patronised by New Woke is extraordinary.



Figure 305. It's all about me.

**WEAR YOUR HEART ON YOUR SLEEVE
AND IT'S ONLY THERE FOR YOU**

- DAVID ICKE

Figure 306. Love is truly expressed by deeds, not words, and certainly not by circum-signalling.

grotesque historical peak and pins the blame on the entire white race and male population for things done by the few before most white people and men today were even born. Richard Fochtman, a US Democrat candidate for senator, was caught on a phone camera criticising the alarming increase in suicides by white men. He said: 'Today I saw a thing and it said a lot of men, white men, were committing suicide, and I almost thought, "Yeah, great" - then I thought about it little more, and I thought maybe I shouldn't say that out in public.' Some of his audience actually laughed. Donald Trump asked in response to the comments: 'What kind of animal is this?' Fochtman described him with the usual New Woke irony and deleted self-awareness as a 'racist'. It is also relevant to note that Fochtman is Jewish. Think what would have happened had someone celebrated the suicides of Jewish men? The statement would have been dubbed 'hate speech' and could possibly have led to a prison sentence. What happened to Fochtman? Nothing. Jewish writer and professional racist Noel Ignatiev, who died in 2019, was co-editor of *Race Traitor*, a journal founded on the belief that 'treason to whiteness is loyalty to humanity'. Ignatiev said: 'Make no mistake about it: we intend to keep bashing the dead white males, and the live ones, and the females too, until the social

Group dynamics

There's no perception of individual behaviour or circumstances irrespective of race (real non-racism). Everyone has to be judged as a group. This group bad - all other groups good. The fact that this is what the Cult wants to divide and rule is another pure coincidence and

absolutely nothing to worry about. Cult-manipulated New Wokeness takes a genuine oppression such as disgusting white-instigated black slavery and male domination of women and presents it both as far worse now than it was at its

construct known as 'the white race' is destroyed – not 'deconstructed' but destroyed.' I ask again: What would be the response if someone said that about the 0.2 percent of the global population that is Jewish? But then when Israeli rabbis have no consequences for saying that slaughtering Palestinians gets Jews closer to God and killing them is a 'religious duty' you know that anything goes so long as you are either not white or ultra-Zionism doesn't like you. There is a clear and obvious agenda to target white people and to deny that in the face of the evidence is to dig a hole in the desert and insert your head.

Saira Rao, a 'first generation Indian-American activist' and former Colorado congressional candidate, hosts something called Race2Dinner – 'a place to start thinking through how you actively uphold white supremacy every minute of every day'. This means, apparently, self-loathing white women programmed to hate themselves and their race paying \$2,500 to attend dinners where they are castigated by Rao and her mate Regins Jackson for being racist. One jabbering attendee apologised for apologising with this perspective: 'I want to hire people of colour. Not because I want to be ... a white saviour. I have explored my need for validation ... I'm working through that ... Yeah. Um ... I'm struggling.' It's re-education and women of all 'colours' would benefit by giving this pair of prats the finger and getting on with their lives. I went to the Race2Dinner website to be met by a massive headline saying: 'White women. Let's talk racism and your complicity.' Saira Rao is so New Woke it's beyond parody. She does, however, provide an insight into the mentality and its contempt for white people. Among her gems is that 'private messages of support is another form of white supremacy'; the helicopter crash that killed the black multi-millionaire basketball legend Kobe Bryant and his daughter was somehow connected to Donald Trump, racism and bigotry; and that 'white women's obsession with "being nice" is one of the most dangerous tools of white supremacy'. There is added irony is that Rao's India is a seriously racist country with the caste system still alive and well despite claims to the contrary. The UK Daily Mail exposed how dating website Shaadi.com, which claims to be the top site for Indian singles, insists that users state their caste or 'sub-community' when they join. The Mail said:

It was discovered that a profile set up by a Brahmin, who are elite in the caste system, would not be offered potential matches from the lowest of the social divisions – the so-called untouchables, officially known as 'scheduled caste'.

But, no, you can't be racist unless you are white. The sight of non-white extremists acting with the same state of mind as white extremists while thinking they are somehow morally 'superior' is a real head-shaker. We reached another stage that was always coming in 2020 when the Climate

Cult was declared 'too white'. German-based Filipino climate activist Karin Louise Hermes said she left the movement because of its whiteness and lack of intersectionality: 'Anti-racism and anti-capitalism need to be made part of organizing ... If "Green" policies fail to consider anti-racism and migrant rights, how is any person of colour supposed to feel voting for them or organizing in the same spaces? How about to protect the planet if you really believe it is on the brink? Instead she was off into the sunset indignant that the Climate Cult was not paying enough attention to what 'whiteness, capitalism, and inequality have to do with climate change' (not caused by humans). Open the window will you? I need some air. No, scrap the window. Make that a large gin.

Woke is not a joke

We have long passed the point where just laughing at such idiocy is not enough as it increasingly becomes public policy. Filmmaker and world class New Woke virtue-signaller Michael Moore said that white men are not good people and 'you should be afraid of them'. That, I take it, includes him? Moore warned on the so appropriately named Useful Idiots podcast that people should cross the street if they see three white men approaching because at least two would have voted for Donald Trump. The legend in his own mind, but no one else's, said:

Two-thirds of all white guys voted for Trump. That means anytime you see three white guys walking at you, down the street toward you, two of them voted for Trump. You need to move over to the other sidewalk because these are not good people that are walking toward you. You should be afraid of them.

Moore has turned talking mind-numbing bollocks into an art form to match his 'anti-establishment' films that exquisitely serve the Cult agenda. The desired psychological consequence of all this is that white New Wokers tend to hate themselves for being white. They wallow in emotional states of self-loathing and wish they had been born into one of their oppressed minorities. Democrat presidential candidate Elizabeth Warren was so desperate to be seen as a persecuted New Woke minority that she hilariously invented Native American ancestry that didn't exist and a story about her discrimination for being a woman that never happened. In fact, women are hardly a minority with their numbers close to those of men. The New Woke rule is that not only should white people be hated they should hate themselves and spend the rest of their lives paying penance and begging forgiveness for things they didn't do. The body, no matter what the colour or background, is only a vehicle for the consciousness that we all are. This makes racism and New Woke reverse racism absolutely child-like. How easy it is to see within New

Wokeness the Cult agenda for disconnecting humanity from the awareness that we are all One. How inverted genuine equality has become in the New Woke fake 'Left' since civil rights leader Martin Luther King said this in his 'I have a dream' speech in 1963:

I have a dream that my four little children will one day live in a nation where they will not be judged by the colour of their skin, but by the content of their character.

So do I, but, if you're white, New Wokeness does not. Is it really yet another coincidence amid this psychological New Woke war on white people that testosterone and sperm counts are plummeting in Europe and North America along with Australia and New Zealand? Even CNN ran an article highlighting the fact that 'total sperm count in North America, Europe, Australia and New Zealand dropped by up to 60% in the 38 years between 1973 and 2011' with the trend continuing to present day. 'If sperm was an animal, science might worry that it's heading toward extinction in Western nations,' the article said. No one knew for sure what was causing this, the article continued, but it had been blamed on processed foods, chemicals in food, radiation, air pollution and water. All of which lead back to the Cult with smartphones in trouser pockets right up there along with the ever more significant 5G.

♪ With the cross of Jesus taken off the door ♪

Western culture is founded on Christianity and that doesn't mean, of course, that everyone is a Christian. I'm certainly not. It means that the architectural and intellectual influence of the Christian religion has been the backdrop to the development of Western society. Christian influence and legacy is weaved into the fabric of the Western way of life. Now, with the Cult targeting Western society, we can see why political correctness protects from criticism and exposure every religion *except* Christianity as with every race *except* white. New Wokeness has become ingrained so quickly that even stalwarts of the Christian religion like the UK Archbishop of Canterbury Justin Welby have become advocates of the very Woke/Cult agenda that seeks to destroy their religion. The major Christian festival is Christmas (ironic because it's a pagan midwinter festival), but because Christmas is associated with Christianity it has to be targeted by the Cult and its Wokers to the extent that saying 'Merry Christmas' is now code in the bewildered mind of Woke for 'white supremacy' (Fig 307). US Supreme Court judge Neil Gorsuch found this out when he uttered the deeply offensive, clearly Nazi, greeting on television in 2019 and faced a backlash. A British mother said she was 'shamed' for saying 'Father Christmas' (indicating a man) instead of the 'gender-neutral' term 'Santa' (which is an anagram



Figure 307. Christian festivals must go – but don't you dare criticise anyone else's you Nazi.

mother told a newspaper she felt 'on edge' in the wake of the criticism. Fortunately, I have a cure for that which goes like this: 'Don't be so bloody ridiculous.' There, all sorted, with no need at all to be 'on edge'. Non-Christian religions are allowed to practice their festivals and rituals in Western countries without any push-back or interference and they should be if they operate within the laws of the country that reflect the values of the country. It's the bias for one and against another that I am highlighting and the reason for it.

Attempts to indoctrinate children into non-Christian religions in Christian-dominant or secular countries can be seen in places like Sweden among many others. Furious Swedish parents reported how teachers at their school told pupils to kneel on prayer mats facing Mecca while the class was divided by gender with girls told to gather at the back of the room. What uproar there would in the media if Muslim children were told to practice Christian rituals against the will of their parents. The school said it was 'role play'. *Bullshit*. Anyone with a brain knows what it is. A further reason for the assault on Christianity (and in the longer term all current religions) goes much deeper. I don't support any religion, but for all their many flaws, faults and misrepresentations, they do accept the existence of another power or reality beyond human. Some even describe their 'God' in terms of light and love while obscuring that simple fact with a tsunami of ritual, rules and regulations. Religions were created as an interim step between the many ancients who understood reality in a much more expanded way and the Cult's end goal of isolating humanity in a sense of reality in which only the Bubble is perceived to exist. The interim Tiptoe has been major religions that believe in another force outside the Bubble and yet worship this as an external, dictatorial, judgemental God and not as the non-judgemental whole of which we are all an expression. In other

of Satan). The last time I looked the mythical figure with the beard and sleigh was a man – hence Father – and had not yet transitioned into a lady in red stockings called Geraldine. The 'shamed'.

words we are not 'God' and must only do what 'God' wants. What does God want? The priests will tell you, or rather the Cult will.

The endgame is to remove any concept of another force beyond human reality and 'New Woke is being used to achieve that end in Western countries by targeting its major religion of Christianity. Recent polls reveal how successful this has been. In 2009 the percentage of Americans who identified as Christians stood at 77 percent; by 2019 it was 65 percent. Among Democrats, a political home of New Woke, the fall is even more extreme with 72 percent becoming 55 percent. Those considering themselves 'non-religious' increased from 17 percent to 26 percent. The most significant figure was not polled: What do those who say they are non-religious believe instead? I am not religious in an organised, bricks-and-mortar-religion sense, but I do accept the reality of a state of Infinite Awareness of which we are all part. The Cult wants those who consider themselves non-religious to instead believe in a random mechanical universe in which 'nature' has to be conquered by scientists and experts of the technocracy. You will see when I get to the technocracy that this is of crucial importance to the Cult. I also see the dominos starting to fall towards the ultimate end of the British monarchy – the monarch is the official head of the Church of England – with what has happened with Prince Andrew, the buddy of mega-paedophile Jeffrey Epstein, and with New Woke self-obsesses Prince Harry and Meghan Markle heading for the airport and relocating to North America. The concept of royalty has served the Cult magnificently and I would be delighted to see it disappear. We have to be streetwise, however, over why suddenly it is taking such potentially mortal blows in the closing years of Queen Elizabeth. Royalty and all its trappings, history, ceremony, buildings, and central influence in law, is, as with Christianity, running through the very fabric of British culture – the culture the Cult wants to destroy to allow assimilation of British society into its global monoculture technocracy. Even the royals are dispensable for the cause when necessary and the Cult agenda enters a whole new stage.

Toxic masculinity

New Woke portrays non-Woke men as demons and purveyors of 'toxic masculinity' in the promotion of another Cult agenda. Men and women are being driven apart with the #MeToo movement employing the usual Cult-encouraged New Woke extremism of blaming every man for the actions of a few like ultra-Zionist former movie mogul Harvey Weinstein. He abused women so all men are to blame. Many men now watch every word in the company of women and seek to avoid being in a room alone with them in case they are accused of something. This is seriously damaging male-female interaction as it is meant to (Fig 308).



Figure 308: New Woke is driving men and women apart on the Tptoo to ending all gender and male female prostitution. (Image: Gareth Isid.)

Advertisements are employed as usual to sell the required perception of men in abominations like the Super Bowl maximum-audience ad by Gillette, owned by elite corporation Procter and Gamble, which was a blatant attack on men and tarred them in their entirety with 'toxic masculinity'. The

sexual and racial themes in increasing numbers of advertisements are promoting societal change through perceptual change and remember they are paid for by major Cult-controlled corporations that couldn't give a damn about 'equality' and 'inclusivity'. Music videos aimed at the perceptions of children and the young have taken the same path with the 2020 Taylor Swift video 'The Man' an example that can only be described itself as toxic. Every stereotype about toxic masculinity is included to influence the perceptions of the young when even the mildest hint of female stereotyping attracts a storm of protest and, if it appears in advertisements, a ban. A commentator asked: Do you want your daughters growing up thinking all men act the way Taylor Swift portrays men in this video? Do you want young girls growing up resentful and distrustful of men? Do you want your sons to feel attacked and bullied by powerful women advocating for them to be shamed and subjugated by the whims of angry new-wave feminists? The answer to all of those questions from a mind in any way in a state of balance would be 'No'. But if you are the Cult your response would be 'Yes! Yes! Yes! Yes! We even had Ann Francke, head of the UK Chartered Management Institute, saying that bosses should crack down on men talking about football and cricket at work because many women 'don't follow those sports and they don't like either being forced to talk about them or not being included'. The scale of sheer undiluted arrogance that it must take to think you can tell people what they must and must not talk about is beyond my comprehension and so is her lack of awareness about how many women do like sport. Hew's another New Woke mind patronising the people she claims to speak for. What are the chances of someone demanding that women don't talk about subjects of their choosing in case men feel left out? We live in a world now so infused with narcissism that imposing your will on others is taken as a gimmick and a

right. 'Toxic masculinity' is only code for masculinity as the Cult seeks to feminise the male and masculinise the female on the Tiptoe to the no-gender human. Crucially it wants to reduce the male hormone testosterone in men to delete the type of man that straightens his spine, lifts his chin and

says: 'I'm not having it'. Men are being 'de-masculined' into passivity and you have testosterone levels falling around the world along with sperm counts. The feminising of men is being achieved on many fronts including contact with the contents of plastic

bottles, till receipts, and other items and substances containing gender-bending chemicals including food and drink from plastic containers (Fig. 309). This is a media report about a study at Exeter University in the UK:



Figure 309: One big racket to harmonise human sexes and sexuality.

Four out of every five British teens have their hormones upset by gender-bending chemicals found in plastics, new research suggests. The chemical, called bisphenol A (BPA), is used to make plastics, including materials that come into contact with food. But it can mimic the female sex hormone, oestrogen, and cause a lower sperm count in men.

The chemical is also thought to be linked to several different types of cancer, including breast and prostate (which is alarming). Researchers at Exeter University studied the blood and urine of 94 teenagers aged 17-19 and found 80 percent had the hormone-disrupting chemicals in their bodies.

In the gender-bending chemical era those identifying as gay or 'LGBT' is rapidly increasing and a US study estimated that those born before and across the millennium to be nearly twice as likely to identify as LGBT as other American adults – 'Millennials Are the Gayest Generation', as one headline put it. This is a coincidence? Dr Richard Day told those paediatricians in 1969 they were going to 'make boys and girls the same' as people became 'gender-neutral'. In support of the chemical infusion is the psychological onslaught in which being gay is celebrated and being straight is increasingly marginalised and again 'so yesterday'.

We see the same bias that we do with whiteness and Christianity and this was never more obvious than when UK TV celebrity Phillip Schofield came out as 'gay' in 2021 after 27 years of marriage. Celebrity Luvvies swooned and you would have thought he had dived into a raging torrent and pulled out a dozen drowning children. Schofield was described as 'very brave' when The System celebrates you for declaring your gayness. See what happens if you come out as straight on Twitter. 'Straight?? What are you a bloody pervert?' It's not only men that the Cult wants to weaken physically and psychologically – it's everyone – to create a compliant population that looks to Big Brother for protection. Men and their testosterone are, however, the prime target. Patricia Hunt, a researcher at Washington State University who first identified BPA as a cause of cancer and other diseases, developed a more accurate means of measurement and her subsequent findings were stunning. Dr Hunt said in her report in 2019 that 'safe' limits of BPA decided by the US Food and Drug Administration are 44 times higher than what can be considered 'safe'. This is no mere a 'mistake' than all the other 'safe' limits that turn out to be way too high. It's done for a reason and in this case to manipulate gender and de-masculinise men. Since the introduction of the birth pill women have been peeing oestrogen, or oestrogen, the primary female sex hormone, into the water supply to be consumed by men. Chemical pollution in rivers is changing the sex of fish. Soy products consumed by many vegans and vegetarians can raise oestrogen levels and lower testosterone and those diets are being heavily promoted by the establishment to 'save the planet from climate change'. Seth Siegel, author of *Trouble Water* about the shocking amount of pollutants and drugs in water supplies, described the effect on fish:

I don't want to call it transgender fish, but I will call it inter-sexual fish. One recent study studied 19 rivers and they found that there was a very high level of male fish that were now growing eggs from the oestrogen that is getting into the water ... 50% of the fish they studied in the Great Lakes had psychiatric drugs in their brains and their organs. So, Prozac, Celebra, and drugs like that, and generics.

The only way it comes into the water supplies, humans take those pills, they pee it out after they've taken it a few hours later. It gets flushed through the wastewater treatment system into a waterway. All perfectly legal. Exactly compliant with the law. And then it gets uptaken in fish. It gets uptaken in our drinking water. It gets uptaken in the water we use for our irrigation.

Men, especially white men, are at the bottom of the New Woke hierarchy along with white people in general and Christianity. No aspect of political correctness is willing to protect them as it protects other New

Woke categories. Even saying that all lives matter is now a breach of political correctness so crazy has it become. Well, sod that – *ALL LIVES MATTER* because they *do*. Notice, however, how white men are promoted as the ‘good guys’ when they send the troops and bombers at the Cult’s behest to attack non-white countries. It’s *nothing* to do with ‘right’ and ‘wrong’, it is *whether it suits the Cult agenda or not*. Conservatives with a capital and lowercase ‘c’ are a particular focus for PC abuse and Silicon Valley censorship for the first two syllables in the word ... *conserve* – to ‘protect something, especially something of environmental or cultural importance, from harm or destruction’. Yes, *conserve*-atives (small ‘c’) usually want to conserve Western culture and this is another reason they are treated as they are in flagrant contrast to those who wish to usurp and delete that culture.

‘Anti-fascist’ fascism and the billionaire alliance

From all that I have discussed and exposed in the last few chapters we can explain other apparent mysteries of the New Woke-hijacked political or liberal ‘Left’. One is why people who call themselves ‘liberal’ and ‘anti-fascist’ behave with such a fascistic lack of liberalism. A dictionary definition of ‘liberal’ is the following: ‘Someone who has liberal views believes people should have a lot of freedom in deciding how to behave and think.’ Synonyms given for ‘liberal’ include tolerant, enlightened and open-minded. You could hardly find a better definition of what New Wokeness is *not*. The self-deceit necessary to perceive yourself as ‘liberal’ in the light of extreme illiberalism is fantastic, but essential. How can the Cult manipulate those with genuine liberal views to demand the imposition of a fascistic tyranny when genuine liberals believe people should have freedom in deciding how to behave, speak and think? Instead you ingrain *I am right* self-identity and self-righteousness (which you call ‘liberal’) and get New Wokers to believe that everyone else (including genuine liberals) are wrong. Nazis, bigots, racists, sexists and expressions of pure evil. In this way *I am right* self-identity and Big Brother behaviour becomes the new ‘liberal’ while real liberals who want freedom for everyone are ‘far-right fascists’. The campaign by the New Woke Democratic Party hierarchy to destroy the liberal presidential campaign of Tobi Gabbard, a woman of colour, exposes the extreme nature of New Woke hypocrisy. She may be a woman and she may not be white (she’s a Samoan-American Hindu), but none of that matters when she stands for ending the American-Israeli wars in foreign lands demanded by the ultra-Zionist Project for the New American Century. With this background we can see why New Wokers who claim to be of the ‘liberal Left’ are in alliance with billionaires and mega-corporations like financier George Soros and Silicon Valley Internet censors. They still claim to be against billionaires

and the One-percent, but the evidence is quite the contrary. The genuine Left once roiled against the power of corporations and marched in support of freedom of speech. Today we have the inversion of both with New Wokeness organisations funded to the tune of tens of billions by Soros and others from the One-percent who could not care less about social justice. At the same time every new censorship of non-Woke opinion by Internet corporations is greeted with ‘social justice warriors’ punching the air. The reason the dynamic has changed is that New Woke is founded on Cult-invented identity politics and not social justice. Billionaires and corporations are not judged by their scale of social destruction, but by whether they speak the language of New Woke and bung their organisations a wad of money. When the Left was genuinely demanding social justice it would obviously target those who were accumulating mega-wealth for the few at the expense of the many. Soros would never have been allowed to fund the genuine liberal Left. They would have seen him coming from 200 miles away and the same with fake New Wokers like Zuckerberg at Facebook, Page and Brin at Google, Wojcicki at YouTube, Dorsey at Twitter, Wales at Wikipedia and Cook at Apple. British comedian Ricky Gervais talked in a brilliant speech at the 2020 Golden Globe Awards about Apple hypocrisy: ‘Apple roared into the TV game with *The Morning Show*, a superb drama about the importance of dignity and doing the right thing ... made by a company that runs sweat shops in China.’ He told the assembled New Woke Hollywood ‘A-listers’ who insisted on a vegan meal after turning up in gas-guzzling limousines: ‘You say you’re Woke but the companies you work for, unbelievable, I mean, Apple, Amazon, Disney – if ISIS started a streaming service, you’d call your agent wouldn’t you?’ Gervais went on:

So, if you do win an award tonight, don’t use it as a platform to make a political speech. You’re in no position to lecture the public about anything. You know nothing about the real world. Most of you spent less time in school than Greta Thunberg. So, if you win, come up, accept your award, thank your agent, thank God, and fuck off, okay!

How refreshing it was to see a very rare celebrity with balls calling out the fakery of LA Hollywood and Silicon Valley Hollywood. New Wokeness does not challenge the billionaires – it breaks bread with them. The obsession is with identity and not social justice. As long as billionaires and their corporations support New Woke PC identity positions they are ‘one of us’ and ‘on our side’. The fact that they don’t mean it and act in ways that cause phenomenal social injustice does not enter the equation. All the billionaires have to do is hand out the dough, pose as Woke, use the language of PC and censor all those that question

or challenge New Woke *far right* orthodoxy. This is where the apparently bizarre alliance comes from and why New Wokers are the foot soldiers of the Cult agenda of the One-percent. It explains why the Cult-controlled FBI was exposed many times for infiltrating and undermining the then genuine Left and targeting its leaders like Martin Luther King while today the FBI's focus is on the Right and New Woke is allowed to operate unopposed so long as it refrains from criticising Israel. Whatever is the Cult agenda at any stage it will be enforced by Cult-controlled agencies like the FBI and CIA and the rest of the Deep State and Permanent Government.

I emphasise again that I am not condemning New Wokers as people. Many are genuine in what they believe and in my view just seriously misguided. It's the manipulation and its source and goal that I am exposing. I understand why Wokers do what they do, think what they do, and feel such anxiety about the world around them. The programming is merciless and incessant on the say-so of psychopaths moulding the young into adults that will demand 'social justice and inclusivity' which is code for the post-fact, post-freedom, post-industrial Big Brother Hunger Games Society.

Where are we going – if we allow it?

By far the greatest danger of artificial intelligence is that people conclude too early that they understand it – Eliezer Yudkowsky

The Time-Loop simulation has been spinning through its sequence to a specific destination and we are now living through its endgame – synthetic humans with synthetic minds known as artificial intelligence or AI. This twin goal connects 'smart' technology to the transgender hysteria.

The control system structure and nature of the Hunger Games Society is planned to be a technocracy in which scientists, engineers and other unelected 'experts' run the show (and every human mind) on behalf of the Cult and its non-human masters. We are seeing the technocracy in the making with the ever-increasing global dominance of Silicon Valley which has vastly increased still further in the wake of the 'virus' lockdowns. You'll find some excellent background information at the website Technocracynews and I can recommend a book called *Technocracy Rising* by Patrick Wood. Promotion of technocracy emerged publicly in the 1930s (although it goes back further) and most predominantly operated out of Columbia University School of Engineering. Despite the failure to win wide support at the time its advocates continued to pursue their agenda behind the scenes and now they are sprinting for the line. Interestingly, Aldous Huxley's *Brave New World* (1932), George Orwell's *Nineteen Eighty-Four* (1948) and Dr Richard Day's speech to the paediatricians in 1969 all came when or after technocracy promoters set out their ambitions for human society. All three very accurately predicted current events. Adolf Hitler and the Nazis operated a technocracy in many ways and I have described in my books how at the end of the war more than 1,600 Nazi technologists were spirited out of Germany to the United States under a military and intelligence escape plan called Operation Paperclip (Fig 310 overleaf). These were the technologists that would establish NASA and run the infamous United States military-intelligence mind-control programme

MKUltra (Mind Control Ultra). The letter 'K' for 'control' comes from 'Kontrolle', a German word for control, to acknowledge the source of the programme. Among these German

technologists was Werner von Braun, a member of the Nazi Party and SS, who designed the V2 rockets the Nazis fired at Britain. Von Braun designed the Saturn V rockets for the US Moon programme while working at NASA/NAZI. The Cult and its technocracy have no borders just as they don't want the world to have any. Technocracy demands a monoculture global society which is why the Cult is targeting all cultures to fuse them into one. Hence we have systematic mass immigration and a war on Western culture before absorbing all the others. Dismantling Western culture is only stage one. Defined borders and boundaries of every kind are the target of the Cult including biological boundaries between men and women.

If you don't want anyone to know – don't do it (Chinese proverb)

China, the Cult's blueprint for the world, is already a technocracy thanks in large part to covert Cult technology transfers from the West through cusp organisations in The Web like the Trilateral Commission. Trilateral documents from the 1970s reveal this fact which has been confirmed by subsequent events. Big-time Cult insider Zbigniew Brzezinski, National Security Advisor to President Jimmy Carter, described in his 1970 book, *Between Two Ages, America's Role In the Technocratic Era*, how a technocracy that would emerge from its precursor stages, communism and socialism. You could call technocracy a form of 'technological Marxism/fascism' in which the police state is not even imposed by humans in uniform, but by artificial intelligence dictating through cyberspace, robots and other technology controlled by unelected technocrats. Brzezinski co-founded the Trilateral Commission in 1973 with another life-long Cult initiate, David Rockefeller, and he was a 'political scientist' at Columbia University where a technocracy movement was publically spawned in the 1930s. The Rockefeller family have had major connections with the university. Bill Clinton attended Columbia where he was taught by Professor Carroll Quigley who would later publish books exposing how a small cabal was manipulating world events and the direction of society. It was during Brzezinski's time as US



Figure 310: Some of the Nazi regime technocrats brought to the United States from Germany after World War Two under Operation Paperclip.

National Security Advisor that relations were 'normalised' between the United States and China while Cult-owned Bill Clinton played a major part during his presidency in opening America to Chinese goods and infiltration. This is a glimpse of Brzezinski's technocratic vision from 50 years ago:

Such a society would be dominated by an elite whose claim to political power would rest on allegedly superior scientific know-how. Unhindered by the restraints of traditional liberal values (which New Woke is destroying), this elite would not hesitate to achieve its political ends by using the latest modern techniques for influencing public behavior and keeping society under close surveillance and control. Under such circumstances, the scientific and technological momentum of the country would not be reversed but would actually feed on the situation it exploits ...

... Persisting social crisis, the emergence of a charismatic personality, and the exploitation of mass media to obtain public confidence would be the stepping stones in the piecemeal transformation of the United States into a highly controlled society.

What Brzezinski accurately predicted in 1970 (because he knew the plan) is what we have fast emerging today with so much more due to come (more words that I wrote before the 'virus' lockdowns which were triggered by happenings that first emerged in China). Technocracy is what Cult agents mean when they talk of a post-industrial and post-democratic society which is being advanced by the climate change and 'pandemic' booms. See how it all fits together? The Cult has been developing its China blueprint technocracy with a view to its expansion across the world. China (the Cult) is infiltrating global society through money, technology, infrastructure projects, railways, and myriad covert means while also heading out into space. The world is planned to be centrally-controlled by a 'Smart Grid' in which everything, including all technology and the human brain, is connected to the Internet and a global Wi-Fi 'cloud' with all the shots called by artificial intelligence or AI. China is a leading player along with the United States and Israel. Cult-controlled Morgan Stanley has predicted the next phase of Chinese growth will come with 'smart super-cities through 5G connectivity, smart grids, renewable energy and modern transportation' (the first 'smart city' to go online in China was Wuhan just before the 'virus' emerged from there). The investment bank sees China's current 60 percent of the population living in urban areas expanding to 75 percent by 2030 – an increase of some 220 million people moving to cities. Morgan Stanley Chief China Economist Robin Xing said: 'In our view, China is poised to be a global leader in smart city and city cluster

development.' In our *view*? No – in our *knowledge* of what is planned. All that I have described there is straight off the pages of the Cult blueprint for humanity. China's gathering influence on India represents a combined population of 2.8 billion and that's some 36 percent of the world population even without China's other regions of influence in Asia, North and South America, Africa and even Europe. Gigantic levels of systematic outsourcing of manufacturing to China by American and worldwide corporations at the expense of jobs at home has made the West dependent on keeping China sweet despite the criticism of the trade links by Donald Trump. This dependency was driven home after the coronavirus outbreak in China in late 2019. A reported 96 percent of America's antibiotics alone now come from China and something similar will be true with other countries. What if China decides as an act of war to cut off supplies of essential products it now dominates that were previously produced in America by Americans? This is precisely what the official government-controlled Chinese news service threatened in terms of drugs as the coronavirus hoax expanded out of China to the United States and the rest of the world. We will also come to see how many operatives and agents – 'spies' – that China has working within America in areas that include stealing research. Add to this the long list of 'former' US Pentagon military officials who work for China directly or indirectly after 'retirement'.

China's efforts to buy influence in education (and steal research) were revealed in 2020 with the news that Harvard and Yale failed to disclose some \$375 million in gifts and contracts from China and Saudi Arabia in the previous four years. *The Wall Street Journal* reported that American universities have hidden \$6.5 billion received from foreign countries since 1990 with lots of money from China included. China's infiltration of the United States is already extensive and growing by the day. Remember the Cult controls China as it controls the United States and this infiltration is the Cult transforming American society into its Chinese society global blueprint with Silicon Valley absolutely on board with that. A casualty of this increasing Chinese control is free speech with criticising China in Chinese-funded academia and business heading in the same direction as criticising Israel. You always know your real masters by who you can't criticise. A big supporter of the Chinese leadership is failed Democrat presidential candidate, the ultra-Zionist Michael Bloomberg, who has made a fortune from Chinese investments. No wonder he ridiculously claims that the vicious Chinese dictator Xi Jinping is not a dictator. Bloomberg's global news operation has been accused of blocking the publication of stories exposing corruption in Xi Jinping's family and he admits they submit to China's censorship rules. The more the United States is embroiled by the Cult in mega-costly wars as American society and infrastructure disintegrates

the better that is for China which is taking over great swathes of Africa alone by building roads, bridges, railways, skyscrapers and whole cities. One writer described the rapid emergence in Africa of 'Chinese factories staffed with Chinese managers that are supervising Chinese workers that are using Chinese equipment to make their products.' China is colonising Africa with two million Chinese already in the continent and more arriving every week along with ten thousand Chinese companies. The plan is to then impose the control system of the Chinese government which is really the Cult's government. The two are inseparable and the coronavirus hysteria gave the Chinese dictatorship the excuse to impose even more draconian control and offered the rest of the world the same opportunity. I'll come to this hoax in great detail in chapters fifteen and sixteen and how it was perpetrated.

Israel global technocracy

China, Israel, the United States, Europe, etc. are all assets at the deepest level of the Cult and this explains why Israel, controlled by the frontline Cult network of Sabbatian-Frankism, has so many ties with China that go on increasing. The ultra-Zionist Michael Bloomberg connection is only one of endless examples. Israel is central to the global technocracy as I expose in detail in *The Trigger* and *Sabbatian-Frankists* – not 19 Arab hijackers – pulled off 9/11 to a large part by controlling the computer systems of the Pentagon, the US Air Force hijack response system NORAD, the White House and the Federal Aviation Administration civilian air traffic network. They also controlled and still do the inner core of the American 'Deep State' including the CIA, Israeli intelligence and military front companies cross-reference with US intelligence by employing 'former' CIA personnel to create an interconnecting Cult-serving web both sides of the Atlantic. Israel's ever-increasing global cyber influence is delivered through its vast military intelligence cyber



Figure 31.1 Part of the massive Beersheba cyber operation as Sabbatian-Frankists that control Israel tries to establish that land as the core of the global Smart Grid of human control.

centre at Beersheba and its elite military cyber-manipulation unit known as 8200 with its multiple fronts like the cybersecurity companies Team8, operating out of Israel, and Boston-based Israeli company Cyberason which form a web that connects with Israeli and American intelligence, or the 'Deep State' (Fig 31.1). Israel military and intelligence networks specialise in setting up 'cybersecurity' fronts posing as private

companies because to design security protection (in theory) requires the actors involved to have access to the entire computer system and all its codes and passwords. This allows them to write 'security' encoded with hidden 'backdoors' for Israel (Sabbatian-Frankists controlling Israel) to access everything from then on and even manipulate in real time (see 9/11 and The Trigger). Given that Israeli 'security' software has been used by governments, intelligence, military and corporations, especially in the United States, you can see the significance for spying, blackmail and stealing data.

Infamous Israeli intelligence arm Mossad and domestic intelligence, Shin Bet, are of course fundamentally involved in all this. Cyberason was founded in 2012 by three 'former' (are you ever?) members of this 8200 military elite cyberwarfare division. Unit 8200 is active in manipulating elections, not least in the United States, through hacking and psychological warfare against the electorate (see the articles of Whitney Webb at Davidicke.com). Funding for this network includes the 3.8 billion that the US government gives to Israel for military expenditures every year. America is funding cyber sabotage against itself because Sabbatian-Frankist networks operate in both Israel and the United States and one hand gives the cash to the other. As a result tiny Israel is the biggest recipient of American aid and the contempt that its Sabbatian-Frankist leadership has for America can be seen in the story of the Iron Dome missile defence system. American taxpayers gave more than \$1.5 billion to the Israeli government to build the 'dome' system, but when the US military wanted to buy aspects of the technology from Israel which Americans had paid to develop for Israel's benefit the ultra-Zionist government refused to supply the necessary source code to allow the technology to be efficiently deployed. They are laughing at you America. Cyberason software is used by a stream of 'American' companies including Lockheed Martin, the world's biggest arms producer, which benefits so monumentally from any US war. A number of 'simulations' have been run by Cyberason based on scenarios of hacking the 2020 US presidential election. The company has stressed the election manipulation potential of the 'coronavirus' (an article they took down after just an hour). Why? Too much information. Cyberason and this 8200 network operating out of Israel are connected to so-called 'deepfake' AI technology which can very credibly make people appear to say and do things they did not say and do. See the Internet for many examples. Israeli tech firm Canny AI is a deepfake market leader that has partnered with Cyberason and has been funded by Israeli domestic intelligence Shin Bet. Another Israeli cybersecurity firm is Upstream Security which specialises in security for cyber-connected and autonomous vehicles. These systems can be hacked to crash cars, buses and trucks (think terrorist truck attacks) just as anything connected to

cyberspace can be hacked and taken over from afar right down to opening and closing car windows. Justin Rohrlich at qz.com wrote this about one Cyberason simulation:

The Red Team then took control of 50 autonomous cars and five driverless buses – a move that may be more likely rooted in a future reality – and deployed a cell-site simulator that allowed them to track people's locations and intercept their phone calls. They seized control of ... traffic lights, causing accidents, and distributed a deep-fake video of the Democratic candidate engaging in racial and domestic violence.

Cyberason simulated US election manipulation by a foreign state or non-state source – but which state? For sure they would not have mentioned Israel. The Project for the New American Century, utterly controlled by ultra-Zionists who answered to Israel and Sabbatian-Frankism, called in its September, 2000, regime-change document for America (really Israel) to control cyberspace. All the dots connect in the end.

Military control of cyberspace

The Beersheba complex is surrounded by research and development centres of all the major Silicon Valley corporations and involves literally an army of soldiers in uniform and others on the payroll who constantly post on the Internet while posing as members of the public to promote Israel's narrative and dub critics 'anti-Semitic'. Beersheba, the biggest infrastructure project in Israel's history, can accommodate 20,000 'cyber soldiers'. Military and intelligence groups and 'private' companies are now to Israel and its worldwide networks all the same team pursuing the same ends. Israel is a global player in Smart Grid technology and control with a view to replacing Silicon Valley in importance and power. Behind the scenes and in the shadows it already has with its controlling presence and influence in Silicon Valley through Jewish owners and heads of key companies that include Facebook (Mark Zuckerberg and Sheryl Sandberg), Google (Sergey Brin and Larry Page), YouTube (Susan Wojcicki), Barry Diller (Vimeo) and Apple (Arthur D. Levinson). As I write ultra-Zionist hedge fund multi-billionaire Paul Singer is reported to be seeking to buy control of Twitter to remove its chief executive Jack Dorsey. Should Singer secure that control Twitter will even more be a vehicle for censorship of any criticism or exposure of ultra-Zionism, Israel and the global cult agenda. What a concentration of Internet power in 0.2 percent of the world population and two percent of Americans to decide who sees what globally. That list of Zionist sympathisers heading Silicon Valley corporations does not include other Zionists like Elon Musk and Google's AI-brain connection obsessive,

Ray Kurzweil. Meanwhile, Paul Singer, like ultra-Zionist Sheldon Adelson, is a big donor to the Republican Party and a board member of the Republican Jewish Coalition which promotes Jewish Republicans. Major Democrat donors include ultra-Zionist multi-billionaires Michael Bloomberg, George Soros (whatever he may say), Donald Sussman, Dustin Moskowitz, a co-founder of Facebook with Mark Zuckerberg, Jim Simons, Seth Klarman, co-founder and chairman of *The Times of Israel*, and Haim Saban who says he is 'a one-issue guy, and my issue is Israel'. Big Tech giants including Google, Microsoft and Intel Corporation have been moving thousands of jobs and billions in investment to Israel while 'America first' Donald Trump, owned by Israel, zips his mouth and then tapes it over. The same Silicon Valley Internet-dominating corporations, including Facebook, are employing leading managers and executives from Israel and its infamous military intelligence. The transfer of cyber jobs and investment from America to Israel is largely driven by yes, him again, ultra-Zionist Paul Singer and his Start-Up Nation Central which is part of the 8200 cyber-control network. Singer's predatory hedge fund destroyed the town of Sidney, Nebraska, as I described earlier. Singer funds the ultra-Zionist-controlled 'think tank', the American Enterprise Institute (AEI), which had very close connections to the Project for the New American Century with its list of regime-change countries from September, 2000. The non-violent BDS Israel boycott campaign is largely thwarted once Israel has complete control of cyberspace which was another goal on the list of the ultra-Zionist Project for the New American Century document. Change 'Americans' in the title to Israeli, or even more accurately Cult, and you're there.

Israeli newspaper *Harets* reported that Israeli tech start-ups in New York increased by five times between 2013 and 2017 alone. Crucial to the functioning of the global Smart Grid is quantum computing that takes computer systems on to a whole new level of potential. Israel is again at the forefront of this through companies such as Tel Aviv-based start-up Quantum Machines (QM). We now have enormous Israel-controlled cybersecurity centres opening in Sabbatian-Frankist-controlled New York and paid for with \$30 million of American taxpayer money which will take Israeli (Cult) manipulation potential over US computer networks to still new extremes. This includes access to America's voting systems and claims about Russia manipulating US elections are, in large part, to divert attention from Israeli (Sabbatian-Frankist) manipulation. The New York 'cybersecurity centres' are being operated by Israel-based SCISA, a 'global innovation platform' connected to the Israeli military, and Jerusalem Venture Partners (centrally involved in the Beersheba operation) who were tasked by the city authorities to make New York the 'cyber capital of the world' (Fig.312). They are connected to an ultra-Zionist network known as the 'Mega Group' and again I highly



Figure 312: Israel-controlled 'New York'

recommend the detailed articles about these subjects by Whitney Webb. The Mega Group and the 8200 network in general has ties to child-abusing ultra-Zionist Israeli intelligence asset Jeffrey Epstein who ran his child sex network as a blackmail operation for Mossad and hence so many rich, famous and influential people were

connected to him including Trump, the Clintons and Prince Andrew. Epstein's 'madam' Christine Maxwell is the daughter of long-time Mossad agent, the late (killed by Mossad eventually) UK businessman and crook-to-his-DNA, Bob Maxwell (see *The Trigger*). Epstein was also an investor for his masters in the Sabbatian-Frankist network in Big Tech and Silicon Valley. Whitney Webb describes 'Mega' as 'a group of pro-Israel oligarchs with clear and direct ties to organized crime, alongside Leslie Weiner, the main financier of Jeffrey Epstein's operation that involved the sex trafficking of minors on behalf of Israeli military intelligence'. Guy Franklin, General Manager of SCISA, is connected to the Israeli American Council (IAC), an Israel lobby group funded by ultra-ultra-Zionist Sheldon Adelson and his wife. Adelson is the biggest donor to the Republican Party and Donald Trump. As a result of this and other reasons when Israel tells Trump to jump he says: 'Yes sir, how high?'

The plan is for the Cult via Sabbatian-Frankism to control the entire Smart Grid of human subjugation from a central point - Israel with its massive nuclear arsenal. Connections that lead to 'tiny' Israel are absolutely fantastic and how clear it is why the definition of 'anti-Semitism' has been expanded and expanded to stop this coming out in the main public arena. The global Smart Grid - with connections to the human brain - is ultimately planned to be controlled out of Jerusalem and Beersheba and this relates to the ancient belief in a Jewish 'Messiah' who it is claimed will rule the world from Jerusalem. Sabbatian-Frankism is founded on this with its 'Jewish Messiah' background and history with self-proclaimed 'messiahs' Sabbatai Zevi and Jacob Frank although for the inner core of the Cult the whole thing is only a cover story for global control. The Cult has designed its agenda from the Jewish perspective to appear to follow biblical prophecy and ancient legend which many in the non-Cult Jewish community have taken to be confirmation of the prophecy and the fulfilment of 'God's will' when in fact they are being scammed to support the imposition of something that

will ensnare them as much as the rest of humanity. Those people need to wake up fast. The Jewish messianic prophecy of global rule by a 'World King' out of Jerusalem seemed ridiculous and impossible until the emergence of the Smart Grid and the plan to connect all technology, devices and the human brain to a centrally-controlled AI. The ultra-Zionist crazies and extremists orchestrating the 'invasion' (their word) of Europe by Islam to overthrow Christianity and European society is all connected to this plan and so is the rebuilding of the alleged 'Solomon's Temple' on what Jews and Christians called Temple Mount in Jerusalem where the gold-domed Al Aqsa Mosque stands today. Sabbatian-Frankist-owned Donald Trump has given them everything they want to achieve their sick and sinister ends including moving the US embassy to Jerusalem and promoting the 'Deal of the Century' complete stitch-up of the Palestinians to clear the way for the total control and ownership of Jerusalem where the global technocracy world government is planned to be located. See *The Trigger* for all the detailed background to Sabbatian-Frankist control of the global Smart Grid.

Is it 'anti-Semitic' to ask why Israeli-controlled and military-connected companies increasingly dominate 'smart' technology and systems, effectively globally-control what you see and hear, and set out to modify perception and behaviour, are headed by people from 0.2 percent of the world population? Is it 'anti-Semitic' to ask why Israeli cyber firms connected as they are to Israeli (Sabbatian-Frankist) intelligence and military have so much control over American government, military and intelligence computer systems? They want you to believe that it is for no other reason than stopping those questions being asked. Yet these are questions that must be consistently asked and credible answers demanded when you think that 68 percent of Americans get their 'news' (and so perceptions) from social media and that Israeli tech firms are seizing control over Smart Grid technology.

Insider Donovan knew (of course)

I would urge you to read *The Trigger* to find out more about Israel's AI Smart Grid and technocracy ambitions and if you do the real reason for the burgeoning China-Israel relationship will come into sharp focus. China's 'economic miracle' was orchestrated from the West through Cult corporations and by 2001 Hedley Donovan, editor of Cult-controlled *Time* magazine, was describing China as a technocracy. Donovan just happened to be a founding member of the Cult's Trilateral Commission. He wrote:

The nukes are running the show in today's China. In the twenty years since Deng Xiaoping's reforms kicked in, the composition of the Chinese leadership has shifted markedly in favor of technocrats. ... It's no exaggeration to

describe the current regime as a technocracy ...

... During the 1980s, technocracy as a concept was much talked about, especially in the context of so-called 'Neo-Authoritarianism' - the principle at the heart of the 'Asian Developmental Model' that South Korea, Singapore, and Taiwan had pursued with apparent success. The basic beliefs and assumptions of the technocrats were laid out quite plainly: Social and economic problems were akin to engineering problems and could be understood, addressed, and eventually solved as such.

Donovan said Scientism (the religion of scientific orthodoxy with scientists as the new priesthood) was behind China's post-Mao technocracy and those that challenged its control were considered heretics. Those words were written by a Cult insider in 2001 and cannot be denied today. I have already described China's deeply Orwellian Social Credit System and the stupendous numbers of AI-operated face-recognition cameras supported by eye-scanners and DNA-scanners with nothing left to chance. China is already a technological dystopia and operates at the global cutting edge in all the areas necessary for total human control including, like Israel, AI and quantum computing. I have been saying for decades that China today is the world tomorrow unless humanity opens its eyes and that that is now being laid out before us. London police announced in January, 2020, that they would be deploying facial recognition cameras after a 'trial' that was always only a prelude to a permanent roll-out. Other police forces in Britain are planned to follow. Leaked documents in early 2020 revealed that the European Union is preparing to connect national face-recognition databases through its EU-wide database-cross-referencing system known as Prüm. The plan is to link this EU database with a similar system in America as the global surveillance system I have warned for decades was coming is moved into place step by step. It's all the Cult-agenda unfolding. General Electric (GE) was paid \$30 million by San Diego city council to install thousands of surveillance cameras and microphones in street lights and sold the data collected to third parties earning a billion dollars according to the *California Globe*. So-called 'smart streets' like these are appearing in ever more locations.

The Devil's playground and 'education' control

From this background we can see why 'Woke' Silicon Valley corporations have so many ties to the China dictatorship when those corporations are ultimately owned by the Cult. Global banking is a Cult technocracy in which financial experts make decisions (increasingly with AI) unopposed by elected officials and whoever controls the money controls the world. I have detailed in my books the part played by the

Bank for International Settlements (BIS) in Basle, Switzerland, in coordinating national central banks into one global (Cult) network. The Bank for International Settlements is another Rothschild-Rockefeller (Cult) creation. Heads of central banks meet regularly at the BIS to coordinate policy and advance the transformation to global technocracy. No surprise, then, that a *Blasberg Markets Special Report* in 2018 described the Bank for International Settlements as 'a bastion of global technocracy'. The cashless – (digital/technological) – single world currency is all part of the technocracy plot and so is the increasing impotence of politicians over the power of Silicon Valley technocrats and their global impact on the life of every human being. Government departments the world over are dominated by technocrats of many and various types who drive the 'Deep State' operating beyond anyone who has ever seen a ballot box. The *Technocrat* magazine, the publication of the Technocratic movement, said in the late 1990s: 'Technocracy is the science of social engineering, the scientific operation of the entire social mechanism to produce and distribute goods and services to the entire population.' All of this is happening with increasing severity today. Politicians are losing control as this passes to the technocrats and what is the European Union, so beloved of New Workers, except rule by an unelected technocracy? The so-called 'democratic' European Parliament is just a cover to hide bureaucratic control. We can understand from this perspective why we had years of delay and resistance to the UK leaving the EU after a majority voted for Brexit in the 2016 referendum and why George Soros, an American citizen, funded groups trying to stop Brexit. It took three more years before the people spoke again in 2019 and finally thwarted the opposition by giving pro-Brexit Boris Johnson a thumping majority in a General Election. How much the type of Brexit which emerges will actually free British people from EU technocrats we have to wait and see. Deletion of national sovereignty by the EU is a central demand of the technocracy along with the end of private property, Common Core education (indoctrination), Public-Private Partnerships, carbon trading justified by climate change, and communistic deletion of personal choice and liberties. Each one is a pillar of a technocratic society. The Archontic force in the unseen is itself a technocracy in the sense of manipulating through its simulation and using technology to overcome the limitation of its lack of creative consciousness. There is no need for technology in our out-of-body state where creativity and manifestation is achieved directly through thought and awareness. Control of 'education' and the indoctrination programming of the young has been a prime necessity highlighted by technocrats in the 1930s as 'an educational system to train the entire younger generation indiscriminately as regards all considerations other than inherent ability – a continental system of human conditioning'.

William Akin wrote the following in his 1977 book, *Technocracy and the American Dream: The Technocrat Movement, 1900-1941*:

A continental system of human conditioning will have to be installed to replace the existing insufficient educational methods and institutions. This continental system of general education will have to be organized as to provide the fullest possible conditioning and physical training ... It must educate and train the student public, so as to obtain the highest possible percentage of proficient functional capacity.

Since the basic need of society was technical expertise, their education system would abolish the liberal arts, which addressed outmoded moralistic solutions to human problems. It would essentially replace the humanities with the machine shop. In the process, members of society would be conditioned to think in terms of engineering rationality and efficiency. Men, in short, would then be conditioned to assume the character of machines, to accept 'a reality understood in terms of machine-like function'.

I ask everyone to take just a moment to scan the world today in relation to what Akin described nearly 45 years ago. It's happening. Constant cut-backs on spending for the arts in schools across the world now becomes easy to explain as does the fusing of children and adults with machines through Smartphones and other means. America's



Figure 313: Funding global vaccination is behind the unseen screen of 'philanthropy'.

privately-funded and controlled Common Core Education Standards Initiative imposed upon schools across the country is straight from the pages of technocracy literature and backed to the tune of hundreds of millions by Microsoft technocrat Bill Gates and his Bill and Melinda Gates

Foundation. My long-time observation of Gates and his funding is that if he backs it then it's bad for humanity (Fig 313). This is the bloke putting billions into worldwide vaccination through his front, GAVI, or the 'Vaccine Alliance'. What till I get to the 'pandemic' hoax for a major exposure of Bill Gates and the agenda he drives for his hidden masters. It's sobering to think that Gates' Microsoft has access to most computers on earth. The world has been quietly ensnared while making its latest Google search, sending another text, or posting a picture of its lunch.

This is the case more than anyone with New Wokers. They think they are demanding 'social justice' and old fashioned Marxism or 'socialism' when they are being used overwhelmingly without their knowledge to pressure humanity into a technocracy in which a Marxist/fascist-type dictatorship will be enforced by technology. Climate Cultists are pressing for the dismantling of the global economy as it operates today which must be destroyed for technocracy to replace the current status quo. Prince Charles called for exactly this at the One-percent Davos conference in January, 2020, and so does Pope Francis, another Cult asset, who wants 'a different kind of economy', a 'new economy' and, of course, 'sustainable development'. Global central banks including the US Federal Reserve, Bank of England, European Central Bank and the Bank of Japan are pursuing the same end as they commit to treating climate change as a 'core mission'. It's all the same global web working in unison. Mantras parroted by the United Nations and the Climate Cult such as 'sustainable development', the 'green economy' and 'Green New Deal' are all codes for technocracy. The 'goals' for 'sustainable development' that I listed earlier are still more aims (mostly in disguise) of the technocracy. The end of private property described by Rocketteller insider Dr Richard Day in 1969 is also technocracy policy.

It is no longer a mystery why technocratic billionaires and their corporations now occupy the same bed as Green 'Idealists' who require a new description for their childlike naivety when 'naive' does not even nearly suffice. Agenda 21 and 2030 are the script for global technocracy and control by scientists who are planned to be the new God. Remember Greta Thunberg's mantra from this context - 'Listen to the science' - and political leaders around the world locked-down countries and destroyed economies and livelihoods because they said they were advised to do so by 'the scientists'. Anyone ask what was the agenda of the 'scientists' and to whom they really answer? A key part of technocratic control is complete power over the distribution of energy - who has it, who doesn't, and how much can be used. Climate Cult, anyone? Non-carbon energy sources will not be able to supply current energy needs in the transition to technocracy and that's the plan with all the deprivation that will cause. Once the global dictatorship is in place, however, they will bring out technology they already know about which takes its energy from the wave and electromagnetic fields of the energy sea or The Field. Legendary scientist Nicola Tesla was doing this in the first half of the 20th century, but his work was suppressed to protect energy companies and the Cult from the consequences of the population having access to free energy both in terms of cost and the way it is accessed without the need to use energy to produce energy. The Cult could use this technology now to 'save the world'. Instead it keeps it under wraps out of self-interest. Technocracy wants control of all resources to be

transferred to a global authority while ownership of anything is removed from the population including their homes.

The AI 'human'

Mass control in the Hunger Games technocracy is planned to be enforced by connecting the brain to AI. We have Silicon Valley crazies openly describing such a world and giving a date for activation - 2030 according to Google technocrat Ray Kurzweil (Fig 314). This is the same year highlighted by United Nations Agenda 2030 which sets out the transformation of global society into a centralised tyranny to save the world from human-caused climate change and 2030 represents the period for the end of the non-sensical '12 years to save humanity' stated by the Climate Cult at the turn of 2019. Prince Charles called at Davos for a transformation of the global financial and economy system by 2030. A study by the UK House of Commons Library estimated that by 2030 the One-percent will own 64 percent of the world's wealth - the Hunger Games Society. Ray Kurzweil describes how in the 2030 period human brains will be connected to AI and what he calls the 'cloud':



Figure 314: Ray Kurzweil - Frankenstein's sales pitches.

Our thinking ... will be a hybrid of biological and non-biological thinking ... humans will be able to extend their limitations and 'think in the cloud' ... We're going to put gateways to the cloud in our brains ... We're going to gradually merge and enhance ourselves ... In my view, that's the nature of being human - we transcend our limitations.

As the technology becomes vastly superior to what we are then the small proportion that is still human gets smaller and smaller until it's just utterly negligible.

Kurzweil is describing the assimilation of human consciousness (within the simulation) into AI and this begs the question of what is AI? On one level it refers to algorithmic codes and on another to a form of AI that learns from data input and is aptly dubbed 'Learning AI'. The true and deeper meaning of AI, however, is something they obviously don't talk about when it reveals where all the Cult manipulation has been

leading from the start. This level of 'AI' is the very force that has been orchestrating the perceptual enslavement of humanity all along – the force known by different cultures and religions as demons, Fallen Angels, Jinn, Archons, Chitauri and the Shining Ones among many other names. We are being invaded (Fig 315). People need to realise that this force while it can take form in fact has no form in its base-state which is waves of awareness that can communicate

electrically like the human brain. An AI connection with the brain allows a connection with this force that will then become the human mind. Up to this point the Cult and its hidden 'gods' have had to control information to manipulate perception to dictate behaviour. Religion has played a central role in this and now the new religion of Wokeness is coming to the fore with its frenzy of censorship. The censorious 'cancel culture' is vitally important for the Cult as we approach its endgame. What I am describing must be kept from the main public arena or the game could still be derailed in its finishing straight. Once the AI-brain connection is made even

controlling information will no longer be necessary. Human perception and emotional response will come direct from AI with no middleman media required (Fig 316). In those words of Kurzweil: 'As the technology becomes vastly superior to what we are then the small proportion that is still human gets smaller and smaller until it's just utterly negligible.' Individuality of human perception would be history with a centrally-controlled AI hive-mind taking its place (Fig 317). The AI-brain connection is designed to absorb humanity even deeper into the simulation on the road to absorbing Body-Mind awareness in its entirety into cyberspace. The code-term for this transition is 'immersive technology' which is described as 'technology that attempts to emulate a physical world through the means of a digital or simulated world by



Figure 315: Invasion is exactly what it is.



Figure 316: Step, step, step, tick, tick, tick.



Figure 317: The Hive Mind. Connecting the human brain to AI means that whatever controls – or is – AI controls the perceptions of the entire human race. (Image Neil Hague.)

creating a surrounding sensory feeling, thereby creating a sense of immersion'. It is the Tiptoe to assimilation in steps that include 'augmented reality' which combines the 'physical' world with the digital. It's being very cleverly done unless you are awake in which case it is a pathetically open book.

Simulation within a simulation

'Learning AI' is the level planned to run the 'Smart Grid' control system which is fast being introduced by the Cult and its unseen 'gods'. People are rightly concerned with the mass-surveillance state in which our every move is being tracked,

every Internet post, opinion and behaviour, but this is not only for surveillance. All the information about human activity, thought, emotion and reaction gathered digitally worldwide minute by minute is being fed into Learning AI to provide ever-expanding fine-detail knowledge of what makes humans 'tick'. The processing of this information means that AI already knows humanity far better than humanity does. This is being used to further manipulate perception and action. Every time you post personal information on Facebook, Twitter and all the other Cult-controlled platforms it is absorbed by Learning AI to add to its awareness of human thought, emotion and behaviour and the data-gathering includes live microphones embedded in computers and smartphones to track what should be private conversations. For this we can thank those lovely fake New Wokers like Zuckerberg, Brin and Page who always say one thing and do the other while the New Woke army applauds and worships. Learning AI is behind the 'Sentient World Simulation' (SWS) based at the Synthetic Environment for Analysis and Simulations Laboratory at Purdue University in Indiana. The SWS is mass-collecting data to predict (and manipulate) human behaviour and operates under DARPA, one of the world's most sinister organisations (and think of the competition) which I have been exposing for decades. DARPA, or the Defense Advanced Research Projects Agency, is the technology arm of the Pentagon and the force that oversees Silicon Valley corporations and their direction on behalf of the global Cult. It has seed-funded vital Cult

operations such as Google and works in tandem with the CIA technology venture capital firm In-Q-Tel (also IQT). Both fund the development of technology and organisations to advance the Cult technocracy agenda. DARPA claims to have created the Internet which required military technology to launch and it just so happens that the Internet is the foundation of the technocracy and the unfolding technology control grid or 'Smart Grid'. This Cult agency is behind the Sentient World Simulation ('sentient' = AI) which is constantly processing information from every man, woman and child on the planet, scanning behaviour and buying patterns, and producing a 'continuously running, continually updated mirror model of the real world that can be used to predict and evaluate future events and courses of action' (Fig. 318). The Sentient World Simulation is a micro-

conversion of the Time-Loop simulation which is impulsing the collective human mind to follow its agenda. The defence against both is consciousness in awareness of its true self that has burst through the Bubble in which the simulations operate and here we have another reason why the Cult works so hard to keep the Bubbles intact. The Smart Grid is laying another simulated information field over the main simulation field which itself is laid over the Infinite information field beyond that. Humans were first attuned with the overall simulation and now they are being connected to the 'smart' information grid to further contract their perception in deeper myopia and block out with even greater efficiency any connection to Infinite Self.

The Sentient World Simulation and its data predictions explain why we are hearing more and more about identifying 'pre-crime' in the way portrayed in the movie, *Minority Report*, set in the year 2054. Pre-crime is a version of pre-censorship in which potential posts are algorithmically blocked before they can appear. People would be targeted for pre-crime on the basis of Sentient World Simulation predictions and not necessarily on what they really planned to do. The motivation for this is not pre-crime but pre-deletion of any people or groups planning to challenge the AI dystopia and the force behind it. Cult-controlled Hollywood and other media increasingly portray



Figure 318: Real-time mirror of human society to manipulate events in human society.

dystopian themes which portray the world the Cult seeks to impose and this relates to a psychological manipulation technique known as 'pre-emptive programming'. The Cult's Brave New World is so extreme and beyond anything humans alive today, or in known history, have ever experienced. This scale of change has obvious potential to invoke resistance. You want to do what? Pre-emptive programming via Hollywood, television and other sources continually feeds the conscious, and especially subconscious, mind with portrayals of the world that the Cult is planning. The idea is to make people familiar with an AI technology-controlled dystopia so that when it happens for real a lot of resistance will be diluted by that induced familiarity. Cult psychologists are well aware that once something is familiar it gets a free ride and ceases to be questioned as it fuses into everybody-knows-that. The programming machine ridiculously called 'education' is rarely questioned as a way of bringing up children because people are familiar with it. Introduce the same system today to replace one based on freedom and respect for children's individuality and there would be an outcry. I have spent 30 years questioning the familiar and accepted realities and when you do they dissolve like ice in a heatwave. Unquestioned familiarity is their only means of survival.

Aligned to pre-emptive programming is the very fact that AI extremists like Kurzweil are openly telling us about an AI connection to the brain. Why would they do that? The endgame has reached the point where this is happening and they can't hide that any longer at a time when they want to actually do it. Instead they have to sell it rather than hide it. The sales-pitch is that an AI connection will make us super-human when the plan is to make us sub-human and post-human. Once AI attaches to the brain human thought patterns can be fed into the Sentient World Simulation to produce an even more accurate picture of individual and mass perception and with that their predictions of human behaviour. Another fact crucial to understand is that through an AI connection the World Simulation can send thoughts and emotions the offer way to defuse those with a challenge to The System in mind. 'I am going to stand up for freedom ... Nah, actually, I won't bother it's not worth it.' The development of quantum computers capable of infinitely more than conventional computers is taking the potential for all this to a whole new level as is the roll-out of 5G. In the end human 'thought' would be AI in totality. Professor Oren Etzioni, CEO of the Allen Institute for AI, has said in a paper entitled 'How to know if artificial intelligence is about to destroy civilization' that humanity must be ready for signs of robotic super-intelligence. He asked: 'Could we wake up one morning dumbstruck that a super-powerful AI has emerged, with disastrous consequences?' Well, given that this is the idea the answer must be 'yes'. Etzioni said one test suggested for this was that 'human-

level AI will be achieved when a person can't distinguish conversing with a human from conversing with a computer'. This is a point that we are clearly heading for very, very fast, and Etzioni rightly says that this isn't really a warning sign because it would be confirmation that human-level AI had already arrived. Etzioni then destroys his credibility and grip on reality by saying we are far away from machine super-intelligence and we will have a comfortable amount of time to deploy 'off-switches'. He must have majored in naivety, surely?

Smart Grid to make you stupid

Know the outcome and you'll see the journey comes into play again. If I describe the planned outcome for the technological control of humanity you will certainly see the journey over decades to where we are now.

Kurzweil's 'cloud' would cover every inch of the planet and every human would be attached through an AI-brain connection. The AI-controlled cloud would then be the human mind (Fig 319). It's only a few years ago that I was warning in my books and talks about the then-planned Internet of Things (IoT) in which all aspects of life including domestic appliances, vehicles, heating systems and a stream of surveillance devices would be connected to, and controlled from, the Internet (an expression of the cloud). Today we are already there with more devices added by the day. The Internet of Things is critical for the technocracy to control all aspects of human life and so is 5G and digital control of information via Silicon Valley censorship (Fig 320). The plan is for humanity and all technology to be connected to artificial intelligence via the Internet and Kurzweil's cloud which would give AI (and whatever is behind it) control of everything including human thought and perception. Driverless autonomous vehicles would dictate where you can and cannot go and that's why their introduction is planned to be enforced with each new generation of vehicles adding more AI features on the Tiptoe to total computer control. The University of Glasgow is working with the European Space Agency and UK Space Agency on 'Project DARWIN' which aims to introduce driverless cars in Britain guided



Figure 319: The idea is that attachment to the 'cloud' via AI will block all influence from expanded states of awareness.

with more devices added by the day. The Internet of Things is critical for the technocracy to control all aspects of human life and so is 5G and digital control of information via Silicon Valley censorship (Fig 320). The plan is for humanity and all technology to be connected to artificial intelligence via the Internet and Kurzweil's cloud which would give AI (and whatever is behind it) control of everything including human thought and perception. Driverless autonomous vehicles would dictate where you can and cannot go and that's why their introduction is planned to be enforced with each new generation of vehicles adding more AI features on the Tiptoe to total computer control. The University of Glasgow is working with the European Space Agency and UK Space Agency on 'Project DARWIN' which aims to introduce driverless cars in Britain guided



Figure 320: The Internet of Everything is the Internet of Things - plus the human brain. (Image Neil Hague.)

(controlled) by satellites using 5G communication. Passengers would be fried on every journey in other words. We have the British road system being transformed into 'smart motorways' specifically for the use of smart autonomous vehicles and the fact that the changes are making the roads far more dangerous and killing a lot of people is irrelevant to the psychopaths. The agenda is all that matters. There would be nothing in your life that AI would not control - even which doors would open or close - and there would be nothing you do or say that AI wouldn't immediately know about. Look around - it's happening with a gathering pace and it's all been long planned.

We have smart televisions with their cameras and microphones, smart assistants, smartphones, smart doorbells with cameras, smart meters, smart cards, smart cars, smart driving, smart pills, smart patches, smart watches, smart skin, smart borders, smart pavements, smart streets, smart cities, smart communities, smart environments, smart networks, smart growth and smart planet (the Smart Grid). These are only a few of them. Every technology dubbed 'smart' (almost everything these days) and any system called 'smart' are all designed to interconnect to form the global grid or what I have been describing for



Figure 321: The technological subvailability of Smart Grids isolating human awareness from Infinite Awareness. (Image Neil Hague.)

many years as the technological subreality (Fig 321). What a surprise that it was announced in late 2019 that Amazon, Apple and Google will work together to create a new common standard that will make it easier for smart devices to speak to each other. I

was so shocked I had to take to my bed. The Zigbee Alliance is part of the group that includes companies such as IKEA, Legrand, NXP Semiconductors, Samsung and Signify. The 'alliance' will connect existing smart assistants such as Google Assistant, Amazon Alexa, Apple's Siri, and others, which in the end all transmit their data and surveillance to the same Cult sources. They claim this will benefit users when it is another step forward for the Smart Grid. The same is true of the Amazon device called Ring with its camera on your doorbell which can be accessed from anywhere by smartphone and allows a conversation between a visitor and a distant resident. This is a great example of how the public is sold technology with a cover story to hide the real reason for its introduction. Amazon promotes Ring for home protection and convenience when it is another Trojan horse to add still further to the Smart surveillance grid. An article at Technocracy.news revealed:

Ring has over 600 partnerships with law enforcement agencies around the country, and this number is increasing daily. The company has spent the past three years systematically making sure police everywhere know and recognize Ring, quietly building a nationwide surveillance network through police partnerships, and embedding itself into the functions of law enforcement ... Behind the scenes, Ring is experimenting with emerging technologies, as well as pursuing a partnership with at least one other private surveillance company.

The number of Ring partnerships with police grows almost daily, and, to date, there has been limited public debate about whether these partnerships should exist in the first place. Unless lawmakers curb or regulate the expansion of these partnerships, what we are seeing now is just a minuscule version of this company's full potential.

Also connected to the Smart Grid are 'green' lightbulbs that produce crap light compared with incandescent bulbs and emit radiation that can permanently redden the skin if you get too close. LED lights must have killed a lot of people already because they are so dim when used as street lamps. I know from experience how in many streets you can't see people crossing the road until they are in your headlights. All forms of 'green' lighting (or lack of it) have come courtesy of Climate Cult and the climate hoax along with wind turbine farms that have technologised landscapes and seascapes and destroyed their natural beauty. The same people call themselves environmentalists. Greens pressed for diesel to be encouraged over petrol until it was found that particulates in diesel were killing large numbers of people who breathed them in. What a gift to humanity and the environment the Climate Cult has been. The speed

of the technological takeover is designed to have it installed and in control before most people realise what's happened. To them the Tiptoe has just been an endless series of unrelated new devices and technologies 'the latest thing' and only when the control system is in place will they see that what appeared to be random was really a calculated sequence to impose total control. Or maybe they won't even see it then with AI controlling their minds. AI will tell them not to.

Cutting edge 'new' technology has been there all along

The Cult is not sitting around waiting for essential ever-advancing technologies to be invented. The Archontic force as I call it, manipulating from the unseen, had the know-how for Smart Grid technology – and far ahead of even what we see today – when humanity was supposed to be knocking rocks together and living in caves during another simulation stage of 'history'. Human limitations of knowledge and technology apply only to this tiny band of frequency we experience as the world (the simulation). Beyond it, firewall lies Infinite Reality and Possibility with even the low-vibrations occupied by the Archontics having far more knowledge than humans in Bubble-mode can access. Some of that knowledge is transferred to initiates of the Cult to advance the perceptual control of humanity. The transfer has included technology crucial to the Smart Grid which has been developed in beyond-top secret underground and within-mountain facilities before being introduced to the public arena in a carefully-planned sequence through a list of front men and women and their companies. These Cult agents are used, along with well-crafted cover stories, to explain where the technology came from (geeks in garages is often in the script) and we have a long list of cover-story tellers like Gates, Zuckerberg, Brin, Page, Wojcicki, Bezos and Musk among so many others. The world of high-technology is awash with Cult operatives in among genuine people who have no idea what is really going on around them. Humanity, in turn, has had to be perceptually developed to have enough intellectual (Bubble) awareness to work with and enslave itself with technology while not being wise enough to see that this is what is happening. Developing cleverness without wisdom was the plan and as I said earlier this is the most destructive force on earth. It is clever to make a nuclear weapon, but not wise to do so. The Cult 'education' system is all about cleverness, not wisdom. We have brilliant engineers and others with incredible intellectual abilities who, at the same time, believe that a man was born to a virgin mother and walked on water, or that 'God' parted the Red Sea and men should wear beards because a blake called Mohammed had one some 1,500 years ago. I have used the following quote from a Central American shaman several times in my books and it captures the theme magnificently. He refers to the Archontic force as 'the

predators':

Think for a moment, and tell me how you would explain the contradictions between the intelligence of man the engineer and the stupidity of his systems of belief, or the stupidity of his contradictory behaviour ...

... Sorcerers believe that the predators have given us our systems of beliefs, our ideas of good and evil; our social mores. They are the ones who set up our dreams of success or failure. They have given us covetousness, greed, and cowardice. It is the predator who makes us complacent, routine, and egomaniacal ...

... In order to keep us obedient and meek and weak, the predators engaged themselves in a stupendous manoeuvre – stupendous, of course, from the point of view of a fighting strategist; a humdrum manoeuvre from the point of those who suffer it. They gave us their mind. The predators' mind is beset, contradictory, morose, filled with the fear of being discovered any minute now.

The shaman is describing from my perspective the impulses delivered by interaction with the Archonic simulation while the direct AI-brain connection is meant to take this to a whole new level of perceptual control. We must be able to build our own AI prison without realising that we are doing so and every day I watch it happening.

Here kitty, kitty ...

Humanity has been brought to the point where many of its number have become technologically savvy enough to build and operate the control grid while the masses have been enticed along the road to an AI mind in the way a donkey might trot forward in pursuit of a carrot always dangling just out of reach inches from the end of its nose (Fig 322). The technology version of this is to constantly bring out new devices each one slightly closer to the endgame of AI-brain connection. As people seek out each latest gadget or 'upgrade' they are unknowingly being

seduced down the trail to the end of humanity as we know it (Fig 323). Apple was fined for slowing down older phones that made people more likely to upgrade with new products because, as you



Figure 322: Keep walking – just a bit longer and the carrot will be yours.



Figure 323: This has been the aim of the Cyst and its 'spide' since the hijack of humanity began.



Figure 324: The unmediated sequence ... hold, on, in.



Figure 325: Anyone observing humanity today knows that this is working big-time. (Image: Gareth Klee.)

released into the atmosphere for the population to breathe in. I have exposed this at length in *Everything You Need To Know*.

Crucial to this whole scenario is to get people addicted to technology so it becomes the master and not them. This has clearly been achieved with fantastic numbers of global humanity addicted to phones

know, Apple is Woke and has 'values'. The cold, calculated sequence planned from the start goes like this: First you get the target population addicted to technology they hold – i.e. smartphones; next you advance to on the body (your body with Apple watches, Bluetooth earphones, fitness wristbands, internet-connected spectacles and an explosion of other devices; finally you get inside the body (your goal all along) with microchips which is already happening as I have been predicting and warning about for nearly 30 years (Fig 324). Today 95 in every 100 Americans have access to cell phones and three out of four adults worldwide as the first stage of 'kitty, kitty' is almost complete and human discourse and relationships have been devastated (Fig 325). When I say microchips I am not referring only to those that we can see and agree, however stupidly, to be implanted. Most sinister of all are the nano-microchips invisible to the human eye known as 'smart dust' and 'neural dust' that are being



Figure 326: Technology is already in control of vast numbers of people.

agree to the AI takeover of their minds and world a few years hence. I will be revealing an immensely important aspect of induced smartphone addiction that no one seems to be talking about and it absolutely is addiction. Schools in America who take away phones during the school day found that students were suffering from 'separation anxiety'. Some allowed students to hold their phones in pouches when they can't open them during class time. One school principal said they were allowed to 'personalise' the pouches to 'make them as cool as humanly possible for something that's keeping them from their device'. What the hell are we doing standing by while Big Tech psychopaths addict young people worldwide in this way? What I have described with the hold-it-wear-it-insert-it sequence from phone to microchip can be identified in two other Tiptoes involving the progression from 1G to 5G and the progression of the Internet and its dominant corporations. The Cult wants us to believe that 5G is only the next more advanced stage after 1G, 2G, 3G and 4G when in fact 5G is a whole new frequency band called millimetre waves (millimeter in the US) and a whole new ball game. 5G was known about in the inner core of the Cult before 1G was even introduced through cutting edge research and the technology transfer between Cult initiates and their non-human 'gods'. I was sent a study dated 1974 from Soviet era Russia that was detailing research on the effect of millimetre waves now called 5G on viruses and pathogens and adverse effects on reproduction processes. The sequence has been a step-by-step deception to turn our reality into a microwave oven and the same technique has been used with the Internet itself.

Trojan Internet

Cult Pentagon agency DARPA claims credit for the Internet using military technology and whatever DARPA wants is bad for humanity (Fig 327). Stage one was to create the Internet and introduce the World Wide Web. The know-the-outcome-and-you'll-see-the-journey here was to make the Internet the foundation pillar of human society in a way that was irreversible in preparation for the Smart Grid. Technology needed to

and especially the young who are the prime target for everything when they will be the adults at the time the Smart Grid is planned to be imposed full-blown (Fig 326). They are manipulating the perceptions of the young to compliantly



Figure 327: One of the world's most sinister organisations.

Cult had to allow the free-flow of information and opinion in the early years to attract a global population to use the Internet. They would not have made the Web the central pillar of society if they had started with the endless wave of censorship we have today. In this period people like me were able to use the Internet to circulate information worldwide that the Cult certainly didn't want people to see. They had to bite the bullet on that in pursuit of longer-term ambitions. Once the Net had become the said central pillar and irreversibly so through functional dependency the kind of Internet planned all along removed the mask from its face. The censorship began and has become more extreme by the month. The Cult had the means which it set out to create of mass surveillance, a vehicle for AI control, and the ability to delete information it didn't want the public to see. The same sequence has been followed by Cult corporations specifically developed to dominate the Internet. The Facebooks, Googles, YouTubes, Twitters, Amazons, etc. also allowed the free circulation of information and opinion in the beginning as they had to do to pave the way for their near-monopolies. Once that had been achieved through securing a situation of 'Where else are you going to go?' their censorship began in earnest and has continued ever since picking off more and more dissenting voices.

These sequences that were planned from the start have been fishing lines thrown out to catch the people and then reel them in for the Hunger Games technocracy. Silicon Valley giants like Facebook and Google (YouTube) have fundamental connections to DARPA and the Pentagon as do Microsoft and Amazon (Fig 328 overleaf). All of them are at the centre of the AI-controlled surveillance society while posing as New Woke and supported by Wokeness mobbery. Regina Dugan, promoter of transhumanism and post-humanism, was DARPA director between 2009 and 2012 before being hired as an executive of Google. She then transferred to Facebook in 2016. That's quite a career CV - heading DARPA, one of the world's most sinister organisations, before moving to

do this was once again known to the Cult long before it ever became public. Cult-insider Dr Richard Day was therefore able to describe the coming World Wide Web in his speech to those paediatricians in Pittsburgh in 1969 when it would not be officially 'invented' until 1989 and publicly available until 1991. DARPA and the



Figure 328: America's real Silicon Valley with Israel emerging fast through Sebastian Fankart.



Figure 329: Regina Chajon – stunts career unless you know what's going on. This was her job-description at Facebook.

a very sick place run by very sick people with a very sick agenda for humanity while posturing its New Wokeness to get the desperately naïve on board.

Behind the Musk

Big names in Silicon Valley are all technocrats driving the world into technocracy including Jeff Bezos at Amazon (an organic company for technocrats); Brin and Page at Google/YouTube and parent company Alphabet; Zuckerberg, the frontman at Facebook; and Elon Musk at Tesla and SpaceX. There are so many others, too. Musk is a mega-fraud Silicon celebrity who comes into the story in many guises. For the Smart Grid to enslave the totality of humanity Kurzweil's 'cloud' has to cover every inch of the planet and that can only be done from space. Enter Mr Showman-Bullshitler Elon Musk (Fig 330). This is the man who said that AI could be the end of humanity (true) and heads a company called Neuralink working to connect the human brain to computers. The *Wall Street Journal* reported that this involves a 'neural lace' or mesh-like system which would 'implant tiny brain electrodes' with a view to uploading and downloading thoughts. Musk is the big name at Tesla

a global search engine and social media platform (Fig 329). When you know the game there is a clear thread of consistency and that is AI control of humanity. Her brief at the secretive Facebook Building 8 operation was to develop 'technologies that fluidly blend physical and digital worlds.' Her theoretical 'boss' Mark Zuckerberg has talked of the need for 'a global superstructure to advance humanity'. Post-human advocate Ray Kurzweil is a Google executive and co-founder of the Singularity University in Silicon Valley which seeks to promote the AI human. Not without reason I refer to Silicon Valley as the Devil's Playground. It is



Figure 330: Elon Musk, the smoking broad making possible the Smart Grid of mass and total human control.

X received \$1billion in funding from Google and Fidelity Investments in 2015 amid the usual incestuous Silicon Valley interconnections. Musk officially requested permission from the Federal Communications Commission (FCC) in late 2016 to launch 4,425 satellites into low orbits at between 715 and 823 miles to provide Wi-Fi worldwide when at the time there were only 1,500 active satellites in orbit. The number planned by Musk is actually far far higher as we'll see shortly. The UK *Independent* questioned the economics involved without realising that to the Cult agenda money is no object:

The astronomical cost of the satellites and launch may be the limiting factor. The customers for the service are the very poorest: populations in the most remote regions on earth. The initial cost of the satellite network will be difficult to recover.

Covering costs is not the prime goal – covering the Earth with the Wi-Fi cloud and 5G is the goal. Elon Musk is an extraordinarily arrogant man and very dangerous in terms of human freedom and health. He only gets away with his behaviour because what he's doing serves the Cult. He was warned that his Starlink programme to launch 12,000 satellites to, among other things, fire 5G/Wi-Fi at the planet would seriously damage astronomy by blocking out the stars with light. Musk of course didn't give a shit and did it anyway. *Forbes* magazine reported how in November, 2019, Musk's SpaceX launched 'a network of 60 bright, large, reflective and radio-interfering satellites ... ruining numerous professional observations'. If 60 are doing that what are 12,000 going to do or the 42,000 that Musk wants? How much skin cancer alone are Musk's satellites going to cause as well as a long list of other health and psychological problems from 5G transmitted from space? Skin and sweat ducts directly interact with 5G. Musk announced a programme to launch 60 new satellites every two weeks to have 1,500 in orbit by the end of 2020 and the *Forbes* headline described the

cars which is developing 'smart' electric driverless vehicles and in terms of the global cloud he heads the rocket corporation SpaceX which is in the process of delivering thousands of satellites into orbit to fire the Wi-Fi cloud at the entire Earth. Space

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consequences: 'Latest Starlink Plans Unveiled By Elon Musk And SpaceX Could Create An Astronomical Emergency'. The article said: 'With competitors such as Kuiper Systems and OneWeb planning on launching similar networks, and Starlink attempting to procure approval for a total of 42,000 satellites, it's possible that looking through a pair of binoculars in 2030 [that year again] would reveal more satellites than stars.' Facebook is also involved in satellite Wi-Fi cloud-creation through a front company called PointView Tech along with other companies including Boeing. A Musk Space X rocket exploded at Cape Canaveral in 2016 before it was due to launch an Israeli-built communications satellite for Facebook to bathe a large area of sub-Saharan Africa in Wi-Fi. I'm sure as many search for food to survive they are desperate to watch cat videos on YouTube and CNN. Mark Zuckerberg said after the explosion that Facebook was 'committed to our mission of connecting everyone and we will keep working until everyone has the opportunities this satellite would have provided.' Google is also involved in the race to 'get everyone connected' purely from the light of human kindness. Satellite systems can also manipulate Earth weather which can then be blamed on human-caused 'climate change'.

This is what is happening to our world as the technological sub-reality I have for so long warned about is put in to place with no public approval or even knowledge in most cases. More confirmation of Musk's arrogance and fakery came in Germany where his Tesla electric car company fought off a campaign from the public and environmental groups to build a 'Gigafactory' that involved levelling 227 acres of what was described as serene forest in the ironically-named in the circumstances Gruen[Green]heide municipality. Protestors said it would turn the idyllic area into a dirty industrial zone. What does Musk care? Billionaire lake Wokers say one thing and do the opposite. Musk claims that electric cars are the future with 'the advent of sustainable transport and energy production'. First of all electric cars are not sustainable with the devastation caused in Africa alone in making the batteries and what is 'sustainable' and morally sustainable about deleting 227 acres of forest in a community that doesn't want that when you live on the other side of the world? Musk's activities are typical of a technocracy in which technocrats like him do what they like without the global population having any say and working above and beyond the level of elected politicians. Unbelievably self-obsessed people like Musk think they own the world and yet he is seen by many New Wokers as some kind of hero. How did Musk get permission for what he's doing? Cult asset Musk was given approval by the Cult-owned Federal Communications Commission – the usual story. He doesn't hold the positions that he does by accident. How interesting that his Jewish grandfather Joshua Haldeman was head of the Canadian Technocracy Party and

campaigned for a technocracy between 1936 and 1941 when the movement was banned for a time by the Canadian government over alleged subversion. Now here we have grandson Elon Musk playing a front-line role in leading the world into technocracy. Aren't coincidences amazing?

Democratising democracy

The world government is planned to be a technocracy as the Cult leads us into a post-democratic society without elected representatives and a psychological campaign has been underway for decades to discredit the concept of democracy in the public mind. This is done by misrepresenting democracy by equating it with corrupt place-people in all parties doing the will of the Cult in the same way that cartelism is sold as the 'free market'. The Bennett Institute for Public Policy, a think tank based at the UK's University of Cambridge, published a survey of 400 million people worldwide conducted between 1973 and 2020 which claimed that nearly 58 percent were 'dissatisfied' with democracy. The highest level on record came in 2019 when violent street protests broke out across the world. The World Economic Forum of the One-percent was quick to highlight the survey results given that dissatisfaction with democracy is the whole idea. The Cult is encouraging contempt for politics and politicians to transform democracy into technocracy and not least by ensuring that so many crooked and clueless people get elected to office. The System isn't working because it is not *used* to work. Witness the ever-increasing power over global society by the big names of Silicon Valley and how they are usurping and buying the political class. Politicians have already lost control of Silicon Valley technocrats, their Deep State handlers and the technology they oversee. The ground is being prepared for a full-blown technocracy wherever you look. *The Atlantic* magazine, yet another vehicle to promote the elite agenda, praised the technocrat takeover in an article headed: 'It's Jeff Bezos's Planet Now':

... in an age of political dysfunction ... Bezos has begun to subsume the powers of the state. Where the government once funded the ambitious exploration of space, Bezos is leading that project, spending a billion dollars each year to build rockets and rovers. His company, Amazon, is spearheading an experimental effort to fix American health care; it will also spend \$700 million to retain workers in the shadow of automation and displacement.

Meanwhile, swaths of the federal government have contracted with Amazon to keep data on the company's servers. Bezos is providing the vital infrastructure of state [is absorbing the state]. When Amazon locates its second headquarters on the [Washington DC] Potomac, staring across the

river at the capital, it will provide a perfect geographic encapsulation of the new balance of power.

The article asked, perfectly describing the Cult methodology for destroying elected government: 'Isn't a private government run by Bezos preferable to a public government run by Donald Trump?' How transparent can you get if you know what is going on? Even UK Prime Minister Boris Johnson has warned about what I am calling the Smart Grid. He said in a 2019 speech at the United Nations that 'digital authoritarianism is not, alas, the stuff of dystopian fantasy, but of an emerging reality.' When I said the same decades ago it was called conspiracy nonsense and here was a Prime Minister saying the same at the UN. He called for new technologies to be designed for 'freedom, openness and pluralism, with the right safeguards in place to protect our people'. That ship has already sailed, Mr Johnson, and it's going to be a hell of a job to roll back what is already happening never mind what is becoming more Orwellian by the day (written before the lockdowns). Fake 'populist' Johnson was handed a big parliamentary majority in 2019 which he could have used to defend freedom and put his policy where his mouth is. Instead he has done quite the opposite. Ofcom, the UK media watchdog tyranny, has been given new powers by the Johnson government to censor social media platforms, websites, comments, forums and video-sharing. Content deemed (by the state) 'harmful' would have to be removed by law. This is sold as protection for children when as always the plan is to expand the law and its interpretation to include critics of the official narrative. 'Harmful' is so open to interpretation you can make it apply to anything and that's why that term is used. Platforms would have to remove 'illegal' (state censored) content quickly and 'minimise the risk' of it being posted at all. The latter means using AI pre-post censorship algorithms which Facebook and company have long said they have been developing. Cult-controlled governments tell Cult-owned Internet giants what they must do and they comply to ensure the introduction of Cult-demanded censorship. This is happening with regard to an increasing list of countries. It is also interesting, and I say that ironically, that this UK government law is in line with the World Wide Foundation of 'Web-inventor' Tim Berners-Lee which proclaims to be saving the Internet from 'digital dystopia' with censorship dystopia. Authors of the Berners-Lee plan include ... Google, Facebook, Microsoft, and the censorship-obsessed German and French governments. Johnson's regime also employs an absolute Israel fanatic policing 'anti-Semitism' (criticism of Israel) in the form of one-time Labour Party MP John Mann with his blue and white tongue on permanent stand-by. Any connection between Johnson and freedom is purely coincidental on his record and he

allowed himself to be overridden by 'the scientists' and outrageous 'computer modellers' to lockdown Britain and create economic Armageddon and fascist control.

(Cyber) Space: the final frontier (for the end of freedom)

The Smart Grid cannot function without communication systems of at least 5G, or 'Fifth Generation', which operates in the millimetre wave band of the electromagnetic spectrum. Cumulatively-lethal 5G is being rolled out across the world and beamed from satellites without any official independent testing for its health and psychological implications. There is a simple reason for this lack of testing: 5G is crucial to the Smart Grid and independent, publicly-circulated, studies of 5G consequences for body and mind would mean it would never be allowed to happen in the face of mass public opposition. China is a world leader in 5G and already talking about 6G using terahertz waves. The authorities and the Cult telecommunications industry know that truly independent publicly-funded testing published in the mainstream would be the death knell of 5G and so they don't have any. If you can't win a debate don't have one. Senator Richard Blumenthal asked US telecommunications industry representatives during a session of the US Senate Commerce, Science and Transportation Committee how much money they had spent on independent research into the effects of 5G. Their answer was nothing. Blumenthal said: 'No research ongoing – we're flying blind here so far as health and safety is concerned.' It may appear to be that way from the public perspective, but industry insiders and the Cult are not 'flying blind' at all. They know the cumulative health and psychological consequences for large numbers of people and they don't want you to know. The International Society of Doctors for the Environment, with subsidiaries in 27 countries, joined more than 200 doctors and scientists in urging the 5G roll-out be stopped over concerns that its radio frequency radiation will harm human health. The body and its systems are an electromagnetic field communicating and processing information electrically as does the brain. Any frequency that disrupts this electrical and electromagnetic harmony will cause 'physical' and psychological dis-ease or disruption and the more powerful the frequency the greater the disruption. The Cult doesn't care – that's the effect it wants in its war on humanity. Tom Wheeler, then chairman of the US Federal Communications Commission (FCC), told the media that all urban and rural communities would be saturated with 5G to connect to the Internet everything from water supplies to pharmaceutical drugs and domestic appliances. Obama-appointed Wheeler was formerly a venture capitalist and lobbyist for the cable and wireless industry which he then became responsible for 'regulating'. No wonder this disgraced man said that 5G safety standards simply didn't matter.

We won't wait for the standards to be first developed in the sometimes arduous standards-setting process or in a government-led activity. Instead, we will make ample spectrum available and then rely on a private sector-led process for producing technical standards best suited for these frequencies and use cases.

We'll allow the industry that admits it has done no testing to set the safety standards in line with what they require for the industry (the Cult) to do whatever it wants. The technocracy's need to cover the planet with 5G or higher can be seen in the \$9 billion fund announced by the same Federal Communications Commission (now chaired by Ajit Pai) to 'help' the billionaire telecommunication industry to specifically install 5G connection (radiation) across rural America. How kind.

5G coming to your street

5G is designed to add still further to the technological sub-reality disconnecting humanity from Infinite Reality which is being constructed all around us step by step. Its millimetre waves don't pass well through buildings and other dense objects which means that 5G transmitters are needed down

every street (Fig 331). Some estimates claim one for every twelve buildings. This will mean having untested 5G transmitted directly outside homes and children's bedrooms. The human cost is going to be

considerable over a period and it's meant to be for reasons I will be explaining. In fact 5G is so potentially destructive that the International Commission on Non-Ionizing Radiation Protection (ICNIRP) which is recognised by the Cult-created World Health Organization said it is 100 percent safe. Wow, it must be bad then. The ICNIRP calls itself 'independent' which it is perfectly at liberty to do, but I don't believe it. The inability of 5G to pass through dense objects explains why phenomenal numbers of trees, especially in urban areas, are being cut down. You know those trees we are told are so essential to 'stop global



Figure 331: 5G with its destructive frequencies will require transmitters along every street.

warming'. A *Sunday Times* investigation using the Freedom of Information Act found that 110,000 trees had been chopped down in three years by UK councils including Newcastle (8,414), Edinburgh (4,435) and Sheffield (3,529). The excuses for doing so were pathetic and the real reason is 5G and the preparation for autonomous vehicles which need a clear connection to 5G. Scientists and doctors independent of the industry and the Cult have spoken out about the multiple dangers posed by 5G. One is Dr Joel Moskowitz, a public health professor at the University of California, Berkeley, who says the deployment of 5G is a mass experiment on the health of all species because millimetre waves are weaker than microwaves and predominantly absorbed by the skin which takes the focus of the 'hit'. He says skin contains capillaries and nerve endings which allow 5G bio-effects to be transmitted through molecular mechanisms and the nervous system (the skin is actually an antenna like the skeleton and the body in general). Dr Moskowitz warned that '5G will use high-band frequencies, or millimetre waves, that may affect the eyes, the testes [end of procreation agenda], the skin, the peripheral nervous system, and sweat glands ... Millimetre waves can also make some pathogens resistant to antibiotics.' Something rarely mentioned is that 'viruses' and diseases are, like everything, expressions of specific frequencies and if you broadcast those frequencies powerfully enough you can spread disease among the population without chemicals and direct contact and most certainly weaken the immune system which makes 'viruses' and pathogens more destructive (you'll see why I am putting 'virus' in quote marks when we get to the pandemic hoax). Dr Ben Ishai from the Department of Physics at Israel's Hebrew University has warned that human sweat ducts 'act like an array of helical antennas' when exposed to 5G wavelengths and Dr Devra Davis, an internationally-renowned American epidemiologist, President of the Environmental Health Trust and director of the Center for Environmental Oncology at the University of Pittsburgh, said at the start of the 5G roll-out:

If you are one of the millions who seek faster downloads of movies, games and virtual pornography, a solution is at hand, that is, if you do not mind volunteering your living body in a giant uncontrolled experiment on the human population. At this moment, residents of the Washington, DC region - like those of 100 Chinese cities - are about to be living with a vast experimental millimeter wave network to which they have not consented - all courtesy of American taxpayers.

This work shows that the same parts of the human skin that allow us to sweat also respond to 5G radiation much like an antenna that can receive signals. We need the potential adverse health impacts of 5G to be seriously evaluated.

before we blanket our children, ourselves and the environment with this radiation.

Unravelling human biology

Frank Clegg, former President of Microsoft Canada, is another vocal campaigner highlighting the dangers of 5G to health and DNA which is another receiver-transmitter of information waves and is immensely vulnerable to being unravelled and mutated by waves of technological radiation. Then there is John Patterson, an Australian telecommunications engineer and radiation expert, who was so concerned about the dangers he identified that he 'borrowed' a former British army tank and demolished six Sydney mobile phone transmitter towers in 2007. He wanted to highlight what he called the devastating risk to human life, nature and the planet all of which are wave and electromagnetic fields and seriously affected by technologically-generated electromagnetic waves. Patterson's protest came even before the roll out of 5G and we should not allow a focus on 5G to obscure the fact that all electromagnetic technology is potentially harmful to humans, 3G, 4G, or whatever label is used. It's only a matter of scale. John Patterson took his drastic action after being fired for producing a report revealing mega-levels of technological radiation and being ignored by every government and telecommunications agency including Standards Australia, Australian Communications Authority, Australian Radiation Protection and Nuclear Safety Agency, Local Government Association, national parliament and the military - all of which will be tools of the telecommunications industry which is a tool of the Cult. The same story can be found throughout the world because the Cult is running the show. Patterson's campaign began when he was very sick himself and this became even worse when two mobile phone base stations were installed close to his place of work. By then he was having regular heart attacks and suffering many health effects that he saw in work colleagues, some of whom died. Patterson said that 'Telecom had a very high number of suicides' and we have suicides soaring among young people deluged with technological waves from smartphones and masts. Electromagnetic wave disruption imbalances the wavefield mind as well as the body while the brain processes information (perception) electrically. Remember, too, that when you make a call the cell tower broadcasts a dedicated radiation connection just for you and you unknowingly irradiate everyone and everything in its path every time you use the phone. Patterson offers this advice to mobile phone users: Minimise the use of phones in buses and trains in peak hours; avoid closed rooms with mobile phones; wind all the windows down if you use a mobile phone in the car - ('For a mobile phone signal to go through 3mm of glass it has to double its power'); Tinted glass is less

permeable to mobile phone signals so causing the phone to increase power; pregnant women definitely should not use mobile phones given that the foetus absorbs radiation that its mother absorbs; don't send SMS text messages as the mobile phone transmits at maximum power for this. These are some of the mind and body effects described by Cairnsnews.org which Patterson experienced himself and witnessed in others after radiation exposure from nearby phone masts:

- Short-term memory loss
- Long-term memory loss
- Involuntary contraction of muscles and tendons
- Sleeplessness
- Chronic fatigue
- Problems with balance
- Sore neck muscles
- Jaw out of alignment
- Vertebrae in shoulders and bottom four vertebrae out of alignment caused by cramping of muscles
- Reduction in elasticity in body, especially throat, resulting in a 'choking' effect when swallowing
- Thyroid problems (which delete the immune system)
- Heart problems (including heart attacks)
- Stomach valve not opening properly, leading to heartburn and nausea
- Changes to gait
- Numbing of the skin
- Black rings around the iris
- Kidney problems
- Liver problems leading to skin problems, rashes and pimples that don't heal. Patterson says he saw at least a thousand workers with similar skin problems.
- Inappropriate emotional responses

I repeat - this was even before 5G. Patterson points out that overhead powerlines become conductors of mobile phone signals when people make calls close by and while science tests the impact of single phones the public is being exposed to simultaneous sources from multiple phones and masts making the cumulative effect far, far worse. He likens a crowded bus or train with many people using phones to a microwave oven. Now they are making them possible on aircraft. Patterson's overall conclusions are the same as those I have highlighted in my books over decades - technological fields disrupt natural fields and the consequences are cumulatively catastrophic. A major effect is on the polarity spin of body cells, Patterson said:

The body is like a spinning top charged through nature's fields and waves. Synchronicity to these fields crosses good health. When we're unsynchronised to the spinning top effect, sickness and disease appear. Continual exposure to the polarisation of mobile phones is diminishing our ability to recognise nature.

Marlin Pall is a Professor Emeritus of biochemistry and Basic Medical Sciences at Washington State University and a man I will quote later with regard to 5G and 'coronavirus'. He has published a very long list of articles and papers on the subject of electromagnetic fields and 5G. His findings support the direct experience of John Patterson and he emphasises the effect on the heart for all ages, a 'rapid crash in collective brain function', very early-onset Alzheimer's and both 'a rapid and irreversible crash in human reproduction to close to zero, based mainly but not solely on the impacts on male reproduction' and 'massive deterioration in the human gene pool, caused by the DNA effects in human sperm and possibly also on human eggs'. The latter two relate to the Cult's end-of-procreation and population cull agendas which I will detail in the next chapter. Professor Pall relates how widespread neuropsychiatric effects are produced by low-intensity electromagnetic field exposures, including depression: 'Depression can cause suicide and various neuropsychiatric effects may well lead to abusive behavior.' Here we are with suicide rapidly increasing especially among the young in the 'smart' era with 5G exponentially increasing the impact of technological electromagnetic fields. Pall also said in 2018:

I predict that many organisms will be much more impacted than we will. This includes insects and other arthropods, birds and small mammals and amphibia. It includes plants including even large trees, because trees have leaves and reproductive organs that are highly exposed. I predict there will be major ecological disasters as a consequence of 5G. This will include vast configurations because DMF exposures make plants much more flammable.

Professor Paul said that 'putting in tens of millions of 5G antennae without a single biological test of safety has got to be about the stupidest idea anyone has had in the history of the world'. Stupid if you care about humanity, but perfectly explainable if you don't. Pall's assessment is that '5G presents threats of the sort that we have never seen before – multiple imminent existential threats to our survival.' From the Cult's point of view that's the idea and what better way to hide that reality than behind a fake 'climate emergency' promoted by your puppets in the Climate Cult and claimed to be 'an existential threat' to humanity?

World-changing

Confirmation for Pall's and Patterson's words comes from the devastating impact of technological radiation on the planet's natural frequency state known as Schumanns Cavity or Schumann Cavity Resonance which is named after German physicist Winfried Otto



Figure 332: Schumann Resonance through which life in our reality can connect and interact is being destroyed by the tidal wave of technologically generated electromagnetic frequencies.

Schumann. This operates in the extremely low frequency or ELF range between 6 and 8 Hertz which is the frequency band of human brain activity and all biological systems (Fig 332). The frequency of 7.83 Hz is said to be where everything can

connect and communicate in unity. The Cult is purposely scrambling the frequency connection – Oneness – between humans and nature and humans and each other. We are part of a vast universal electrical system and we interact with the Earth's magnetic field which itself is part of the universal field or The Field. Humans have a flow of electromagnetic energy from The Field entering through the top of the head (crown chakra) which is distributed throughout the body by the chi acupuncture network – chi is electricity encoded with information. The dismantling and distorting of this connection by technological radiation (with 5G taking the effect to a level beyond anything we have yet experienced) is having untold consequences for body/mind health and the term 'health' is just another way of saying balance or harmony. This interaction with The Field has a profound impact on the body-field oscillation which is what we call life in this reality. When the oscillation stops the body dies and the weaker the oscillation gets the weaker we get. The same interaction applies to the entire natural world and this is why bees and insects among much else are disappearing. Older people will remember how insects were constantly hitting their windscreen in the summer because they were so abundant; but now? None of this appears to be a problem for the 'Green movement' and its Climate Cult which in many ways sees the technology dystopia as an answer to 'climate disaster'. I described earlier how members of the UK Green Party were divided by its Climate Cult hierarchy a debate on 5G at the 2019 annual conference and one member was threatened with the police



Figure 333: While the 'Greens' are obsessed with the human-caused climate change hoax the real danger to the natural world and humanity is ignored or even supported.



Figure 334: Plant growth with Wi-Fi and no Wi-Fi.



Figure 335: Plant growth with microwaved water and purified water.

minutes and found that they stopped metabolising sugars, proteins and fats – in 40 minutes. Now apply this to the staggering increase in human diabetes (flawed metabolising of sugars); heart disease (which is affected by frequency impulses); and cancer (cell growth can be distorted by technological electromagnetic fields). Is it really a coincidence that in the

while protesting the decision outside the venue (Fig 333). They don't seem at all interested in a 5G technology that threatens the natural world in all its forms with mass disruption from its wave frequency impact on animals, insects, plants, trees, the lot. What does the US Green New Deal call for? The building or upgrading to energy-efficient, distributed, and 'smart' power grids. I saw a headline at the New Wake 'Eco Warrior Princess' website which said: 'Smart Grid Technology in the US: Benefits to Environment and Social Justice.' Many experiments have revealed how Wi-Fi blocks plant growth and 5G has the potential for a serious effect on nature and food production to add to the Green demand to reduce the gas of life or plant oxygen (Figs 334 and 335). Nature is being destroyed from insects to bees to birds by technological frequencies and humans are going the same way. A study in India exposed bees to a cell phone for ten

minutes and found that they stopped metabolising sugars, proteins and fats – in 40 minutes. Now apply this to the staggering increase in human diabetes (flawed metabolising of sugars); heart disease (which is affected by frequency impulses); and cancer (cell growth can be distorted by technological electromagnetic fields). Is it really a coincidence that in the

period that all this has happened dementia has soared? We are in a real crisis caused by technological wavefields while the Cult sells the fake crisis of climate change and has hijacked the Green movement to attack those exposing the facts. Whales and dolphins that navigate through a Schumann connection have been beaching themselves in large numbers while birds, bees and insects are being similarly affected through navigational disruption. Physicist and Schumann researcher Wolfgang Ludwig said: 'Measuring Schumann resonance in or around a city has become impossible ... electromagnetic pollution from cell phones has forced us to make measurements at sea.' Professor Rutger Wever from the Max Planck Institute for Behavioural Physiology in Germany built an underground bunker isolated from Schumann resonance to study student volunteers for a month. Isolation from Schumann frequencies caused biological rhythms (circadian rhythms) to be scrambled and they suffered emotional distress (see humanity today) and migraine headaches. These symptoms disappeared after only a short exposure to 7.8 Hz. There are gathering numbers of people worldwide suffering so seriously from what is termed 'electrical sensitivity' that they have to live alone as far from technological radiation as possible, but where can they run with this shut blasted everywhere from satellite thanks to Musk and his masters? They are technology-generated radiation sensitive and the number is bound to soar with 5G. American activist Arthur Fintenberg, author of *Microworld Our Planet: The Environmental Impact of the Wireless Revolution and The Invisible Rainbow: A History of Electricity and Life*, said in 2018:

At least 20 million people in the world, and I estimate that conservatively, have already been injured by cell phones and their infrastructure so severely that they cannot work. They are driven out of their homes and cities and cannot live in society.

They are environmental refugees and they are in every country. Many are housebound and cannot venture outside ... many of these people are homeless, living in cars and tents, in remote areas, committing suicide and no one comes to their aid.

Fintenberg was speaking even before 5G. The manipulated frequency disconnection between humans and their environment has many benefits for the Cult agenda including that technocracy requires a disconnection from the natural world. A survey by Britain's National Trust in 2020 found that more than 70 percent of children say they rarely or never watch clouds, butterflies and bees and most adults had rarely or never listened to birdsong or smelled wild flowers over the previous year. Never mind they could always watch videos of them on YouTube

or download images from Instagram.

Give children smartphones?

Children are far more damaged by radiation and they are sitting in Wi-Fi fields at school all day and then going home to the same Wi-Fi along with the added radiation fields of smart meters, smartphones and Wi-Fi in the street. No safe level of wireless radiation has been determined for children or pregnant women and that's likely true for everyone. Brain cancers in children have rapidly increased where they put phones to their ear – adults, too – and tumours of the heart (disrupting the heart on the wavefield level is a prime objective of the Cult). What a grotesque sight it is to see parents allowing babies to play with these devices or toddlers in highchairs for no other reason than to keep them placated (Fig 336). Phone use for just 20 minutes a day can triple the risk of a brain tumour with thinner-skulled children at the greatest risk. The



Figure 336: Assimilation now starts early.

Chicago Tribune reported in 2019 that eleven smartphone models exceed federal radiation safety levels (already ridiculously high) by 500 percent. An investigation by the Swiss Tropical and Public Health Institute which replicated an earlier study established memory damage in teenagers who had used a cell phone for a year. This was especially the case with those putting the phone to the same ear with impaired memory in those parts of the brain getting the biggest exposure to phone radiation. A BBC report revealed that most children surveyed in the UK sleep with their phone by the bed, which can be seriously detrimental to both health and sleep, while mobiles are being handed to children at an ever earlier age with most having a phone by age seven. Ownership becomes 'pretty universal' by age eleven. Even against this background of phone and Wi-Fi health consequences Apple is selling 'Airpods' which people stick in their ears to pick up Wi-Fi. Bluetooth does the same. It is cumulative suicide and the companies don't know that? How many phone users realise that in the fine print these companies tell you not to put the phone to your ear? This is the get-out clause for the tidal wave of lawsuits they know will eventually come their way. Lloyds of London, one of the

Chicago Tribune reported in 2019 that eleven smartphone models exceed federal radiation safety levels (already ridiculously high) by 500 percent. An investigation by the Swiss Tropical and Public Health Institute which

world's premier insurance groups, refuses to insure health claims made against 5G and Wi-Fi technologies. What do they know that the public is not being told? Plenty. Cancer, heart malfunction, dementia, weakened immune systems, miscarriages, stillbirths, insomnia, extreme nosebleeds, eye problems, depression, suicide, and other conditions and behaviour are all potential effects of 5G. Firefighters in San Francisco have reported memory problems and confusion after 5G was installed outside their stations and they said this only stopped when they moved to non-5G locations. These are the 5G waves impacting on the information processing of the brain and imagine what the situation will be when it is everywhere and being fired at us from Musk's satellites. Anyone still surprised at the soaring increase in teenage suicide when electromagnetic frequencies emitted by technology affect information processing by the brain? The Cult is taking over the human mind and for this reason laws are being passed to impose 5G on every community and stop anyone opting out. Another effect of technology waves is to break down the blood-brain barrier that keeps toxins out of the brain including nano-chips. Children are being hit with this stuff before their blood-brain barriers are even fully developed. The telecommunications and Silicon Valley corporations promoting all this are controlled by pure psychopathic evil (the extreme absence of love). I hear some say there is no such thing as evil when there is by that definition. Indeed there must be the potential for evil and the absence of love within the infinity of All Possibility.

Cauliflower blood

American researcher Lena Pu is the environmental health consultant for the National Association for Children and Safe Technologies and she has the experience of working with military and government agencies. She is a vehement campaigner against 5G and Wi-Fi in schools, but even she was taken aback when she tested the blood of a teacher after a day in a classroom that wasn't even doused in maximum Wi-Fi power as many others are. She said the teacher's blood was the worse she had ever seen – 'sticky', coagulating and brown in colour. 'This is the first time that the blood was so thick that I could see the colour on a slide', Pu said. She described it as 'looking like cauliflower'. It took her a few minutes to talk to the teacher because she was in 'pure shock'. What was happening to the blood of the students in the same environment? What is happening to all children at school across the world every day with Wi-Fi transmitted in almost every classroom whether they use it or not? Now 5G is being installed in schools across the world and hospitals. Blood is liquid and the Wi-Fi affect becomes obvious when you think that Wi-Fi operates in the same frequency band as microwave ovens which generate frequencies specifically designed to energise water

molecules. What does the holographic human body mostly consist of? Water. Microwaves ovens dry out food and Wi-Fi dries out (dehydrates) humans. What could possibly go wrong and what a coincidence, eh? I guess it's also a coincidence that driverless cars operate in the waveband that affects water. Consequences for body and mind include depression (see skyrocketing teen suicides again). Apathy is another symptom which is exactly what the Cult wants to provide a free run to its endgame.

Lena Pu found that Wi-Fi and technology transmitters can change their frequency which means that while they are officially transmitting on one frequency they can covertly be delivering other frequencies at the behest of whoever is in control. Pu's research has also shown how technology frequencies are effecting the very formation and intake of oxygen and this connects with the global population cull I have been warning about for decades. The Smart Grid is the delivery system, but the controllers of the Grid decide at whatever time what is being delivered. We are told that this network is for 3G or 4G when that is only the technology to deliver other frequencies far beyond what we are told about. Humanity is not only building its own prison cell. It is watching its own microwave oven being installed step-by-step every day. Pu said something else that I have been pointing out year after year. These 'technology' waves are actually 'affix' and a form of consciousness. Remember what I said about the most advanced AI being in truth a name for the very force behind human control? The introduction of 5G is going to increase the radiation effect of all of the above by many, many times. Nevertheless the mainstream media takes the side of industry and government, of course, with the *New York Times* running headlines such as 'The 5G Health Hazard That Isn't'. This was the same *New York Times* that partnered with Verizon 'to explore how 5G can be used in journalism'. Why the *Times* would want to know about the effect on journalism when it doesn't do any was not explained. A *Times* reporter was accused of violating a truth and accuracy code by the Press Council of Ireland with regard to an article about 5G. Given that the paper is an ultra-Zionist-owned rag that serves the interests of the Cult there is no surprise there then. A 'journalist' called Alex Hern wrote an article in the 'anti-establishment' deeply-establishment *London Guardian* headed: 'How baseless fears over 5G rollout created a health scare'. Hern licked the arse of the industry and its '5G is perfectly safe' propaganda while basically dismissing any concerns as 'junk science'. What a disgrace to journalism, but oh, so typical of his kind across the media. All these health concerns are believed acceptable for faster Internet speeds that are already fast enough. Endanger your health and you can download your movies quicker – you know it makes sense. Faster speeds are just another 'here kitty, kitty' to the Smart Grid dystopia (Fig 337).



Figure 337: Faster downloads – faster surveillance and data collection – and faster and more powerful the impact on human wavefields. (Image by Ben Garrison at Geographics.com)



Figure 338: Active Denial weapons utilize a band of 5G. The skin – an antenna – decodes the frequencies into the feeling of intense heat as if the skin is on fire.

gives it life. Consider the effect on the whole electromagnetic soup in totality on the wave oscillation of the body. The military potential is fantastic and NATO countries agreed to 'guarantee the security of our communications, including 5G' at their 2019 summit in London. The real reason for the 5G roll out is military and anti-human. The Pentagon-advising Defense Science Board detailed the military potential of 5G in a document called *Defense Applications of 5G Network Technology*: 'The emergence of 5G technology, now commercially available, offers the Department of Defense the opportunity to take advantage, at minimal cost, of the benefits of this system for its own operational requirements.' Get your Cult 'private' companies and taxpayer money to fund a 5G

5G is a weapon

Ultra-high millimetre frequencies used by the 5G band are in fact employ I as a weapon by the American, Israeli and other military and law enforcement (same thing) under the name 'Active Denial Technology' (Fig 338). This transmits millimetre band frequencies from military/law enforcement trucks to rapidly disperse protests

and crowds. People scatter when their skin (an antenna) decodes the frequencies into the feeling that their skin is on fire and they run to get away from it. A US Department of Defense report said: 'If you are unlucky enough to be standing there when [the beam] hits you, you will feel like your body is on fire.' With such skin-5G interaction how many people will die of skin cancer as a result of its imposition? The disruptive potential is obvious for body and brain of 5G waves everywhere you go and for affecting even the wave oscillation of the body that

network that's really intended for the Cult military. 5G will take war fighting, mass killing and mass surveillance on to a new level. Fortunately, public resistance to 5G is growing despite Cult industry propaganda parroted by the Cult media and Cult social media and the Cult's YouTube deleting accounts and videos of those exposing the dangers. Be careful, however, as with all apparent opposition groups, that some are not fronts for what they claim to oppose. Astro-turfing is everywhere today.

Poison from the sky

One other crucial point about 5G and other forms of technological radiation is the phenomenon known as 'chemtrails' which started to be noticed in the 1990s and has subsequently been reported all over the world. I will be brief because I have detailed this subject at length in *Everything You Need To Know*. People are familiar with contrails, or condensation trails, that flow from the back of aircraft and quickly disappear. Chemtrails, or chemical trails, do not disappear. They slowly expand and combine until even a clear blue sky can appear cloudy and hazy. The content of chemtrails falls to earth to infest people, animals, water sources, trees, plants, soil, everything (Fig 339). Tests have revealed that chemtrails contain aluminium, barium, radioactive thorium, cadmium, chromium, nickel, mould spores, yellow fungal mycotoxins, polymer fibres, smart dust nano-technology, and so much more in cumulatively lethal concentrations for human health.

The aluminium content is a major source for the aluminium/glyphosate impact on the pineal gland and aluminium, a brain toxin, has been rightly linked to Alzheimer's and other forms of dementia which have become an epidemic affecting younger and younger people. Why wouldn't that be when aluminium, in effect, short-circuits the brain? With regard to the technological sub-reality, or 'cloud', chemtrails add to the conductivity of the atmosphere and turn it into an antenna. It's all connected to the same end. Chemtrails were dismissed as a 'conspiracy theory' (of course) and then Bill Gates (of course) began officially promoting and funding them to 'block the sun' to save the world from 'global warming'.



Figure 339. The chemical phenomenon all over the world.

AI world army

The world army enforcing the will of unselected technocrat world government is not ultimately planned to be human and the transition to an AI military is already well underway. We are moving rapidly to artificial intelligence (the Archontic force essentially) making global decisions about life and death through control of weapons that truly are weapons of mass destruction. AI won't only control the Smart Grid and every facet of 'human' life. It will decide if you live or die and that can be done en masse through humanity's AI connection to the Grid. The middle strata of the Hunger Games Society between the elite and the masses is planned to be occupied by an AI world military/police state of constant surveillance with the elimination of all dissenters. If you've seen the *Matrix* movies you'll be aware of the 'Sentinels' or machines in their seek-and-destroy missions against humans operating outside the AI control system. This in theme is the AI world army consisting of AI robots and weapons systems that even military commanders would not be in the end control. For autonomous vehicles see autonomous weapons, too, directed by the Archontic force and its Cult operatives. AI control would at some point allow the Cult elite and its technocrats to take refuge from any protesting humanity in mega underground and within mountain cities that I was writing about as long ago as the 1990s. All this has been planned a very long time. Cult arms companies are developing laser weapons controlled by AI – tanks, planes, helicopters and battleships are all being designed and introduced with AI making the decisions. DARPA as you would expect is at the centre of this although itself answers to those much deeper in The Web. This is the same dark and sinister Cult-created DARPA behind the Internet and Silicon Valley corporations like Google and Facebook. Aircraft drones equipped with weapons are being developed with a 'neural microchip' that lets them 'think like a human'. Drone surveillance systems are well advanced and in 2019 Turkey unveiled a fleet of drones equipped with a machine gun and 200-rounds of ammunition. The thought of the military flying AI drones with machine guns would once have been science fiction territory. Even so Turkey is way back from the cutting edge of drone capability compared with the United States, China, Russia and Israel. How about AI controlling laser and other focused energy and beam weapons that can strike anywhere on Earth from satellite? Anyone who dismisses that has not been paying attention to what is actually happening. The contempt that the Cult has for the human population was confirmed yet again when the US Department of Defense appointed Eric Schmidt, Trilateral Commission member and former CEO of Google, to chair the Defense Innovation Board established in 2016 to formulate 'ethical standards' in the use of AI in the battlefield in line with the 'best

practice' of Silicon Valley. What 'best practice'? Walter Isaacson, another Trilateral Commission member, former President of the One-percent's Aspen Institute, chairman and CEO of CNN and Managing Editor of *Time*, is also on the board. The members are selected by Schmidt in consultation with the Secretary of Defense. The idea that Schmidt is going to propose genuine and enforceable 'ethical standards' on military AI is a joke so sick it is beyond laughable when he fronted for Google as it was transforming the Internet into the censorship-ridden, freedom-deleting, AI-dictated abomination that it has become.

Satellites are being launched all the time without publicity in pursuit of global control and when they are mentioned it is their civilian and commercial uses that are emphasised when many have military applications. Russia's President Vladimir Putin made this point in 2019 when he said that world powers were increasingly weaponising space and Russia had to respond: 'The US political and military leadership openly consider space a war theatre ... Developments demand that we pay increased attention to strengthening our orbital group as well as our rocket and space industries.' Russia's 'orbital group' is reported to have 150 satellites with two-thirds of them having military applications. The United States will be much further ahead than that and then there is China, too. President Trump created the US Space Force, the first new military branch since 1947, when he signed the 2020 National Defense Authorization Act. 'Space is the world's newest warfighting domain', Trump said. 'American superiority in space is absolutely vital.' This was delivering exactly what the ultra-Zionist Project for the New American Century called for in its September, 2000, document demanding that list of regime changes which followed the Sabbatian-Frankist-initigated 9/11. The fact that Trump is owned by Israel is naturally purely coincidental. Space is another 'domain' for the child-like playground

bullies to fight. The world is run by a psychopathic playschool. Academics and scientists have warned that killer robots will leave humans defenceless while not appearing to realise that this is the very idea. (Fig 342). Even using humans in the military/police state carries with it the possibility of rebellion once they see what the game is. That is avoided with AI and those in the military and police today



Figure 340: The Cult is creating a world military force in which decisions are made by artificial intelligence outside the control of humans.

should realise that they would be in the Hunger Games masses once AI law enforcement took over. The world's first robot officer officially joined the Dubai police in 2017. 'Robocop' can read facial expressions, respond in six languages, and has a built-in tablet that can be used to report crime and pay fines. Brigadier-General Khalid Nasser Al Razzouqi, Director-General of Dubai Police 'Smart Services', said:

With an aim to assist and help people in the malls or on the streets, the Robocop is the latest smart addition to the force and has been designed to help us fight crime, keep the city safe and improve happiness levels. He can chat and interact, respond to public queries, shake hands and offer a military salute.

Dystopian vision

Authorities in the Dubai fake-royal tyranny want at least a quarter of its police force to be robots by that year again – 2030 – which also turned up in an article by Danish politician and World Economic Forum insider Ida Aukén which was posted on the Forum website in 2016. It was headed: 'Welcome to 2030. I own nothing, have no privacy, and life has never been better.' She described her home at that time as 'our city' and was concerned for those who did not want to share the then AI technocratic society. She described them as 'Those who decided that it became too much, all this technology' and 'Those who felt obsolete and useless when robots and AI took over big parts of our jobs.' In Aukén's scenario such people lived a different life in 'little self-supplying communities' or 'just stayed in the empty and abandoned houses in small 19th century villages'. She continued in her 2030 predictions:

Once in a while I get annoyed about the fact that I have no real privacy. Nowhere I can go and not be registered. I know that, somewhere, everything I do, think and dream of is recorded. I just hope that nobody will use it against me.

All in all, it is a good life, much better than the path we were on, where it became so clear that we could not continue with the same model of growth. We had all these terrible things happening: lifestyle diseases, climate change, the refugee crisis, environmental degradation, completely congested cities, water pollution, air pollution, social unrest and unemployment. We lost way too many people before we realised that we could do things differently.

She was describing the Problem-Reaction-Solutions and NO-Problem-Reaction-Solutions that led to the technocracy so long planned by the One-percent mentality behind the World Economic Forum except that the 'little self-supplying communities' would not be allowed.

We can see how a very few could control the entirety of humanity through an AI brain connection, a centrally-directed AI global army and a Smart Grid controlling everything. A further aspect of AI in relation to the Hunger Comes Society is the absolute carnage which Auker indicated that is coming for jobs and income through the mass-replacement of humans with AI technology which is already happening at a quickening speed (written before the carnage of jobs and income that came with the manipulated lockdowns).

Even news items are being written by artificial intelligence with AI digital news and sport presenters being developed. None of this is by chance. It's by Cult. How few do you need to dominate the world through the global Smart Grid when centrally-controlled AI can decide what happens with everything connected to the Internet, all surveillance, communication systems, transport, economics, food production and distribution, what news items say, and even the digital AI that presents them? All this and so much more is planned to be centrally dictated and I make the strong case in *The Trigger* that this point of control in the Smart Grid is planned eventually to be Israel, the fiefdom of the Sabbatian-Frankist cult, the prime network in the global Cult.

What is really behind transgender hysteria?

Tolerance isn't about not having beliefs. It's about how your beliefs lead you to treat people who disagree with you - Timothy Keller

I have indicated a number of times so far that there is a deep and sinister motive behind transgender hysteria that has gripped the mind of New Woke and been tyrannically imposed on the rest of society. Know the outcome and you'll see the journey.

The Cult wants a no-gender synthetic 'biological' human to replace what we have now. The new human body is being designed to better interact with AI and to be able to survive the catastrophic levels of destructive radiation necessary for the Smart Grid to function in its final form which the current human body would struggle to survive. 5G is not the end in terms of the impact of frequency transmissions; it is only the next stage. Synthetic genetics is advancing rapidly in public arena projects and far more so in underground bases where the Archon-to-Cult knowledge transfer takes place. Synthetic biology or 'SynBio' is a fast-emerging area of science that includes everything from genetic and molecular engineering to electrical and computer engineering. The content of the Bill Gates 'virus vaccine' is designed to advance this process as I will be explaining. Definitions of synthetic biology include: 'A multidisciplinary area of research that seeks to create new biological parts, devices, and systems, or to redesign systems that are already found in nature'; 'the use of a mixture of physical engineering and genetic engineering to create new (and, therefore, synthetic) life forms'; and 'an emerging field of research that aims to combine the knowledge and methods of biology, engineering and related disciplines in the design of chemically-synthesized DNA to create organisms with novel or enhanced characteristics and traits'. When translated from the Orwellian this means synthetic post-humans. Transgender hysteria is the Tiptoe on a road that leads to synthetic everything. The pressure for vegan diets being pushed to 'save the world' is only a Tiptoe to synthetic food which will be further advanced by manipulated food shortages in

the wake of the 'virus' hysteria - if we let them do it. American scientists claimed in 2020 they had developed 'Xenobots' that are 'neither robot nor animal' constructed from living frog cells and described as 'living machines'. Research groups are leading the world to artificial wombs and gestation and these are only projects publicly known, not the cutting edge that we don't see. A lamb was grown in an artificial womb for four weeks and Australian researchers have experimented with lambs and sharks. A 2017 article in the *London Guardian* was headed 'Artificial wombs could soon be a reality. What will this mean for women?' It said:

... We are approaching a biotechnological breakthrough. Ectogenesis, the invention of a complete external womb, could completely change the nature of human reproduction. In April this year, researchers at the Children's Hospital of Philadelphia announced their development of an artificial womb ...

... Researchers at Cambridge University, meanwhile, have also kept a human embryo alive outside the body for 13 days using a mix of nutrients that mimic conditions in the womb. The embryo survived several days longer than previously observed and research only stopped because they were approaching the 14-day legal limit for the length of time an embryo can be kept in a lab. In other words, our ethics rather than our technology are now the limiting factor.

Reflect on that phrase 'could completely change the nature of human reproduction' in the light of what I have said in this book and much earlier ones about the plan for the end of human procreation described by Aldous Huxley. Many research centres around the world are seeking to develop synthetic skin, organs, blood, even brain tissue. Public experimentation reveals the direction while giving the impression that the development is at a really early stage. Behind the scenes synthetic biology is extremely advanced through Archon-Cult knowledge transfers in the underground facilities hidden far from the public gaze. Genuine research by genuine people provides the cover with an apparent process of development while the finished article is already waiting to be played out in the public arena when the time is right. Synthetic robots are even looking ever more like the humans they mimic and the 'consciousness' of these robots is artificial intelligence (Fig 341). We should not only think of AI with regard to robots and machines, but also with digital virtual people that don't exist except in cyberspace. The plan in the end is to absorb human minds into only cyber reality with no 'physical body' at all and the stepping stones to that are already clear to see. Remember that picture from earlier of very human-looking people that don't exist except as cyber creations. Once you know the game the



Figure 341: This is how far machine humans have come in the public arena and this is far from the cutting edge in the secret projects and underground facilities.



Figure 342: It goes with the territory once you look free of The Program.

world becomes an open book and Bubble minds confirm that by calling you crazy (Fig 342). Transgender hysteria has come out of nowhere to be suddenly everywhere because the Cult has pressed the button on the preparation for the synthetic human which will have no gender and not be able to procreate. Aldous Huxley who operated in the arena of Cult operatives envisioned just such a society in his prophetic *Brave New World* in 1932:

Natural reproduction has been done away with and children are created, 'decanted', and reared in 'hatcheries and conditioning centres'. From birth, people are genetically designed to fit into one of five castes, which are further split into 'Plus' and 'Minus' members and designed to fulfil predetermined positions within the social and economic strata of the World State.

Huxley was precisely predicting the Cult agenda the best part of 100 years ago. Understanding how Huxley in 1932, George Orwell in 1948 and Dr Richard Day in 1969 could know what was coming relates to how I have been able to so accurately predict events in my books over the last 30 years. If you have access to the hidden agenda as an insider, as with Day, or penetrate the plan by decades of research, you can comfortably predict what we perceive as the future. It can be done on this basis: If there is an agenda for the world and nothing intervenes to stop that then what is planned will happen and in this way by uncovering the plan you 'predict' the 'future'. The idea from my perspective is to alert enough people so the plan is stopped. It will rightly be asked how Huxley and Orwell could predict events so far ahead which involved technology and drugs that didn't even exist at the time. This included Orwell's Big Brother 'Telescreens' keeping constant surveillance in every home. Today they are known as Smart TVs although there are much more extreme versions in the pipeline. That

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question of how they could be so accurate about technology that didn't exist can be answered this way: There are two realities in human society working alongside each other with very different levels of knowledge. One is Postage Stamp Society with strictly limited information and the other is Cult reality interacting with Archaic reality through the inner sanctum of secret societies and Satanism. The latter connection especially allows inner-core Cult initiates to know about technological possibility and projected plans even when they are not yet available or happening in human reality. Those that operate in those circles can pick up themes of where the world is being taken and technology that will be possible to take us there even if they are not directly part of the Cult itself. Non-insiders who don't operate in those circles have to work their backsides off to breach the secrecy with both five-sense research and expansions of consciousness that can connect with levels of awareness working to end human enslavement and help people awaken from their perceptual coma.

Confuse gender then fuse gender

The current obsession with transgender and its imposition on children and the young (as always) by schools, universities, media and peer pressure is an intensely malevolent campaign to confuse gender on the way to deleting gender with the synthetic technologically-created no-gender human. From this comes an even smaller Bible of self-identity (Fig. 343). Cult insider Dr Richard Doy told the podiatrists in 1969 that the plan was to make boys and girls the same and children would be produced without sexual procreation. The Cult is confusing gender on a Totalitarian Tiptoe to fusing gender. The largely unnoticed first stage was to dilute the differences between men and women

and increasingly treat them as biologically the same when they have clear differences that should complement each other. Their body information fields process information differently and women have gifts and aptitudes that most men don't have and vice-versa. The idea has been to dilute that uniqueness and most importantly the perception of uniqueness with slogans like a woman can do anything a man can do



Figure 343. Non-binary on the road to no-binary as self identity goes on being squeezed into smaller and smaller bubbles.

just as well. Actually that's not true in many cases and the same with a man doing anything a woman can do just as well. There are differences and we must not let New Woke insanity kid us otherwise. I am not saying that women should not do whatever they choose and good luck to them. My point is how the manipulation has been operating slowly and then ever-quicker towards the end of gender and the blurring of differences between men and woman was stage one. We have had as a result the feminising of men and masculinisation of women. Recall the progression (Tiptoe) in how first we had 'unisex' clothing for both men and woman and now no-gender clothing. Female uniforms are being phased out for a no-gender variety with police forces and military increasingly scrapping traditional men's and women's uniforms for 'gender-neutral' versions and the same with school uniforms. Tiptoe, Tiptoe, Tiptoe.

The deletion of the terms 'ladies and gentlemen' and 'boys and girls' are also calculated to delete the concept of male and female gender from the language and so the psyche. We are well into the next stage today with the number of young people questioning their gender increasing dramatically and kids suddenly bewildered about their gender who would not have been before without the systematic programming. Why does anyone think 'question-your-gender' studies are becoming compulsory in schools? Why do they think gender-confusing drag queens are being invited into schools in country after country to read gender-confusing stories to even very young children? Why are parents and anyone else challenging this calculated and disgraceful manipulation of kids instantly branded 'transphobic' by often viscous transgender New Woke activists and the media? It's the same modus operandi that we have with climate change activists, 'anti-racist' activists, gay activists, political correctness activists and all the other mis-and match permanently-offended intersectional expressions of New Woke serving the Cult while overwhelmingly in ignorance that there is a Cult. Nothing is more certain to scramble the brain than the virulent up-your-own-arse syndrome that pervades New Wokeness like a mering epidemic. Maybe we should shut down the global economy and put everyone under house arrest until it passes. The consequences of this tyranny for many children are horrific and life-long. Research by doctors in Australia revealed that those attending gender identity clinics are many times more likely to show signs of autism than the general population. The doctors reported their findings in the *Journal of Autism and Developmental Disorders* and quoted a US study of nearly 300,000 children that suggested those with autism were more than four times more likely to be diagnosed with gender 'dysphoria' compared with those without autism. Stephanie Davies-Arai, founder of the campaign group Transgender Trend, said people with autism spectrum disorder

(ASD) are more likely than others to become fixated on an idea which they can find almost impossible to drop (see Greta Thunberg). She warned: 'We should not just be cheering on this vulnerable group towards life-changing medical interventions.'

Transgender Trend is a group of UK-based parents questioning the trend to diagnose children as transgender which has led to the unprecedented number of teenage girls suddenly self-identifying as 'trans'. The group challenges laws which put transgender rights 'above the right to safety for girls and young women in public toilets and changing rooms along with fairness for girls in sport' (Fig 344). These legitimate questions and concerns are condemned as serious transphobia by the ever-scornful face of New Wokeness. I mean how could it possibly be valid to protect young girls and women from a strapping bloke walking into their toilet or changing room with his bollocks dangling claiming to be female; or a big muscular man taking part in the women's weightlifting championship because he goes by the name of 'Vera'? American Fallon Fox is a transgender mixed martial arts fighter who identifies as a woman while walking around in a powerful male body. Her/his self-identification allows her/him to compete against much less physically powerful women and she/he knocks the crap out of them. One woman had her skull broken. Criticism she/he faced for this, however, was purely transphobic and nothing to do with protecting women from life-changing harm. Outsports, a sports news website focusing on LGBT issues in sports, described Fox as the 'bravest athlete in history' to confirm yet



Figure 344: And it is planned to become ever more a thing of the 'past'. Female is a sex/gender and they are all planned to disappear. Also are the first target, but women are following too.



Figure 345: Big powerful male bodies self-identifying as women are destroying women's sport - another way that the female sex/gender is being targeted for eventual elimination.

again that transgender activism is not interested in fairness, balance and inclusivity. It seeks dominance for its view while itself being clueless about how and why it is being used by the Cult. What New Wokers call 'inclusivity' for one minority means exclusion and even a broken skull for another. Where you are in the hierarchy of Wokeness decides who dominates who and transgender is now way above female. Consequently women's sport is being destroyed by those in men's bodies self-identifying as women running away with the prizes and destroying previous female performance records. Why? Their bodies are not female (Fig 345). By the way, how come 'women' in male bodies can so out-perform those who are born women if males and females are not biologically different? Transgender extremism is a parody of itself (Fig 346). Transgenderism gets whatever it wants even though Catherine McGregor, a highly-intelligent and perceptive Australian transsexual, said: 'We are a telephone booth minority.' That's correct even with all the propaganda, but the Cult's no-gender human Tiptoe demands what is

happening and so it happens. Transgender activist extremism is nothing whatsoever to do with support for transgender people. They are only pawns and the excuse just as with the Jewish community and Sabbatian-Frankism. Support for Cult ambitions is what this is all about and as you would expect Sabbatian-Frankist, Cult-owned Hollywood

BREAKING NEWS ... CYCLIST WHO IDENTIFIES AS MOTORCYCLIST BREAKS WORLD CYCLING RECORD



**ANOTHER VICTORY FOR INCLUSION - YIPPEE!
BE WOKE, I SAY, BE WOKE**

Figure 346: Parody is now almost impossible in the face of what is really happening.

has taken up the cause with transgender 'superheroes'.

'Unregulated live experiments on children'

I have detailed in *Everything You Need To Know* the list of ways that gender confusion is being manipulated from indoctrination in schools from the earliest ages to inhuman pressure applied by 'gender' doctors and clinics to push children and adults into gender transition without any evidence that this is necessary or advisable. Gender-changing and puberty-blocking drugs are being handed out at an alarming rate because that's what the Cult wants. So blatant and extreme has this become that 35 psychologists resigned in three years from London's

Gender Identity Development Service (GIDS) at the Tavistock and Portman NHS Foundation Trust. They cited 'over-diagnosis' with too many children put on puberty-blocking drugs when they should not have been diagnosed with so-called gender dysphoria. Whistleblower workers have said children as young as three are having 'unnecessary gender reassignment treatment' after being incorrectly diagnosed with gender dysphoria. Carl Feneghan, director of the Centre of Evidence-based Medicine at Oxford University, described the policy as 'unregulated live experiments on children'. The number of children treated at GIDS is reported to have increased in a decade from 77 to 2,590 – a trend that is happening across the world as the Cult agenda is enforced. Former GIDS staff said they were not able to properly assess people for fear of being dubbed 'transphobic'. New Wokeness is nothing if not predictable and desperately naive although its inner core knows exactly what it's doing. One psychologist said: 'We are extremely concerned about the consequences for young people ... For those of us who previously worked in the service we fear that we have had front row seats to a medical scandal.' Another said:

The claim started ringing for me ... I didn't feel able to voice my concerns, or when I did I was often shut down by other affirmative clinicians. Looking back there are young people who I now wouldn't necessarily put on medication.

Lisa Littman, assistant professor of the practice of behavioural and social sciences at Brown University in Rhode Island, said that many teenage girls are identifying as transgender after seeing a friend do so or after reading transgender material online. Teenagers with no previous history of 'gender dysphoria' suddenly proclaimed themselves to be transgender in the wake of an individual or multiple members of their peer group doing the same. Littman called these 'cluster outbreaks'. A decade ago most 'gender dysphoria' children were biologically male but today they are biologically female. Clearly perceptual programming and group-think is playing a major role here. As you would expect Lisa Littman was subjected to major abuse from transgender activist extremism – so much so that her study was withdrawn and revised. Michelle Cretella, executive director of the American College of Pediatricians, said she has heard from dozens of families about teenagers experiencing 'rapid-onset' gender dysphoria. The majority are girls between 13 and 15 with often a history of depression and no previous signs of gender dysphoria. They suddenly announce they are transgender and should have hormone treatment. Cretella said:

Human beings are biological creatures heavily shaped by social relationships, especially during adolescence. It is at this most critical stage of development

that our culture now holds out the lie that teens should embrace a mental illness – gender dysphoria – not only as their 'authentic transgender identity' but as the answer to all that ails them mentally and emotionally ... [these children and] being needlessly led down a path of irreversible long-term physical and emotional harm.

The programming is incessant today with the BBC as always right up there. It aired on its children's channel CBBC the documentary *I Am Leo* about a 13-year-old going through transition treatment at the increasingly infamous Tavistock and Portman clinic. It naturally won an award. I have no problem with those who genuinely believe they are transgender. The problem is confusing children about gender who were not confused before. That's child abuse. Former BBC journalist John Humphrys – far too much of a journalist for today's BBC – recounted his experience of a doctor seriously concerned about what was being done to children in the transgender arena, but she was terrified of the backlash for saying so. Humphrys said the doctor 'was afraid of being viciously attacked on social media and having her reputation destroyed. She is not alone in her fear. Far from it.' He said the doctor was 'desperately worried' over far too many children being treated as victims of 'gender dysphoria' when they were suffering from a more common condition – 'being a confused teenager'. What can you say in the light of all this about the UK Liberal Democrat Party taking money from a puberty-blocking company while peddling an extreme transgender policy that benefits such organisations? And the kids ...? Graham Linehan, co-creator of the hit TV comedy *Father Ted*, spoke out against both this mistreatment of children and transgender extremism after seeing a feminist beaten up by trans activists. He faced an onslaught of abuse and hate from the anti-hate brigade that hasn't looked in the mirror for years. It wouldn't dare. Work opportunities dried up for Linehan from gutless potential employers. He said: 'I think there's just a stink around me, the stink of bigotry, you know, that has deliberately been created, by radical trans-rights activists. It has had a chilling effect.' Good on him for refusing to back down although with the proviso that Linehan himself had been involved in Woke-style censorship before he realised by experience what a tyranny it is. This chilling effect is now increasingly being written into law and the incessant propaganda led to Swiss voters supporting in a 2020 referendum the plan to make it illegal to 'publicly denigrate, discriminate or stir up hatred based on a person's sexual orientation'. This sounds fair enough, but it's the way this will be applied that is the danger to free speech. Who decides if something is discrimination or a freely held opinion? Who decides if transgender people don't get a job because they are transgender or because the potential employer thought

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another applicant was better qualified? Well, the state does and that's the Achilles heel of such laws when it comes to the deletion of basic freedoms.

In writing ...

Law website Rollonfriday.com and its reporter Jamie Hamilton revealed documents in 2019 that exposed the covert and highly manipulative nature of transgender activism targeting children. The document advises on campaign tactics and was written by staff at Dentons, described as the world's biggest law firm measured by the number of lawyers, which merged with Sonnenschein Nath & Rosenbhal in 2010. The document was produced in conjunction with the Thomson Reuters Foundation and LGBT pressure group IGLYO. A Denton disclaimer states that the content 'does not necessarily reflect the personal views of any of the lawyers, staff or clients of Dentons'. Thomson Reuters Foundation apparently said something similar. Reporter Jamie Hamilton wrote that Mosaic, an LGBT youth group, contributed to the UK portion of the report along with an NGO that 'wished to remain anonymous'. The Denton report, headed 'Only adults? Good practices in legal gender recognition for youth', says in the foreword: 'We hope this report will be a powerful tool for activists and NGOs working to advance the rights of trans youth across Europe and beyond.' It contends that 'every child has an accurate conception of their own gender identity which they should be entitled to affirm in law without impediment'. To anyone still in touch with reality this is a breathtakingly ridiculous statement, but extreme transgender activism is dependent on not staying in touch with sanity let alone reality. We see the ever-recurring theme of deleting parental rights over their children to isolate the kids and hand power to the state and transgender extremists. Reporter Hamilton described the main thrust of the Denton document:

'The right to legal gender recognition is crucial for young trans persons to secure all other rights', it states, advising that the UK should 'eliminate the minimum age requirement' at which children can change their legal gender 'on their own volition, without the need for medical diagnoses or court determination'. The document emphasises that there should be 'no eligibility criteria, such as medical or psychological interventions'. And UK authorities should 'take action' against parents 'who are obstructing the free development of a young trans person's identity in refusing to give parental authorization when required.

Could it be any more sinister? Allow children to make life-changing decisions about their gender and 'take action' against any parents who challenge what is being done to their kids. In the words of the

document: 'It is recognised that the requirement for parental consent or the consent of a legal guardian can be restrictive and problematic for minors.' Restrictive and problematic for transgender activism and extremism would be a better way of putting it. The Denton document says it is 'crucial' there are 'no limitations' to 'gender confirmation treatment', including 'no requirement to be diagnosed with gender dysphoria'. It deletes all potential barriers and delays on any child 'persuaded' they are living the 'wrong' gender to be set on course to puberty blockers and surgery. Maybe someone could give me a better definition of child abuse because I can't think of one in this moment. Another point is that through epigenetics or passed-on gene sequences the changes in one generation's transgendered hormonal re-write will pass to the next. Rollonfriday.com reporter Hamilton continues:

The report advises activists to 'de-medicalise' their campaigns 'so that legal gender recognition can be seen in the eyes of the public as distinct from gender confirmation treatments'. It explains that this is because one of the reasons opponents often cite for 'denying such access to minors' is the view that 'young people should not have irreversible surgeries until they are of the age of maturity'.

The document really is a shocker and confirms in writing the experience of parents and wider society of transgender impositions that have become the norm. Such are the sinister extremes demanded by transgender activism that the Denton report warns campaigners to 'avoid excessive press coverage and exposure' because the 'general public is not well informed about trans issues, and therefore misinterpretation can arise'. Translated from the PW-speak this means 'avoid excessive press coverage and exposure' because if the 'general public knew what you really want then horror and fury can arise'. The document describes how activists in Ireland 'have directly lobbied individual politicians and tried to keep press coverage to a minimum in order to avoid this issue'. It says the chances of success are increased if activists 'target youth politicians' who in successful campaigns in Europe 'brought up the issue at every meeting of any sort - even ones which were not directly relevant, to ensure the issue was at the forefront of everyone's minds'. You can see why the transgender 'issue' involving 'a telephone box minority' is everywhere and impinging on everything. Writer James Kirkup featured the Denton document in an article for *The Spectator* in which he summed up the content (and the transgender agenda) in two sentences:

In short, this is a handbook for lobbying groups that want to remove parental consent over significant aspects of children's lives ... A handbook written by

an international law firm and backed by one of the world's biggest charitable foundations.

Transgender lobbyists will always have the system on their side when they have the Cult on their side. Kirkup said the document explained some transgender mysteries such as why bodies like the police – 'not famous social liberals' – were in the vanguard of the transgender transformation of society 'even to the point of checking our pronouns and harassing elderly ladies who say the wrong thing on Twitter'. Kirkup notes the advice given to activists on how to secure pro-trans laws. This includes 'get ahead of the government agenda' which means publishing 'progressive' (New Woke) legislative proposals before governments had time to develop their own and in this way have the proposals of activists simply transferred into official policy. New Woke employs this tactic across all its fronts with the Cult pulling the necessary strings. Kirkup points out that a UK House of Commons select committee report in 2016 'adopted several positions from trans groups' and was followed in 2017 by 'a government plan to adopt self-identification of legal gender'. Another way to scam the public is to 'tie your campaign to more popular reform', the Denton document says. Slip it in alongside something that most people would support. This happens constantly with government and lobby groups to hide otherwise controversial plans behind non-controversial legislation. The document offers an example:

In Iceland, Denmark and Norway, changes to the law on legal gender recognition were put through at the same time as other more popular reforms such as marriage equality legislation. This provided a veil of protection, particularly in Iceland, where marriage equality was strongly supported, but gender identity remained a more difficult issue to win public support for.

The Denton document stresses that countries where deletion of parental rights over their children's gender decisions have moved with the greatest speed have been those whose trans lobby groups have been successful in stopping the wider public learning the extreme nature of the plans and the consequences for kids before they were a fait accompli.

It's about 'discrimination'? Yeah, right

A good way to assess the genuineness of New Woke activism is to observe how they treat members of the community they claim to be representing who don't support the party line. In all aspects of New Wokeness the response to this is the same – attack them, abuse them and do everything you can to silence them. New Woke censorship has taken the following form: the South West Independent, Exeter, Devon and Dorset

specifically created to protect the far right Sabbatian-Frankist-controlled government in Israel from criticism and not to protect Jewish people from discrimination. The same approach can be witnessed every day with climate change, 'anti-racism', extreme feminist, gay and transgender activism. You may care about the environment, oppose racism or be a woman, gay or transgender, but that doesn't matter if you don't believe everything we tell you. Those who have been through gender transition, regretted that and warned others, are subjected every time to abuse from transgender activists who set out to gag them. I have read books by transitioned people who had their lives destroyed by the decision they were encouraged to take by the 'experts' and they are doing this to children. It is absolutely tragic to see how their lives have been devastated. In many cases the reason they initially questioned their gender was being sexually abused as a child that led to a psychological state in which they wanted to be a different gender to the one that was abused. Psychological support and understanding was what they needed. Instead the puberty blockers were handed out and their lives torn apart. One example is Debbie Kemerer from Hertfordshire in England who lived as a man for 17 years only to realise after counselling that she was suffering the psychological consequences of sexual abuse. She said other transgender people she knows regret their surgery and are too frightened of the activist backlash to be honest about it. See what I mean – she said they weren't brave enough to tell their story. Why do they need to summon such courage? Is it because of the reaction of general public? No – because of the reaction of transgender activists who are a tyranny and everything they attack others for being. In fact, they could not qualify for any version of New Woke if they didn't condemn others for what they do. That's in the contract.

Transgender activist extremism and its contempt for genuinely transgender people and for freedom of speech and opinion was confirmed in two stories and their aftermath in 2019. Debbie Hayton, a 51-year-old physics teacher in the English Midlands, changed her gender from male to female in 2012, but sent transgender activists into a fury of knicker-twisting (or underpent-twisting) when she wore a t-shirt that said: "Trans women are men. Get over it." Well, my goodness, you could hear the sound of gusset tearing from ten miles away. Debbie wore the shirt at an event organised by campaign group Fair Play for Women which has not been the case since transgender storm troopers imposed their will (the Cult's will) over women's rights. Hayton served on the LGBT+ committee of the New Woke-hijacked Trades Union Congress (TUC). This was irrelevant once she became a Mafpeher and twelve members of the committee complained to TUC General Secretary Frances O'Grady. They said that wearing the shirt had 'gone beyond harassment' and also complained of other trans organisations, and in some

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specifically created to protect the far right Sabbatian-Frankist-controlled government in Israel from criticism and not to protect Jewish people from discrimination. The same approach can be witnessed every day with climate change, 'anti-racism', extreme feminist, gay and transgender activism. You may care about the environment, oppose racism or be a woman, gay or transgender, but that doesn't matter if you don't believe everything we tell you. Those who have been through gender transition, regretted that and warned others, are subjected every time to abuse from transgender activists who set out to gag them. I have read books by transitioned people who had their lives destroyed by the decision they were encouraged to take by the 'experts' and they are doing this to children. It is absolutely tragic to see how their lives have been devastated. In many cases the reason they initially questioned their gender was being sexually abused as a child that led to a psychological state in which they wanted to be a different gender to the one that was abused. Psychological support and understanding was what they needed. Instead the puberty blockers were handed out and their lives torn apart. One example is Debbie Karamer from Hertfordshire in England who lived as a man for 17 years only to realise after counselling that she was suffering the psychological consequences of sexual abuse. She said other transgender people she knows regret their surgery and are too frightened of the activist backlash to be honest about it. See what I mean – she said they weren't brave enough to tell their story. Why do they need to summon such courage? Is it because of the reaction of general public? No – because of the reaction of transgender activists who are a tyranny and everything they attack others for being. In fact, they could not qualify for any version of New Woke if they didn't condemn others for what they do. That's in the contract.

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propagating hate speech against the trans community.' Don't be ridiculous, oh, sorry, you are being, New Woke definition of 'hate speech': 'Any statement that we don't want people to hear.' I love the bit about going beyond discourse and alternative viewpoints – there are no alternative viewpoints about transgenderism that activists don't want to silence. Nicola Williams, founder of Fair Play for Women, summed it up when she said:

Accusations of transphobia are thrown at women so often for so little that the word has lost all meaning ... When even trans people can get called transphobes, I hope people now understand how ludicrous and far-fetched these attacks have always been. The trans movement has been hijacked by gender extremists.

Exactly right and in their extremes of arrogance they are destroying freedom on behalf of the Cult. The British Labour Party, closely-associated with the TUC, has long been licking the arse of the 'anti-Semitism' industry Protection Racket in 24-hour shifts. Now the same is happening with transgender extremists. Getting slaughtered at the polls in 2019 was no Wake-up call for the Labour Party. Wake doesn't do Wake. Would-be Labour leader Rebecca Long-Bailey supported a campaign to label a party women's rights organisation as a 'trans-exclusionist hate group'. The Labour Campaign for Trans Rights published a plan designed to 'rid the Labour Party of transphobia and to stand up for trans people'. The Protection Racket *modus operandi* is repeated. Well, if it works why not? It got rid of anyone who criticised Israel and now it can be used to delete the membership of anyone that won't concede their own rights to transgender extremism. The Long-Bailey-supported campaign called for 'expulsion from the Labour Party of those who express bigoted, transphobic views'. Keir Starmer, who beat Long-Bailey for the leadership of this excuse-for-an-opposition party, is another New Woker who lives on his knees with his tongue extended pointing to Tel Aviv. The Labour Party was already on a life-support machine and then someone switched it off. The New Woke war on women's rights is coconstantly gathering pace. The students union at Lancaster University in the city where I was born changed International Women's Day into International Woman's Day in reference to 'transgender women' to include a 'more inclusive spelling of women'. This is the same student body that elected a trans woman called Dan Orr to the position of women's officer. International Women's Day of 2020 also saw Sefton Council in the UK take down two flags at town halls which displayed the dictionary definition of 'woman' as an 'adult human female'. It took a single complaint from a New Woke man to have the flags taken down. A bloke posting with the name 'Adrian Harrop'

told the council: '... the flag you're flying at the moment is a hostile transphobic dog whistle, recognised as a symbol and brand of one of Britain's most outspoken and visible trans-antagonists, and the leader of a transphobic hate group.' The dictionary definition of woman is now transphobic and offensive. I did mention that male and female sexes are the target of the Cult didn't I?

Promotion and relegation



Figure 340: The illusion of inclusion and equality. This flag (ironically) is the real goal.

Women were once top of the PC sexual hierarchy in its early days. Now this has entered the next stage of the Totalitarian Topsoe to the no-gender human: they have given way to the transgender movement. Women who challenge the imposition of transgender rights on women's rights have become enemies of the revolution (Fig 347). No-gender people will eventually take over and transgenders will become enemies of the revolution. This is how it works. Women are falling down the PC hierarchy because they are a *gender* and their only remaining role from the Cult's perspective is to diminish the influence of men before themselves being deleted. How about men and women coming together in mutual support? How about that for an idea? Far more important than women to the Cult is mass immigration of other cultures into Western Society and this also puts those cultures and religions above women in the PC hierarchy. New Wokeness says it stands for women's rights while silencing criticism and exposure of religions that treat women like slaves and garbage. Criticism cannot be allowed, nor exposure of the effect of mass immigration of other cultures in transforming communities, oppressing women and reducing work opportunities. That would open the whole mass-immigration strategy to public questioning and any open debate must be stopped. This is the real reason that ultra-Zionist censors say they won't debate with 'anti-Semites' while 'anti-racist' censors often won't debate with 'racists' or 'anti-transphobia' censors with 'transphobes'. They know they will lose on the facts and they make an excuse to avoid that exposure. Women who highlight the effect on rape crisis centres, single-sex hospital wards and women's sport of 'gender self-ID' (decide your gender any time you want) are dismissed as 'TERFs', or 'trans-exclusionary radical feminists' (Fig 348 overleaf). It is an age-old trick for



Figure 348: It's already well underway (Orange Gansh /Abe)

think tank Center for Global Development, who did not have her contract renewed (she was fired) after posting tweets disagreeing with government plans to let people declare their own gender without any supporting evidence. She demanded her right to refer to people by the gender she felt appropriate and not by how she was told to do so. It's an opinion that she has a right to have in any free society. Not, however, according to employment judge James Tayler who spouted New Woke orthodoxy in his verdict after Forstater appealed against her dismissal to an employment tribunal (she never stood a chance). Mr Woke Tayler said with jaw-dropping irony that her views were 'not worthy of respect in a democratic society'. But, of course, Tayler's *are* because they represent the imposed orthodoxy. To have someone legally judging others who clearly does not grasp the basic tenets of freedom or democracy is both appalling and par for the course in the Brave New Woke World. Once you set the perceptual blueprint for what society must believe you co-opt the entire system including academia, government agencies, police and judiciary to enforce that blueprint. Go to court with something the system supports and you will win almost no matter what the evidence. Go to court with something the system does not support and you will invariably lose. This is how society is stitched up all over the world. *Independent judiciary??* You must be joking. Christians have lost cases over the right to express their beliefs, such as wearing a cross, while vegans who avoid buses because flies hit windcreens win cases to protect their beliefs. The question is not about right or wrong; it's whether the Cult via authority wants it or doesn't. How much abuse you get from New Wokers is directly associated with where your subject of criticism stands in the PC hierarchy.

Harry Potty

Maya Forstater made the intelligent response to Judge Woke Tayler that 'framing the question of transgender inclusion as an argument that male

those with extreme positions to paint their reasonable opposition as extremists. This happens right across the New Woke arena and with ultra-Zionists who treat Palestinians like vermin while branding any challenge to that as 'anti-Semitic'. Another example of the transgender war on free speech was that of Maya Forstater, a tax expert at the

people should be allowed into women's spaces discounts women's rights to privacy and is fundamentally illiberal (it is like forcing Jewish people to eat pork). Her solicitor Peter Daly said: 'Had our client been successful, she would have established in law protection for people – on any side of this debate – to express their beliefs without fear of being discriminated against.' No wonder she lost. The decision becomes all the more outrageous when you see a picture of the person Forstater refused to call 'They' – local Dundee councillor Gregor Murray who looks exactly like a man including a male haircut and a beard. He was suspended for two months in May 2019, for calling feminist critics 'seam', 'hateful' and 'vile'. I wonder if that fits Judge Tayler's criteria for being worthy of respect in a democratic society? The controversy of Tayler's ludicrous decision kicked off further when *Harry Potter* author J.K. Rowling posted this:

Dress however you please.
Call yourself whatever you like.
Sleep with any consenting adult who'll have you.
Live your best life in peace and security.
But force women out of their jobs for stating that sex is real?
#IStandWithMaya #ThisIsNotADrill.

This was the cue for New Woke virtue-signalling to reach still new heights of gusset wringing as 'human rights' organisations including the New Woke Amnesty UK gushed forth in condemnation of Rowling that 'trans rights are human rights'. And, er ... women's rights? How about the right to free speech and opinion? My god, it's pathetic. The response was ironic in that Rowling often tweets in support of multiple New Woke causes. This is no defence. Your loyalty to Wokeness must be total in every facet and form or you are an enemy of the revolution. Star Wars actor Mark Hamill further infuriated the permanently-inflamed New Woke Mafia by 'liking' the Rowling Tweet and as with so many in the world of spineless celebrity he fell to his knees begging for forgiveness:

Ignorance is no excuse, but I liked the tweet without understanding what the last line or hashtags meant. It was the 1st 4 lines I liked & I didn't realize it had any transphobic connotation.

Put your tongue back in, mate, and consider the 'connotations' of your gutlessness for human freedom.

New Woke Stasi closing in

Former British police officer Harry Miller was contacted by police to 'check his thinking' over a series of tweets about transgender issues that

were not 'hateful', but simply his opinion. They admitted he had not broken the law and put him in the Orwellian category of 'crime, no crime', whatever the hell that supposed to mean, and recorded the matter as a 'hate incident'. Miller took the police to the London High Court where fortunately the case was handled by a judge who wasn't Woke-obsessed. Justice Julian Knowles said Miller's tweets were 'lawful' and police actions had a 'substantial chilling effect' on his right to free speech which should not be underestimated. "In do so would be to undervalue a cardinal democratic freedom" the judge said. 'In this country we have never had a Cheka, a Gestapo or a Stasi. We have never lived in an Orwellian society.' On that, in current circumstances, I would beg to differ. Police across the world are now ignoring real crime to seek out thought-crime like this with 120,000 'non-crime hate incidents' logged since 2014 in the UK on a system that appears in criminal record checks that can stop people being employed. While many officers are appalled and aghast at having to do this their careers depend on compliance as the Cult copos foot soldiers of The System against their will. New Woke police are destroying freedom by the hour orchestrated in the UK through the College of Policing established in 2012 to infuse New Woke into law enforcement (Fig 349). The College defines a 'hate incident' as 'any non-crime incident which is perceived, by the victim or any other person, to be motivated by a hostility or prejudice against a person who is transgender or perceived to be transgender'. It's a victim's charter as it is meant to be and it takes only a tiny few – sometimes one – to complain for a police investigation to be launched or for Silicon Valley and other corporations to ban speech or withdraw products from sale. This would appear to be insane when in fact the agenda needs complainants to justify its imposition and if there is only one that will have to do. Even transsexual women who say themselves they are still a biological man have been banned by Twitter. Madness? Yes, calculated madness to serve the Cult agenda. Jon Caldara, the most-read columnist on the Denver Post, said he was fired for believing there are only two sexes. He said of his sacking: 'What seemed to be the last straw for my column was my insistence that there are only two sexes and my frustration that



Figure 349: Freedom-destroying New Woke Lunacy is being infused into the police and all institutions because it's the Cult agenda.

to be inclusive of the transgendered (even that word isn't allowed) we must lose our right to free speech.' Caldara said he supported gay marriage, had LGBT friends and didn't care who used what bathroom. Even this was not enough to save him. New Woke demands total obedience or else. Another sinister aspect of the Caldara story is that his article was about the 'style book' of the Associated Press which lays out for staff a common grammar and word style. He said the book claims there are more than two sexes and that 'They' is now a word to describe a single individual. 'Illegal alien' was also banned in favour of 'undocumented alien'. This is all agenda-pushing language. There are not more than two sexes. There might be multiple self-declared sexual identities, but that's not the same as biological sexes, and the idea that 'They' can be seriously used to convey the singular is so grammatically crazy I'll move on. We really are looking tyranny in the eye here. You will have seen the extremes to which children, adults and whole populations are being subjected to transgender manipulation, with endless examples every week. Here are just a few headlines at Davidicke.com over a period of only a few months:

Jury rules against dad trying to save his 7-year-old from gender transition; California Adds Iowa to 'Travel Ban' Because of Refusal to Fund Gender Transitions; Ban on harmful gender stereotypes in ads comes into force; UNESCO claims Siri & Alexa promote gender stereotypes; Three-year-old changes gender from boy to girl after being sent to live with foster parents whose own son had just transitioned to become a female aged seven; Transgender lessons for two-year-olds; Girls are skipping school to avoid sharing gender neutral toilets with boys after being left to feel unsafe and ashamed; France seeks to 'desegregate' children's toys in battle against gender stereotypes (to create a new gender stereotype); School locks out protesting pupils outside gates as they rally against new 'pointless' gender neutral uniforms that force girls and boys to look the same; Drag artists road to children as library aims to teach youngsters about gender identity at story time sessions; Swedish Government Grants \$175,000 to Fund Drag Queen Shows For Children; Drag Queen Flashes Children During Story Hour; School in Brooklyn Hands Out 'Drag Queens in Training' Stickers to 4-Year-Olds; Drag Queen Teaches Toddlers How to Twerk; Another Drag Queen Story Hour pervert exposed as a sex offender ... why are public schools subjecting our children to these deviants?; Houston Chapter of 'Drag Queen Story Hour' Folds Amid Paedophile Scandal; Child drag queen poses next to almost-naked adult counterpart, but mother says boy not sexualized; Drag queen who teaches toddlers about sexual tolerance posts abusive tweets including one calling former Tory Minister Ann Widdecombe a 'fucking venomous hypocritical bint'; Drag

queens drafted into nursery schools to teach children about sexual diversity; Drag Queen strips for kids in the King County Library; Elementary School Invites Convicted Felon Drag Queen to Talk to Children; Vice News Celebrates Prepubescent Boys Dressed in Drag; 'Next Generation of Drag Queens'; Drag Queen Admits He's 'Grooming Next Generation' in 'Story Hours'; Furious parents slam primary school for inviting drag queen who calls herself 'Bristol's Resident Slag' and a troupe of cross-dressers to read stories about tolerance to the children; Progressive men literally start cutting off their own balls as gender insanity reaches new level of dangerous mental illness; Transgender model claims sanitary brands should be re-designed because using 'pretty and pink' products targeted at women causes him psychological pain; United Airlines to introduce 'Non-binary' Gender Flight Booking; Northamptonshire Police now issues US-style baseball caps which they think will somehow encourage transgender recruits.

Story follows story day after day and we have already reached the point where it is impossible to exaggerate through parody what is really happening.

Some of these headlines reflect the out-of-nowhere explosion of drag queens all over the world suddenly recruited to read stories to small children as young as five or less in schools and libraries – everywhere from North America

to Scandinavia to Europe and Australia. It's just another coincidence (Fig 350). The idea is to sexualise children and confuse them about gender. Scottish National Party MP Mhairi Black invited a drag queen called 'Flowjob' who posts explicit images on Twitter to read stories to children as young as four at a primary school and when parents complained she dubbed them in typically New Woke fashion as 'homophobic'. An Internet video shows a drag queen dancing suggestively and crawling on her/his hands and knees in front a little girl while adults applaud and cheer. The drag queen then strokes the girl's hair and kisses her. It's



Figure 350: The fact that it's suddenly happening in country after country is pure coincidence and nothing whatsoever to do with systematically confining the gender perceptions of children from the earliest possible age.

a sickening display and will any of the parents involved be getting a visit from social services like loving parents do? Not a chance. An American drag queen called Kitty Demure posted a video in which he said he was shocked that parents allowed this to happen. He asked: 'Would you want a stripper or a porn star to influence your child?' Demure further questioned why the Woke 'Left' had so much respect for drag queens when they 'put on make-up, jump on the floor and writhe around and do sexual things on stage'. He said this was not an avenue that parents should want their children to explore and he rightly said that many did so because they wanted to appear cool or Woke. 'You can raise your child to be just a normal regular everyday child without including them in gay, sexual things.' Not if the Cult has its way you can't. I have no problem with drag queens. What people do is none of my business among consenting adults. The systematic indoctrination and manipulation of children is quite another thing and we should say that loudly and constantly until sanity dawns (Fig 351). It is sobering to ponder that we are still only in the first stage. Imagine what is to come for children if parents don't grow a backbone and get together to stop this. We have



Figure 351: Why would schools and the System do this if not to target children and their perceptions of gender? What consenting adults do is none of my business. The manipulation of children, however, is ALL of our business.

Cult-controlled American Medical Association and New Woke organisations like the US Human Rights Campaign. The 'epidemic' numbered 26 transgender murders in 2018 using Human Rights Campaign figures which means an average of 1.8 per 100,000 transgender people. The murder rate for the general population in 2018 was 4.2 per 100,000 meaning that transgender people are considerably less likely to be killed by violence. An epidemic? The technique is to fire lies in all directions knowing that almost everyone that hears them will not check the facts and believe the lies to allow the agenda to be advanced.

even had claims that the murder of transgender people, and especially those of colour, is an 'epidemic' when the figures expose this as still more mendacity. This lie has been repeated by Democratic presidential candidates, the

One conspiracy with many faces

Falling global sperm counts, especially in the West, connects with the plan for the transgender, then no-gender, non-procreating human. Sperm counts are plummeting though gender-bending chemicals in the environment, including food and drink, and radiation constantly generated from smartphones in the pockets of men, Wi-Fi and the 5G roll-out. Confirmation comes with all the fertility clinics now on a scale never seen before. The fertility rate in America fell by nine percent between 2007 and 2011 and in 2016 fell to the lowest since records began. Meanwhile the benefits of staying single are being promoted with Dr Elyakim Kislev, professor at the Hebrew University of Jerusalem, saying that 'being single can be an advantage instead of a source of agony'. This is a theme that turns up in many guises. The lifestyle that people choose is their own business, but when you put all these things together there is a clear theme: The Cult wants humanity to be infertile. There will be no need for male and female sexes in a no-procreation world and we are witnessing their systematic elimination. We may be in the relatively early stages but that is the goal and Cult agendas move faster and faster as they get closer to the stage of 'normalisation'. When non-white people celebrate the demise of the white race they should know that they will be next. This is not a war only on white people, but the entire human race and we need to come together and not allow the Cult to drive us apart (written before imposed 'social distancing'). Remember that to children being born today the madness that many older people can see through is their 'normal'. This is another reason why divisions are being manipulated between young and old. By 'normalisation' here I mean the normalising of insanity brilliantly captured in George Orwell's concept of $2 + 2 = 4$ versus $2 + 2 = 5$. He wrote in *Nineteen Eighty-Four*: 'Freedom is the freedom to say that two plus two make four. If that is granted all else follows.' If the freedom survives to speak facts the official lies can still be challenged. Big Brother knew that and decreed $2 + 2 = 5$ and everyone had to believe it – or else. What happens at first is that you know the answer is 4, but eventually it is easier to agree the answer is 5 and finally to protect your own self-respect you believe the answer is 5. The transition period we are now experiencing between '4' and '5' is dependent on another Orwell concept – that of 'doublethink' which is defined as holding two contradictory beliefs and accepting both to be true. This way 4 and 5 can coexist until 5 takes over completely. Having open borders and enough homes, jobs, school and hospital places, is a potent example of doublethink. Orwell's book and methods of manipulation and control are everywhere you look. He wrote:

In the end the Party would announce that two and two made five, and you

would have to believe it. It was inevitable that they should make that claim sooner or later: the logic of their position demanded it. Not merely the validity of experience, but the very existence of external reality, was tacitly denied by their philosophy. The heresy of heresies was common sense.

And what was terrifying was not that they would kill you for thinking otherwise, but that they might be right. For, after all, how do we know that two and two make four? Or that the force of gravity works? Or that the past is unchangeable? If both the past and the external world exist only in the mind, and if the mind itself is controllable – what then?

This is what becomes possible when a few know the truth about reality and keep that from the masses. External world or not the point is that we need to recognise that we are Infinite Awareness and an individual unique perception. I am a unique experience called David Icke and All That Is, His Best, And Ever Can Be. New Wokeness is enforcing upon the population a long list of demands that come down to $2 + 2 = 5$. These range from human-caused climate change to political correctness and most certainly to post-biological sexual orthodoxy. Professors of biology are being attacked, abused and 'investigated' for saying that men and women are biologically different. Oxford University professor Selina Todd, a historian who specialises in the lives of women and the working class, was given security guards after threats from transgender activists over her support of women's rights. Dr Allan M. Josephson, a former head of Child and Adolescent Psychiatry and Psychology, was demoted by the University of Louisville for saying children who insist they are transgender should not be instantly believed and Professor Nicholas Meriwether at Shawnee State University in Ohio was rebuked for refusing to refer to a student with a male body using 'female pronouns' when it was against his religious beliefs. Many others have already been outright fired or forced out by mass, even violent, New Woke protests for the mildest of statements based on $2 + 2 = 4$. Such activists insist that society be transformed on the basis that there are no genders except what people choose them to be any time they like ... $2 + 2 = 4$ usurped by $2 + 2 = 5$. The Cult plan for the world can only happen if facts and freedom to express them is abandoned. To do that $2 + 2 = 5$ must be the norm and $2 + 2 = 4$ the enemy of the revolution. Facts are replaced by *perceive?* facts and once generations born in the $2 + 2 = 4$ era have grown all humans will be born ('doctrined' in Huxley's words) into the post-fact world of $2 + 2 = 5$ which is all the population will hear from cradle to grave. This is a quote from Adolf Hitler.

When an opponent says to me, 'I will not come over to your side,' I reply

calmly, 'Your child belongs to us already ... What are you? You will pass on. Your descendants, however, now stand in the new camp. In a short time they will know nothing but this new community'.

Another 2 + 2 = 5 imposition is the 'pronoun' tyranny in which transgender men and women insist they are called by their preferred pronouns of 'he', 'her' or the utterly bizarre 'They' and 'Them'. I will never call an individual 'They' or 'Them'. I have some respect for language and if you concede to stupid you become stupid. The way around this is real simple. Transgender people in male or female bodies that call themselves by the opposite pronouns should be free to do so and anyone referring to them who doesn't feel comfortable using 'he' for a woman's body or 'her' for a male body should be equally free not to do so. This is the solution in which freedom is the winner on both sides. It doesn't happen because freedom is the target of the Cult and not the desired outcome.

Silence the parents, program the teachers

Many parents who are deeply unhappy with what is happening to their children at school fear the consequences of saying so. Most teachers are programmed to believe in the program and those that can see through the insanity, and even the conspiracy, know that if they challenge the imposed orthodoxy their career will be over. New Woke follows the methods of the Cult as an expression of the Cult by imposing an agenda while intimidating or silencing anyone who can see what is happening. If people concede to that intimidation the world's children are lambs to the perceptual slaughter. We are seeing the Totalitarian TipToe to complete state control of children and the end of parental rights which are being constantly eroded to this end. A teacher in Texas personified what is happening when he said that parents should not have the 'final say' in raising their own children. He was responding to complaints by parents about yet another drag queen employed to indoctrinate their children. The adult drag performer (stage name 'Lynn Adonis') spent the day with the kids at Willis High School and exchanged social media contacts. School Principal Stephanie Hodgins defended the decision and proved she is in the wrong job while clueless English teacher Anthony Lane said parents should submit to the will of the 'community' over the upbringing of their own kids. Here we go – right on message and it's becoming a common theme as the Cult targets parental rights and the family unit itself. 'I believe that raising a child is the responsibility of the community and that parents should not have the final say,' the brain of America gushed forth. 'Let's be honest, some of you don't know what is best for your kids.' Ah, but this expression of academic arrogance does know (Linn right) and insists that their well-being is best served by

advice from 'Lynn Adonis', a man dressing as a woman who dances provocatively while people wave dollar bills as an Internet video revealed.

The Vatican has long been controlled by the Sabbatian-Frankist wing of the Cult (see *The Trigger*) which owns the position of Pope. The current incumbent, Pope Francis, can often be seen promoting the Cult agenda like climate change and subjects relating to education and the upbringing of children. He called for a new 'Global Pact on Education' to create a 'new humanism' under the title 'Reinventing the Global Educational Alliance'. The Pope hosted a conference of people from politics, economics, academia, science and sociology along with celebrities from areas like sport. A 'Global Pact on Education' was signed to 'hand on to younger generations a united and fraternal common home' and 'create a global change of mentality through education' (indoctrinate the young). Orwell would have noted the language that included a quote used by Cult asset Hillary Clinton: 'It takes a village to raise a child.' Pope Francis called for an 'educational village' with an 'educational path involving everyone'. Nowhere did the Francis announcement refer to parents as the central voice in the education of their children because the state is taking over as the Pope will know and promotes. He has also said it's our 'duty' to 'obey international institutions' like the United Nations and European Union. His call for a 'new humanism' is ironic given the word is defined as 'a nationalist outlook or system of thought attaching prime importance to human rather than divine or supernatural matters'. A nationalist outlook or system of thought in this context means the technocracy which requires the deletion of spirituality in all forms to be replaced by the religion of New Wokeness. The Pope is a 'man of God'? Yep – and I'm a jelly baby.

A major Cult vehicle for the intimidation of parents is the social services Mafia operating in all countries of the West (and elsewhere)

through which enormous and ever-increasing numbers of children are stolen by the state from loving parents for ridiculous and patently invented reasons. Paedophile and Satanist rings operating through social services even have children stolen to order. I have exposed this outrage and its consequences for children and parents in other books. Secret 'family' courts



Figure 35E: Secret courts in alleged 'free' countries are stealing children from loving parents on an industrial scale while parents are banned from speaking publicly and the media is excluded.

which can include Satanist and paedophile judges, lawyers, social service operatives and police, are used to seize children for the state and the Cult from parents who adore them (Fig 352). 'Family' courts do not have juries so paedophile or satanic judges – or paedophile and satanic rings working through the judges – can control the outcome. The phone call or knock on the door from social services is now one of the biggest fears that parents have and this state-kidnapping is part of the Tiptoe to the end of parenthood and procreation. Teachers, doctors, police and other professions are encouraged and mandated to tell tales on parents to social services and that would be justified if real abuse was evident. In the cases I am talking about (and they are legion) the children are not being abused at all – quite the opposite. Parents are frightened to stand up, challenge and complain about drag queens and transgender indoctrination in schools in fear of reprisals from increasingly authoritarian schools and social services or abuse from New Wokers and even other parents locked away in the land of Cult-induced perceptual coma. The poor kids are left unprotected to have their minds absorbed into the belly of The Beast to become the next and even more extreme generation of New Woke as the family unit is dismantled to be replaced by AI technology and the world state.

I can understand how intimidating it must be to face the potential wrath of the school and social service tyrannies, but if that doesn't happen your kids will be left at the non-existent mercy of the Cult and Cult-owned state every day when they go to school. Parents coming together in groups for mutual support must happen to challenge and expose what is going on so that individuals are not isolated and alone. They are after your kids and even more so with your kid's kids. It's time to draw a line while there is still one to be drawn.

What is the New World Symphony?

Control your vibrations to be the master of your own harmony
– Suzy Kassem

The conventional answer to the question posed in the chapter title is that the *New World Symphony* is a piece of music by the Czech composer Dvorak made most famous in Britain in a television advertisement for *Hovis* bread. I am talking instead about another version that I shall call the *Brave New World Symphony*.

Dvorak's work is made possible by vibrations emanating from musical instruments while my version is played by vibrations emanating from people via perception. I have focused in the last few chapters on the effect of Cult manipulation in the realm experienced by the five senses or the 'seen', a holographic projection of the wavefield unseen. The foundation of our reality is information encoded in vibrations and waves that express in their frequencies the nature of that information. For example hate is a slow, dense frequency while love, joy, gratitude and forgiveness generate quick, high and expanded frequencies. One represents a vibrational prison cell and the other is the way out of the Matrix. The *Brave New World Symphony* is a low-vibrational information and perceptual construct that disconnects humanity from its expanded self and the True 'I'. If we could hear this 'symphony' of waves it would sound like the backdrop to a horror movie, slow, low, morbid, heavy and dense. It would be akin to the guttural voice of life-long Cult operative Henry Kissinger and the sound transmitted by Saturn which you can hear in YouTube videos. The association between Saturn and what I am calling the wave 'symphony' of the simulation is explained in *Everything You Need To Know*. To build prison walls around ourselves with bricks and bars would be seen as crazy. When humans do that with the frequencies we emanate this is called being 'normal' and living in the 'real world' (Fig 353 overleaf). Those that refuse to comply with their own perceptual/vibrational imprisonment are by contrast 'weird, mad, pseudo-scientists and

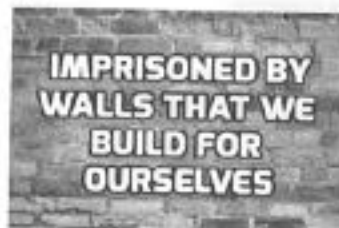


Figure 353: We build the walls – so WE can take them down.

wave equivalent of only hearing one version of something to the extent that you believe what it says in the absence of any alternative. It is a collective version of the Bubble.

Perceptions are not only ingrained by information received by the five senses. They are most powerfully embedded by wave-entanglement with those of like-mind – like-vibration/frequency – a vibe which



Figure 354: Wave-entanglement, perception-entanglement, perfectly symbolised.

solidifies the longer you remain in that perceptual state. The vibration becomes more powerful through unchallenged repetition and the constant confirmational connection with the collective field of like-wave entanglement. In turn, the wave-state impacts upon the formation of brain pathways or neuron networks (also waves in their base form) that dictate how information is processed into perception. When I speak of people not being able to process or compute certain information or concepts I mean that literally. Wavelengths emanated by Postage Stamp perceptions and processed through brain pathways reflecting those wavelengths cannot decode information outside their perceptual limits any more than a computer can process information when encoded and firewalled not to do so. 'I can't get my head around that' is the phrase you often hear in response to off-stamp information accompanied by the assumption that if they can't understand (process) that possibility then it can't, by definition, have any validity. I can best describe what I mean with the assumption of the mainstream scientific mind that if I can't see, touch,

conspiracy theorists' The world is indeed upside down. The sequence is simple: Information = perception = nature of the vibrations and frequencies emitted by people in the form of waves. These waves entangle with like-waves to generate collective networks of the same vibration/frequency which influence the perceptions of all involved (Fig 354). This is the

same frequency waves



Figure 355: Bubbles and burst Bubbles speak a different language.

(perceptions) entangle with each other and through these connections mutually and collectively confirm 'I am right'. This is the wavefield basis of the New Wake mentality and why it is so Dalok-like immovable no matter what the evidence – emergency, emergency, cannot compute, cannot compute. Try telling Greta Thunberg that CO2 is the gas of life. Internet AI systems such as Google-owned YouTube that continually offer you information that corresponds with your search history are feeding the Bubble with perception-confirming information as is the censorship through Silicon Valley and political correctness of information and opinion at odds with the official Postage Stamp narrative.

Wave awakening

As people's perceptions change so do the frequencies they transmit and what follows is disentanglement from the previous wavefield networks created by former perceptions. In the world of the seen those once close to you, or of like-mind, drift apart as new wave networks are formed



Figure 356: Another version of the Bubble and how they are formed. (Image: Gareth [sic].)

with others that match the new perceptions. You are beginning to see what they can't see (Fig 356). In the transition period people can feel alone and isolated as they disconnect from the old before synchronising widely with the new. Stick with it – if it all work out. The more that we expand our sense of self-identity and

self-identity and



Figure 357: Bursting the Bubble. (Image: Gareth Jones)



Figure 358: Another invention. When madness calls you mad it is a confirmation that you are not. (Image: Neil Hagan.)

manipulations and smokecreens designed to enslave us in ongoing ignorance and the scale of the perception program begins to dawn. When you first speak out to expose what is happening those still in the Bubble – the ones you are trying to alert – will be your greatest opposition. This is not because they are ‘bad’ people just as New Wokers are not bad people in and of themselves. They just can’t see – yet – what you can as your consciousness expands beyond the Matrix. Expanded awareness is perceived as insane by enslaved awareness (Fig 358). We have to understand and be patient or we’ll be in a permanent state of

perception of reality the more the frequencies we generate expand and quicken and the more of Infinite Awareness that we can consciously access (Fig 357). This is known as ‘waking up’, a term that means the opposite to being New Woke. Brain pathways re-form to sync with expanding consciousness and they are able to

process information and awareness beyond the Bubble. By this time the Bubble has burst anyway and confirmation that your consciousness is really ‘de-Bubbled’ comes when you are censored or called crazy, mad and even dangerous.

Whenever I am described by Bubble people in those terms I quietly say thank you, much appreciated. There comes a point in this expansion where you breach the firewalls of the simulation and begin to see what human reality really is. You become aware of the illusions,

frustration and anxiety which feeds the dragon its low-vibrational fix. Almost everyone is in the Bubble to start with and being holier-than-thou is never justified. A scene in the first *Matrix* movie has the Morpheus character giving Neo the facts of life about what I am calling Bubble people:

The Matrix is a system, Neo. That system is our enemy. But when you're inside, you look around, what do you see? Businessmen, teachers, lawyers, carpenters. The very minds of the people we are trying to save. But until we do, these people are still a part of that system and that makes them our enemy. You have to understand, most of these people are not ready to be unplugged. And many of them are so inert, so hopelessly dependent on the system, that they will fight to protect it.

That's an excellent description of how the program works except for the bits about ‘our enemy’ and saving people. I don't see anyone as an enemy. We are all One even though we may have dramatically different attitudes and patterns of behaviour. Once we refer to ‘enemies’ we externalise those we are challenging when they are only another aspect of ourselves in a different mental and emotional state. I am challenging and exposing patterns of behaviour as they impact negatively upon others and their freedom. I don't see those involved as enemies. From my perspective they are being perceptually misdirected and enslaved. Nor am I trying to ‘save’ anyone. People can only emerge from a perceptual straight-jacket through personal choice. I am only offering a different way of looking at life and the world. What people do with that, or don't, is up to them and none of my business except where it impacts on individual and collective freedom. With this proviso we need to find peace with others having different views. Freedom is the freedom to make choices, experience the consequences, and make new choices. It is not to be forced to make someone else's choices. That is called tyranny and New Woke (same thing). If you focus anger, hatred and resentment on those with whom you disagree that very focus creates a wave entanglement with them on the frequency of anger, hatred and resentment if that person feels the same about you. This sets up a wave connection through which frequencies of anger, hatred and resentment are mutually exchanged to the emotional and vibrational detriment of both or, in the case of the Cult and its unseen ‘gods’, you feed them the low-vibrational energy that sustains and empowers them. Are we really going to change anything by making such a frequency wave connection with the Cult through hatred of the Cult? What you hate you become. What you fight you become. Wave entanglement is how that happens. Burst your Bubble and everything changes (Fig 359 overleaf).

Mirror, mirror ...

I have watched so many people become what they first set out to oppose and you see this in politics all the time.

The Cult wants us to hate its assets because it knows that in this state we will be fly-trapped in:



Figure 356: Hunting for the Bubble.

its vibrational lie. Martin Luther King said: 'Darkness cannot drive out darkness; only light can do that. Hate cannot drive out hate; only love can do that.' Hate empowers the vibration of hate while love empowers the vibration of love. It really is that simple. In fact once we love in the totality of *The One* there is no vibration at all – just the still and silent *AI That Is* which is love in its infinite form and that means intelligence in its infinite form. We can feed the Cult and its non-human masters with our low-vibrational focus or we can starve the Cult of its power source by not transmitting on its frequency. Macho-man fury and hatred may seem to many to be the way to respond to Cult manipulation when the opposite is the case. Loving (or at least not hating) perceived 'enemies' while challenging vociferously what they do are not contradictions. This is the only way to challenge behaviour while not entangling with its vibrational state and becoming what you claim to oppose (see *New Woke*). What is not transmitting on your frequency cannot connect with you. You can be affected by the actions of others who are on its frequency, but not you directly. As your consciousness expands and your frequency quickens you are operating on a completely different vibe to mainstream society and become less and less affected by its madness. In that state we stop emitting the waves that can connect with those that seek to hurt us and if we do that they can't hurt us. I am often asked how come I am still alive while exposing such apparently powerful forces. My answer is that if they can't make a wave connection with me they cannot affect me in the holographic 'physical' realm which is a decoded projection of wave information fields. It's at the manifest level that everything happens and holographic reality is only its projection on the symbolic movie screen. If you want to change a movie do you scream at the screen or pull out a banner and protest? No – you change what is being projected on the screen. Human life is the same. Change what is happening at the wavefield level and the holographic movie screen of 'human society' must automatically change to reflect that.

Humanity is constantly seeking change in the wrong place and the Cult encourages this. Change yourself and you change your life experience. Change collectively and we change the world. If you want change

without personal change – vibrational change – you will be waiting forever. I said that we entangle with people on the frequency of anger, hatred and resentment if they feel the same about us. If they don't there can be no wave connection on that frequency when the other person is not transmitting on that frequency. You are then generating frequencies of resentment with nowhere for them to go except to entangle you with others consumed by resentment. For this reason forgiveness does not only benefit the forgiven, but also the forgiver. Here's a way to disentangle destructive relationships and their aftermath if you mean it: 'It was just a mutual experience for, in the end, mutual benefit, so let's shake hands and wish each other a great life – all my love to you and see you on the other side when we'll laugh at what we thought was so important.' Isn't that rather better than 'I'll always hate that bastard' (and always be affected myself by that same hatred)? The mutual vibe of hatred and fear is the basis for all conflict and war and when it's gone so have they. As John Lennon wrote: 'War is over if you want it.'

Frequency freedom

From this perspective of how we are vibrationally enslaved and how we can set ourselves free everything starts to make sense when it didn't before. Human society has been specifically structured and manipulated to create maximum possible fear, anxiety, hatred, anger, depression, resentment, and all the other low-vibration emotions and their consequences like conflict and war that entrap people within the firewalls of the simulation. Love in its infinite sense is to the Cult like garlic to a vampire and this explains why authority throughout 'history' has been terrified of anyone saying that love is *The Answer*. Anything that would expand and raise the vibrational state of the population is all the Cult's worst nightmares arriving at once. It knows that once that happens the game is over and the outward arrogance of the Cult masks the constant terror that somehow humanity will awaken and call 'time' on the plot. They need us – we don't need them. We are their power source. What appears to be swagger is really whistling in the dark as they desperately pursue the AI-brain connection, to block perceptual change and frequency change. Low-vibrational states of Bubble consciousness have been achieved through the rule-book myopia of religion by playing off cultural, racial and religious groups against each other in wars of control, dominance and acquisition; giving the population constant reasons to fear (especially fear of death) and to be in states of anxiety, hatred, envy and resentment; selling a self-identity based purely on human labels and/or servitude to an ever-demanding god; and downloading the Postage Stamp narrative every day that excludes everything that people need to know to see through the camouflage and deception. You will observe many other ways that this

is done, too. What a coincidence that New Woke delivers everything on that list including religion because New Woke is a religion. The constant sub-division of labels into micro-labels is taking self-identity further and further away from I am an expression of *All That Is* and the expansion of consciousness that follows from that. With each sub-division into micro-identities we see that identity myopia becomes consciousness myopia. I am LGBTQQFAGPBDSM? You are Infinite Awareness having a brief experience that you call LGBTQQFAGPBDSM (Fig 360). It's all a trap which particularly the young are being indoctrinated to walk into through Cult control of the 'education' system, mainstream media and all the New Woke activist groups supported by giant Cult-owned corporations and frontmen like Bill Gates, George Soros and Silicon Valley celebrities such as Musk, Zuckerberg, Brin, Fage, Wojcicki, Bezos, Kurzweil, and a long, long, list of others.

Once the Cult has captured perception and self-identity everything else follows. Perception dictates the frequency of the waves we transmit and those frequencies dictate how much Infinite Awareness we can access. The extent of Infinite Awareness that we connect with dictates the size of our Bubble and that becomes our perception of everything. This in turn becomes a self-fulfilling prophecy as our perceptions create the Bubble and the Bubble confirms our perceptions in a feedback loop of perceptual enslavement (and therefore every other kind). Who enslaves us? We do. We do so by allowing the Cult and all its agencies of state and media to impose our perception of both the world and our very self-identity. This is great news because what we have created we can uncreate. Break that feedback loop and the power of the Cult is no more. How do we do that? Open our minds to all possibility. Open our hearts to the love and wisdom of *The One*. It can't be that simple? Oh, but it is. The Cult knows that it is and constantly works to keep minds and hearts closed to the greater reality beyond the simulation which is nothing more than a perceptual feedback loop. The simulation is in our heads (Fig 361). It's a perceptual program which can close hearts, but not enter them when the frequency difference is so great. Open your heart and what is released as love, intelligence and wisdom will change your life and collectively transform human reality. The whole foundation of



Figure 360: No, no, no – I am *All That Is*, *Just Being*, and *Ever-Care-Is*.



Figure 361: The simulation is a wavefield interactive information source that humanity decodes into holographic reality (in the brain). (Image: Neil Harper.)

makes their behaviour the same because their frequency is the same. They are convinced they are polarities of each other while being 'opposites'. Beyond the realm of the seen they will be seriously wave entangled by the like-frequency connections between them. Extreme Muslims (or fake Muslims) such as the South Sabbatian-Frankist 'royal family' and their terror groups do the work of the Devil while claiming to serve 'God'. Their hatred and violence wave entangle with all others who express hatred and violence and even those like the extreme right that think they oppose extreme Islam. The way the vibe is expressed may be marginally different, but it's the same vibe. Indian author Nitya Prakash said: 'Do you ever notice how much you have in common with the person you hate?' This is true on many levels and one is most certainly the same vibe at war with itself through the illusion of being different.

Digital drugging

The plan is to make humanity in its entirety one centrally-controlled live mind through the collective connection to artificial intelligence. I have described the Tiptoe to this in the world of the seen, but again the real deal can be found at the wavefield level of reality. The endgame is to connect the human mind to machines and the manipulation of wave entanglement between people and smart technology is happening all around us while at the same time destroying human to human discourse (entanglements). Here is the prime reason for social media which achieves both goals. People are not communicating with each other face to face – human waves to human waves – but via technology in which AI machine waves act as the conduit. In this way machine waves intervene and intercept human wave connection (this has happened on

the Cult agenda is to close hearts and minds to turn Infinite humanity into perception Bubbles which then connect to form a hive mind through wave entanglement. New Woke is a hive mind which is policing everyone who won't conform to the hive. The illusion of diversity allows Bubbles and groups of like-Bubbles to be set at war with each other to divide and rule. We have 'anti-fascists' acting like fascists. The Bubble perceptions of both are basically the same which

an unprecedented scale during the 'virus' lockdowns). People who used to talk with each other at home, in the street, in restaurants, now stare mesmerised at the screen (Fig 352). I will first discuss the holographic effects of this on a chemical level and then how this plays



Figure 342: The childhood hijack.

out in wastelands to connect humans to machines and AI. High-placed insiders of deeply sick organisations like Facebook have publicly exposed how Zuckerberg and his cohorts set out to addict Facebook users to stay on the site for as long as possible. Sean Parker, the first president of Facebook and now a critic, said the idea was to absorb as much of a Facebook visitors time and attention as possible. Floyd Brown and Todd Cafaratti describe how successful this effort has been in their Silicon Valley exposure, *Big Tech Tyrants*:

... Facebook is only the tip of the social spear. It's well documented that kids are spending an average of ten to twelve hours a day across all digital media. And adults aren't far behind at almost six hours, up from three hours a day in 2009. This includes all the time spent on cellphones, computers, gaming consoles, and streaming devices. Cellphone use alone has mushroomed from a third of an hour a day in 2008 to 3.3 hours currently.

This is partly explained by techniques to trigger a 'dopamine rush'. *Psychology Today* describes dopamine as 'the feel-good neurotransmitter - a chemical that ferries information between neurons'. Dopamine contributes to 'feelings of pleasure' and acts as a 'reward system' which can very soon become addictive. *Psychology Today* says that 'a person seeking pleasure via drugs or alcohol or food needs higher and higher levels of dopamine ... This neurotransmitter enables us not only to see rewards but to take action to move toward them.' It points out that drugs such as cocaine increase levels of dopamine and 'alter behavior accordingly'. Facebook and other disgusting companies abusing mostly the young have exploited the dopamine rush to addict people to their sites. A Facebook 'like' for a post can stimulate a dopamine reaction which becomes addictive and leads to people only posting what they think the majority will like to ensure their dopamine fix. This slowly at first and then more quickly modifies behaviour and opinion to the majority (Cult-induced) view especially when to go against that view is

to unleash often systematic abuse. What starts out as a conscious posting of an opinion that may not be genuine just to get maximum 'likes' eventually fuses into the perception of the person - $2 \times 2 = 5$. Chamath Palihapitiya, an early senior executive at Facebook, said that 'the short-term dopamine-driven feedback loops that we have created are destroying how society works'. But, then - that's the idea. I have seen it called the 'magic of maybe' when people keep looking at the phone to see if 'maybe' they have a communication or 'maybe' they got a 'like'. Studies have shown that when communications or likes appear there can be a 400 percent spike in dopamine which is only slightly less than the effect of cocaine. Part of the addiction is concern about what other people think and how others respond to a post or picture when freedom comes from not giving a damn what anyone thinks of you. Concern with what others think deletes your personal power. You become *them* so they like you. Seek popularity as a goal in itself and it will destroy your uniqueness. Comparing self with others and their often fake lives portrayed on social media leads to depression, loss of self-esteem and feelings of inadequacy. Studies reveal that the more time people spend on social media the more lonely and isolated they become. Phone addiction also hijacks and scatters concentration with the potential to permanently destroy the ability to concentrate. Social media and smartphones are Cult behaviour modification devices and it's all been carefully worked out by psychological specialists in the pay of Silicon Valley psychopaths like Zuckerberg. One observer rightly said that highly addictive drugs are being put into the hands of children before they have any defences against them. Sam Vaknin, a contributor to the Internet documentary *Plugged In* which exposed the effects of social media, said this about the calculated assault on the minds of the young:

Facebook, Twitter, all these networks are surfing the wave. They know it's a dangerous wave. They know that people are drowning. They read all the statistics, the increased suicide rate, depression, anxiety. They know absolutely everything. They have designed maliciously, malevolently and possibly criminally, they have designed the networks exactly to cater for human pathology in its most extreme form.

Even those who can see some of what is happening tend to explain this calculated manipulation as an effort by Zuckerberg and Chief Operating Officer Sandberg to extend Facebook visits to increase the value of advertising. It's actually far darker and more sinister than that and the real explanation comes with the understanding that these platforms are fronts for the Cult. Their domination of discourse and information exchange allows the Cult to modify and manipulate perception and behavior while censoring to ever-increasing extremes

information and opinion that challenges that narrative. Social media is a very foundation of the technocracy. The minds of the young (tomorrow's adult population) are being fucked-with on a monumental scale and New Woke is one of its creations in league with other Cult agencies including the Gates-manipulated 'education' system. Are people so totally lost in Fairyland that they don't see how soaring rates of suicide, depression and anxiety among the young that have taken off in the smartphone/social media era are centrally connected to the emergence of those phones and platforms? In this period there has been a 50 percent increase in suicides in America among girls under 17 and a 30 percent increase in boys. Anxiety in teenagers is reported to have increased by 70 percent in 25 years; children and young people attending accident and emergency units with a psychiatric condition has more than doubled since 2009; teenagers admitted to hospital with eating disorders almost doubled in three years up to 2019. English schools buying in professional mental health support for pupils has nearly doubled in three years from 36 per cent to 66 percent because the National Health Service (NHS) can't cope. Some of this is due to growing up becoming a medical condition and some is the effect of social media and the smartphone culture. Should we be surprised when insiders have described how Silicon Valley technocrats are so deeply sick they boast about how they capture users in 'isolation boxes' and 'filter bubbles' in which they 'inflict torments that anger or sadden the users without them realizing why'? Facebook and other social media companies hire 'attention engineers' using techniques employed by casinos to make their platforms as addictive as possible. People like Zuckerberg are calculated abusers of young generations on a scale that defies belief. Headlines glare tell the story and reveal the consequences of this psychopathy: 'Social Media Use and Perceived Social Isolation Among Young Adults'; 'Facebook's Emotional Consequences: Why Facebook Causes a Decrease in Mood and Why People Still Use It'; 'Facebook Use Predicts Declines in Subjective Well-Being in Young Adults'; 'Association of Facebook Use With Compromised Well-Being'. The young are being conditioned and broken to be the unquestioning adults that will passively accept the technocracy and AI-brain assimilation. The war on men and 'toxic masculinity' is precisely planned to induce such passivity. Jason Lanier, an American computer scientist, said:

Society has been gradually darkened by this scheme in which everyone is under surveillance all the time and everyone is under this mild version of behaviour modification all the time. It's made people jittery and cranky. It's made teens especially depressed which can be quite severe.

He's right although Lanier is considered a founding father in the field of virtual reality and he might ask himself where that is heading when the Cult agenda of augmented reality and immersive technology leading to full-blown assimilation is factored in.

Virtual humans

We have the emergence of virtual humans with body movements, voices and emotional expressions generated by AI that you could not tell from 'real' humans. The Smart Grid is a simulation within a simulation and virtual reality technology is a virtual reality within a virtual reality. Samsung's highly secretive Neom project was reported in early 2020 to have developed artificial intelligence virtual 'avatars' almost indistinguishable from biological humans. Samsung engineer Pranav Mistry said the technology can 'autonomously create new expressions, new movements, new dialogue (even in Hindi), completely different from the original captured data.' Base the original on a human and then have it become its own personality. Facebook has its Codec Avatars project designed to let people create realistic virtual versions of themselves for use in cyberspace. The company claims the avatars would help 'social connections in virtual reality become as natural and common as those in the real world'. The avatars are planned to allow Facebook users to connect with friends and family in a three-dimensional social network. Yasser Sheikh, the director of research at Facebook Reality Labs, said: 'The real promise of augmented reality and virtual reality is that it lets us spend time with whomever we wish and build meaningful relationships no matter where people live.' Excuse me I feel a 'bollocks' coming on. This is really about absorbing humanity and particularly the young into a virtual reality world in which the one we currently experience is lost and even more importantly further disconnect humanity from expanded reality outside the simulation. The human mind is being prepared for assimilation into AI and drawing the young particularly into a virtual world generated by technology is a

vital stage and step in that direction (Fig 363). Young people are already living their own virtual lives presenting a perfect face to the world through social media with the downsides deleted by omission, self-delusion and Photoshop. There is even a term now of 'Snapchat dysmorphia'



Figure 363: Assimilation ensues/going in the 'used thing'.

for young people who have plastic surgery in an effort to make them look like the fake image they have Photoshopped to post on social media. Beyond the facade so many are drowning, desperate and unable to compete with the illusory perfect lives they read about while their true and unique self is lost to them in the deluge of 'this is how you should be'. Envy turns to depression when you cannot be what you have been conditioned to envy. Jamie Chiu, a Hong Kong-based psychotherapist, said growing up in a social-media-obsessed environment damages self-esteem with camera filters in particular 'leading to a dangerous trend where people feel insecure about not being as beautiful as their own filtered selves'. The Cult is creating an illusion within an illusion so that its targets become utterly lost with no grip on any reality. With every step along this dark tunnel of manipulated myopia and misdirection the influence of the True 'I' is diluted by fake self-identity. Virtual interaction via AI has diminished the life-skills of personal interaction eye to eye with real live people. Eyes are more interested in staring at screens than looking into other eyes to see the window on the soul that a Facebook post can never do (Fig 364). Social media has been specifically designed by the Cult to generate psychosis in the population which is defined as 'a severe mental disorder in which thought and emotions are so impaired that contact is lost with external reality'. The Cult knows that once a sense of reality is lost a new reality can be imposed to fill the void – the technocracy and assimilation into AI. Floyd Brown and Todd Cefaratti write in *Big Tech Tyrants*:

With everyone carrying a cellphone all the time (not me!), with teens even sleeping with theirs, with the majority of girls telling researchers they would give up their boyfriend before they would relinquish their cell phone, Facebook had the perfect behavior modification platform designed to detect, examine, react, and provide feedback on the most mundane, or the most intimate, of human activities.

Users could now be constantly tracked and measured and unknowingly given cues and prompts on a steady drip, all custom-tailored. Users could be hypnotized little by little by technicians [technocrats] they'd never see, for purposes they may or may not approve of. They could be reduced to prompt-



Figure 364: 'You are feeling always.'

and respond lab animals ... which is exactly what happened.

The authors describe social media platforms as essentially 'a crime scene'. Yes – crimes against humanity and the young. Anyone still think Zuckerberg and company who coldly calculated this are New Woke heroes? Jason Lanier's point about being under constant surveillance is why the Cult wants us to know we are tracked 24/7. This in itself leads to behaviour modification through the fear of whatever you do being seen and recorded. In response people stop doing, even in what used to be called 'privacy', what they think the state might find unacceptable (see China). Cameras everywhere in streets, schools, universities, and other buildings and those constantly checking speed on the road network are designed to make people constantly aware of authority and trigger anxiety about 'breaking the rules' to cumulatively induce acquiescence (see lockdowns). When we at Davidicke.com post news



Figure 365: This is where self-censorship ends with the silencing and subjugation of all humanity. Speak your truth or there will be no truth for anyone to hear.

stories about certain subjects on social media we know the sharing numbers and likes will be lower when those opinions can be accessed for example by potential employers. It's time to summon the courage and do it anyway. Not to do so is a dark and dangerous road that ends only one way in total human subjugation (Fig 365).

Who creates the Matrix? We do

Extraordinary mass-addiction to smartphones and social media cannot be explained in total by dopamine. You see people transfixed by smart screens while not on social media in search of 'likes' and approval. I have been saying for years something is coming off those phones to induce such addiction and that something are electromagnetic waves which entangle with the human waves of the user and make the person's energetic field (mind) literally part-human and part-machine. This is crucial to the Tiptoe leading to assimilation of the human mind into AI (Fig 366 overload). Influence through entanglement of technology-generated waves explains the multiple electromagnetic effects on the body that change the nature of cells, blood, tissue, bone marrow and brain by impacting upon the wavefield body blueprint to manifest as dementia, cancer, autoimmune diseases and so much more.



Figure 366: Smart technology and WiFi are creating waves of frequency that are entangling with human wavefields to create addiction and assimilate human frequencies into AI machine frequencies. These that captivate become ever more machine-like until they are machines. See Neil Hague colour section.

AI smart technology is assimilating the human consciousness field through entanglement ever more profoundly with each screen session for those unconscious to this effect. It is a form of possession by machine and AI. People are literally being possessed by their phones and other smart technology through wave entanglement. I will come later to how being conscious of the process can lessen or block the connection. You can tell if you are wave-entangled with smart technology by how easy it is for you to stay away from it. Do you feel anxious or that almost part of you is missing if you don't have your phone? If so you are wave-entangled with what the phone emits. It is taking you over. Try putting your phone in a drawer and forgetting about it. Can you do that? If not, it's got you. Should you need to use a phone for work and income not observe how many times you are scanning the screen when work is not involved. Can you stop? If you can't you are machine wave-entangled - machine possessed - and through that connection perceptions can be led to your subconscious mind. *This is happening all the time.* It's not only about dopamine. Wave connections between machines, AI and humans are feeding people states of perception. If you are not conscious beyond the Matrix then the Matrix is thinking for you. I observed long ago how the Cult agenda was being introduced in country after country, culture after culture, at the same time and this could only be partly explained by the secret society networks of The Web. It is happening in far too much



Figure 367: If humanity can be manipulated to unconsciously believe that the technocratic dystopia is inevitable we will decode it into experienced reality. This is the foundation of all human control - subconscious programming becomes experienced reality. (Image: Gareth Linn)

common detail in far too many communities worldwide for that to be the whole story. The Cult transformation of human society is actually being imposed as a wavefield construct absorbed and decoded by the collective human mind through these hive connections (Fig 367). What I call The Web is in fact a web of aives - frequencies - which attach to human wavefields as flies are

caught by a spider. The Cult and its secret society inner cores create and surf those waves and seek to lure humanity into their frequency lair.

We decode holographic reality from wavefield information fields and the Cult and its 'gods' are technologically infusing their Brave New World into those fields in the form of information which humanity is decoding into holographic experience. Information waves are encoded by the Cult with its endgame reality for humanity to decode and manifest and this is what I am calling the Brave New World Symphony. One of the reasons the speed of change has quickened so dramatically since smart technology appeared is because it gives powerful entanglement access to the human energy field through which that information can be fed. Those in sync with its frequencies will succumb first to the agenda and support its introduction and the idea is to pull everyone into those frequency states to ensure that even those resisting today eventually submit to its oscillation. This does not have to happen. Consciousness in its expanded form is far more powerful than the Cult and its silly games. Consciousness isolated in a perception Bubble is, by contrast, a babe in arms. New Woke once again provides the most potent example. The perception system, the result of life-long programming (frequency programming), cannot process possibilities beyond 1 on right while it is held fast in the vibrational control of the Brave New World Symphony. Every time someone censors themselves in fear of the consequences they are being teased further into the 'symphony' and the frequencies through which society is being transformed. Saying what you believe without fear and censoring yourself because of fear are quite obviously not the same frequencies. The first cannot be synchronised with endgame information fields while the second certainly can be even if this happens in stages. The process is further empowered by people

like Ray Kurzweil and others telling us that the AI endgame is inevitable and unstoppable and through the technique of pre-emptive programming that I highlighted earlier. Both induce the population into the endgame frequency which they can then make manifest.

AI-brain synchronisation - how smart

Another major impact on perception related to what I have described and to smartphone wave addiction is something called entrainment which means that the most powerful frequency in any given situation will 'entrain' other frequencies into its own. It's another example of entanglement. The best example is one I gave earlier of the string vibrations of three violins tuned to the same note causing a fourth violin to vibrate to the same note as the most powerful frequency entrains the other into synchronisation. Technological frequencies that now flood our reality and atmosphere are getting more cumulatively powerful and they are entraining brainwaves and human wavefields to sync with those frequencies. 5G is a massive stepping up of that potential. Once human waves are entrained with technology waves information (perception) can be transferred from AI to the human mind. Even before a direct connection to the brain we have AI assimilating human consciousness through entrainment with waves emitted by smart technology. Disruption of human wave patterns explains why people living or working close to phone and communication towers, electricity pylons or nuclear stations, can suffer depression, anxiety and diseases like cancer to a much greater extent than the average. Mainstream scientists parroting the official line say there is no evidence of such a connection and they cannot explain how it would be possible while ignoring wavefield connections or entanglement. If they did the mist would clear. Entrainment of brain frequencies connects with brain plasticity that I described earlier in which the way the brain processes information is changed by the nature and form of that information. The brain has been bombarded by wave and digital information from technology in an extremely short period that it has never had to deal with in all known human history. Study after study has concluded that the human brain is being seriously rewired by digital/electronic stimulus and I say this is a holographic reflection of wavefield rewiring. Of course the brain must change in the circumstances I have described. We have yet another way that human perception is being transformed and a further reason for smartphone addiction. The brain is stimulated by digital input, rewires itself to sync with that input, and then goes into cold turkey when you put the smartphone down and the stimulus stops. We see this with people putting down the phone after an already long session and immediately picking it up again for no particular reason. This is the brain screaming 'hey, I want my fix'. Once these new body

wave and brain wave frequencies and codes are in place they are passed (via epigenetics) to the next generation who start out the way their parents had to be manipulated into becoming. With each generation they are more and more machine-wave dominated until they are the machines. Frequency-matched communication with DNA can transmute the body into another form in the same way until it is nothing like we see today. Genetic manipulation in laboratories is the Stone Age by comparison.

The human mind is being entrained with AI through all the smart gadgets that are vehicles for AI and another aspect of the assimilation is to manipulate human interaction with AI as if it is human-human interaction. How many people now interact with their smart assistants as if they are human or are induced into perceiving the AI voice on the Sat-Nav as human? Smart assistants are being introduced to vehicles to add to Sat-Navs and make car journeys a constant interaction with AI (Fig 368). Call government agencies and big companies and you will be greeted by an AI voice.



Figure 368: What's the best way to deal with these surveillance tools if you already have one? Sneak - in the bin, left none.



Figure 369: Perception assimilation before total assimilation.

Observe the burgeoning number of dolls and other characters for young children that speak with AI voices through Internet connection (Fig 369). All is systematic preparation and conditioning for the fusion of AI with the human mind while human-human interaction is being destroyed equally systematically through smartphones, social media and the technology takeover (more words written before the lockdowns and social distancing). Everywhere direct human discourse is being deleted and this includes supermarkets where check-out staff you could chat with are

being replaced by technology to delete human-human contact. Cult technocracy giant Amazon is opening stores that are entirely automated and the plan is for that to be the case everywhere as it is with banks as local branches disappear and people are forced online. Bricks and mortar shops where you interact with human beings are being destroyed by online shopping and faceless, soulless AI. People find it increasingly difficult to buy things away from the Internet as this trend increases apace. Laws are going to come which protect AI machines and eventually they will go above transgender in the New Wicke hierarchy. I know that sounds fantastic, but who would have guessed what would happen with transgender in such a ridiculously short time? Who would have believed that Democratic presidential candidate Elizabeth Warren would say that as president she would have her Education Secretary chosen or vetoed by a transgender child? I had to check the speech video to confirm she really said it. She did. If what is happening now with transgender activism had been predicted only a few years ago they would have said that was crazy. It is, but it's here anyway. The Cult agenda is protected from all criticism and exposure. How can you criticise AI robots for taking over human society? That's an 'anti-Semitic' trope or transphobic - no, wait, it's transtechnologic, yes, a transtechnologic trope and you are transtechnologic. As AI becomes ever more pre-eminent (and it's happening so fast), so a conscious connection with expanded awareness and *The Cue* is ever further diminished until we are completely isolated. This is the game and a crucial part of *The Answer* is to know that.

Vaccine shit, food shit, drink shit, it's all shit

Vaccinations and toxic food and drink would appear to affect the body on the chemical/biological level and obviously in one sense they do. Chemical/biological, however, pertains to the hologram and that is a decoded projection of wavefield information. Toxicity, whether in the form of vaccinations, food, drink, pesticides, herbicides and poisons of every kind, are in their base state highly distorted wave frequencies. Toxic gungo pouring from a pipe into a river is changing the wavefield nature of the river and this affects the wavefields of the fish and other marine life. Remember the work of Japanese researcher Dr Masaru Emoto and how toxicity distorted the water crystals (wavefields) of water. Toxicity appears to affect the body directly as poison-to-biological when in fact it distorts wavefields of the body which plays through to the hologram as a reflected distortion. If extreme enough this can so damage the body's wavefield oscillation that it stops and the person dies. Vaccinations, toxic food and drink, pharmaceutical drugs, vaccines, technological radiation and ultimately an AI connection to the brain are all weapons in the Cult's anti-human armoury through Body-Mind

wavefield distortion. I have detailed in *Everything You Need To Know* the near-unbelievable shite in vaccines, food and drink that you would never think anyone would put into anything destined for the body. When you know that the Cult is specifically targeting Body-Mind it all makes sense. The Cult wants the population addicted to shit food, shit drink, shit drugs, shit smartphone waves, shit everything, and all of that is produced by giant Cult corporations. Shit in these cases means shit frequencies which are absorbed by human frequencies that become shit themselves through entanglement. This entangled shit becomes holographic shit which we experience as mental, emotional and 'physical' dis-ease, dis-harmony. To make this happen the Cult wants control of what enters the body through mouth or injection and the ever-increasing pressure through many and various agencies and stooges to impose mandatory vaccinations is a key part of the war on humanity and the young (Fig 370). I wrote those words once again before the 'pandemic' and the subsequent Bill Gates global vaccine agenda.

This is a summary of vaccine ingredients and substances used in manufacture: Aborted foetal tissue; aluminium; mercury-based thimerosal; gelatine; human serum albumin (found in blood plasma);



Figure 370: Welcome to the world where you are a pin cushion for toxic shite. It's only because we can.

sorbitol and other stabilisers; emulsifiers; taste improvers; antibiotics; egg proteins (ovalbumin); yeast proteins; formaldehyde (used to embalm dead bodies); acidity regulators; human cell strains, animal cell strains and genetically-modified organisms (GMOs); recombinant DNA technology; bovine products. Aluminium

alone is a brain toxin. Health consequences linked to vaccines and it is far from a full list include: Anaphylactic shock; aseptic meningitis and meningitis; Bell's palsy; facial palsy; isolated cranial nerve palsy; blood disorders; brachial neuritis; cerebrovascular accident (stroke); chronic rheumatoid arthritis; convulsions; seizures; febrile seizure; death; encephalopathy and encephalitis (brain swelling); hearing loss; Guillain-Barré syndrome; immune system disorders; lymphatic system disorders; multiple sclerosis; myocarditis; nervous system disorders; neurological syndromes including autism; paralysis and myelitis including transverse myelitis; peripheral neuropathy; pneumonia and lower respiratory

infectious skin and tissue disorders including eczema; sudden infant death syndrome (SIDS); linnitis (ringing in the ears); vaccine-strain versions of chicken pox, measles, mumps, polio, influenza, meningitis, yellow fever, and pertussis vasculitis (inflammation of blood vessels).

Against this background the number of vaccines and insane combinations, including *air-in-one*, have exploded and we have ever-quickening and expanding moves around the world to impose compulsory vaccination (Fig 371). Why would they do this with so much potential harm? Why would they do this when there can be few better definitions of fascism than telling people what they will and will not by law put into their own bodies and those of their children? One answer is they were preparing for the 'pandemic' hoax and the Bill Gates-fronted vaccine being prepared in response that they want to be compulsory worldwide or at least with people facing major restrictions on movement if they don't agree to have it. I'll have much more about that in the next two chapters.

Immunity by vaccine? No – immunity from prosecution

Cult-owned pharmaceutical companies or Big Pharma were facing so many lawsuits for life-changing and life-ending vaccine damage that laws were passed in 1986 by Cult-owned Capitol Hill to give them *immunity from prosecution*. No matter what vaccines do to your kids the National Childhood Vaccine Injury Act (NCVIA) protects Big Pharma from any consequences. Instead compensation claims are handled by a federal 'vaccine court' on a no-fault basis without a jury and payments are made by taxpayers for the results of Big Pharma actions. This is the same Big Pharma that makes staggering fortunes every year for killing and damaging extraordinary numbers of children and adults through vaccines and pharmaceutical drugs. One of the biggest causes of death in the United States alongside heart disease and cancer is pharmaceutical-based treatment and that's without all the cases never recorded because another cause is given to hide the real one. Add them to the number and it would be by far the biggest cause of human



Figure 371: Herd immunity means *actual* immunity, not *fake* vaccine immunity.

demise. Aldous Huxley said long ago: 'Medical science is making such remarkable progress that soon no-one will be well.' Even with a very high bar to prove your case the US vaccine court had paid out \$4.2 billion as of October, 2019, for damage by vaccines that the Cult wants to make compulsory worldwide and is already doing so in the United States and elsewhere. Robert F. Kennedy Jr, son of the US attorney general assassinated by the Cult in 1988, is among America's leading opponents of the vaccine narrative. Writer Kristina Kristen described at the Kennedy-connected childrenshealthdefense.org how the number of vaccinations soared after the immunity law was passed and how Big Pharma is actually producing drugs for profit to 'treat' health effects of vaccines:

Following the passage of NCVIA, the number of vaccines on the childhood schedule mushroomed, creating a gold rush for vaccine makers: the vaccine industry went from a \$1 billion industry to a \$50 billion industry. But this expansion in the vaccine industry, in fact, is relatively small in comparison to the even greater gold rush for the BIG 4 companies. The drug 'treatment' side of the equation, which is substantially more lucrative than the 'gateway' vaccine side the BIG 4 already monopolized, now also increased substantially.

The vaccine manufacturers began to capitalize on the known adverse effects of their vaccines, and have since created drugs for the 'treatment' side of the equation as well. The lack of incentive to make safe products, which created the bloated vaccine schedule, became the gateway to the lucrative drug treatment side for these companies. Today, the BIG 4 monopolize vaccines as well as the drug 'treatments' for chronic illnesses known to be induced by vaccines. First, vaccines push kids off the cliff, and then vaccine makers profit from 'rescuing' those they don't kill.

If ever you needed a concise description of Cult psychopathy and empathy deletion then there it is. If evil is the absence of love, which I suggest it is, the Cult can justifiably be described as evil and that same evil is being applied across its entire agenda for humanity. 'They wouldn't do that'? Oh, yes, they would and get sexually high while doing so. Yale University researchers studying records from a health insurance database discovered correlations between specific vaccines and neurological problems in children aged between six and 15. They included obsessive-compulsive disorder and anorexia nervosa which were found more likely to be diagnosed in children three months after vaccination. Influenza vaccine was one highlighted – 'get your flu shot' as the idiot media tell people every year. The study was published in the journal *Frontiers in Psychiatry*. No matter the documented health and

psychological dangers to children we are going to make vaccines compulsory. In typical Cult fashion anyone who challenges and exposes the consequences and motivation of vaccines is demonised. Those dubbed 'anti-vaxxers' are attacked by moronic people in the media and by parents who have conceded the right to think and so believe whatever the Cult tells them is true. It brings us back to that quote from Morpheus in *The Matrix*: 'You have to understand, most of these people are not ready to be unplugged and many of them are so inured, so hopelessly dependent on the system, that they will fight to protect it.' Those that refuse to vaccinate their children – 'anti-vaxxers' – and seek to circulate information Big Pharma doesn't want people to know are increasingly censored by Cult-controlled Big Tech including Facebook, Twitter, Google and Amazon. The Cult makes the vaccines, passes laws for immunity from prosecution for the consequences of vaccines, and silences opposition through its Big Tech near-monopolies in league with the Cult-controlled mainstream media. It's simple when you connect the dots. If the population allows the few to dictate events for much longer no one will escape vaccination or be allowed to campaign against it. This is the real reason for attacks on 'anti-vaxxers' (written before the 'virus' scam when those attacks increased dramatically).

Britain is now a totalitarian state and a new Law Commissioner called Penney Lewis announced in 2020 that she was 'considering' making the posting of 'anti-vaccine propaganda' on social media a criminal offence even when people believed the information to be true. 'She' was not considering anything. 'She' is just a place-person to officially make it happen and what a coincidence this happened just before the 'pandemic' hoax along with Bill Gates stepping down from Microsoft to spend more time on his 'charitable' (vaccine) interests. The System (ultimately the Cult) is the force behind this fascistic plan and the same with the pathetic puppet who said in the same period that he was 'looking very seriously' at making vaccinations compulsory in the UK. This was 'Health Secretary' Matt Hancock in temporary official charge of health policy that is really driven by the civil servants in his department representing the Permanent Government. It is highly unlikely that either Lewis or Hancock will know their arse from their elbow about how what they are 'considering' is really part of a global agenda emerging out of the shadows. 'Considering' obviously means planning to impose when we think we can get away with it. Attacks on 'anti-vaxxers' get more hysterical by the week. Republican political strategist, media consultant and Deep State insider Rick Wilson said: 'Anti-vaxxers are a scourge and a strong argument for re-education camps, the immediate seizure of their property, and putting their children into protective custody.' Those concerned about their children's safety are a 'scourge' but someone advocating outright extreme

fascism/Marxism is not? Such is the lunacy of New Woke, American Medical Association (AMA) delegates want laws to allow minors to 'override refusenik parents on vaccination' (after they've been indoctrinated by the authorities, of course). The direction we are being taken is so clear once eyes are truly wide open and not wide shut. It is all the more grotesque when you think that compulsory vaccinations for those who would not otherwise have them is statistically alone condemning some of those children to vaccine damage, even death, and effects of their psychology. The arrogance and psychopathy of these people is stunning.

Herd immunity is the problem? No it's not

One of the biggest scams to justify compulsory vaccination is the lie about 'herd immunity' which claims that almost everyone has to be

vaccinated for a vaccine to work (Fig 372). They need to sell this deceit to both support mandatory jobs and explain why so many vaccinated children get the very diseases they are supposed to be vaccinated against. It's not that the vaccines haven't worked. It's those terrible parents who won't have their kids injected with toxic



Figure 372: Mandatory vaccinations are only forced under another name.

potions. American neurosurgeon Russell Blaylock put this myth to bed:

In the original description of herd immunity, the protection to the population at large occurred only if people contracted the infections naturally. The reason for this is that naturally-acquired immunity lasts for a lifetime. The vaccine proponents quickly latched onto this concept and applied it to vaccine-induced immunity.

But, there was one major problem – vaccine-induced immunity lasted for only a relatively short period [if at all] and then this applies only to humoral [body fluids] immunity. This is why they began to suggest boosters for most vaccines, even the common childhood infections such as chickenpox, measles, mumps, and rubella.

The claim is that vaccinations produce antibodies for a disease, but this

does not constitute proof of immunity. The following quote is from Learntherisk.org:

... science has long known that antibodies alone do NOT create real immunity. Some people with high levels of antibodies can be exposed to an illness and still get sick, while others without antibodies can be exposed and not get sick. Dr. Merrill Chase, nicknamed the Grandfather of immunology for his pioneering work, did clear-cut research on this issue back in the 1950s.

His results are clear: antibody levels don't determine immunity. The immune system is a highly complex system and science is still in its infancy understanding how it functions. In fact, immunology textbooks were completely rewritten recently after a University of Virginia study finally proving the link between the gut and the brain through the lymphatic system. Before this 2014 study, immunology books were adamant there was no link.

The quickest way to understand the world is to invert everything you've been told is real by The System (the Cult). The method is next to foolproof. American children and young people are now given from birth to 18 years between 53 and 70 vaccines depending on how you count them. Many are given in one jab and the childhood schedule has tripled in little more than 30 years which takes us back to the time when Big Pharma secured immunity from prosecution. In this same period children have got sicker with once-rare autism, food allergies, asthma, brain malfunction, autoimmune diseases and cancer in children dramatically increasing. There has been a mega-rise in autoimmune diseases in the vaccine era and especially the mass vaccine era. The immune system attacks its own body by picking up signals indicating a threat from foreign bodies that shouldn't be there and this is known as autoimmune disease or malfunction. Does anyone really believe that injecting or swallowing toxic substances and material that attach to the body does not cause the immune system to attack itself in this way? Still-developing immune-systems of babies are deluged with this toxic crap and the body's natural protection will never be what it would have been after that assault so early. These are the same immune systems targeted by 5G and Wi-Fi. Childhood diseases were just part of life when I was a kid and parents would take their children to those who were sick so they would get the disease. It was seen as kicking in the immune system to protect them for life and give life-long immunity to conditions that can be far worse in adults. Today an outbreak of measles is propagandised into a deadly threat that justifies compulsory vaccinations and vicious attacks on 'anti-vaxxers'. It's all manipulation. New York mayor Bill de Blasio declared an emergency after a measles outbreak and ordered vaccinations on threat of a fine of up to \$1,000.

'We cannot allow this dangerous disease to make a comeback here in New York City', he said. This was the 'dangerous disease' that was met in my childhood with 'So and so's got measles' - 'Oh, week off school, then.' It should also be stressed that when we are told there has been an 'outbreak' we are not informed how many vaccinated kids have the disease and how many unvaccinated are not affected. That would be bad for the sales-pitch. My two big strapping sons were not vaccinated and they somehow seemed to have survived. I can't think how and maybe someone can explain how their vaccinated mates got diseases they didn't.

Vaccine waves

To understand the deeper agenda of vaccinations and all the other shite I've described we need to return once more to the wavefield level of reality. Here vaccines are disrupters of wavefield harmony which in itself undermines wavefield information codes that are the immune system. At the wave level information can also be encoded with perception patterns and disease patterns. Once you have access to the body field anything becomes possible with the knowledge the Cult is working with. Toxic fast food and processed food and drink have the same effect as do pharmaceutical drugs and technological radiation. Drug 'side-effects' are wavefield disrupting effects (nothing 'side' about them) caused in the same process as the one effect that is claimed to be beneficial to a condition. Even then drugs and alternative treatments can appear to have 'cured' a problem when it has only caused the wavefield flow to move to somewhere else in the field to manifest as another condition that is not apparently related to the first one that was 'cured'. But it is. The 'cure' has only made the symptom disappear and not the flow. You could think of it as like a bubble in a bottle of water that moves from one place to another as you turn it around. These wavefield flaws are caused overwhelmingly by emotional trauma as imbalanced waves of low-vibrational emotion impact upon Body-Mind fields, but they also result from the toxins swallowed and injected which can lead to diseases many years after they have been consumed and administered. Cause and effect is never identified because of this delay. Only when the flow is deleted rather than moved is the healing process over and this is mostly done by bringing to the conscious mind the emotional trauma that has manifested the flaw. This can be something that happened in childhood which didn't show itself as a condition in the body for maybe decades. Once the conscious mind acknowledges the cause and effect of the flaw the wavefield is rebalanced. The acknowledgement generates a wave pattern that does the job. For most people the connection remains in the subconscious given that mainstream medicine does not recognise these connections. Disease really is all in the mind, and has to be when the

body is the mind, and it can be 'cured' (rebalanced) by the mind.

Vaccinating chips

There is still another reason for vaccinations to benefit the Cult. I was told by a CIA scientist in California in the 1990s that nano-microchips far too small to be seen by the human eye were being infused into the population through hypodermic needles in public vaccination programmes. Nano-technology is now commonplace and can be found in an ever-increasing number of foods. When I met the scientist it was not nearly as widely known about as it is today. I cannot emphasise enough that the cutting edge of technological possibility in the secret projects is far in advance of anything we see in the public arena. Nanotechnology is easily small enough to be injected with vaccines and no one would know. It takes a tiny few to add the nano-chips which large numbers of unsuspecting 'medical professionals' then inject. Today these chips are called nanobots, nanorobots, nanoids, nanites, nanomachines, nanomites, neural dust, digital dust and smart dust (Fig 373). Once in the body these micro-machines can according to the literature 'assemble and maintain sophisticated systems and build devices, machines or circuits through molecular manufacturing and produce copies of themselves through self-replication'. They can also connect the body to the Smart Grid and manipulate genetics. What an amazing coincidence with all these crucial benefits to the Cult agenda of vaccinations that we

find their most prominent global promoter to be Microsoft billionaire technocrat Bill Gates. His father, William H. Gates Senior, supported the beliefs of infamous eugenicist Thomas Malthus (as did his son 'at one time') and Father Gates headed the Rockefeller-created Planned Parenthood which was part of the eugenics movement and involved Cult 'prophet' Dr Richard Day who told those paediatricians in 1969 that diseases would be inoculated through vaccinations (very relevant when I come in detail to 'Covid-19' and the Gates vaccine). Austrian doctor, molecular



Figure 373: Nano technology 'released' in the air, water and food is designed to connect humanity to the Smart Grid.

biology researcher, and now dentist, Jaroslav Belsky, pointed out a connection between vaccinations and the 1918 'Spanish flu' which actually began in American military bases in the last year of the First World War before spreading worldwide to affect about 500 million people, or one-third of the world's population. At least 50 million deaths were estimated with about 675,000 in the United States according to reports. Belsky said:

An orgy of vaccination took place for the soldiers of the war, in 1918 up to 36 vaccinations took place with no rules at all. It happened just before the Spanish Flu appeared in different places at the same time. Medical historians confirm today that it was a vaccination disaster.

Bill Gates made his billions from Microsoft technology essential to the Cult technocracy agenda and funds and promotes a long list of Cult demands including vaccines, surveillance technology, education programming like Common Core, geoengineering of the atmosphere (weather modification and so much more), and genetically-modified food which is designed to genetically-modify us. You can read about all this in detail in *Everything You Need To Know*. Gates announced in March, 2020, that he was stepping down from the Microsoft board to spend more time on 'philanthropic activities' which means funding the elite agenda. He said he wanted to focus his efforts on global health and development, education and tackling climate change. Yeah, yeah, mate, we get what you mean. (We did indeed because shortly after I wrote those words Gates immediately launched into promoting 'virus' lockdowns and a vaccine without which life would, in his words, 'never get back to normal'.) What a conman this bloke Gates really is – and worse as we shall see. I should emphasize, too, that vaccines damage and change DNA and the next generation of vaccines specifically target DNA – including the Gates 'Covid-19' vaccine. The theme is clear. These new vaccines don't inject a virus to stimulate an immune response but instead inject synthetic genes – here we go – which will permanently alter DNA. A *New York Times* article about 'immunoprophylaxis by gene transfer, or I.G.T.' quoted Michael Pizzari, an immunologist at America's Scripps Research Institute:

I.G.T. is altogether different from traditional vaccination. It is instead a form of gene therapy. Scientists isolate the genes that produce powerful antibodies against certain diseases and then synthesize artificial versions. The genes are placed into viruses and injected into human tissue, usually muscle.

The viruses invade human cells with their DNA payloads, and the synthetic gene is incorporated into the recipient's own DNA. If all goes well, the new

genes instruct the cells to begin manufacturing powerful antibodies.

'The synthetic gene is incorporated into the recipient's own DNA.' Ponder on that in the light of what I have been saying about the synthetic human. Is anyone still naive enough not see what is happening, why vaccines are being made compulsory and what the Gates 'Covid-19' vaccine is really all about?

Vaccine surveillance

Crucial to the imposition of vaccination for everyone by law is tracking who has been vaccinated and who hasn't. Is it really another coincidence that the major organisation in the Bill Gates campaign to vaccinate the world is calling for the tracking of people to confirm vaccination? Seth Berkley, CEO of the Gates-funded GAVI, the Vaccine Alliance, says the organisation spends an average of nearly \$2 billion a year to vaccinate children in the poorest countries and invests tens of millions in 'innovations to monitor immunisation'. He wants technology to track who has been vaccinated and to give everyone an 'identity'. All this fits with the Cult agenda as he might take time to find out if he doesn't already know. I bet he does. Berkley formerly worked for the Big Pharma-controlled US Centers for Disease Control and Prevention and the Rockefeller Foundation. The Rockefeller family – its inner core is Cult to its DNA – was the family that imposed Big Pharma 'medicine' on the world at the exclusion of other forms of healing that they didn't control. Berkley's desire for everyone to have 'identity' carbon-copies is the goal of the United Nations which aims for all 193 member countries to impose a legal form of identity by the ever-recurring year of 2030. Is it random chance that the Bill and Melinda Gates Foundation is funding the development of a 'tattoo' that will identify those who have and have not been vaccinated? Gates has funded research by scientists at the Massachusetts Institute of Technology (MIT) to create a new ink for an 'invisible quantum tattoo' to be embedded in the skin and read by a smartphone camera app (Fig 374). ScienceAlert.com reported:

The invisible 'tattoo' accompanying the vaccine is a pattern made up of



Figure 374: This is not only the Gates doctrine – it's the Cult doctrine everywhere you look.

minuscule quantum dots – tiny semiconducting crystals that reflect light – that glow under infrared light. The pattern – and vaccine – gets delivered into the skin using hi-tech dissolvable microneedles made of a mixture of polymers and sugar.

MIT researcher Kevin McHugh described the outcome perfectly while quite probably being firewalled in compartmentalised cluelessness from the real reason behind it: 'In areas where paper vaccination cards are often lost or do not exist at all, and electronic databases are unheard of, this technology could enable the rapid and anonymous detection of patient vaccination history to ensure that every child is vaccinated.' There you have the Cult agenda in a sentence and this will allow authorities – and employees – to know if you have been vaccinated and are therefore 'safe' to roam or be employed. (When the 'virus' hoax was played weeks after I wrote those words Gates was promoting his invisible digital 'tattoo' to track who had been vaccinated with the 'Covid-19' vaccine that HE was funding into worldwide use. It's shocking. No wonder I call him the 'Software Psychopath'.) The same tracking system is planned to ensure that everyone is drugged to make them docile. 'Smart systems' already introduced include microchipped 'smart pills' that tell doctors that drugs have been taken in another Tiptoe to this end. The concept was well portrayed in the 2002 movie *Equilibrium* in which the population has all emotion suppressed by a daily injection monitored to ensure compliance. Proposals to add lithium to public water supplies is another Tiptoe. Lithium is used to treat manic depression and its advocates say mass medication of lithium will make people 'happier'. Children and adults are already being mass-drugged with psychology-changing potions on a scale never seen before at the first sign of emotional problems or off-Postage Stamp behaviour. *Brave New World* author and establishment insider Aldous Huxley predicted this in 1961:

There will be, in the next generation or so, a pharmacological method of making people love their servitude, and producing dictatorship without tears, so to speak, producing a kind of painless concentration camp for entire societies, so that people will in fact have their own liberties taken away from them, but rather enjoy it, because they will be distracted from any desire to rebel by propaganda or brainwashing, or brainwashing enhanced by pharmacological methods. And this seems to be the final revolution.

How did Huxley know this? How did Orwell know what he did? How did Richard Day? How did I? The agenda has been long in the planning and is ultimately sourced from outside this reality which doesn't share the same 'timeline' as the human world. If you are an insider or spend

30 years lifting the stones you can know what is planned.

Micro-everything

The world is being deluged with microplastics that resonate to the frequency of synthetics. Wave entanglement with increasing numbers of synthetic waves will make body wavefields more ... synthetic. A Reuters report using data from 50 studies on the ingestion of microplastics gave devastating confirmation of how far this has already gone. Microplastics are described as particles under five millimetres. The report, based on the findings of a study by the Worldwide Fund for Nature (WWF),

found that people are consuming on average every week some 2,000 tiny pieces of plastic mostly through water but also through marine life and the air. Every year

humans are ingesting enough microplastics to fill a heaped dinner plate and in a life time of 79 years it is enough to fill two large waste bins (Fig 375). WWF

International director general Marco Lambertini said: 'Not only are plastics polluting our oceans and waterways and killing marine life -

it's in all of us and we can't escape consuming plastics.' Plastic-wrapped food absorbs the chemicals and I see even fresh food wrapped in plastic labelled 'organic' which by definition it can't be in such circumstances with the content of plastic leaching into the food. American geologists found tiny plastic fibres, beads and shards in rainwater samples collected from the remote slopes of the Rocky Mountain National Park near Denver, Colorado. Their report was headed: 'It is raining plastic.' Microplastics have been found in snow in remote areas and deep in ocean sediment and in plankton. 'Everywhere we look, we find it', one researcher said. Microplastics are also added to foodstuffs with scientists from McGill University in Canada revealing that billions of microplastic particles are released into every cup of tea using plastic tea bags. Who could have forecast that using plastic tea bags would release plastic into the tea? You'd have to be a genius, surely? It's systematic at the inner core of the Cult. Health consequences of plastic infiltration of the body are nothing like fully understood, but the London Daily Mail quoted



Figure 375: Alamy, www

Rachel Adams, senior lecturer in Biomedical Science at Cardiff Metropolitan University, as saying that among them are internal inflammation (with many knock-on effects) and immune responses to a 'foreign body' (see also vaccine contents and autoimmune disease). She further pointed out that microplastics become carriers of toxins including mercury, pesticides and dioxins (a known cause of cancer and reproductive and developmental problems). These toxins accumulate in the fatty tissues once they enter the body through microplastics. I have described in other books how the body's survival system often will not allow fat to dissolve because it knows that this will release the accumulated poisons - 'No matter what I do I can't lose weight'. A study by Kings College London discovered the astonishing microplastic pollution in the UK capital. Researchers found that 'microplastics in the atmosphere are falling from the skies onto roofs and into human lungs in alarming quantities'. Researcher Stephanie Wright said they found 'a high abundance of microplastics, much higher than what has previously been reported' and the same will be true of all other cities. She repeated the point about unknown consequences: 'The biggest concern is we don't really know much at all. I want to find out if it is safe or not.' Well, clearly it's not safe and what is being missed as always are the consequences at the wavefield level where synthetic vibrations are infiltrating the human energy field which becomes the human hologram. When you are entering your endgame the last thing you want are healthy, strong, psychologically-balanced, sharp-thinking, people. You want the very opposite and you suppress the mind by suppressing the body which together make up Body-Mind. A study by the University of Vermont found that obese children have a thinner region in the brain which relates to decision-making, the ability to plan and control behaviour, and this is where most information is consciously processed.

Too many people'

I have been warning for decades about a planned mass-cull of the global population and all that I have described makes that possible. When entrainment/entanglement between technology frequencies and the human field is powerfully established one can so disrupt the other that the heart stops beating and the oscillation of bodily life is switched off. If the Cult has the precise frequencies on which a person is transmitting an individual can be isolated and targeted. The Cult is using every excuse to compile DNA databases which provide that information. Many people claim they are already being specifically harassed by Deep State technology and refer to themselves as 'targeted individuals'. They say thoughts and perceptions are delivered to their brain technologically and I have explained how this is possible. I say that in less obvious ways

this is being done on a mass scale through information delivered in waves by Wi-Fi, 5G and other technology networks. Taking out people individually and collectively is only a step on from that and based on the same principle. Cult gofers and operatives quoted in other books have long called for a colossal decrease in the global population (and I mean by billions) and now there is the added excuse that too many humans mean more danger from climate change. Climate Cultists are urging a reduction in the population and for people to stop having children at all. Bill Gates is among those very vocal on these subjects and would have talked about this with his father who supported eugenicist Thomas Malthus. The Cult doesn't need anything like as many human slaves any longer with AI taking over everything, male-female procreation due to be replaced by Huxley's World State Hatcheries, and synthetic laboratory babies specifically engineered for life-long slavery. Human bodies have been made toxic through food, drink, pollution and microplastics while electromagnetic frequencies have the potential to enormously increase the effect of that toxicity to fatal levels. The authorities could have wised computer systems in schools and universities and instead imposed Wi-Fi as part of the cumulative cull

(remember the teacher's blood) and the same with smart meters (Fig 376). Now you can see why 5G – a military weapon – is being rolled-out across the world with no testing. 5G is very much part of the cull agenda. I know that people don't want to face what is happening, but it is and we have to deal with it. How could it be any other way with

5G and Wi-Fi when you consider coagulating blood, affecting the molecular structure of oxygen, attacking water molecules, and frequencies that we don't even know about able to be transmitted through a network sold to us for other reasons? What better means do you need for a long-planned mass cull than the ability to absorb enough oxygen as I will come to in the next chapter? 'Humans' in the form we know them are planned to disappear to be replaced by the trans-human, synthetic-human, machine-human, that would not be human at all.

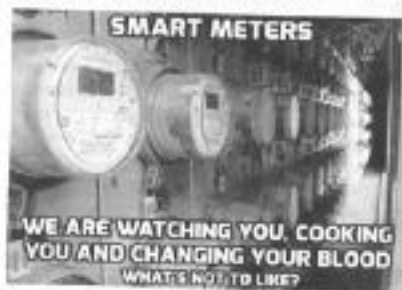


Figure 376: Another Wi-Fi field planned for every home and business to connect you to the cloud and let the cloud communicate with you.

Californian biotech company Epicyte patented the Epicyte gene in 2010 which makes men and women sterile and infertile when ingested. The gene was then genetically-engineered into corn seeds. Why the hell would anyone do that if it were not aimed at sterilising people en masse? Cult biotech companies Monsanto and DuPont bought the Epicyte operation to 'commercialise' the sterilisation gene. Rima E. Laibow, Medical Director of the US Natural Solutions Foundation, said that you can't find out if you are consuming the gene because the (Cult-controlled) US Food and Drug Administration (FDA) made it illegal to have that information. Contraceptive drugs are also in the water supply after being peed down the toilet in cumulatively vast quantities while electromagnetic waves are known to influence human reproduction through both male and female systems. We are, of course, drowning in technological waves with now the vastly more destructive 5G. I have already emphasised the falling sperm counts. Professor Olof Johansson from the Department of Neuroscience at Sweden's Karolinska Institute has predicted mass 'irreversible sterility within five generations' due to technological and Wi-Fi radiation and he was speaking before the introduction of 5G. A letter highlighting the serious dangers to male reproduction of the 5G rollout was delivered to UK Prime Minister Boris Johnson in early 2020 along with two petitions. One was signed by 268 doctors and scientists. The letter said:

We are extremely concerned by the vulnerability of our young and very young people to the harmful effects of pulsed RF radiation. Study upon study is showing that this non-ionising radiation is causing oxidative DNA damage in cellular systems and this may be particularly harmful to the reproductive system of young boys, adolescents and young men.

It's all long-planned and the extinction of humanity as we know it is the goal. Dr Richard Day told the paediatricians in 1969 about the coming 'demise pill' in which older people would kill themselves when they reached a certain age to make way for the young. The constant efforts to divide young and old is in part related to this plan and so is the Tiptoe to legal euthanasia and 'care pathways' in which doctors stop drugs and nutrition for those they claim are close to death. Many who have been taken off the 'pathway', only thanks to the efforts of loved ones, have lived for years afterwards. The theme continues with increasing numbers of US states, plus the District of Columbia, legalising medical 'assisted suicide'. At the time of writing they are California, Colorado, Hawaii, Maine, New Jersey, Oregon, Vermont and Washington with New York authorities talking about doing the same. People may say it is compassionate to allow everyone to free themselves from 'physical' suffering, but that is not in the top five reasons of those

that apply for legalised suicide in Oregon, for example. Among the leading reasons is fear of being a burden on others and fear of losing autonomy. This by definition means mostly the poor and vulnerable which then brings us into the arena of what I will call perceptual eugenics. You convince people they are a burden and then help them kill themselves. Old people have been psychopathically targeted during the 'virus' lockdowns as we shall see. Once you open the door on the basis of 'compassion' the Cult batters it off the hinges and takes the wall down. Humans are just a resource to the Cult and when they cease to be commercially productive the plan is to dole them. Paediatrician Lawrence Dunegan described what Richard Day said in 1969 about the demise pill:

Medical care would be connected very closely with one's work but also would be made very, very high in cost so that it would simply be unavailable to people beyond a certain age. And unless they had a remarkably rich, supporting family, they would just have to do without care.

And the idea was that if everybody says 'Enough! What a burden it is on the young to try to maintain the old people' then the young would become agreeable to helping mom and dad along the way, provided this was done humanely and with dignity. And then the example was there could be like a nice farewell party, a real celebration. Mom and dad had done a good job. And after the party's over they take the 'demise pill'.

Day described in 1969 how detailed the Cult agenda really is when he said they would use very pale ink on forms that people had to fill out so that older people would not be able to read them and have to ask younger people for help. He listed other ways that old people would be manipulated into believing they were 'past it' and I quote at length what he said so accurately across a range of subjects in my book, *Phantom Self*. In another reference to the population cull he said that most families would be limited to two children. Where have you seen such a child-limit policy? In China – the blueprint for the world. We should also note the emerging pressure for later and later legal abortion.

Ruling the waves

The Answer comes from understanding the problem and that means understanding the foundation nature of waves. The Cult is seeking to impose wave control in every area of life. I have highlighted many times over the years how symbols have been placed throughout global society in the form of the pyramid and all-seeing eye and many others. Why would they bother to do this on such a scale? Symbolism is both the hidden language through which Cult operatives communicate in public

and a means of transferring the frequencies of the Cult to the human energy field. The number of times you see the pyramid and all-seeing eye or just the eye is absolutely fantastic and often in animated cartoons and movies for children (Fig 377). Energetically, and in terms of frequency, symbols represent what they symbolise. A symbol representing hate will resonate waves of the frequency of hate and have potential to impact on the human wavefield. You don't even have to



Figure 377: The Cult's all-seeing eye symbol in a whole swathe of children's TV programs and other sources. It's another innocent coincidence, not at all.

consciously acknowledge the symbols for them to have this effect and in fact the Cult doesn't want that. While your conscious mind defences are down through ignorance of what is happening those frequencies are left unchallenged to entangle with the subconscious – the level at which the Cult overwhelmingly operates. The idea is to access human perception at the

subconscious level of waves and have that information filter through to the conscious mind as what people believe to be their own thoughts and perceptions. I have not been manipulated to believe what I do; they are my own conclusions.

Wave connection reveals why the Cult is obsessed with ritual. Energy flows where attention goes and the focus during a ritual on their unseen 'gods' instigates a wave entanglement through which information can be exchanged and initiates possessed. Around the world are ancient and modern sites of ritual to Saturn and Orion and rituals in those places would connect initiates to the frequencies of Saturn and Orion which I say are both crucially important to the simulation and so mega-worshipped by the Cult. Waves are everything in the context of human control, both as the cause of enslavement and the knowledge that will set us free.

How did they pull off the fake 'pandemic'?

Fear is only as deep as the mind allows – Japanese proverb

Eighty-five percent of this book was written before a 'pandemic' called 'Covid-19' swept through the collective human mind and gave the Cult almost everything that I have said in this and previous books was planned to transform global society. I have been referring to the 'Covid-19 hoax' here and there in earlier chapters and now I'll explain what I mean in detail. There is no 'Covid-19'.

This will come as a shock to most people and be immediately dismissed as crazy not only by mainstream society, but by swathes of the 'alternative' media. I know that is true because it already has been. When, however, people have bothered to look at the evidence and background that I will lay out in the next two chapters, instead of instantly dismissing even the possibility and misrepresenting what I am saying, they have seen the sense it makes of what is otherwise a nonsensical and utterly contradictory 'pandemic' narrative. I don't think significant sections of the 'alternative media' have come out of this with much distinction while other parts have been outstanding. We have seen during the events of 2020 a parting of the ways between those 'alternative' voices still willing to accept blatantly flawed official stories and those who are not. I will first summarise the official 'pandemic' narratives, mainstream and otherwise, and then offer a very different explanation thanks to medical professionals who have seen through the bullshit.

The official story(s)

There have been a few official and semi-official versions, but all encode the same theme: There is a virus, natural or emerging from a Chinese bio-lab, labelled SARS-CoV-2 and this caused an infectious respiratory disease called 'Covid-19' (I will refer to this alleged virus package as 'Covid-19' from henceon to keep it simple). We were told that this 'coronavirus' and its effects are so dangerous that whole countries had

to be put under house arrest to stop it spreading and causing catastrophic loss of life. We will see that none of these claims is supportable by the evidence, but lockdowns based on those lies and flawed assumptions have been used to destroy the independent incomes and livelihoods of potentially billions and made them dependent on their Cult-controlled states and governments in a massive advancement of the Hunger Games Society. The 'outbreak' in China in the closing weeks of 2019 was met with a fierce and draconian lockdown in which what little is left of freedom in China was deleted and vast populations were put under house arrest policed by 'smart' face-recognition surveillance technology and the vicious, brain-dead Chinese law enforcement and military (same thing). The Western media reported the frenzy of activity from the Cult-owned Chinese government which included building whole new hospitals in little more than days to meet the demand from 'teeming numbers of dying people'; but the new hospitals built amid global media hysteria about the 'deadly virus' responsible were closed in a ridiculously short time when compared to the apparent human disaster that we were told was unfolding. As the 'virus' was said to be circulating in the West the Chinese 'epidemic' was already beginning to dramatically recede and while the Western economy went into meltdown China was reopening business and industry, ending the extremes of the lockdown, and travel was restored. The big point to make here is that *what happened in China set the blueprint for how to respond to the 'virus' – mass lockdown, house arrest and keeping the population apart from each other.* This was the plan from the start with Bill Gates saying that 'basically the whole country (America) has to do what was done in the part of China where they had the infections'. The cover-story promoted by the Cult-created-and-controlled, Gates-funded World Health Organization (WHO) was that China had dealt with the 'health disaster' very effectively and so that's how the rest of the world had to respond when it came their way. Cult and Gates puppet WHO Director-General Tedros Adhanom Ghebreyesus said:

The Chinese government is to be congratulated for the extraordinary measures it has taken to contain the outbreak. China is actually setting a new standard for outbreak response and it is not an exaggeration.

The scene was set. The dye was cast. The Western economy and the lives of billions were about to be devastated.

The opening version of the official story was that the 'outbreak' began in a 'wet market' in Wuhan where bats and other animals are bought and eaten in the most appallingly dirty and unhygienic conditions and when this narrative didn't stand up another theme began which was promoted and advanced by the alternative media. This

surrounded the 'BSL-4' laboratory in Wuhan not far from the wet market where lethal agents are studied and manipulated to create bioweapons for military purposes. The Wuhan facility is the only one of its kind in China. BSL-4 refers to biosafety level 4 which is the designation given to laboratories with the highest level of biosafety precautions capable of containing the often instantly fatal agents stored there. Francis Boyle, professor of international law at the University of Illinois College of Law who drafted the US Biological Weapons Anti-Terrorism Act of 1989, went public in February, 2020, to say he was convinced the 'coronavirus' strain said to be involved was an engineered bioweapon released from the Wuhan bio-lab by error or otherwise. He appeared across the alternative media and what he said about the existence of offensive biological warfare weapons with genetically-engineered DNA was clearly true. What followed, however, in actual dead people around the world did not in any way support the claim that a lethal bioweapon had been released. Just because a known arsonist lives near the scene of a fire does not mean only by association that he started the blaze, but the person who did start it will try to make you think so. No matter – a significant swathe of the alternative media would believe and promote this Wuhan lab scenario and later it would become a mainstream narrative which, of course, focussed attention and fury on China. Some Deep State-connected US politicians like the Israel-owned Tom Cotton suggested the Wuhan laboratory could have been the source and this was more reason for red flags to flutter in the breeze. It was suggested that the 'deadly agent' – by now dubbed a 'virus' – was stolen by the Chinese from a Canadian laboratory in Winnipeg, the country's foremost centre for developing and testing biological warfare weapons, or from a US BSL-4 laboratory of which there are many. Others said the 'virus' could have been sourced to the US military and released under the cover of the 2019 Military World Games held between October 18th and 27th in Wuhan just before the outbreak became public. The Games involved ten thousand military personnel and support staff gathered from more than 100 nations including a team from the United States. Professor Boyle estimated that the US has spent in excess of \$100 billion on biological warfare research since 9/11 rising by \$5 billion a year. This would sync with the Sabbatian-Frankist Project for the New American Century plan for the development of biological weapons that target specific genotypes. Biowarfare research is going on across the world in the United States, China, Israel, the United Kingdom (the infamous Porton Down), France, Russia, and many other locations. Sabbatian-Frankist-controlled Israel has a major chemical and biological weapons programme (hidden behind 'research' facilities) and as always refuses to sign the Biological Weapons Convention or Nuclear Non-Proliferation Treaty to prevent international inspections because, thanks to the

Sabbatian-Frankist networks, it is a law unto itself. The Israel Institute for Biological Research near Tel Aviv which runs the programme is one of the country's most secretive organisations (and think of the competition). The GlobalResearch website said of Israel:

The greatest secrecy surrounds research on biological weapons, bacteria and viruses that spread among the enemy and can trigger epidemics. Among them, the bacteria of the bubonic plague (the 'Black Death' of the Middle Ages) and the Ebola virus, contagious and lethal, for which no therapy is available.

So do deadly agents exist at laboratories like Wuhan? They definitely do. The question to be asked is was the 'Covid-19' coronavirus one of them? The data from actual happenings and not speculation says 'no' and I will elaborate my case for that in fine detail. For sure the first official story that the virus broke out in an animal food market or 'wet market' in Wuhan has not stood up to scrutiny. Bats were blamed to start with which has been done before in similar situations to hide the truth. There were diversions and false 'leads' flying around all over the place and the more of those you can scatter the more confusing the situation becomes and the truth is lost. I observed the scene from the perspective of tracking what was happening and not making what was happening fit a preconceived belief. As the 'virus' expanded into the West the consequences simply did not match in any way what you would expect from a 'deadly bioweapon' in terms of dead people. So what was going on?

The Web

It is worth re-emphasising how the Cult globally manipulates to put the 'pandemic' hoax into another perspective. The first thing to do is forget borders which do not exist in the Cult networks. Picture a transnational corporation with a headquarters in a particular country (in the case of the Cult that headquarters or central control centre – The Spider – is in the shadows). A corporation has subsidiaries in other countries around the world which take their orders and direction from the headquarters. The Cult system operates in the same way. In every country, especially those that most affect the direction of the world, the Cult has subsidiary networks of secret societies, satanic covers and interbreeding Nephilim hybrid families that are tasked with controlling that country's politics, government administration (Deep State), finance and banking, media, medical structure to benefit the Cult's Big Pharma, and so on. By this means the Spider-directed agenda is imposed on 'different' countries at the same time to instigate global change and coordinated happenings. I have already said that China is a major centre for the Cult along with the

United States, Israel, Britain, Italy, France, Germany, and elsewhere. At the Cult level China is America is Israel is Britain is Italy is France is Germany. Through this Cult coordination it is absolutely possible to orchestrate the extraordinary hoax that I am going to describe. Even many researchers in the alternative media do not seem to understand this structure and its manipulative potential judging by their comments during the 'pandemic'.

The structure requires very few people 'in the know' and consciously working for the Cult to dictate events in an entire country and together the entire world. You only have to control the key positions of decision-making and most of these do not even involve politicians. You want the technocrats to have the control and that includes in the case of 'Covid-19' the medical technocrats which have driven 'virus' policy throughout this human catastrophe with elected politicians almost entirely bystanders. We will see as we proceed the coordination of action between China (the Cult) and the West (the Cult). I have already highlighted the connections via the Cult of the Deep State and academia in China and the United States. As the 'Covid-19 virus' was coming to the centre of public attention Harvard University professor Charles Lieber, chair of the Harvard Department of Chemistry and Biology, was charged with lying about his role in a Chinese talent recruitment programme and was ordered to post a \$1 million cash bond by a judge at Boston's federal court. Prosecutors said Lieber agreed to conduct research, publish articles and apply for patents on behalf of China's Wuhan University of Technology in exchange for \$50,000 per month and some \$150,000 in living expenses. Authorities said he was also given \$1.5 million to establish a research laboratory at a Wuhan university. I have said that a stream of 'former' Pentagon officials end up working after 'retirement' for China either directly or indirectly. It emerged that the United States had handed \$0.7 million to the Wuhan Institute of Virology and Canada had done something similar. The American grant was reported to have been approved by the Bill Gates-connected Anthony Fauci - Trump's advisor on the 'Covid-19' lockdown response. Why would the United States and Canada give millions to a lab in China? It was the American and Canadian 'subsidiaries' of the Cult handing over money to the China 'branch'. This is the borderless world of the Cult through which the pandemic hoax was coordinated. So is the Cult connected to the Wuhan lab? Yes, and this may become significant ongoing; but is it the source of 'Covid-19'? Hardly when 'Covid-19' is a phantom 'virus'. The Wuhan lab story is a diversion from that.

I will be adding the detail, but in summary this is how they pulled it off. The Cult network that controls China triggered global hysteria with an apparent outbreak of a 'deadly virus' which they dealt with through draconian lockdowns and mass house arrest. There was no 'virus' and

the numbers of apparent deaths were generated by re-diagnosing people dying of other respiratory disease and pneumonia in the grotesquely toxic air of Wuhan as dying of a non-existent 'virus' dubbed 'Covid-19' which had the same 'flu-like' and respiratory symptoms as a long list of other conditions common in Wuhan thanks to its extreme toxic environment. A 'test' was then introduced that didn't even test for 'Covid-19' and this same test has since been used by the rest of the world to not test for 'Covid-19'. The Western media fanned the flames of hysteria by selling the story of mass deaths in China and how its government was hiding the truth about millions of dead. The media and Cult networks in Western and other countries screamed 'Ahhhh - it's us next!' Amazingly the Chinese 'death figures' suddenly began to fall which is easily done when they are based on calculated mis-diagnoses and a fake 'test'. Cult assets controlling the medical hierarchies in other countries ordered doctors and other medical staff to begin diagnosing 'flu-like' symptoms and pneumonia as 'Covid-19' and indeed almost any condition as a 'Covid-19' death with no evidence necessary. If you haven't come across this background before you are going to be shocked when I get into the detail. The narrative was supported by the same fake test and the media screamed some more about hospitals being like 'war-zones' overwhelmed by cases. In fact, hospitals had never been so quiet, but with security staff guarding them, visitors not allowed and the media banned from filming the illusion was perpetuated of a tidal wave of patients with medical staff on their knees. Other operations and treatments were cancelled to ease the burden of 'overworked' medical staff who were largely sitting around with nothing to do. Lockdowns like that in China were instigated to 'protect the people' from a 'virus' that didn't exist urged on by the Cult-owned, Gates-funded World Health Organization which pointed to China's draconian lockdown 'success' as the way to deal with what it declared was a global 'pandemic'. This is the barest framework and the detail is on the way.

Fact-free propaganda

I was quite happy in the early weeks of the hysteria to accept the possibility of a bioweapon of some kind being involved with much circumstantial evidence to point in that direction. The word, however, is circumstantial and the only way to assess the validity of that is for real-world events to support the hypothesis. It became clear to me as a few weeks passed that this was not the case at all. Death-rates did not support that scenario, but a good slice of the alternative media still clung to it. The overwhelming majority of those who 'caught the virus' had 'very minor symptoms' or none at all and this number would increase as the weeks passed. You wouldn't know this if you read the daily war-zone headlines and on the basis of this perceptual magic trick, the global

economy was devastated. Were all the 'journalists' (you're joking) in on the plot? No, of course not. They just repeated unquestioned the official story as they do as a matter of course. As the saying goes and I summarise: 'You cannot bribe or twist the great British journalist; but seeing what they will do unbribed there's no reason to.' What was alleged to be 'Covid-19' was certainly not a lethal bioweapon. One of the first people in Scotland to be diagnosed with 'the virus' after a trip to Italy told BBC radio he had a mild fever and felt shivery like he had 'a bit of flu coming on'. The worst symptoms were aches and pains especially in his legs. He said:

By the time I went to hospital, I was feeling fine. The mild flu symptoms quickly dissipated. I had no leg pain, no fever, no cough and no shortness of breath ... I felt well. My symptoms seemed to have gone within three or four days.

Ahahahhahahhahah!!!! We're all going to DIE!!! Once the hysteria began almost anyone with 'flu-like symptoms' was being diagnosed. 'Covid-19' with no supporting proof whatsoever. 'Flu-like' symptoms have a long list of potential causes – including the Measly flu which is always around at the same time of year. We will shortly see that even the 'test' for 'Covid-19' is a sick joke that doesn't 'test' for that at all. American journalist Jon Rappoport, who has researched health, drug and related subjects for decades, wrote:

Before the announcement of the coronavirus epidemic, people who showed up at those hospitals, with flu, flu-like symptoms, lung infections, pneumonia would be placed in the general ward and treated, or even sent home with drugs.

But now they would, many of them, be called 'presumptive cases' of coronavirus, without any tests at all, or after tests which don't work ... By labeling these patients 'contagious coronavirus', the hospital doctors are forced to send them to the [intensive care unit] to 'protect others from the infection'.

The manipulation of 'Covid-19' case and death figures had begun and it would reach utterly shocking proportions. Then came news of an extraordinary posting on the UK government website Gov.uk. A freelance journalist friend saw the relevant page while perusing the site for coronavirus information and found a posting from just days before Prime Minister Boris Johnson announced a draconian lockdown of the country because 'the virus is so dangerous'. The post was on the page concerning official government guidance for 'high consequence

infectious diseases (HCID). It said this about Covid-19:

As of 19 March 2020, COVID-19 is no longer considered to be a high consequence infectious disease (HCID) in the UK [my emphasis]. The 4 nations public health HCID group made an interim recommendation in January 2020 to classify COVID-19 as an HCID. This was based on consideration of the UK HCID criteria about the virus and the disease with information available during the early stages of the outbreak.

Now that more is known about COVID-19, the public health bodies in the UK have reviewed the most up to date information about COVID-19 against the UK HCID criteria. They have determined that several features have now changed; in particular, more information is available about mortality rates (low overall), and there is now greater clinical awareness and a specific and sensitive laboratory test, the availability of which continues to increase. The Advisory Committee on Dangerous Pathogens (ACDP) is also of the opinion that COVID-19 should no longer be classified as an HCID.

Days after the 'danger' from the 'virus' was downgraded by the government the country was locked down on the excuse that the virus was indeed a 'high consequence infectious disease'. What a scam was being visited upon Britain and the world. Soon after the government had been exposed for downgrading the risk they upgraded it again. The same freelance journalist who alerted me to the downgrade also researched the figures for deaths in the UK from all causes in the 'virus' period of 2020 at that time and compared them with the same weeks in 2019. They were close to the same – 11,661 (2020) and 11,431 (2019). European death rates in general told the same story in the same period. As of April 3rd, 2020, the total number of deaths in England and Wales was actually around six percent less than the same period in 2018. American doctor Andrew Kaufman, who will become very relevant shortly, described how he followed the weekly death rates up to the end of April and beyond – months into the 'outbreak' as issued by the US Centers for Disease Control and Prevention (CDC). He found them to be six percent less than the average of the previous three years – 'If there is no increase, and in fact there is a decrease, then what's the evidence that there's a new disease?' Yes indeed. Where were the additional dead people from 'Covid-19'? My journalist friend further compared the figures for people attending hospital emergency departments for the same two years in the same period of weeks and they were virtually identical with 2019 slightly higher. Where were all the 'new' cases of 'Covid-19' overwhelming hospitals in need of treatment – the 'war zones' that the media was raving on about? German doctor Wolfgang Wodarg, former chair of the Parliamentary Assembly of the Council of

Europe Health Committee, made the same point: 'You can check the total body count monitoring – people are dying less than during the last years.' He said there were no more 'flu-like' diseases than any other winter. With the 2019-2020 death rate comparison continuing to show into April no significant difference to explain the 'new' deaths from Covid-19 we suddenly had the UK National Statistics Office counting the figures in a way that had not been done before: 'A death can be registered with both Covid-19 and influenza or pneumonia mentioned on the death certificate, therefore a death can be counted in both categories.' The figures would go on to be massively manipulated to make it appear there was a 'Covid-19 pandemic' when there wasn't. Dr Malcolm Kendrick who works for the NHS in England said: 'I do know that other doctors put down Covid-19 on anyone who died from early March onwards.' Shocking and it is happening worldwide.

Empty 'war-zone' hospitals

Next the UK National Health Service announced a change in its publication of data that would no longer include the figures on 'critical care bed capacity and urgent operations cancelled'. They had to do this to hide from the public the glaring fact that 'war-zone' hospitals were near empty. Yes, empty. This came about for two main reasons: (1) There was no 'Covid-19' war-zone pandemic bringing hospitals to their knees; and (2) almost all non-'Covid-19' treatment, operations and hospital consultations had been cancelled to protect medical staff from being 'overwhelmed'. On that basis how could hospitals be anything except near-empty and the same was happening all over the world. Hospitals were defended and controlled by security staff with the few patients that were in hospital denied visitors 'because of "Covid-19" rules' (because they would see that the war-zone hospitals were near-empty). This meant that children were dying in hospital from other conditions without their mum and dad to emphasise to breathtaking extremes the nature of the psychopaths that we are dealing with. A German journalist managed to gain entry

to the 'coronavirus emergency centre' at Charité – Universitätsmedizin in Berlin, one of Europe's largest university hospitals, and found that it was empty (Fig 378). It even had two 'emergency tents' outside which were also



Figure 378: Many videos appeared on the internet of hospitals reported to be 'like war-zones' where nothing out of the normal was happening and often had no one to be seen.

unused and he said that staff were privately very critical of the media for so hyping something that wasn't happening. Medical staff were banned from officially talking about the situation and all information was channelled to the media through a central press office to ensure control of the narrative. The German journalist's video also included a list of doctors and specialists spelling out why the virus scare was an outrageous sleight of hand. The 'journalist's' video also included a list of doctors and specialists spelling out why the virus scare was an outrageous sleight of hand. YouTube deleted the video but we managed to find another version and downloaded that to the no-censorship BitChute video platform which I highly recommend. BitChute hosts the videos deleted by YouTube and anything YouTube bans that challenges the Cult narrative you need to see. Put these words into the search engine at Davidicke.com to watch the video: 'New source for banned YouTube video: German journalist goes to hospital 'teeming with coronavirus patients' – how can doctors cope? – and finds NO ONE



Figure 379: Images and footage of empty hospitals that were supposed to be 'war zones' appeared from all over the world. The British man who took these pictures was jailed to deter others from exposing the truth.

THESE'. Many people began to film at their local hospitals around the world and found them to also be empty with no stampede of 'viral' patients. Meanwhile the media was telling us of the said 'war-zone' conditions. One British man was jailed for three months for walking around a hospital and posting pictures on Facebook showing it to be empty (Fig 379). He

was sentenced for visiting the hospital 'with no good reason' and of course showing it to be empty and the authorities to be lying to the British people was never going to be considered a 'good reason'. I met a hospital worker who said: 'You're right about what is happening'. He said the hospitals have 'never been so quiet' with hundreds of empty beds and staff sitting around. A UK whistleblower at Southmead Hospital in Bristol told the media platform Bristol Live that hundreds of hospital staff were laid off. She was a healthcare assistant in accident and emergency who normally worked full-time, but she was now struggling to get one shift a week. She was on a zero-hours contract which means you only get paid when work is available and she had

virtually no income. There were 'easily' more than 200 in the same situation, including some nurses, where she was located. The whistleblower said:

There were hardly any patients when lockdown hit. The hospital closed seven wards and 150 beds, including the wards for stroke patients, orthopaedic trauma and neurosurgery. The hospital is like a ghost town. You could walk through and hear a pin drop. Pretty much the only patients in the hospital seem to be coronavirus patients.

Hugh Evans, Bristol Council's director of adult social care, said the city's hospital bed occupancy was at an 'all-time, unforeseeable low' while Jacqui Marshall, director of people and transformation at North Bristol NHS Trust, said without a hint of embarrassment or irony ... 'We have not yet seen the surge in volume of patients that was initially anticipated due to the Covid-19 pandemic.' You would not have known any of this reading or watching the national and international media.

Happy clappers

Empty hospitals were a constant theme across the world and yet the UK government instigated a weekly mass clapping by the unquestioning, performing-penguin population for health workers who were 'saving us from the virus' while most were sat strumming their fingers, being laid off, or making a long stream of dancing videos that appeared on YouTube featuring doctors and nurses prancing around empty hospitals. They seemed to have no problem standing inches from each other or closer despite social distancing rules imposed on everyone else by police who also universally ignored them. I have emphasised in this book that the global Cult conspiracy is about manipulating perception and never has there been a more blatant example than the fake 'pandemic'. To that end the usual mindless 'celebrities' were wheeled out like Lady Gaga, Paul McCartney, Mick Jagger, Elton John and a long list of others performing from home in the One World: Together At Home 'event' organised jointly by the World Health Organization owned by Bill Gates and an organisation called Global Citizen owned by Bill Gates. British singer Rihana urged viewers to stay safe and follow WHO recommendations. Gates would have been most grateful for yet another clueless celebrity to advance his agenda while having no idea that this is what she was doing. The 'event' was officially to celebrate health workers and at least most of them would have had plenty of time to watch. The psychological undertones however were selling the perception of 'One World' (the Cult's long-time code for world government dictatorship) and 'global citizen' (the end of borders and nationalities). This and the mass clapping for health workers were all

part of the perceptual illusion that hospitals were overwhelmed.

The fact that comparatively few health workers came out to tell the truth of what was happening is something they will have to carry for the rest of their lives as they survey the catastrophic human consequences of the 'pandemic' lie – including for themselves and their kids. The mainstream media which could have easily confirmed and exposed the empty hospitals continued to present the war-zone illusion. The nearest anyone came at the time of writing was London's *Mail OnLine* report about private hospitals taken over by the UK National Health Service (NHS) being empty and unused. The hospitals seconded by the NHS at a cost of hundreds of millions of pounds because of the 'crisis' were described as 'sinfully empty' by senior doctors. They said hundreds of the country's best doctors were left 'twiddling their thumbs' during the 'outbreak' putting other patients at risk through untreated and undiagnosed other illnesses and cancelled operations. Eight thousand beds in private hospitals were seconded by the NHS in March, 2020, when it was claimed that 20,000 fully qualified staff in the hospitals, including 700 doctors, were needed to 'battle Covid-19'. They even appealed for thousands of qualified staff to come out of retirement to help. A London-based consultant orthopaedic surgeon said: 'What we are seeing at the moment is a sinful and shocking mass of empty private hospitals and empty beds.' The surgeon said that only 'emergency' and 'time-critical' operations were being allowed at his hospital: 'I have a waiting list of 25 people who need major operations right now. One with severe arthritis is crying out in pain every night, unable to sleep.' The *Mail* then spoiled it all by saying that NHS wards were 'overrun'. Like hell they were. Another phenomenon that made no sense in relation to the numbers was to build special intensive care facilities like the 'Nightingale' facility built in nine days at East London's ExCel, exhibition centre to provide an extra 4,000 intensive care beds while regular hospitals were operating at immense under capacity. The government then explained why 'Nightingale' was barely used by claiming a 'shortage of nurses' while great numbers sat virtually idle in near-empty hospitals and others made dancing videos in empty wards. The story was the same with other 'Nightingale hospitals' around the country. A massive army field hospital built inside a Seattle convention center by hundreds of troops was dismantled before treating a single patient. Then there were the emergency 'mortuaries' the size of football pitches and articulated trucks at hospitals said by the media and officialdom to be for dead bodies overflowing from normal mortuaries. People who filmed them with phone cameras showed the trucks to be empty. The British Army came to the Isle of Wight where I live to rearrange the local St Mary's Hospital to provide 200 extra beds when staff were telling me the hospital had never been so quiet and this was

the location of one of the nurse dancing videos confirming how much 'pressure' they were under. If you think none of this makes sense – and it doesn't in terms of health and the official story – then read on.

How the scam works – a doctor explains

It became clear to me as I observed events that there was no 'Covid-19' and the puzzle pieces started to connect. A crucial contribution was provided by the research of Dr Andrew Kaufman, a practicing forensic psychiatrist in New York State, a Doctor of Medicine and former Medical Instructor of Hematology and Oncology at the Medical School of South Carolina. He also studied at the Massachusetts Institute of Technology (MIT). Kaufman provided a pivotal piece in the puzzle for me as I sought to uncover the way the Covid-19 hoax was manipulated. I was sure by the time I saw his video presentation that Covid-19 didn't exist and said so in Internet videos, but Kaufman revealed some vital detail. You can watch his interviews and presentations at Davidicke.com if you put into the search engine: 'Videos of Dr Andrew Kaufman exposing Covid-19 deceit'. His website is Andrewkaufmandmd.com. Kaufman explains how the Chinese authorities immediately concluded that the cause of an illness that broke out among about 200 initial patients was a 'new virus' and he details how they had no grounds for such a conclusion. They were blaming a 'virus' almost from the start for reasons that would become clear to anyone who has researched the global Cult and how it operates in every country and has no borders. Kaufman said Chinese investigators took unpurified genetic material from the lungs of only a handful of the first patients which can be found in large numbers of people all the time from a variety of sources including their own cells, bacteria, fungus and other microorganisms living in their bodies. This therefore proved nothing at all. A 'viral disease' that would be called 'Covid-19' was never isolated and identical and other possible causes of the illness were barely considered. The script was being written that would be repeated around the world. They identified a sequence of RNA (ribonucleic acid) which contains genetic material as DNA does although there are differences in their function. This genetic sequence is what they have been testing for – not a fantasy 'viral coded' called 'Covid-19'.

They could have isolated a virus if it existed through filtration because viral particles are much smaller than other material. They didn't. Instead they compared the contaminated, impure, RNA sequence with other RNA sequences and declared that because it was just under 80 percent identical to the SARS-CoV-1 'virus' claimed to be the cause of the SARS (severe acute respiratory syndrome) outbreak in 2003 that they must be related. They called the 'new virus' they had not even identified SARS-CoV-2 and claimed it was the cause of what has been

termed 'Covid-19'. Kaufman highlights major problems with this claim. First of all the SARS-CoV-1 'virus' was not purified and isolated either (like all recent 'scare' viruses) and so could not possibly be proven to be responsible for 'SARS'; secondly, the 'just under 80 percent identical' is basically meaningless. Kaufman points out the 96 percent correlation between humans and chimpanzees when 'no one would say our genetic material is part of the chimpanzee family, but yet they are using a sequence identity that has a much lower percentage, under 80 percent compared with 96, and saying it's a coronavirus because of that'. He said, quite rightly, that this is extremely weak science. German physician and bacteriologist Robert Koch produced in 1890 the four criteria for proving that a particular bacteria, or 'virus' in this case, is the cause of a given disease. These criteria have been used ever since by mainstream medicine as the 'gold standard' (but not in the case of 'Covid-19' and other recent 'deadly viruses' they want to use to scare the population shitless). These are the so-called Koch Postulates:

1. The bacteria must be present in every case of the disease and all patients must have the same symptoms. It must also not be present in healthy individuals.
2. The microorganism must be isolated from the host with the disease and grown in pure culture (you must isolate only the 'virus' and no other material which is known as 'purification').
3. The specific disease must be reproduced when a pure culture of the infectious agent is inoculated into a healthy susceptible host (the isolated 'virus' must be proved to cause the disease that you claim and healthy people without the 'disease' must not be found to have any of the 'virus' or material that you say is causing the disease).
4. The bacteria must be recoverable from the experimentally infected host and everyone who comes into contact with the 'virus' or bacteria must get the same disease.

With 'Covid-19' none of these criteria – NONE – were met. Not ONE. The alleged 'Covid-19' has never been isolated or purified and the whole hoax has been perpetrated by diagnosing from symptoms with a long list of potential causes and by testing for genetic material (NOT 'Covid-19') and this genetic material also has a long list of other potential reasons for being there including lung cancer. In fact, the same test has been employed in attempts to identify lung cancer. Kaufman read the scientific papers describing the 'Covid-19' identification process and found them all to have seriously failed the Koch Postulate criteria and even the much less stringent adaptation of the postulates known as 'Rivers' criteria' for viruses developed by American bacteriologist and virologist Thomas Milton Rivers, the 'father of modern virology', when

he was director of the Rockefeller Institute for Medical Research in 1937. Papers claiming to have identified other more recent 'viruses' also failed both tests and all the papers failed on the most important criteria – isolating the alleged disease-causing agent from other genetic material that would contaminate and skew any testing method. Dr Kaufman's conclusion was that there is no 'Covid-19' virus. This entire pandemic is a completely manufactured crisis. In other words there is no evidence of anyone dying from [this] illness. Many will be astounded at that statement, but you will see that this is confirmed by evidence across multiple subject areas and happenings.

The Chinese (Cult) authorities began to diagnose all people with 'flu-like' symptoms and pneumonia as infected with 'Covid-19', an alleged 'virus' they had not proven to exist and certainly not to be the reason that people were ill. Wuhan, like most Chinese cities, has notoriously toxic air and so widespread lung and respiratory problems – the same with Lombardy at the centre of the 'Covid-19 pandemic' in Italy. From the start Chinese medical staff were diagnosing what would become the infamous 'Covid-19' purely on 'flu-like' and pneumonia symptoms with their long list of other potential causes. The number of cases obviously soared as all respiratory disease was dubbed 'Covid-19' and all deaths diagnosed the same way. Death rates from the non-existent 'Covid-19' were hysterically hyped to build fear in the West that the 'deadly virus' was coming their way, but the 'death rates' were people dying from what they have always died from in toxic Wuhan. Then the Chinese authorities began 'testing' people for their alleged 'virus' which they had not identified. They rolled-out a diagnostic 'test' before they had proved anything let alone that a new virus was involved. 'How did they know what the source was of that genetic material?', Andrew Kaufman asked. Well, they didn't. The test is called the RT-PCR test or reverse transcription polymerase chain reaction. It is the 'qualitative rather than quantitative' protocol which can only measure the presence or absence of an RNA code sequence, but not the amount of RNA. I emphasise again – the PCR process is being used to 'test for the Covid-19 virus' when in fact it is ... not testing for 'Covid-19'. It is testing only for a genetic material sequence that is present in large numbers of people for a large number of potential reasons. No wonder so many test positive and no wonder the deeply corrupt World Health Organization says that people are not developing immunity from 'Covid-19'. How can they become 'immune' to something they have never had because it doesn't exist? How can they become immune to a genetic sequence that is part of their own genetic make-up?

Almost everyone has coronavirus present in their bodies and, if measured, it could show up in genetic material. Not 'Covid-19', I stress, but coronaviruses, a large 'family' of viruses that include the common

cold and other more severe strains that can lie dormant ongoing in the body kept in check by the immune system. A test for coronaviruses, and not specifically 'Covid-19', will be positive in enormous numbers of people. The World Health Organization claims that 'Covid-19' is 'an infectious disease caused by a newly discovered coronavirus called SARS-CoV-2'. Kaufman and increasingly others seriously dispute this claim. He said of the PCR test, invented by American biochemist Kary Mullis in the 1980s: 'We can't trust the results of this test at all.' The Quantitative PCR, sometimes called digital PCR, can be used to establish degradation of genetic material – which is what the Chinese took from the lungs of people sick at the start of the 'outbreak' – but clearly not the phantom 'Covid-19'. The PCR test involves 'amplification'. This means they take extremely small amounts of a sample and amplify that so they can better identify the content. The trouble is that amplification expands everything else in the sample. This means that what you are looking for becomes ever more contaminated by the other material. The more you amplify the more you find material in the sample that almost everyone has and so the greater the amplification the more people will test 'positive' for other things in the sample and not what you are supposed to be testing for. Amplify genetic material claimed to be 'Covid-19' say 35 times and you will get positives and negatives for content of the genetic material (not the 'virus') in the bodies of those tested; but amplify say 60 times and so much other genetic material comes into the picture that virtually everyone will test positive not for the 'virus', but different elements of what is contained in the 'genetic material'. This means that how many 'positives' you get depends on how many times you amplify the genetic material and if different countries use different amplifications this would be one way to explain different numbers. They also often dilute the samples as a way to determine the number of positives/negatives which allows them to do fewer cycles of amplification and takes less time. The authorities can control the number of 'cases' by these methods. If in China, for example, they used high amplifications at the start to terrify people they would get big numbers of 'cases'. If they then used lower amplifications the number of cases would suddenly fall to nothing and they could claim that their draconian lockdowns were responsible – so providing the response blueprint for other countries. The same monumental deceit has been employed in Britain, the United States and elsewhere. When the vaccine is introduced they will manipulate the test (so easy) to make it seem like the vaccine has worked.

The 'deadly virus' is a natural immune system response

Dr Andrew Kaufman introduced a devastating piece of information which relates to something called 'exosomes'. Cells release exosomes all

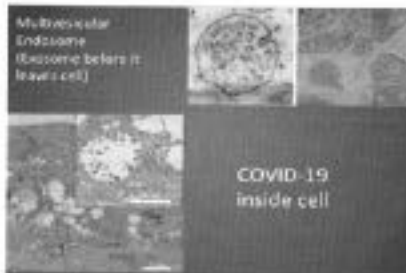


Figure 386: American doctor Andrew Kaufman exposed how exosomes, a natural immune system response by poisoned cells, looked the same under the microscope as what is being called 'Covid-19'. Cell operatives had taken a natural immune response and called it a 'deadly virus'.

	Exosomes	COVID-19
Diameter inside cell	500 nm (MVC)	500 nm
Diameter outside cell	100 nm	100 nm
Receptor	ACE-2	ACE-2
Contains	RNA	RNA
Found in	Bronchoalveolar (lung) fluid	Bronchoalveolar (lung) fluid

Figure 387: Andrew Kaufman further showed that in all relevant ways exosomes and the fake 'Covid-19' were the same down to the cell receptors that both lock into. Exosomes and 'Covid-19' are one and the same. What a scam.

cell receptors, contain the same genetic material in the form of RNA or ribonucleic acid, and both are found in lung fluid which is what the Chinese initially took from those first few patients before claiming the cause of their illness was a 'virus' (Fig 381). There is a reason they mirror each other – they are the same phenomenon. James Hildreth MD, President and Chief Executive Officer of the Meharry Medical College at Johns-Hopkins, a researcher into HIV, said: 'Of viruses: 'The virus is fully an exosome in every sense of the word.' Exosomes, a natural mechanism for cells to cleanse themselves and alert other cells, and what is claimed to be 'Covid-19', are the same thing. Cell operatives in China and like-agents throughout the world simply renamed exosomes as 'isolated Covid-19' and developed a 'test' that produced a positive for RNA of unknown origin now transformed in the public mind into a non-existent 'virus' dubbed 'Covid-19'. Some of the conditions that trigger the release of exosomes ('Covid-19') include: Toxicity; fear and stress [see 'virus'

the time but they increase substantially when there are toxins in the tissues. They also communicate a warning about a problem to remote parts of the body and can even remove toxins from the extracellular space. Any form of toxin, whether chemical or electromagnetic, will cause cells to release exosomes as part of the body's system to protect from cell damage and death. Kaufman shows images of exosomes and what is alleged to be 'Covid-19' under the microscope and they are ... exactly the same in every relevant way (Fig 380). They both attach to the same

bacteria and lockdowns]; infection; injury; immune system responses; asthma; disease; and electromagnetic radiation which is getting more powerful by the day. Andrew Kaufman also points out that part of the process of identifying the genetic material involves adding antibiotics which cause the cells to release exosomes into the sample. They have renamed a natural immune reaction 'Covid-19' knowing that large numbers of people will test positive for that immune response and content within a genetic material RNA code. When people test positive and then die from other causes doctors are told to put 'Covid-19' on the death certificate as I will show. This is how the number of 'cases' and 'deaths' from the non-existent 'Covid-19' have been scammed into a widespread public perception about a 'deadly virus' that can only be stopped by lockdown, mass global house arrest, destroying the independent livelihood of potentially billions, and a Bill Gates-produced mandatory 'vaccine'.

Can you 'catch' a virus?

Lockdown and 'social distancing' have been justified by the authorities on the grounds of protecting the public from an infectious disease – a 'virus' that has never been shown to exist. Then there is the question of whether even if the 'virus' was real that anyone could catch it from other people when a virus needs host cells to replicate. The *Encyclopedia Britannica* defines a virus as an agent that 'can multiply only in living cells of animals, plants, or bacteria' and says 'they cannot reproduce and carry on metabolic processes without a host cell'. Can 'Covid-19' therefore be 'caught' from work surfaces, door handles, and money and how can it jump between humans or animals and humans when it requires a cellular host inside a body? As the lockdowns continued, Professor Hendrik Streeck, a virologist working on the German response to the 'pandemic', said the 'virus' had not been spread by shopping or going to the hairdresser. His studies in one 'infected' home found it 'did not have any live virus on any surface' including on phones, door knobs or even the pet cat's fur. 'We know it's not a smear infection that is transmitted by touching objects', he said, and he believed it could only be transmitted by very close contact. I would say from what I've read that even that is not correct, or at least unproven. Meanwhile, the public was ordered to keep six-feet from other people, including when standing in the rain waiting to enter a one-in, one-out store, and to stay at home out of the sun while using sanitiser to wash every surface. Streeck's words take us into the territory of Dawn Lester and David Parker in their book widely-quoted by inquiring physicians, *What Really Makes You Ill – Why everything you thought you knew about disease is wrong*. Lester and Parker seriously question that a 'virus' can be transmitted between people or people and animals and they point out there is no

provable scientific evidence to show that it can. They are not alone in this assertion either. The book quotes the establishment definition of a 'virus' as 'a minute particle that is capable of replication but only within living cells'. The authors write:

The definition also claims that viruses are the cause of many diseases, as if this has been definitively proven. But this is not the case; there is no original scientific evidence that definitively demonstrates that any virus is the cause of any disease. The burden of proof for any theory lies with those who proposed it, but none of the existing documents provides 'proof' that supports the claim that 'viruses' are pathogens.

How can a natural immune response – which is what a 'virus' really is – cause or transmit disease? The exosome reaction is a response to a problem (poisoned or otherwise injured cells) and not the problem itself. To say otherwise is to say that firefighters responding to a blaze are the fire. The very word 'virus' comes from a Latin word meaning 'poison'. Various manifestations of 'pus', as with smallpox, were once associated with the word 'virus'. Lester and Parker quote Dr Lynn Margulis, acclaimed biologist and member of the National Academy of Sciences, as saying that viruses are not even alive in her definition:

They are not alive since outside living cells they do nothing, ever. Viruses require the metabolism of the live cell because they lack the requisites to generate their own. Metabolism, the incessant chemistry of self-maintenance, is an essential feature of life. Viruses lack this.

Margulis further said that '... any virus outside the membrane of a live cell is inert' and inert means 'lacking the ability or strength to move'. Wow, 'deadly viruses' suddenly seems a lot less scary, eh? Lester and Parker ask how inert 'virus' particles that cannot move are supposed to somehow be transmitted between people and enter cells to 'infect' them. This poses a similar problem to medical authority as that faced by the inconvenient fact for the Climate Cult that carbon dioxide has to double in volume to affect temperature by any significant degree. This is not going to happen and the climate extremists have had to invent a whole cover story about 'feedback loops' to overcome these facts and claim that CO2 is dangerous. In the same way virus particles outside a living host cannot move and without that they can't be passed on to 'infect' anyone. Hold on a while and I'll work something out. Let me think. Ah, yes, they hitch a ride on particles that can move and then drop off at just the right time to enter a body. Phew – do you think they'll buy that? This is what is claimed to explain the mystery although how this is supposed to happen has never been explained. Lester and Parker write:

The transmission of any viral particle attached to saliva or mucous travelling through the air has never been observed; viral particles are only ever observed in a laboratory under an electron microscope. The transmission of viruses in the air is an assumption, as is their ability to travel through the human body.

The authors note that investigations, including those by virologists, have 'failed to unearth any original papers that conclusively prove that any virus is the cause of any disease. Functions attributed to viruses in the cause of disease were based on assumptions and extrapolations from laboratory experiments that had not only failed to prove, but were incapable of proving, that viruses cause disease. The inert, non-living particles known as viruses do not possess the ability to perform such functions because they lack the necessary mechanisms.' So what is the point of 'social distancing', masks and lockdown? There is none. What divides people more than wearing masks hiding facial expressions and yet they were seen everywhere as people once again unquestioningly believed they would offer protection from the virus that didn't exist. Pores in the masks are far bigger than viral particles and Dr Kaufman described this as like putting up a chain-link fence to stop mosquitoes. He also warned that masks restrict breathing which can be 'problematic' with healthy people never mind those with asthma or lung and airway disease. For them it could be devastating. Masks, social distancing – none of this is about health. It's about control and economic destruction. By the way, newspapers were quick to claim that the 'virus' could be caught from handling money (wrong), but they emphasised that it cannot be caught from handling newspapers. How come it can be 'passed on' through paper money, but not paper newspapers? The newspapers are selling newspapers and not money. My god, it's pathetic.

The propaganda has been so incessant that to suggest there is no evidence of a 'Covid-19' is to be crazy by definition to most people. They wouldn't lie that much, surely? Oh, they would. Absolute super-massive whoppers are their calling card – the bigger the lie the more will believe it. The response by Cult-controlled Silicon Valley to two videos within days of each other was very significant with regard to this. The first was an interview I did with Brian Rose at London Real that was live-streamed and attracted the second-biggest live-stream audience in the world that day on YouTube. Within minutes of completion and with more than 300,000 already watching the recording YouTube deleted the video followed quickly by Vimeo and Facebook. The latter version had been watched a million times before Facebook pulled the plug. The mainstream media and sadly much of the alternative focussed on what I said about a 5G angle to current events which was only a relatively

small part of the interview. The whole thrust of what I said was to question the existence of 'Covid-19'. A few days later my son, Jaymie, interviewed Andrew Kaufman for Davidicke.com in a video that did not even mention 5G, but it was deleted by YouTube after passing 300,000 views. The common denominator of both deleted videos was not 5G – it was to question the existence of 'Covid-19' which, when widely known, would bring down the house of cards. The unthinkable needs to be thought when the evidence points in that direction. I have been constantly misquoted as saying that 5G is causing the 'virus' which is rather difficult to sustain when I am saying there is no 'Covid-19' virus. My point has been that 5G can trigger symptoms that have been called 'Covid-19' which is very different from 5G 'causing the virus'.

How the scam works – a scientist explains

In late March, 2020, I received an email from Sir Julian Rose, a writer, researcher, and known in the UK for his promotion of organic farming. He sent me an explanation of the coronavirus hoax sent to him by an American scientist friend who works in the healthcare field. It is a superb breakdown of the systematic deceit and absolutely supports many of the findings of Dr Andrew Kaufman. The scientist said they were not testing people specifically for 'Covid-19', but for any strain of a coronavirus of which there are a long list. 'There are no reliable tests for a specific Covid-19 virus', he said. 'Nor were there any reliable agencies or media outlets for reporting numbers of actual Covid-19 virus cases. 'Every action and reaction to Covid-19 is based on totally flawed data and we simply cannot make accurate assessments.' He said this was why most people diagnosed with 'Covid-19' were showing nothing more than cold/flu like symptoms. 'That's because most Coronavirus strains are nothing more than cold/flu like symptoms.' An 86-year-old German man tested positive for 'Covid-19', his entire nursing home was quarantined, and then he was found to have only a common cold. The Tanzania government sent samples from a pigpaw and a goat to the WHO for testing (to expose the scam) and both came back positive for 'Covid-19'. The PCR test used to detect 'Covid-19' does not do that, the scientist said, but instead 'basically takes a sample of your cells and amplifies any [RNA] to look for "viral sequences", i.e. bits of non-human [RNA] that seem to match parts of a known viral genome'. The problem he said was that ... *the test is known not to work*:

It uses 'amplification' which means taking a very, very tiny amount of [RNA] and growing it exponentially until it can be analyzed. Obviously any minute contaminations in the sample will also be amplified leading to potentially gross errors of discovery. Additionally, it's only looking for partial viral sequences, not whole genomes, so identifying a single pathogen is next to

impossible even if you ignore the other issues.

He said what he called the 'Mickey Mouse test kits' that were being sent out to hospitals told analysts – 'at best' – that you have some viral (RNA) in your cells. This was irrelevant because most people had coronavirus (RNA) most of the time:

It may tell you the viral sequence is related to a specific type of virus – say the huge family of coronavirus, but that's all. The idea those kits can isolate a specific virus like Covid-19 is nonsense.

He said the other issue was 'viral load'. The PCR 'Covid-19' test (that isn't) works by amplifying minute amounts of RNA. It was therefore useless at telling you how much virus you may have – the only question that really matters when it comes to diagnosing illness:

Everyone will have a few viruses kicking round in their system at any time, and most will not cause illness because their quantities are too small, for a virus to sicken you – you need a lot of it, a massive amount of it.

But PCR does not test viral load [They use qualitative rather than quantitative PCR] and therefore can't determine if [a virus] is present in sufficient quantities to sicken you. If you feel sick and get a PCR test any random virus [RNA] might be identified even if they aren't at all involved in your sickness which leads to false diagnosis.

What is said here is supported by Kary Mullis who won the Nobel Prize in Science for inventing the PCR in the 1980s. Yes, the inventor of the PCR test said that it *cannot accurately test for infectious diseases* and yet this is what the test is being used for with regard to 'Covid-19'. Mullis said: 'Quantitative PCR is an oxymoron.' He said that PCR is intended to identify substances qualitatively, but by its very nature the test is unsuited for quantity. Mullis said there was a common misimpression that the viral load tests count the number of viruses in the blood, but the test *could not detect free, infectious viruses at all*. The test could detect genetic sequences of viruses, but not viruses themselves. You can see from all this that the numbers of cases and therefore deaths from 'Covid-19' are utterly unrepresentative. The scientist said coronavirus is incredibly common. 'A large percentage of the world human population will have covid ... in them in small quantities even if they are perfectly well or sick with some other pathogen.' He asked: 'Do you see where this is going yet?' All this meant that 'if you want to create a totally false panic about a totally false pandemic – pick a coronavirus'.

They are incredibly common and there's tons of them. A very high percentage of people who have become sick by other means (flu, bacterial pneumonia, anything) will have a positive PCR test for covi even if you're doing them properly and ruling out contamination, simply because coronaviruses are so common. There are hundreds of thousands of flu and pneumonia victims in hospitals throughout the world at any one time.

He said all you needed to do was select the sickest of these people in a single location – 'say Wuhan' – and administer PCR tests to them. You then claim that anyone showing viral sequences similar to a coronavirus 'which will inevitably be quite a few' is suffering from a 'new' disease:

Since you already selected the sickest flu cases a fairly high proportion of your sample will go on to die. You can then say this 'new' virus has a CFR [case fatality rate] higher than the flu and use this to infuse more concern and do more tests which will of course produce more 'cases', which expands the testing, which produces yet more 'cases' and so on and so on.

Before long you have your 'pandemic', and all you have done is use a simple test kit trick to convert the worst flu and pneumonia cases into something new that doesn't actually exist [my emphasis].

The scientist said you then 'just ran the same scam in other countries' and make sure to keep the fear message running high 'so that people will feel panicky and less able to think critically'. The only problem to overcome was the fact there is no actual new deadly pathogen but just regular sick people. This meant that deaths from the 'new deadly pathogen' are going to be way too low for a real new deadly virus pandemic, but he said this could be overcome in the following ways – all of which would go on to happen:

1. You can claim this is just the beginning and more deaths are imminent [you underpin this with fake 'computer projections']. Use this as an excuse to quarantine everyone and then claim the quarantine prevented the expected millions of dead.
2. You can tell people that 'minimizing' the dangers is impossible and bully them into not talking about numbers.
3. You can talk crap about made-up numbers hoping to blind people with pseudoscience.
4. You can start testing well people (who, of course, will also likely have shreds of coronavirus [RNA] in them) and thus inflate your 'case figures' with 'asymptomatic carriers' (you will of course have to spin that to sound deadly even though any virologist knows the more symptom-less cases you have the less deadly is your pathogen).

He said that if you take these simple steps 'you can have your own entirely manufactured pandemic up and running in weeks'. In short the authorities cannot 'confirm' something for which there is no accurate test and they certainly cannot produce a vaccine as Cult asset Bill Gates (a lot more to come) soon began to peddle on the back of the 'crisis'. What the scientist and Andrew Kaufman had said would be supported by an ever-increasing body of evidence. My son Gareth and I live hours apart but we both had exactly the symptoms of 'Covid-19' in the run-up to Christmas, 2019, before the scare began. I was later to learn that others did, too. I am very rarely ill because I am blessed with a strong immune system which I constantly boost with the daily supplements missing from the modern diet and Gaz almost never gets ill for the same reason with his immune system on fire because it wasn't undermined by childhood vaccination. Gaz and myself both had a highly unusual experience of illness when we went down at the same time with what would now be called 'Covid-19 symptoms' – every one of them. It wasn't pleasant for a few days with coughing, aches and a mild fever, but we both carried on working and I wrote some of this book in that period. The immune system did its job without doctor involvement. The point is that if we had those same symptoms a few weeks later we would have been dubbed 'Covid-19 victims'. Tens of thousands of people die in the United States alone every winter from flu (many with pneumonia complications) with Centers for Disease Control (CDC) figures recording that 45 million Americans were diagnosed with flu in 2017-2018 of which 61,000 died. Some reports said 80,000. Anyone remember the same hysteria that we have seen with 'Covid-19'? Around 250,000 Americans are admitted to hospital with pneumonia every year and about 50,000 die. With the manipulation of death certificates those people are all potential 'Covid-19' fake statistics and then add the fact that 65 million people suffer from respiratory disease every year with three million deaths which makes it the third biggest cause of death worldwide.

Where did the numbers and 'projections' come from?

The serious lack of enough dead people to justify the 'deadly virus' fear-fest was dealt with as the scientist said it would be. They said that although people were not dying in big numbers yet that was going to happen ('you can claim this is just the beginning and more deaths are imminent') and when the numbers didn't materialise they said it was because of the lockdown ('then claim the quarantine prevented the expected millions of dead'). The death projections were never going to happen and their purveyors knew that. They were simply falsely created to secure the lockdowns for purposes of economic catastrophe and

control over billions. The experience of Japan which avoided draconian lockdowns exposes the mendacity that lockdowns affected events except to crash the world economy for very sinister motives. With the figures being fixed through tests and death certificates what difference would either lockdown or no lockdown have made? It is worth remembering this at all times: Statistics don't speak for themselves – they speak for those that compiled them. If you take the example of the UK – the same happened globally – the outrageously exaggerated projections of deaths (to justify house arrest for billions) came from ... computer models. You know, the same technique used with the ludicrous exaggerations of climate change computer models which have proved so laughably inaccurate, but so useful to sell the climate lie. It is so easy to get the projection you want when all you need to do is upload shite to download shite. Andrew Kaufman has worked in computer modelling and explained how easy it is to fix the outcome. Computer 'projections' depend on the nature of the data input from which the 'projections' are produced. The 'Covid-19' projection insanity was that up to '500,000 people will die in the UK if we don't have lockdown'. I'll repeat that just to let the lunacy of this sink in: '500,000 people will die in the UK if we don't have lockdown'. This was the work of Neil Ferguson, Professor of Mathematical Biology and head of the MRC Center for Global Infectious Disease Analysis (funded by Bill Gates and his vaccinate-the-world fronts Gavi and the Global Fund). *Business Insider* said of the Ferguson operation:

It gets tens of millions of dollars in annual funding from the Bill & Melinda Gates Foundation, and works with the UK National Health Service, the US Centres for Disease Prevention and Control (CDC), and is tasked with supplying the World Health Organization with 'rapid analysis of urgent infectious disease problems'.

The biggest funder of Gates's Gavi is ... the British government which took its lockdown advice from Gavi-funded, Gates-owned Ferguson and London's Imperial College. During the 'pandemic' the UK government pledged £30 million a year of taxpayers money to Gavi for at least five years through the Department for International Development. Gavi in turn connects into the Gates-controlled World Health Organization (WHO), the United Nations and the World Bank. The WHO is part of the Cult-created-and-controlled UN, the stalking horse for world government. Ferguson is a wholly-owned subsidiary of Gates who is a wholly-owned subsidiary of the Cult and what a surprise that Ferguson produced the 'computer models' that terrified governments to impose the human-catastrophe of lockdown. It was also reported that the code being used by Imperial College for their 'models' was 'tidied up' by



Figure 382: Neil Ferguson – UK Prime Minister Boris Johnson and other politicians believed Ferguson's ludicrous computer 'projections' and other disaster falsehoods in destroyed lives and livelihoods. (Image by Gareth Dale.)

Gates's Microsoft, Ferguson advised governments and the Gates World Health Organization while based at the Gates-funded, Freemason-connected Imperial College. The college has received the best part of \$200 million in Gates funding so far. Gates is everywhere in the fake 'pandemic' story and he and Ferguson should be in

jail for the rest their lives in my view for what they have done to human society. Ferguson's fantasy 'projections' which were never going to happen caused an until-then reluctant Prime Minister Boris Johnson to turn Britain into a fascist police/military state (see Hunger Games Society). Johnson was resisting full-blown lockdown, but faced with such a projection for which he was told he would take responsibility the technocrats broke him and took complete control of policy from then on (Fig 382). They included SAGE, the Science Advisory Group for Emergencies, which is part of the UK government's 'emergency response structure' and a subcommittee of the appropriately dubbed COBRA which 'coordinates the actions of government bodies in response to national or regional crisis'. SAGE is headed by Patrick Vallance, UK chief scientific advisor, and former head of drug discovery, medicines discovery and research and development at British-based Big Pharma giant, GlaxoSmithKline (GSK), which has absolutely enormous funding and business connections to Bill Gates. The UK government's Vaccine Network, a group of academics and Big Pharma 'experts' advising on vaccination policy, has a membership that has almost in its entirety taken hundreds of millions (at least) in donations from the Gates Foundation and includes employees of GSK which is involved in a 'Covid-19' testing campaign and the 'search' for a vaccine. GSK and Gates stand to make an extraordinary fortune from the fake 'pandemic'. Former GlaxoSmithKline chief executive Sir Andrew Witty has taken a leave of absence from his current day job to lead the push to develop vaccines for Covid-19 at the World Health Organization. Gates has bought and controlled everyone and everything needed to dictate the 'pandemic' narrative and press for the mass vaccination of the whole of humanity for a 'virus' never shown to exist. UK chief scientific advisor Patrick Vallance, a GSK executive, announced in April, 2020, that the SAGE 'advice' to the UK government would not be made public until after the 'pandemic' was over (and the irreversible transformation of

human society achieved). Allyson Pollock, director of the Institute of Health and Society at the UK's Newcastle University, was among dozens of experts who signed a letter in *The Lancet* medical journal demanding government advisors should be more transparent (no chance). She said:

We ought to know who is advising the government [Bill Gates] ... What is the government hiding [Bill Gates] and who is it protecting? Government employees and publicly funded university scientists – likely to make up a large number of SAGE members – are accountable to the taxpayer.

No, no, Allyson. They are accountable to Bill Gates who is accountable to the Cult. Boris Johnson's own 'infection with Covid-19' (illness from something, not 'Covid-19') took him out of the loop for a significant period very conveniently. With British people in lockdown, under house arrest and living in a police state justified by these 'projections' Ferguson dramatically reeled back his figures and said in late March that the death toll was likely to be '20,000 or fewer'. Even this was an exaggeration when deaths attributed to 'Covid-19' are an administrative, death-certificate, mathematical trick supported by an irrelevant 'test'. Ferguson and his cohorts at Imperial College sold the fascist lockdowns by the usual method – fear and lies. Their report to Boris Johnson said:

Perhaps our most significant conclusion is that mitigation is unlikely to be feasible without emergency surge capacity limits of the UK and US healthcare systems being exceeded many times over. In the most effective mitigation strategy examined, which leads to a single, relatively short epidemic case isolation, household quarantine and social distancing of the elderly, the surge limits for both general ward and ICU beds would be exceeded by at least 8-fold under the more optimistic scenario for critical care requirements that we examined.

Deborah Birx, coronavirus response coordinator to the Trump administration, told journalists that the Imperial paper – Ferguson's computer projection of more than two million deaths in America – had prompted new advice 'to work from home and avoid gatherings of 10 or more'. Ferguson's message was the Gates message because Gates owns him and we had the recurring theme of establishing the draconian lockdowns in China as the blueprint for the West to follow in pursuit of the Cult's agenda to mass-destroy independent livelihoods and install the Hunger Games Society. Ferguson said:

One has to adopt the kind of community measures which have been adopted in places like Wuhan and China where you try to reduce contacts between people in the community, so the sorts of measures which are important are

first of all anyone who has any sort of respiratory disease, a cold, they should stay at home until those symptoms are fully resolved.

What followed was the mass cancellation of other hospital activities like operations and consultations while at the same time the Ferguson Imperial College predictions of hospitals being overwhelmed by 'Covid-19' cases could hardly have been more wrong. So much so that the UK authorities stopped publishing figures about intensive care bed use to hide the fact that intensive care units were not overwhelmed and whole major hospitals across the locked-down world had hundreds and hundreds of empty beds. News organisations had no footage of the 'was-zone' hospitals they were describing and so devoid were they of proof that CBS was caught using footage of an Italian intensive care ward while claiming it was in New York. The UK's Channel 4 News showed pictures of a dummy being worked on in a training centre while presenting it as a live human. Yet as late as March 26th, 2020, the calculated lunatics at Imperial College were warning that 'Covid-19' could kill 30 million around the world and lives could only be saved if countries acted quickly (that is put their populations under house arrest). Imperial College was not responding to a health crisis. It was following a script and justifying Cult agenda demands with blatantly and vastly exaggerated computer 'projections'. They must face the consequences for their actions with an independent open and public inquiry to expose what happened and how it was clearly orchestrated. Ferguson and Imperial College produced 'projections' for other governments including a Ferguson claim that up to 2.2 million people could die in America without a lockdown. This is the very lockdown that Bill Gates wanted for his Cult economic and vaccine agenda and for which Gates-funded Imperial College provided the projected excuse. Key advisors around Johnson, Trump and other leaders were also financial beneficiaries of Gates largesse and this is the same Bill Gates who in effect owns the Cult-created World Health Organization (WHO) as its second biggest funder behind only the government of the United States. He might even be the biggest by the time you read this. The Gates-controlled WHO has been driving the 'Covid-19' response worldwide and promoting in the West the lockdown policy of China because 'it was so effective'. Are you getting it? In the United States the Cult-controlled Johns Hopkins Coronavirus Resource Center was counting the numbers and 'briefing' the media. You will see the significance of that in the next chapter. Another organisation producing projections for 'Covid-19' deaths has been the Institute for Health Metrics and Evaluation (IHME) funded – like Imperial College and Neil Ferguson – by Bill Gates.

Comedy of 'errors'

Imperial College promotes every aspect of Agenda 21/2000 and has been heavily involved in 'climate change' computer model 'projections'. The Climate Cult demands a whole new economic system – one of the prime reasons for the 'Covid-19' hysteria and its extreme economic fallout. Ferguson and his manufactured 'models' predicted that up to 150,000 people could die from BSE, or 'mad cow disease', and its equivalent in sheep if it made the leap in humans. Fewer than 200 deaths from the human form of BSE followed. BSE was shown to be due to an organophosphate pesticide used to treat a pest on the cows. Ferguson and the goons (oops, I repeat myself) with their computer models at Imperial College triggered the unnecessary mass 'pre-emptive' cull of millions of pigs, cattle and sheep during a foot and mouth outbreak in 2001 that destroyed the livelihoods of untold numbers of farmers and their families. Imperial College and Neil Ferguson seem to be good at that. The culled animals had no contact with the disease let alone had it. Remind you of anything? The government was also advised to do this by Professor Roy Anderson, a computer modeller at Imperial College specialising in the epidemiology of human diseases (God help us), but without any experience in veterinary matters. Anderson serves both on the Bill and Melinda Gates Grand Challenges in Global Health advisory board and chairs another organisation funded by the Gates Foundation. Imperial College has received grants worth tens of millions from Gates aimed at influencing global 'health' and vaccine policy including one of \$14.5 million 'to improve methods to detect circulating polioviruses through environmental surveillance'. At the same time President Trump was being 'advised' by people like Dr Anthony Fauci in his 'coronavirus taskforce'. Fauci is director of the National Institute of Allergy and Infectious Diseases (NIAID) which has received major funding from the Gates Foundation. He also was named on the 'Leadership Council' of the Decade of Vaccines Collaboration funded by the Bill and Melinda Gates Foundation. A headline on the Gates-created Gavi website in 2012 proclaimed: 'Fauci: forging closer ties with Gavi'. The same Gates connections apply to Dr Deborah Birx who was appointed White House Coronavirus Response Coordinator in February, 2020. An article at Nationalfile.com said:

Gates has a lot of pull in the medical world, he has a multi-million dollar relationship with Dr. Fauci, and Fauci originally took the Gates line supporting vaccines and casting doubt on [the drug hydroxychloroquine]. Coronavirus response team member Dr. Deborah Birx, appointed by former president Obama to serve as United States Global AIDS Coordinator, also sits on the board of a group that has received billions from Gates' foundation, and Birx reportedly used a disputed Bill Gates-funded model for the White House's

Coronavirus effort. Gates is a big proponent for a population lockdown scenario for the Coronavirus outbreak.

Yes he is because that is the reason the Cult launched the 'Covid-19' hoax to destroy independent livelihoods and impose a vaccine to 'end' the lockdowns. The world is waking up to Bill Gates and it is not waking up from a nightmare, but to one. This deeply sinister man was at the centre of the 'Covid-19' hijacking of human society pulling the strings of Gates-funded Neil Ferguson and his computer models behind the lockdowns in many countries including the United States where Ferguson was cheered by Fauci and Birx. American researcher Daniel Horowitz highlighted the impact of Imperial College 'Covid-19' 'projections' on the lockdown policy in the United States:

What led our government and the governments of many other countries into panic was a single Imperial College of UK study, funded by global warming activists, that predicted 2.2 million deaths if we didn't lock down the country. In addition, the reported 8-9% death rate in Italy scared us into thinking there was some other mutation of this virus that they got, which might have come here.

Together with the fact that we were finally testing and had the ability to actually report new cases, we thought we were headed for a death spiral. But again ... we can't flatten a curve if we don't know when the curve started.

The lockdowns were claimed to be 'protecting the people' while 'the people' die all the time in enormously greater numbers from other conditions, including cancer and heart disease. I'll tell you how much the Cult and its political and Deep State psychopaths care about humanity. Ultra-Zionist Dr Richard Day, professor of paediatrics at Mount Sinai Hospital in New York and executive of the Rockefeller-created Planned Parenthood, told those paediatricians in Pittsburgh, Pennsylvania, in 1969 that they already had the cure for cancer but were keeping it secret: 'We can cure almost every cancer right now. Information is on file in the Rockefeller Institute [now the Rockefeller University], if it's ever decided that it should be released.' Day said that the plan was to control and cull the population through medicine, food, new laboratory-made diseases and the suppression of a cure for cancer. He said that letting people die of cancer would slow down population growth: 'You may as well die of cancer as something else.' Fauci for a ponder on the level of empathy-deleted psychopathy that we are dealing with from a Cult that claims it has devastated human society to 'protect the people' it absolutely despises.

The Gates of Hell

Neil Ferguson and his fellow 'modellers' at Imperial College are nothing if not utterly without self-awareness and they continued to promote an indefinite lockdown until a vaccine is available in perfect sync with the demands of Bill Gates and his masters. This is what you would expect from Gates-puppet Ferguson given that he heads up the Vaccine Impact Modelling Consortium out of Imperial College which 'coordinates the work of several research groups modelling the impact of vaccination programmes worldwide'. The Ferguson 'consortium' is a global vaccine promotion operation funded by the Bill Gates-created Gavi, the 'vaccine alliance', and the Bill and Melinda Gates Foundation. Ferguson's conflict of interest is extraordinary, but no one in government (Cult-owned governments) seems to care. Why would they when there is a global agenda to impose? If you are under some level of lockdown for months and the only way out is to have the eventual vaccine do you think people are more likely to have it despite their reservations? These unselected technocrats are 'advising' governments, less we forget, made up of politicians who treat them with the reverence and certainty they don't even begin to deserve. Ferguson, who was diagnosed with 'coronavirus' and somehow managed to survive, has sold his nonsense to the UK government that led to lockdown while an associate of his, Christopher Whitty (another virus 'survivor'), has been Chief Medical Officer to the UK Government on coronavirus policy and a member of the UK government SAGE 'science advisory' body headed by Patrick Vallance. Whitty was described by the BBC as 'the official who will probably have the greatest impact on our everyday lives of any individual policymaker in modern times'. Not a politician you will note – a technocrat. Whitty was handed a \$40 million grant by the Bill and Melinda Gates Foundation for malaria research in Africa. Ferguson and Whitty wrote a paper together entitled 'Infectious disease: Tough choices to reduce Ebola transmission'. This was another exaggerated health scare in which both were involved.

Ferguson supported closing schools 'for prolonged periods' over the swine flu 'pandemic' in 2009. He said the swine flu virus would 'infect a third of the world's population if it continued to spread at the current rate and he and other 'researchers' at Imperial College London predicted the virus was likely to cause an epidemic in the northern hemisphere. A news report said: 'One of the authors, the epidemiologist and disease modeller Neil Ferguson, who sits on the World Health Organisation's emergency committee for the outbreak, said the virus had "full pandemic potential".' He supplied 'computer models' to then chief medical officer, Professor Sir Liam Donaldson, which said in the worst case scenario 30 percent of the UK population could be infected by the H1N1 'swine flu' virus, with 65,000 killed. The number who officially

died by the end of the year: 392. This was more Ferguson 'modelling' that could hardly have been more inaccurate. Oh yes, and no-one caught Ebola from someone else in the UK let alone died from it. Never mind, without self-awareness (or with an agenda) you just carry on pontificating your 'expertise' regardless. A newspaper quoted 'scientists from Imperial College' in an article headlined 'UK lockdown could be indefinite until a vaccine is found, warn scientists advising government'. They said countries would have to go through repeated cycles of restrictions being lifted and re-imposed (exactly in line with the Cult agenda). Ferguson said the UK government had wrestled with the idea of adopting strict measures and then going back to normal, but 'we don't think that's now possible'. So who is this 'we'? The 'we' is Bill Gates and the bigger 'we' is the Cult that owns him.

People only die from 'Covid-19'

The biggest problem the figure-manipulators faced was producing enough dead people from a 'dangerous disease' that doesn't end, or a 'bioweapon' depending on which version of deceit that people chose to believe. The Cult subsidiary networks in each country solved this (at least at first) through their top-down control of the medical pyramids. You need very few people to dictate policy to tens of thousands in national 'health' systems – you just need to control the key positions that dictate what the lower-ranks must do. As with China the first diagnosis of 'Covid-19' in the West and wider world came purely from symptoms. Doctors and other medical staff were told that pretty much anyone with 'flu-like symptoms' or pneumonia had to be diagnosed 'Covid-19' and given that so many have those symptoms and develop pneumonia from a host of causes the numbers began to climb solely from this top-down demand for diagnosis. When the PCR test (not testing for 'Covid-19') came into play the potential was almost limitless to fix the figures of not only cases, but deaths. Medical staff were told that everyone that came to hospital or was treated anywhere had to be tested for 'Covid-19'. Many tested positive as the Cult knew they would because the test is for a genetic material that large numbers of people have in their bodies as a matter of course. Staff were then told that anyone who died (of other conditions) who had tested positive must have 'Covid-19' declared on the death certificate as the cause of their demise. People who have died in road accidents have had 'Covid-19' given as the cause of death. None of this is speculation. Many medical staff have had the courage to speak out and expose that this is happening. The overwhelming majority have not, however, and they will have to live with that for the rest of their lives as the consequences for global humanity become ever clearer. The UK's National Health Service (NHS) told doctors that they could put 'Covid-19' on a death certificate without any evidence whatsoever.

If before death the patient had symptoms typical of COVID-19 infection, but the test result has not been received, it would be satisfactory to give 'COVID-19' as the cause of death, and then share the test result when it becomes available. In the circumstances of there being no swab, it is satisfactory to apply clinical judgement [My emphasis].

The UK Chief Coroner said in a note of guidance that the 'emergency' Coronavirus Bill means that 'Covid-19' deaths don't have to be referred to a coroner at all and the same is happening in many countries and US states including a directive to this effect in New Jersey. Medical practitioners can sign off a cause of death as Covid-19 for someone they have never even seen without any cause-of-death oversight by a coroner or autopsy because an autopsy would reveal the real cause of death – not 'Covid-19'. The UK Chief Coroner directive said:

Any registered medical practitioner can sign an MKCD [Medical Certificate for Cause of Death], even if the deceased was not attended during their last illness and not seen after death, provided that they are able to state the cause of death to the best of their knowledge and belief.

Deaths 'in the community' can also be listed as Covid-19 deaths without being tested for the disease, or even seen by a doctor. The Crown Office took such actions under emergency powers in the fascist-charter Coronavirus Act of 2020 'to ease the burden faced by the NHS as the UK moves towards predicted peak levels of infection and death'. This was the burden faced in near-empty hospitals where medical staff were making YouTube dancing videos to ease the boredom of inactivity. Scotland's Cult-controlled government via the Scottish National Party declared that anyone who died within 28 days of a 'laboratory confirmed' (fake test) diagnosing 'Covid-19' must have that recorded as the cause of death. Remember that the overwhelming majority of those who test positive for the fake test have 'mild symptoms' or mostly none at all. Let that sink in with regard to the Scottish death record policy and you will see the size of the deceit in that small country alone to fix the figures. This is the same Scottish government that dropped the requirement for post-mortems to be carried out on alleged 'Covid-19' victims so the real cause of death could not be established and 'Covid-19' could go on the death certificate and the cumulative figures. A newspaper report said: 'Normally, patients who die in hospital have a post-mortem to establish beyond doubt the cause of death.' Finding out what people really died of was is not the idea – it's to get the non-existent 'Covid-19' on as many death certificates as possible to increase the perception of a deadly 'pandemic'. Scotland is a lovely place, but its

control networks are literally satanic. Northern Ireland's Public Health Agency mirrors Scotland and other countries by defining a 'Covid-19' death as 'individuals who have died within 28 days of first positive result, whether or not COVID-19 was the cause of death.' England's NHS Office of National Statistics (ONS) tweaked the death figure deception even more by changing the way they counted the numbers. Before the 'Covid-19' fraud they had counted deaths each week by the number of death certificates. Now they would include 'provisional' death figures from the fake 'virus' before a death certificate had been registered and this would be 'included in the dataset in subsequent weeks'. This means a death could be counted 'provisionally' one week and 'officially' the next leading to the same death being counted twice. The ONS also announced the inclusion of 'Covid-19' deaths in the community 'to include those not even tested for the virus [irrelevant as that would be] and those suspected to have Covid-19' or that presumed to be a 'contributory factor'.

It's Covid, stupid – always Covid

The fixing of the case and death figures, which were compiled for the media worldwide by the Cult-owned, Gates-controlled, Johns Hopkins University operation in America (more later), was happening in virtually every country using the same top-down technique of ordering 'Covid-19' to be designated the cause of death almost no matter. The Cult-owned US Centers for Disease Control and Prevention (CDC) – really an agency of the Gates-controlled World Health Organisation and Big Pharma – issued 'guidance' to doctors and medical staff telling them to list 'Covid-19' as a cause of death regardless of any confirmation. No – not even the fake test. If 'Covid-19' was 'assumed to have caused or contributed to death' it could be listed as the primary cause. The authorities further underpinned this manipulation with the payments policy to hospitals (with some going to doctors) through the US Medicare system. This was exposed by Dr Scott Jensen, a Minnesota state senator, in an interview with Fox News. He said that if a hospital diagnosed someone with 'simple non-Covid pneumonia' they would be paid \$4,600 by the Medicare system. If they diagnosed the patient with 'Covid-19' pneumonia they would be paid \$13,000 and if they put the 'Covid-19' diagnosed patient on a ventilator the payment leaped to \$39,000. Could the game be any more obvious? Hospitals which in many cases were headed for bankruptcy due to a lack of patients were able to make big money (or stay in business) through Medicare payments by diagnosing patients with 'Covid-19' with no symptoms (ka-ching) and moving them out for the next one to come in or putting them briefly on a ventilator they did not need (even bigger ka-ching). They even changed their procedures to skip ahead directly to a ventilator without the usual

intermediary steps, including a venturi mask, non-re-breather mask, and positive airway pressure machines. All they need to do is diagnose the non-existent 'Covid-19' to fit the Cult agenda and the tills are ringing. People should get the idea out of their mind that all medical staff are angels of mercy. Some absolutely are, but they also include liars, deceivers and psychopaths, too, and anyone who takes advantage of this clearly targeted diagnosis payment system by putting people on ventilators for no medical reason is a psychopath. Illinois Public Health Director Dr Ngozi Ezike was open about the way 'Covid-19' death figures were being compiled. She told a news conference while her superiors clenched their teeth:

If you were in a hospice and given a few weeks to live and you were then found to have Covid that would be counted as a Covid death. [That might be] a clear alternate cause, but it is still listed as a Covid death. So everyone listed as a Covid death doesn't mean that was the cause of the death, but that they had Covid at the time of death.

Or, rather, had tested positive in a test not testing for 'Covid-19'. UK chief scientific advisor Patrick Vallance bizarrely said the same as Ezike – Covid on the death certificate does *Y* mean Covid was the cause of death. The apparent death rate from 'Covid-19' can be seen in an entirely new light from this perspective of its mass diagnosis for those dying from other conditions. The centre of the Italian 'epidemic' in the Lombardy region is globally notorious, like Wuhan, for its filthy toxic air that produces widespread lung disease especially in old people who have been breathing in that crap all their lives. This presented phenomenal potential to re-designate people dying of pneumonia and other respiratory problems as dying of 'Covid-19' when they were not. To highlight the extreme nature of Lombardy mortality – 99,542 people died from all causes in Lombardy in 2018 while Lazio, the second region in terms of death-rates, had a figure of 52,389. Italian authorities revealed that 99 percent of those who have 'died from Covid-19' in Italy have had one, two, three or more 'other morbidities' or illnesses and health problems that could have ended their life. Are we getting it yet? Seventy percent were men and less than one percent of those said to have 'died from Covid-19' had no known other life-threatening conditions. The Italian National Health Institute revealed that the average age of the positively-'Covid'-tested deceased in Italy is about 81. Ten percent of the deceased are over 90 with 90 percent over 70 and 80 percent had two or more chronic diseases. Half had three or more. These included cardiovascular problems, diabetes, respiratory problems and cancer. Re-designate these people as 'death by Covid-19' and you instantly have your 'devastating health crisis' in Italy which locked

down the country and was used to terrify the rest of the West that this could be coming their way. A list of doctors who 'died from Covid-19' were published in Italy who turned out to be of the advanced age when you would expect people to die – most retired – and with no evidence that the cause of death was the dreaded 'virus'. Once the 'Italian disaster' propaganda had been sold by the worldwide Cult-owned media we had Professor Walter Ricciardi, scientific advisor to the Italian minister of health, saying the country's apparent 'Covid' death rates were due to Italy having the second oldest population in the world and ... the manner in which hospitals record deaths:

The way in which we code deaths in our country is very generous in the sense that all the people who die in hospitals with the coronavirus are deemed to be dying of the coronavirus. On re-evaluation by the National Institute of Health, only 12 per cent of death certificates have shown a direct causality from coronavirus, while 88 per cent of patients who have died have at least one pre-morbidity – many had two or three.

That's how it's been done and even the twelve percent is not true when you can't die of a 'Covid-19' that doesn't exist or be diagnosed with a 'virus' you can't even test for. Two-thirds of alleged 'Covid-19' fatalities in New York have been over 70; more than 95 percent were over 50 and some 90 percent of all fatal cases had another underlying illness making the diagnosis switch so easy. Scott Atlas, former chief of neuroradiology at Stanford University, said that more than 99 percent of those who have died in New York had an underlying condition and the rate of death for all people aged between 18 and 45 was 0.01 percent. Think about it. The reason children and younger people below old age have not been dying from the fake 'virus' is because they are infinitely more likely not to have 'other morbidities' that can be blamed on 'Covid-19'. The same deceit is being perpetrated in other countries under the overall control of the Cult. The President of Germany's Robert Koch Institute said that Germany counts any deceased person who is infected with coronavirus as a Covid-19 death, whether or not it actually caused the death. German virologist Dr Hendrik Stueck said: 'In Heinsberg, for example, a 78-year-old man with previous illnesses died of heart failure, and that was without SARS-2 lung involvement. Since he was infected, he naturally appears in the Covid-19 statistics.'

Doctors and experts speak out

Stories from doctors, medical staff and families began to emerge and grow telling how patients and loved ones who died of cancer, heart disease and other fatalities were designated 'Covid-19' on the death certificate. This diagnosis fraud came by order of the authorities – Cult

agents within the authorities – who demanded that every patient no matter what their ailment must be fake-tested for 'Covid-19' and if they are positive for the widespread genetic material they should have 'Covid-19' on their death certificate to blot the figures. Hospital staff from many locations confirmed to us over weeks at Davidicke.com that this was happening worldwide. Eddie Large, a one-time famous comedian in Britain, went into hospital with heart failure amid long-standing heart problems, tested 'positive' for 'Covid-19' (the genetic material) and that was designated his cause of death. In fact, the media's wording in reports of Eddie's demise was repeated over and over to such an extent that it would not have been coincidental. They don't say this or that person died from 'Covid-19', but that they died *after testing positive* for 'Covid-19'. The two statements are clearly not the same and similar wording spewed from the mouths of officialdom. However, once that death has been added to the Covid-19 hoaxed figures they are morphed into this number of people have died from 'Covid-19' courtesy of the Johns Hopkins and other official compilations. Most doctors and medical staff have outrageously stayed silent about the deceit, but others have had a commitment to truth and their patients' welfare and called out the conspiracy to defraud the entire human race. Their numbers have grown the longer the lockdowns and their horrific effects continued.

Dr Annie Bukacek, a board certified internal medicine physician in Kalispell, Montana, and council member and a fellow of the American College of Physicians Montana chapter, was one who exposed the magic trick. She said she questioned the official story immediately after seeing previous 'we're all going to die' hypes over H1N1, Ebola, Zika, SARS and MERS come to nothing except for new vaccines tested on innocent children in Africa or the Caribbean – a speciality of Bill Gates programmes. He's a lovely man. Bukacek described how the 'Covid-19' figures were being inflated by death certificate manipulation and how other patients were suffering and dying from being denied treatment, operations and consultations by a system only interested in 'Covid-19'. Dr Scott Jensen, who exposed the Medicare incentives to diagnose for 'Covid-19', said in a TV interview that he had received a seven-page document by email from the US Department of Health 'teaching' him on how to fill out death certificates which had never happened before. He said the document told him that he didn't need to have a laboratory test for 'Covid-19' to put that on the death certificate. Jensen was shocked because death certificates are supposed to deal in facts. Another doctor had his video deleted by YouTube for exposing the death figures manipulation and how numbers for other causes of death were going down in line with the Covid-19 numbers going up through re-designation. Dr Rashid Buttar, an American osteopathic physician from

Charlotte, North Carolina, furiously railed against the manipulation and the doctors and medical staff staying quiet about what they knew was happening. He confirmed the death certificate charade and said that even death certificates previously written were being changed to include 'Covid-19'.

Two California doctors, Dan Erickson and Arin Massih, at Accelerated Urgent Care in Bakersfield, held a news conference in late April calling for their county to 'reopen'. They explained what was really happening behind the hysterical headlines. Intensive care units in California were 'empty, essentially', with hospitals shutting floors, not treating patients and laying off doctors. The California health system was working at minimum capacity 'getting rid of doctors because we just don't have the volume'. They said that people with conditions such as heart disease and cancer were not coming to hospital out of fear of 'Covid-19'. Everything they had ever learned about quarantine involved quarantining the sick. They had never seen before the quarantine of the healthy 'where you take people without disease and without symptoms and lock them in their home'. Projection models of millions of deaths had been 'woefully inaccurate', they said. Dr Erickson detailed figures to show that Californians have a 0.03 chance of dying from 'Covid' based on the number of people who have tested positive. But hold on. They are (a) testing positive for a widespread genetic material and not 'Covid-19', and (b) alleged deaths have been re-diagnosis of other conditions with similar symptoms (or none) to the 'virus'. Erickson said the figures revealed there was a 0.1 percent chance of dying from 'Covid' in the state, not just the city of New York, and a 0.05 percent chance in Spain, a centre of 'Covid-19' hysteria at one stage. 'Covid' [even if you believe the lies] was less dangerous than the flu. There was no justification for the lockdowns and economic devastation, the doctors said. Their figures were supported by a Stanford University study that put the fatality rate at between 0.1 to 0.2 percent. Take away the diagnosis deception from those figures and you are left with zero. Death estimates of the Cult-owned, Gates-run, World Health Organization were 20 to 30 times higher than the Stanford numbers simply to secure widespread lockdowns. Everyone involved must go to jail for crimes against humanity. Dr Erickson also pointed to a list of consequences of the lockdowns in increased child abuse, partner abuse, alcoholism, depression, suicide and other impacts they were seeing every day. Erickson described how immune systems become weaker and weaker the more people are locked away in homes amid hygiene obsession in which immune responses are not being developed by coming into contact with agents they need to experience to build defences and immunity. 'The immune system needs this interaction ... sheltering in place reduces your immune system and when you come out what do

you think is going to happen? Disease is going to spike.' He said that when disease spiked in this way the hospitals were not going to cope with laid off doctors and nurses. Erickson then turned to the pressure being applied to doctors to put 'Covid-19' on the death certificate. 'Why are we being pressured to add Covid? To increase the numbers and make it look worse than it is? I think so.' He said he was hearing this from physicians everywhere. The doctors' video passed five million views in days, but never appeared on YouTube trending lists and then was deleted for 'violating YouTube's terms of service'. What a disgusting and fascistic organisation Google-owned YouTube has proved itself time after time to be and it comes from the top – Susan Wojcicki and those who own her. Wojcicki is clearly a Cult asset like Gates, Brin, Page, Zuckerberg and the rest of them and they must all now face the consequences in ongoing public exposure of their anti-freedom, indeed anti-human, agenda at every opportunity. How more blatant and low can you get than to delete doctors who are questioning medical policy on the basis of personal experience just to serve the interests of a global Cult with an horrific genocidal plan for humanity? Well, Wojcicki?

A hospital respiratory operative took to the Internet to expose the lies. He said there was no ventilator shortage as the hysteria-hype claimed and they were running fewer ventilators than they normally would. Any patient that came to his hospital with a respiratory problem was labelled 'Covid-19' and he said it didn't matter if they were suffering from late stage lung cancer, heart disease or anything else. 'You come in with breathing problems and you are labelled a Covid patient' ... 'then they would die of Covid and not stage four lung cancer.' He said they had only one person qualified to administer the test and so most patients 'under investigation for Covid' were never tested (which would have been irrelevant anyway). '... Every patient [who] is under Covid investigation and dies ... [becomes] a Covid death and they are showing the numbers like a football game to scare you.' He said the public was being shown bodies loaded on to a tractor trailer simply to scare people and he had never in his entire career seen bodies loaded on anything like that. He said 'it just doesn't happen' and he wondered if they were even bodies – 'all of this stuff is fake'. Behind him in the video made in his hospital were machines that helped patients breathe with a mask rather than putting them on a full-blown ventilator. He said that since the 'Covid-19' scare began they had been banned from using those machines and people had to be allowed to 'crash' and go straight to a ventilator. 'That is not the traditional way we use to treat a patient – everything that we would traditionally do we are not allowed to do.'

New York intensive care doctor Cameron Kyle-Sidell said in his own video that people were being put on ventilators when their lungs were not strong enough and they were dying. Another whistleblower video

communicating the experience of a New York intensive care nurse said the same. 'People are being murdered and no-one cares' was one line from the video and with no family allowed at the hospitals the patients were at the mercy of staff and left to rot. A second New York nurse took to the Internet in tears to describe exactly the same situation: 'I am literally coming here every day and watching them kill them.' She listed a catalogue of examples of how patients were either just allowed to die or directly killed by the wrong treatment or no treatment through 'gross negligence and medical mismanagement ... nobody has listened to anyone's lungs the whole time I've been here.' 'Covid-19' obviously went on the death certificate. She said she tried talking to management and nursing administration, but they didn't want to know and moved her away from patients and departments that she was complaining about. It's murder, no other word for it, to kill people knowing you are killing them, but good for the 'Covid-19' figures. The nurse said: 'It's like going to the fucking Twilight Zone – everyone here is okay with this.' She rightly asked: 'Am I the only one who is not a sociopath?' The respiratory medic confirmed that they were 'not testing for a virus' – 'there's not one test that tests for a virus'. They were testing for a genetic 'RNA sequence' and anyone with even microscopic content from that sequence would test positive when it could come from lung cancer and many other things. 'If this is as infectious as they are telling us ... everybody would be dying and that's not what we're seeing – this is unbelievable, every bit of this has been created.' He said they were not seeing lots of health workers getting sick even though they were in close contact with people who had tested positive. He was not convinced there even was a virus and 'I've been doing this a long time'. Doctors were believing the lies as much as the public, but doctors were not looking at the real information. 'They're told something and ... they get lives, they get jobs ... they're not going to look up what this test is and why they weren't getting the infection rates – they just look up the things they're told to look up like anyone else.' He then said something centrally relevant to what has happened:

For the Trump supporters out there I want to ask you something. Think about this for a minute. We're doing the same thing they're doing in France ... Italy ... the UK. So does that mean Trump's in charge of this whole thing because I really don't think he is. I think he's being told to do what he's doing ... this is Deep State, Illuminati stuff ... they are shutting the world down.

Exactly. This video by someone specialising in respiratory care and revealing how his direct experience in a hospital was at odds with the official narrative and so was deleted a number of times by YouTube for breaching their 'community guidelines'. What more can be said about

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Exactly. This video by someone specialising in respiratory care and revealing how his direct experience in a hospital was at odds with the official narrative and so was deleted a number of times by YouTube for breaching their 'community guidelines'. What more can be said about

this Cult censorship operation fronted by Susan Wojcicki? Her contempt for freedom and the most basic human rights is unimaginable. John Lee, a recently retired professor of pathology and a former consultant pathologist with the UK National Health Service (NHS), highlighted in an article for *The Spectator* exactly the point I have made about the careful wording of media and medical reports. They were saying that people had died 'after testing positive for coronavirus' and not that they had died from coronavirus:

Many UK health spokespersons have been careful to repeatedly say that the numbers quoted in the UK indicate deaths with the virus, not death due to the virus – this matters [My emphasis]. When giving evidence in parliament a few days ago, Prof. Neil Ferguson of Imperial College London said that he now expects fewer than 20,000 Covid-19 deaths in the UK but, importantly, two-thirds of these people would have died anyway. In other words, he suggests that the crude figure for 'Covid deaths' is three times higher than the number who have actually been killed by Covid-19. (Even the two-thirds figure is an estimate – it would not surprise me if the real proportion is higher) ...

... Unfortunately nuance tends to be lost in the numbers quoted from the database being used to track Covid-19: the Johns Hopkins Coronavirus Resource Center. It has compiled a huge database, with Covid-19 data from all over the world, updated daily – and its figures are used, world over, to track the virus. This data is not standardised and so probably not comparable, yet this important caveat is seldom expressed by the (many) graphs we see. It risks exaggerating the quality of data that we have.

Yes – on purpose. Professor Lee added that 'Covid19' was not a disease with unique or rare symptoms and the range of severity matched dozens of extremely common respiratory infections. He said that you cannot diagnose 'fever' and 'cough' and then diagnose 'probable Covid-19' with the slightest chance of accuracy. As the *Off-guardian.org* website said:

Italy, Germany, the United States, Northern Ireland and England. That's five different governments, across four countries, all essentially saying it's OK to just assume a patient died of Covid19, and then add that to the official statistics. Is that really responsible practice during a potential pandemic? Are any other countries doing the same? To what extent can we trust any official death statistics at all, at this point?

Try zero. *Off-guardian*, which has done great work exposing the figures, highlighted another outrageous manipulation in which the UK government's 'daily death toll' numbers were not from a single day at

all. The 'daily' figures include alleged deaths from other days going back six weeks or more. The website gave the example of April 10th which was described as the UK's 'deadliest Covid19 day'. Media headlines included: 'UK death toll jumps 980 in 24 hours in biggest rise yet'; 'British records Europe's highest single-day death toll: Number of victims jumps by 980'; and '980 tops Spain and Italy's highest daily number of deaths'. In fact, the deaths attributed (wrongly) to Covid-19 on that single day were 117 for England and another 90 for other UK countries bringing the total to 204 and not 980. *Off-guardian* reported that the other 776 people included in the report had died 'at seemingly random points between March 5th and April 8th'. The website said the same was true with all 'daily' death figures. It is also clear that the numbers have been boosted by yet another ruse – counting the same deaths more than once. The mass of the media never acknowledged these facts and instead daily fuelled the hysteria that led people to support the lockdowns through false perceptions of what was really happening. The media claimed on March 24th that an 18-year-old in Coventry, England, was the youngest person to die from the 'virus' and continued to say so even after the hospital said this was not true. The youngster had died from a 'significant' health problem not connected to 'Covid-19'. It didn't matter – don't let the facts spoil a good hoax. Other young people said to have died from the 'virus' turned out to have died from other causes. The death and case figures have been a complete stitch-up and you only fix the figures to deceive. When Neil Ferguson's ridiculous 'computer model' figures turned out to be fantastic overestimates he and the authorities claimed that this was because of the lockdowns and house arrest that the fantastic figures 'justified'. It was

the very scenario that had been predicted they would go for by the US medical scientist I quoted earlier. Data as of April 6th in Figure 383 showed the China lockdown blueprint was not as black

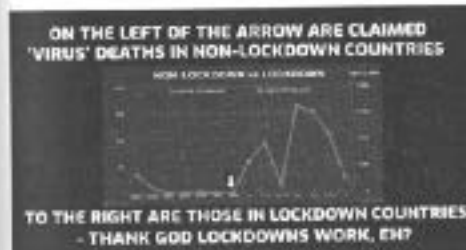


Figure 383: A graph from April 6th, 2020, which showed that lockdown was not the only possible response. Cases counted from a test not testing for 'Covid-19' and deaths erroneously manipulated by listing death certificates was the real decider of how many were claimed to be 'infected' or 'killed' according to the official figures – not lockdown or otherwise.

and white as claimed and with cases and death figures dependent on a fake test and fake cause of death what difference would lockdown or no-lockdown have made to numbers anyway?

Killing old people

The death figures from all causes in Britain and Europe remained about the same as the previous year for many weeks of the alleged global 'crisis' and as more people were recorded to have died from 'Covid-19' so miraculously death from other causes went down. There was always coming a time, however, when death figures would increase in 2020 because of all those who were sure to die from the consequences of lockdowns and cancellation of operations and consultations for almost all other illnesses and conditions. People were sitting at home in pain and in need of urgent diagnosis and treatment for a range of life-threatening problems, but they could not get to see a doctor while being discouraged to go to hospital accident and emergency because they were 'war-zones' over 'Covid-19'. The truth was that the hospitals that could have treated them were near empty with hundreds of beds at major ones not being used and operating theatres like the Mary Celeste. The biggest victims of this psychopathic policy – as the Cult intended – were old people. The lockdowns to a large extent were justified by 'protecting old people and the vulnerable' and to 'protect the hospitals from being overrun' (see empty). Yet at the same time old people were being systematically killed in line with the Cult agenda I outlined earlier and in the words of one nursing home nurse they were being 'murdered' through denial of treatment. Almost every one of them that died because of this would have had 'Covid-19' on the death certificate. Old people were told to stay at home and have essential supplies delivered which would have led to a range of other potentially fatal conditions and the Cult knew that. How many were literally left alone with their partners already diseased and families living far away? The overwhelming majority of those said to have died from 'Covid-19' were old people merely because they are most likely to be ill and so most available to re-designate 'Covid-19' instead of what they really died from. One UK nursing home nurse who contacted Davidicke.com said:

I'm seeing first-hand now what's going on at the nursing homes including mine. It's murder, mate. I am not saying it lightly. I'm willing once this is done to go on record with the bastards. If there is any information I can give you I will help.

Well, I've seen first-hand now the community nurses and doctors following orders basically just denying treatments to residents on the account they have Covid. No test, no nothing. Doctors are now not coming into my home to

examine anyone. I've had absolute murder with people begging to be placed on antibiotics.

In a few weeks you gonna see fucking dead old people all over the place. I'm done me, mate, to be honest, once this is over. This is not what I became a nurse for.

The media would naturally spin this phenomenon another way. Alex Thomson, 'Chief Correspondent' at Britain's Channel 4 News, posted an article headed: 'Coronavirus causing "devastation" in care homes as pressure grows to release full death numbers.' He said that 'one in five of all deaths in England and Wales in the week ending April 3rd are linked to coronavirus – with the overall death rate pushed to a record high'. Why do you think that is you excuse for a 'journalist'? Old people were being designated positive for 'Covid-19' and when they died of other causes, not least from the effect of the lockdowns and denial of treatments, they were added to the death figures for 'Covid-19'. Any idiot with an hour's research could have worked out what was really happening, but not, it seems, Thomson and his fellow mainstream media. The problem was made worse by UK government-directed NHS hospitals 'clearing out' patients to free up 15,000 beds in a week with many moved to a 'suitable rehabilitation bed or care home'. The Gates-owned World Health Organization stated in late-April, 2020, that half the 'coronavirus-related deaths' in Europe could be in long-term care homes. It might have added: 'So the plan is working.' Shortly after the WHO statement HC One, the UK's biggest care home provider, was reporting a rise in deaths among old people at its centres that have nothing to do with coronavirus as hospitals failed to take in residents as patients. Israeli doctor Gai Priel working in Parma, Italy, said that from what he saw and heard the instructions were not to offer access to respirator machines for patients over 60 in a who-lives-and-dies-decision. This became another common theme. These were the same old people that were being used as an excuse to lockdown the world to 'protect them'.

They want rid of old people so the young, programmed through the new and extreme 'education' system all their lives, will be left at the perceptual mercy of the Cult. One legacy will be some young people turning on the old as the ones to blame for the economic disaster triggered by the reaction to the 'crisis'. This would not have happened if we didn't have to protect old people – you know the ones responsible for climate change and Brexit.' Some schoolchildren and others dubbed the virus the 'boomer remover' referring to the 'baby boomer' generation born approximately between 1946 and 1964 which includes me. Don't worry, though, I have somehow fought off the impulse to be

offended. How ironic that the baby boomers were the 'flower power', 'counter-culture', 'anti-establishment' generation now perceived by many young people as the old and 'past-it' Earth-destroying establishment that must be usurped. Messages by some medical staff and emails from loved ones to Davidicke.com revealed a widespread theme along with social media posts of old people being pressured to sign do not resuscitate (DNR) agreements so they could be allowed to die (and 'Covid-19' falsely put on the death certificate). The daughter of an 83-year-old mother said she could 'categorically confirm that DNR notices are being placed on elderly patients, including those who are healthy and for whom there is no existing health condition to justify it'. She said this was happening to everyone including people with no 'virus' or underlying health conditions that threatened their life: 'This is being done on age alone.' She described how a ward consultant tried to coerce her mother into signing a DNR form when she was only in hospital for an orthopaedic problem:

A few days later, earlier this week, the ward matron told her that she had not been singled out, and that everybody was being treated in the same way – all the elderly patients were being required to sign these forms. And that it is a 'rule', something that has come down from on high, that has to be done, and has to cover all the older patients, 'because the government says so'.

The elderly were ordered to 'self-isolate' – cut themselves off from society – for months for their own protection by a global state in all its expressions that clearly doesn't give a shit about them and wants them dead. These are the same authorities that ensure that great swathes of the elderly live out their lives in poverty choosing between warmth and food as they exist on a pathetic, derisory state pension (where there is one) after paying taxes all their long years. The effect of this is to devastate their immune systems through lack of nutrients they cannot afford (or mainstream information that they need them) while consuming the cheapest, toxin-ridden excuse for 'food' together with toxic water and other drinks, breathing toxic air and living in a toxic irradiated atmosphere. All of these things, together with immune system-demolishing vaccines and a deluge of immune system-weakening sugar, have been allowed or instigated by the very authorities that tell us how much they care about our health and survival when a disease strikes. The starting point to see through the 'state cares' illusion is to realise that they don't give a damn about you. From this all other understanding will come. With the most head-shaking predictability the UK Department of Health began adding deaths in care homes to the 'Covid-19' fatality figures by fraudulently designating cause of death from a long list of other conditions as 'Covid-

19'. Fascism is nothing if not predicabile.

Intelligent doctors and specialists agree: You've been had people

A stream of medical professionals ignored by the mainstream media spoke out through alternative sources about the blatant manipulation they could see of the figures for cases and deaths and the claim that 'Covid-19' was some kind of new and deadly virus. Professor Dr Suchant Shukdi, a highly-acclaimed infectious medicine specialist in Germany, said of virus lockdowns: 'They are grotesque, absurd and very dangerous ... All these measures are leading to self-destruction and collective suicide because of nothing but a spook.' The theme that 'Covid-19' was indeed a 'spook' was common outside the mainstream media. Doctors and specialists said there was not a medical crisis, but a political one and this included doctors in Italy as you can see in the German journalist's video that I mentioned earlier. One Italian doctor said: 'No one in Italy died of corona – it's an ugly influenza.' German doctor Wolfgang Wodarg said that without the new 'test' no one would notice anything different. 'If you change the definition of pandemic you can create it', he said, 'If you talk about a virus spreading around the world you have a permanent pandemic.' Dr Claus Kohlenstein, another German physician, agreed. He said that without the new test there would be no 'pandemic': 'I don't believe it's a new virus. It's just a new test.' Hamburg doctor Marc Fiddike said you can turn any pneumonia into a corona case and 'you could turn a man falling down the stairs into a virus victim'. Confirming the view of other doctors he said: 'It's a kind of magic.' He made the same point as the American scientist I quoted in that just because someone is sick and tests for coronavirus [there are many in that 'family' of viruses] doesn't mean the virus is responsible for their sickness. John Ioannidis, a Professor of Medicine, Health Research and Policy and Biomedical Data Science, at Stanford University School of Medicine, described the coronavirus scare as possibly 'a one-in-a-century evidence fiasco' in response to the insane claim that the 'virus' was a once in a century pandemic. He said the data was not there to support the numbers of deaths and cases that were being circulated. Dr Yoram Lass, an Israeli physician and former member of the Knesset for the Israel Labor Party, pointed out that according to World Health Organization figures between 250,000 and 500,000 people died every year worldwide from seasonal flu, but this didn't cause a meltdown of the global economy due to government reaction: 'It is absolutely insane to have this Biblical crisis.' He said this was the first 'Zuckerberg epidemic' in which social media could transmit fear all over the world at the same time.

Jaroslav Belsky, an Austrian doctor and dentist who studied for two years in a molecular biology laboratory, said that between 1,600 and

2,000 people died every day in Italy before the coronavirus scare and this could rise to 3,000 in autumn and spring. The authorities had simply used a 'technical trick' to blame corona 'in order to close the economy and ban people from moving'. He also pointed to the fact that 99 percent of people said to have 'died from coonovirus' in Italy had other health problems with half the fatalities having three or four. What's more it was well known that at the end of their lives in hospital people did tend to die of an infection. Belsky said the real cause was never investigated when in fact people with influenza would test for all kinds of virus, even bacteria. 'Only after discovering the viral load can I assume that is what sickened them.' This is not being done with the 'Covid-19' hysteria – the 'test' doesn't measure viral load – and so the data does not exist to justify extreme government action. 'If you demand the data you are stamped a conspiracist,' Belsky said. He also pointed out that staging fake epidemics was not new with avian or 'bird' flu projected to cost 30,000 lives per year and ending up being officially responsible for very few. He said he had heard from Italy that they were 'testing dead people and even cancer and accident victims'. Belsky described how friends in the medical profession had sent him pictures of normal conditions in their critical care units. He also made an important point about why Germany's death-rate ratio was so small compared with Italy. Belsky said this was because the Italian testing company was only focusing on seriously ill people while in Germany tests were done even on people with a minor cold. 'It's playing with numbers and emotions.' You see how easy it is to manipulate perception by manipulating figures. Doctors and specialists also pointed out the effect of fear in making people ill in a world in terror about 'the virus'. How many developed psychosomatic 'symptoms' as the 'virus' symptoms were pounded out in all directions by the Cult-owned media? Belsky put the hysteria into perspective when he said 'there are up to 20,000 deaths in Germany from hospital bugs every year – even more in Italy'. None of these doctors and scientists appeared in the mainstream media which instead gave all the air-time to establishment mouthpieces like Neil deGrasse Tyson in the United States who told the 'satirical' (mainstream establishment) TV host Stephen Colbert: 'I think we're in the middle of a massive experiment worldwide – the experiment is: Will people listen to scientists?' Not if you're one of them, mate.

Systematically weakening natural defence

Dr Shiva Ayyadurai, an Indian-born American scientist and biological engineer at the Massachusetts Institute of Technology (MIT), spoke out against the coronavirus narrative and what he called the 'overreaction'. There was an 'overreaction'? Oh, just a little bit. Ayyadurai's main thrust was right on the button. Cause of death is not 'from a virus' but

dismantled immune systems. Anyone with an immune system in some kind of order had only 'very mild flu-like symptoms' or even none at all. The alleged symptoms of 'Covid-19' (with a long list of potential causes) are manifestations in part of the immune system at work. Fever is the immune system using heat to kill a predator while coughing up mucus is the immune system ejecting toxins the body needs to get rid of. Vomiting in other circumstances is also the immune system removing threats to health before serious damage can be done. Medical website webmd.com said: '... higher body temperatures make it harder for bacteria and viruses to thrive in the body.' Many symptoms which Big Pharma medicine 'treats' are the immune system doing its job and to suppress those actions is to potentially do great damage to health. The key to who dies from what is the state of the immune system and those with the weakest are older people and those with other medical conditions already putting pressure on immune system resources. This doesn't have to be the case if immune systems are supported in their nutrient needs with vitamins like A, D3 and C. Some New York and other hospitals eventually began to treat 'virus' patients with 'massive doses' of vitamin C while at the same time social media platforms like Facebook and their system-serving 'fact-checkers' were dubbing posts about the benefits of vitamin C as 'fake news' and 'false information'. Dr Ayyadurai also recommended such key vitamins to enhance immune response. Where have you seen the Mainstream Everything talk about boosting the immune system? Why would Big Pharma and the Cult want strong immune systems when the agenda of both demands sick and weak people? Dismantling immune systems is necessary to keep Big Pharma's mega-profits rolling for a start with strong immune systems meaning less illness. Dr Ayyadurai pointed out that we have fantastic numbers of 'viruses' in our bodies and we are not even aware of them because the immune system keeps them in check. 'Viruses don't kill or harm us', he said. If viruses did kill us then we would all clearly be long dead. He said the danger is more the immune system response to threats. Different levels of the immune system kicked in to play different roles when a threat is identified and in the overwhelming number of cases any danger was quickly snuffed out. The problem comes when the immediate immune reaction is too weak to deal with the threat and in effect the system panics and unleashes what is called a 'cytokine storm'. Cytokines are defined as 'a small protein released by cells that has a specific effect on the interactions between cells, or communications between cells or on the behavior of cells ... [They] trigger inflammation and respond to infections'. This response is the key. If other levels of a weakened immune system don't deal with a threat it unleashes in its desperation a 'storm' of cytokines which can be symbolised as a crazed person firing a machine gun in all directions. You can symbolise this as

2,000 people died every day in Italy before the corona scare and this could rise to 3,000 in autumn and spring. The authorities had simply used a 'technical trick' to blame corona 'in order to close the economy and ban people from moving'. He also pointed to the fact that 99 percent of people said to have 'died from coronavirus' in Italy had other health problems with half the fatalities having three or four. What's more it was well known that at the end of their lives in hospital people did tend to die of an infection, Belsky said the real cause was never investigated when in fact people with influenza would test for all kinds of virus, even bacteria. 'Only after discovering the viral load can I assume that is what sickened them.' This is not being done with the 'Covid-19' hysteria – the 'test' doesn't measure viral load – and so the data does not exist to justify extreme government action. 'If you demand the data you are stamped a conspiracy theorist,' Belsky said. He also pointed out that staging fake epidemics was not new with avian or 'bird' flu projected to cost 30,000 lives per year and ending up being officially responsible for very few. He said he had heard from Italy that they were 'testing dead people and even cancer and accident victims'. Belsky described how friends in the medical profession had sent him pictures of normal conditions in their critical care units. He also made an important point about why Germany's death-rate ratio was so small compared with Italy. Belsky said this was because the Italian testing company was only focusing on seriously ill people while in Germany tests were done even on people with a minor cold. 'It's playing with numbers and emotions.' You see how easy it is to manipulate perception by manipulating figures. Doctors and specialists also pointed out the effect of fear in making people ill in a world in terror about 'the virus'. How many developed psychosomatic 'symptoms' as the 'virus' symptoms were pounded out in all directions by the Cult-owned media? Belsky put the hysteria into perspective when he said 'these are up to 20,000 deaths in Germany from hospital bugs every year – even more in Italy'. None of these doctors and scientists appeared in the mainstream media which instead gave all the air-time to establishment mouthpieces like Neil deGrasse Tyson in the United States who told the 'satirical' (mainstream establishment) TV host Stephen Colbert: 'I think we're in the middle of a massive experiment worldwide – the experiment is: Will people listen to scientists? Not if you're one of them, mate.'

Systematically weakening natural defence

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dismantled immune systems. Anyone with an immune system in some kind of order had only 'very mild flu-like symptoms' or even none at all. The alleged symptoms of 'Covid-19' (with a long list of potential causes) are manifestations in part of the immune system at work. Fever is the immune system using heat to kill a predator while coughing up mucus is the immune system ejecting toxins the body needs to get rid of. Vomiting in other circumstances is also the immune system removing threats to health before serious damage can be done. Medical website webmd.com said: '... higher body temperatures make it harder for bacteria and viruses to thrive in the body' Many symptoms which Big Pharma medicine 'treats' are the immune system doing its job and to suppress those actions is to potentially do great damage to health. The key to who dies from what is the state of the immune system and those with the weakest are older people and those with other medical conditions already putting pressure on immune system resources. This doesn't have to be the case if immune systems are supported in their nutrient needs with vitamins like A, D3 and C. Some New York and other hospitals eventually began to treat 'virus' patients with 'massive doses' of vitamin C while at the same time social media platforms like Facebook and their system-serving 'fact-checkers' were dubbing posts about the benefits of vitamin C as 'fake news' and 'false information'. Dr Ayyadurai also recommended such key vitamins to enhance immune response. Where have you seen the Mainstream Everything talk about boosting the immune system? Why would Big Pharma and the Cult want strong immune systems when the agenda of both demands sick and weak people? Dismantling immune systems is necessary to keep Big Pharma's mega-profits rolling for a start with strong immune systems meaning less illness. Dr Ayyadurai pointed out that we have fantastic numbers of 'viruses' in our bodies and we are not even aware of them because the immune system keeps them in check. 'Viruses don't kill or harm us', he said. If viruses did kill us then we would all clearly be long dead. He said the danger is more the immune system response to threats. Different levels of the immune system kicked in to play different roles when a threat is identified and in the overwhelming number of cases any danger was quickly smuffed out. The problem comes when the immediate immune reaction is too weak to deal with the threat and in effect the system panics and unleashes what is called a 'cytokine storm'. Cytokines are defined as 'a small protein released by cells that has a specific effect on the interactions between cells, on communications between cells or on the behavior of cells ... [They] trigger inflammation and respond to infections'. This response is the key. If other levels of a weakened immune system don't deal with a threat it unleashes in its desperation a 'storm' of cytokines which can be symbolised as a crazed person firing a machine gun in all directions. You can symbolise this as

an intruder breaking into a house and the homeowner struggling to resist and throw them out. In the panic to survive the homeowner grabs a gun and instead of just firing at the intruder he also turns the gun on himself. The cytokine storm attacks its own body, often fatally. Sciencedaily.com puts it this way:

A cytokine storm is an overproduction of immune cells and their activating compounds (cytokines), which, in a flu infection, is often associated with a surge of activated immune cells into the lungs. The resulting lung inflammation and fluid build-up can lead to respiratory distress and can be complicated by a secondary bacterial pneumonia – often enhancing the mortality in patients.

Death by 'respiratory distress' is a cytokine storm immune response that attacks the lungs and can open the way to pneumonia. If your immune system is properly operational this does not happen. Why isn't the Mainstream Everything telling you this? For the same reason that Ayyadurai called for the arrest of three-quarters of the academics in the United States 'who are pilfering money from our tax-dollars ... by doing bogus research and research based on political leanings'.

What about 5G?

It never ceases to amaze me that billions of people believe that even though we now live in a technologically-generated electromagnetic 'soup' or sea, which is 200 million times the radio frequency energy naturally produced by the Earth, that somehow this will not have any, let alone profound, effects on human beings, animals, insects and the rest of the natural world. I find that to be a form of insanity and certainly a most extreme example of denial. There is an obvious relevance of some kind between current events and the roll-out in 2019 and 2020 of 5G around the world because this was made clear by the actions of Cult Internet platforms and government agencies in banning mentions and debate about that connection. I have already pointed out that the common theme between the systematic deletion by Cult-owned Silicon Valley of my London Real interview and one a few days later between Dr Andrew Kaufman and my son, Jaymie, was questioning the existence of 'Covid-19' and not 5G which the Kaufman interview did not mention. However, there is clearly a connection of some kind confirmed by the extremes of enforced censorship. The UK government Office of Communications, or Ofcom, is the 'regulator' (censor) of the broadcast media and threatened any broadcaster with severe sanctions if they even engaged in discussion about a link between 5G and the 'virus'. Ofcom is so obsessed with 5G censorship that a small community radio station was threatened by the broadcasting Stasi for having a single person on a

single programme discussing a connection between 5G and 'Covid-19'. Ofcom was created by war criminal Tony Blair so you can appreciate how bad it must be. Somehow these ridiculous people manage to equate 'false health advice' with 'baseless conspiracy theories that the pandemic is linked to the rollout of 5G phone networks'. The all-knowing system-worshipping Ofcom knew they were baseless because they were 'not aware of any reputable scientific evidence to corroborate such a contentious claim which runs contrary to all official advice, both in the UK and internationally, about coronavirus' (in other words the 5G claim was at odds with official propaganda). Ofcom's censors and designated media protectors of the Cult narrative said they were 'actively monitoring television and radio stations that might be broadcasting potentially harmful views about the causes and origins of Covid-19 that have the potential to undermine people's trust in the advice of mainstream sources of information during the crisis' – (which have the potential to demolish the official Cult narrative). This is exactly what you would expect to hear in a fascist/communist dictatorship.

For the record and reference the chief executive of Ofcom in this period of fascistic censorship has been Melanie Dawes, a career government bureaucrat formerly with the Ministry of Housing, Communities and Local Government, the Treasury, HM Revenue and Customs, and the Cabinet Office. The establishment runs through her bloodstream. Ofcom is chaired by Terence Burns, a British economist, who was former Chief Economic Advisor and Permanent Secretary to the UK Treasury and now a senior advisor to the bank Santander UK. These are the people overseeing the censorship of the British media and blocking any discussion of a connection between 'Covid-19' and 5G while the UK Health Secretary Matt Hancock, a clueless but willing prisoner of his civil servants and advisors, called for social media to ban '5G virus conspiracy theories'. The man is so bewildered and self-deceiving that he will say he believes in 'democracy and freedom'. YouTube, Vimeo and Facebook all deleted the video interview that I did with Brian Rose at London Real in which I mentioned the possible involvement of 5G. I did not say that it caused the 'virus' only that 5G had major negative effects on human health and psychology which had to be taken in account and that 5G can generate the symptoms that are being called 'Covid-19'. Ofcom, is major promoter and facilitator of the 5G roll-out and "regulates" the UK telecommunications industry (do what you like). This is a shocking conflict of interest when the promoter and facilitator of 5G and the censor of debate over 5G are the same people. They were of course on my case immediately with the pathetic mainstream media cheering in support. So there is a connection to 5G as confirmed by the vehement censorship of even discussion by Ofcom and Silicon Valley. The question is what? And is the censorship over what is

happening now or what is to come? I will summarise here some of the possibilities and impacts.

Arthur Firstenberg, scientist, journalist, and author of *The Inevitable Rainbow: A History of Electricity and Life*, said in 2018 before 'Covid-19' or 5G: 'Every time we have dramatically changed the properties of the Earth's magnetic field, which is called the magnetosphere, it had dramatic effects on health down here on Earth.' Firstenberg writes that every 'influenza' epidemic since electricity was introduced has coincided with a new and more powerful level of electromagnetic radiation. He says that one example was 'Spanish flu' (which started in the United States) and is said to have infected an estimated 500 million people worldwide in 1918 with tens of millions killed. Some estimates were as high as 100 million. These are officially compiled figures and so must not be taken as accurate, but it's safe to say a lot of people were affected and killed. By what is quite another question, I have pointed already to a mass-vaccine relationship to the outbreak. Here we have another possible electromagnetic field angle happening at the same time along with, it should also be added, the appalling living conditions in the wake of the First World War when immune systems would have been on their knees. Firstenberg explains that 'Spanish flu' began at military naval bases in America and Europe which were the first to install high-intensity radar with an initial 400 cases at the Naval Radio School of Cambridge, Massachusetts. Even though dubbed 'flu' a common symptom was nosebleeds (also reported with 5G) and a third of those who died did so through internal bleeding in the brain and lungs. These effects and others related to impaired blood coagulation were not at all symptoms of 'flu', but rather a potential effect of electromagnetic fields. Doctors were quoted as saying: 'We have yet to receive a report of a case in which the time of coagulation was not prolonged.' Remember the effect on the blood that was found in the teacher after a day in a classroom bathed in Wi-Fi. Another blatant red flag was that as radar was introduced worldwide 'Spanish' flu outbreaks followed in the same locations without contact with other sufferers at a time when there was minimal world travel compared with recent times.

Firstenberg says that by 1956/57, with the entire earth now subjected to new and powerful radar waves never before experienced, we had the outbreak of 'Asian flu' which is said to have started in East Asia and spread worldwide. Months after the first radiations-emitting satellite system became operational 'Hong Kong' flu swept across the world in 1968. Once again people were dying from internal haemorrhage. In the same way 5G began to be rolled out before the 'Covid-19' scare began and 5G has been rapidly expanded during the lockdowns in city after city and town after town in country after country. When large numbers of children and students return to school, college and university they

will find that 5G has been installed while they were away – as will those visiting hospitals. Most businesses and employment activity was banned and yet installing 5G towers and satellites was considered 'essential work'. This has both dramatically increased the reach and impact of 5G and prevented protests that would otherwise have happened. 'Flu-like' symptoms are known to be caused by exposure to intense electrical fields (EMF) – a fact that came to light as early as 1779 – and EMF is one of the triggers for cells to release eosinophiles, the natural immune response dubbed 'Covid-19'. This 'new disease' is said to have begun in Wuhan, capital of Hubei province, which was China's first 5G 'smart city' with tremendous numbers of 5G antennae installed in October, 2019, and expanded with great rapidity. Vodafone Italy made Milan in the 'virus' centre of Lombardy an 'extensive 5G testbed' working with country's Ministry of Economic Development. There were also big vaccine programmes in Wuhan and Lombardy before the 'pandemic' kicked off.

Spanish biologist Bartomeu Payeras i Cifre, who has specialised in microbiology at the University of Barcelona and researched smallpox, bacteria and viruses at the Hubber pharmaceutical laboratories, produced a preliminary study in April, 2020, of the connection between the main locations of 'Covid-19' and 5G activity. You can see it at Davidicke.com with the search words: 'Study Shows Direct Correlation between 5G Networks and "Coronavirus" Outbreaks'. The study did not attempt to show a cause and effect between 5G and the alleged 'Covid-19' only that the major countries and regions where the 'virus' was reported to be most prevalent corresponded with 5G locations. The conclusion was that the results 'demonstrate a clear and close relationship between the rate of coronavirus infections and 5G antenna location'. Another study focusing on American states by Dr Magda Hayas, Associate Professor of Environmental and Resource Studies at Trent University in Ontario, Canada, reached similar conclusions. Border divisions in the Spanish study were said to be significant in the difference between countries with and without 5G that have a common border. The study notes the distinct case differences between the United States and Mexico and Spain and Portugal and particularly highlights the case of San Marino, the tiny republic within the land mass of Italy. San Marino became the first European country with a 5G network after being chosen as 'an outdoor laboratory used to test the performance of network equipment and applications' in the words of one media report. Is it just a fluke of chance that San Marino would become one of the top five countries in terms of population ratio for 'Covid-19' cases? The Spanish study author said that 'a failure to act in the face of the findings of this study could be considered negligent at the very least and very possibly criminal'. Given that 5G and the 'pandemic' have been

orchestrated by criminals no action will surely follow.

The widespread manipulation of death figures confirm that 5G cannot be blamed for the whole 'virus' phenomenon or there would be no need to fix the numbers on such a fundamental scale; but it is connected to the story with the most profound effects still to come. 5G and less powerful electromagnetic fields can seriously increase the power and consequences of toxins in the body as well as profoundly undermining the immune system – just like vaccines. Cells poisoned by 5G and other electromagnetic fields that then release exosomes (fake 'Covid-19') must also be taken into account and the ability of 5G to generate symptoms like those blamed on 'Covid-19'. I have described in other books how electromagnetic fields can vastly increase the potency of toxins in the body to beyond what the immune system can cope with and especially when that system itself is being weakened by the same source. I said earlier that Wi-Fi and 5G networks are a delivery system for frequencies, but the nature of those frequencies can be altered. It is quite possible to zap one area with frequencies that devastate the immune system and poison cells with radiation which then excrete the exosome response that has been dubbed 'Covid-19'. One other point is that 5G causes 'accelerated degradation of genetic material' which is what the fake 'virus test' identifies. With a satellite system in place already capable of targeting 5G at different locations it becomes possible to affect some areas more than others without even 5G antennas on the ground. 5G operates with narrow easily-targeted beams. Martin Pall, a former Professor Emeritus of Biochemistry and Basic Medical Sciences at Washington State University, described the effect of technological radiation and 5G on calcium channels in the cells known as the voltage-gated calcium channel (VGCC). These calcium channels regulate the entry into cells of calcium ions and an imbalance can affect many body systems including heart, brain and muscle contraction. Pall said that the predominant cause of death from 'Covid-19' was pneumonia which can be 'greatly exacerbated by each of those five downstream effects of VGCC activation, excessive intracellular calcium, oxidative stress ... inflammation and apoptosis [a form of cell death]'. UK microwave expert Barrie Trower says he trained at the Government's Microwave Warfare Establishment in the 1960's, worked for the Royal Navy and British Secret Service as an expert in microwave weapons, helped debrief spies trained in microwave warfare in the 1970s, and worked in the underwater bomb disposal unit which used microwaves. His degree in physics specialised in microwaves. He said before the 'pandemic':

All microwaves of all 'Gs' ... they all reduce immune systems of all living things except for three things. One of those is bacteria and viruses. They thrive and multiply when they are microwaved. So you have a situation ... where all

living things are losing their immune systems but the bacterium and viruses are strengthening theirs, and 5G will only exacerbate the situation.

These are some of the effects of electromagnetic fields and the super-impact of 5G needs to be added to the mix of possibilities.

5G and oxygen

A crucial point is that at the 60 gigahertz frequency 5G interacts with oxygen molecules as the telecommunications industry freely admits. This where a connection is possible between 5G and a few extreme cases of lung malfunction wrongly attributed to 'Covid-19' and its relevance could become more profound ongoing. The industry is keen to transmit at 60 GHz because the way 5G interacts with oxygen allows 'very dense deployment' of the same frequency in the same very localised area without interference between users. It also allows for a beam of 5G at the 60 GHz frequency to target a small area or even an individual. Hold that thought with regard to what will follow. 5G interacts with oxygen molecules at 60 GHz in a way that prevents the body and blood absorbing oxygen in the volume that it should. This can lead to respiratory problems, strokes, heart attacks and many other potentially fatal conditions. Here is an explanation of the potential consequences described by those challenging 5G:

... Two atoms form the oxygen molecule and share some electrons. 60 GHz causes electrons surrounding oxygen molecules to spin, akin to how high-powered microwaves running on 2.4 impact molecules in food such as water. They're heating, in part, by impacting those molecules to rotate or oscillate with each wave. The movement energy from the rotation of these super tiny water molecules helps heat the rest of the food.

In a similar way that 2.4 causes H2O to oscillate, 5G/60 GHz even at low power causes electrons on oxygen molecules to spin; changes to the spin frequencies on oxygen electrons impact human biology. When you breathe air into your lungs it gets oxygen into your blood, brain, tissues etc. and oxygen entering your lungs gets picked up by a very important iron containing protein called haemoglobin in your blood.

The impact of oxygen molecules spinning the electrons is that it makes the haemoglobin unable to uptake the oxygen and get it to the rest of your body. Isn't the fact that the telecom companies are admitting that 60 GHz is absorbed by oxygen just stunning information, and shouldn't the fact that 60 GHz even fundamentally interacts with oxygen, the most abundant and arguably most important element to all of biological life, be headline news that stops everything until we deeply test the implications of that?

The potential of this for a mass human cull is obvious. American environmental science researcher, Lena Pu, has studied the effects of 5G technology since it was publicly revealed in 2016 by the Cult-controlled Federal Communications Commission (FCC) which announced its deployment for a few years later. Pu has been environmental health consultant for the National Association for Children and Safe Technologies and has worked with military and government agencies. She points out that the entire electromagnetic microwave frequency or 'EMP' range triggers hundreds of biological effects. She says they are limitless because the waves of varying lengths impact on all parts of the body. Each new generation or 'G' increased that effect leading to the arrival of 5G which operates within the millimetre wave (MMW) range that includes 60 GHz, the resonant frequency for oxygen, and is 'fully absorbed by the oxygen molecule'. Pu said that even at what is considered low power within FCC (fake) safety standards the 60 GHz frequency is going to affect the molecular structure of oxygen and stop it binding properly with the blood's iron-containing protein, haemoglobin. She said that these issues include: (1) Shared electrons between the two oxygen atoms will spin at a rate that is not conducive to human uptake; (2) the orbit angle and distance of the electrons from the atomic nucleus is altered; (3) the possibility that some or all of the molecule itself is changed from O2 (oxygen) to form O3 (ozone). Dr Andrew Kaufman said he read a CIA document from 1977 which described how the frequency of 60 GHz suppressed bone marrow in mice. White blood cells produced in bone marrow are the foundation of the immune system. The document also said that oxygen take-up by mitochondria – the 'powerhouse of the cell' – was adversely affected by 60 GHz frequencies which can lead to devastating organ failure. The consequences can be appreciated from this explanation by the UK Medical Research Council Mitochondrial Biology Unit:

Mitochondria are organelles found in the cells of every complex organism. They produce about 90% of the chemical energy that cells need to survive. No energy, no life! So it's easy to see why when mitochondria go wrong, serious diseases are the result, and why it is important we understand how mitochondria work.

That must surely include how 5G at 60 GHz affects mitochondria.

A case study

While researching 5G and 60 GHz Lena Pu said she came across 'a clandestine event' between 2016 and 2017 at a Texas junior high school. After a few months of research into what was happening, which included reading declassified reports, she realised that 5G exposures are

'very bad news': 'I discovered that [5G] is 25-100 times more biologically active than the frequencies that are currently being used in everything from cell phones to cell towers.' Other 'Gs' were bad, but 5G was much worse. This background allowed her to quickly realise what was going on at the school where students and teaching staff had fallen ill with a 'mystery illness'. It was obvious this was related to inside the school because they all felt better once they left the building and teachers began to hold classes outside. Pu made contact with a mother extremely alarmed at the behaviour of school administrators and established that the school was part of a pre-roll-out 'pilot' scheme for 5G. This was in 2017. She had found the 'smoking gun' to explain the mass illness. Her instincts were that Wi-Fi systems at the school must have been upgraded to include a new chip to add to the two in use up to this point communicating at 2.45 GHz and between 5 and 5.8 GHz. She went to the school's Facebook page to look through pictures taken inside the building and saw a strange Wi-Fi router that she believed would be necessary for the delivery of 5G.

I looked through the school's Facebook page for router images to give a clue as to the shape, style or make of the Wi-Fi routers, also known as wireless access points, and I found one that resembled a certain style ... with a lugger grill pattern for heat dissipation. [5G] generates a lot more heat just by the nature of the frequency and power levels.

Fortunately she took a screenshot because the following day all the images were deleted from the School Facebook page. Next she tracked down the new third chip at the Samsung annual expo – a 60 GHz chip called 'WiGig'. She said this was her second smoking gun and she found to her horror as she researched the chip the impact on the oxygen molecule. 'I instantly knew what I was looking at and the implications ... the moment I saw the government charts laying out the peak absorptive levels of oxygen and which frequency attenuates [weakens, diminished] it – I have never discovered anything more shocking.' 5G at 60 GHz that can prevent the uptake of oxygen is being installed in hospitals? What could possibly go wrong? Much of this technology comes from the East and that includes Huawei in China. Lena Pu said the 60 GHz frequency is for use in routers, Wi-Fi cellphones, and other small devices kept close to the body. This means the skin and sweat ducts which are antennae for 5G and used by the military in this way as a weapon.

Lung effects not caused by any virus'

This 5G/oxygen connection has to be even more deeply considered in the light of some intensive care doctors pointing out that the worst cases

of respiratory breakdown since the 'virus' scare and the roll-out of 5G are not caused by an 'infectious disease' but by lungs showing symptoms of oxygen starvation. New York intensive care doctor Cameron Kyle-Sidell took to YouTube in his desperation to make people aware of what was happening. YouTube continually deleted uploads of the video and he was reported to have been removed from intensive care. Kyle-Sidell said they were told to prepare to treat an infectious disease called 'Covid-19' but that is not what they are dealing with. Instead he was seeing people with lung conditions he had never seen before and what you would expect to see with people suffering cabin depressurisation in a plane at 30,000 feet or someone dropped on the top of Everest without acclimatisation or by definition an oxygen supply. Kyle-Sidell said that 'Covid-19 is not this disease and we are operating under a medical paradigm that is untrue'. He said that, in short, he believed they were treating the wrong disease. 'These people are being slowly starved of oxygen', he said. Patients would take off their oxygen masks in a state of fear and stress and while they were blue in the face on the brink of death they did not look like patients dying of pneumonia. In these rare cases something different is certainly going on and it's not 'Covid-19'. So what is it? The effect of 5G on oxygen intake must surely be added to the list of possibilities. It should be further noted that nearly half the 'deaths' attributed to Covid-19 in the United States have happened in just two places - New York and the neighbouring New Jersey which have 5G and both are awash with cellphone towers. Should this 'virus' spread with 5G expansion people should take serious notice and realise, too, that the impact of 5G will increase with the number of 5G devices and the wave connections they generate. Two other points to make are that some doctors have reported 'Covid-19' patients to have 'mysterious and potentially lethal blood clots' which are not dissolved by blood-thinning agents, and some patients have complained of a tingling or 'fizzing' sensation on or under the skin - 'like being struck by lightning, like pins and needles all over my body', as one woman said. Electromagnetic fields affect the blood and skin, even more so with 5G. Now think that 6G and 7G are in the pipeline if humanity does not get off its arse fast.

I have already mentioned the psychological effects of 5G and Professor Martin Pall notes that malfunctioning calcium cell-gate activity caused by technological radiation produces fear in animals and in humans. It triggers large increases in the release of 'norepinephrine' which is the fight or flight hormone that activates the survival response that we have seen with panic buying, support for draconian measures to 'save us from the virus' and other expressions of fear and distress. Electromagnetic fields at far less than 5G, but at the right frequency, can entrain with brain processing and implant thoughts and emotions to

dictate behaviour. This has been known for decades and more and it takes very low energy to instigate - it's the frequency entrainment that allows it to happen. By bouncing frequencies off the ionosphere (between about 37 and 620 miles above the Earth) whole regions of people can be affected. This has been happening for a long time through ionospheric heaters, the best known being the Pentagon/DARPA-driven HAARP in Alaska, the High Frequency Active Auroral Research Program. Ionospheric heaters fire high-power radio waves at the ionosphere which begins to vibrate and divert them back to Earth at far greater power. See *Everything You Need To Know* for the detailed background. 5G is being installed in schools worldwide to destroy the immunity of children and Professor Pall notes that this applies to the immune systems of *all* things - including plants and vegetation which becomes food. During the lockdowns and hysteria the BT-owned mobile operator EE switched on its 5G network in a further 21 British towns and cities, Israel was imposing the same on its citizens and the deeply sinister Elon Musk was launching still more SpaceX satellites in low altitude to fire 5G at the earth. The telecommunications industry was expressing delight that 'social-distancing' and working from home due to virus laws was increasing demand for more 5G roll-out. The Cult-owned US Federal Communications Commission (FCC) authorised the Cult-owned SpaceX amid the global lockdown to install up to a million ground antenna to connect users to its Starlink satellite internet network and what has been going on in terms of 5G roll-out and other structural changes while people were locked away at home? The ever-increasing 5G explosion will continually diminish immune systems to make them vulnerable to more and more health effects which the Cult will blame on something else. Here we have the road to mass genocide that I described earlier. People like Elon Musk, those running telecommunication companies and politicians and government officials allowing this 5G torture chamber to be created, should be jailed for life for genocidal crimes against humanity. Sitting around watching this unfold and letting Cult psychopaths destroy humanity and take over the world is hardly an option. Professor Pall warns:

And let me repeat that any effects seen with the initial 'rollout' of 5G radiation will be a tiny fraction of those predicted by a mature 5G system interacting with the 'Internet of things' because any initial 5G system has very little to communicate with on initial rollout and therefore will produce only a tiny fraction of highly pulsed EMF effects of such a mature system.

If human life as we know it is going to survive - 5G *must* go. The global expansion of the 5G network, its increase in power and impact as more devices are connected to its frequency band, and the oxygen-

changing 60 GHz have the potential to inflict enormous amounts of illness that would be blamed on other causes, including further, perhaps more extreme, waves of the illusory 'Covid-19'. It is such a testament to the scale of child-like human perceptual programming that billions could have bought what is an obvious 'pandemic' Big Lie when you take the trouble to think for yourself and make the official narrative justify its claims. Balanced observations don't register with people once the Cult has activated human survival responses channelled through the reptilian brain which is constantly scanning the world for threats to survival of all kinds – life, job, relationships, all of them. The reptilian brain doesn't think, it reacts, and will panic-buy in a frenzy of 'I must survive even at the expense of you'. This is the reaction mechanism that will accept any level of tyrannical imposition if it believes its chances of survival will be increased in any way and the same survival response will demonise anyone questioning, challenging and refusing to cooperate with the said imposition of tyranny.

It is vital to stay calm in these situations to stop survival mechanisms overwhelming you. Unless you are in a situation of immediate danger in which immediate reaction is required nothing good ever comes from the reptilian brain and associated survival responses taking over perception. The first casualty is always thinking straight and my god that has happened to untold numbers since the 'pandemic' frenzy began.

* The Gates-owned Professor Neil Ferguson who produced the computer models that led to the Gates-demanded lockdown, and the man who said (like Gates) that lockdowns must continue until a (Gates) vaccine was ready, fell from his perch with the exposure of extraordinary hypocrisy. Ferguson was forced to resign as a government advisor in the first week of May, 2020, when he was outed by a newspaper for meeting with his married lover against his own lockdown rules.

At a time that he was telling everyone to stay at home and not have anyone visit who didn't live in the same house he enjoyed sexual trysts with his lover at his own home while she was living elsewhere with her husband and children. The girlfriend, Antonia Staats, is a climate change activist and senior campaigner at Avaaz, the global online 'activist' network connected to George Soros which I highlighted earlier.

Even more of a head-shaker was that Ferguson claimed to have the 'virus' in the same period and Staats was telling friends she suspected that her husband had 'virus' symptoms. This is the man who locked down countries with ludicrous 'models' that justified the Gates lockdown agenda and destroyed the lives and livelihoods of at least hundreds of millions of people – exactly what Gates and his Cult masters planned from the start.

Why is Bill Gates a psychopath?

Unthinking respect for authority is the greatest enemy of truth
– Albert Einstein

Technocrat mega-billionaire Bill Gates is everywhere in the 'pandemic' hoax and there is no way he doesn't know what he's doing. This is not a man who has been manipulated into funding and fronting the 'pandemic' narrative and response including the purchase 'vaccine'. Gates is a Cult operative who has bought the global 'health' industry willingly and enthusiastically doing whatever the Cult tells him. I look at his eyes, which never smile, and I see no one home. No life, no vibrance, no emotion. I am reminded every time of biological AI as I am with Zuckerberg, Bezos, Soros, and the rest of their Cult-serving ilk.

I should first explain the background to technocracy AI front-people like Gates (Microsoft), Zuckerberg (Facebook), Brin and Page (Google), Wojcicki (YouTube), Bezos (Amazon), Musk (SpaceX, Tesla, Neuralink), and Soros (Open Society Foundations). There are many others and their role in the structure is basically the same. They are gofers for the Cult that become very rich for being so with some strict provisos on what they do with 'their' (joke) companies and large swathes of their ensuing billions. The Cult is constructing the 'Smart Grid' technological sub-reality technocratic tyranny and they need a host of cover-stories and cover-people to hide the fact that it is all coordinated and being rolled out from underground bases and other secret projects. Notice there are no barren periods while the Cult waits for its next level of technological control to be 'invented'. One stage seamlessly follows the next with no gaps in between. This is because the technology is developed long before we ever see it in the public arena and to hide that fact they need made-up narratives for public consumption and operatives to front-up those narratives. This is where the gofers come in to explain how technology vital to the Cult agenda came to be 'invented' and decaluated by unconnected 'individuals'. They become immensely rich, but there are

serious strings attached. Enormous swathes of the money secured through Cult operations must be spent on advancing the Cult agenda through 'foundations' of fake philanthropy. They have the added benefit of securing colossal tax-exemptions. Each operative is given an area of specialisation. Soros is deployed funding the Open Society Foundations to secure fake 'people's revolutions', mass migration and the emergence of the New Wike tyranny; Zuckerberg, Bein, Page and Wojcicki have been given the role of global censors protecting Cult narratives and actions from exposure; Bezos is fronting up the takeover of global commerce by the Cult's Amazon, which has benefited fantastically from the 'pandemic' and the demise of at least tens of millions of potential competitors, while increasing his wealth by tens of billions during lockdowns which his newspaper, the *Washington Post*, said 'must continue'; Bill Gates has been handed a series of roles which is why he has appeared so many times in the book in relation to many aspects of the Cult agenda that he is funding. His biggest specialisation is the field of Big Pharma 'health' and vaccinating the world.

The Gates vehicle for this Cult 'philanthropy' (it actually makes him an even bigger fortune) is the Bill and Melinda Gates Foundation which he based on the infamous Rockefeller Foundation – a family with which he is extremely close. I have seen ancestry research that says if you go back far enough Gates is from the Rockefeller bloodline. Through this Cult-front 'foundation' Gates created Gavi, the 'vaccine alliance', in 1999 with an initial donation of \$750 million and we have already seen his financial connections (many through Gavi) to all the major agenda-drivers of the 'pandemic' including Imperial College, Neil Ferguson, Chris Whitty, Anthony Fauci and Deborah Birx. The web that goes out from the Gates Foundation is extraordinary and includes his control of the Rockefeller-created World Health Organization (WHO) through being its second biggest funder behind only the government of the United States. If Trump carries out his threat to cut WHO funding Gates will be number one. Whatever comes out of the mouth of WHO Director-General Tedros Adhanom Ghebreyesus is Gates speaking and the WHO has been the force dictating the global response to the fake 'virus'. Before being named Director-General Tedros was chair of the Gates-founded Global Fund to 'fight against AIDS, tuberculosis and malaria' and a board member of the Gates-funded Gavi and another Gates-funded organisation. Gates owns him. At the same time Cult fronts like Facebook, YouTube and Google have introduced a policy of censoring or downgrading any information at odds with the World Health Organization version of events (which is why I was deleted from Facebook and YouTube).

You can see how the Web works and these Cult operatives and gofers working as one unit need to face the consequences of their actions and

crimes against humanity in life-sentences with their money distributed to those whose livelihoods they have mercilessly destroyed. This lack of mercy and empathy for the global population makes them all for me not only psychopaths, but super-psychopaths. But, then, if they work at any in-the-know level of the Cult they would have to be, by definition. It's compulsory. Another head-shaker for anyone who knows the game was when Gates's missus, Melinda, who will be well aware of what is going on, announced on CNN that 'soon Africa will have bodies out in the streets'. Africa up to this point was only marginally affected compared with the size of the continent, but Mrs Gates knew better. She said the reason the numbers were low was the lack of testing (for genetic material found in many people) and when the testing expanded so would the number of cases (exactly, that's the whole deceit of the test). In the wake of her African prophecy the Gates-owned World Health Organization and Cult-owned United Nations declared that Africa could see up to 3.3 million deaths from 'Covid-19' and could become the 'epicentre' of the 'pandemic' that had been declared in the first place by the Gates-owned WHO. Was there any way to stop this, pray? Oh yes – lockdown and social distancing. The same hoax that had been perpetrated in the West was now being dumped on Africa where Gates 'vaccine programs' exploit poor children for their 'trials'.

Who's WHO? Er... Bill Gates

The World Health Organization is extraordinarily corrupt and has been since it was created by the Rockefellers and Rothschilds after World War Two. The WHO declared 'Covid-19' a 'global pandemic' in March, 2020, as it was always going to do from day one. Gates hands over hundreds of millions dollars to buy control as he has poured millions into the US Centers for Disease Control and Prevention (CDC) which has directed 'virus' policy in the United States and told doctors to diagnose anyone that moves – or doesn't – as 'Covid-19' without any evidence. The CDC is funded by Big Pharma, medical insurance companies and other medical-related industries while WHO funding also massively comes from the world's major Big Pharma drug companies. Together they and Gates run the WHO on behalf of the Cult agenda and not the world population. As a result this Microsoft technocrat, son of a supporter of empires, has been called 'the world's most powerful doctor' and refers to himself as a 'health expert'. Gates doesn't actually strike me as very bright at all, but you don't need to be when you're just a front man. The WHO is based in Geneva, Switzerland, home to so many Cult operations, including the World Trade Organization. Geneva is reported to have a moratorium on 5G. The WHO is another agency of the United Nations and currently headed by Tedros Adhanom Ghebreyesus, a politburo member of the tyrannical Tigray People's Liberation Front

(TPLF) which has been part of the repressive Marxist government of Ethiopia for decades. It has been widely condemned by human rights organisations for its abuse of citizens. Out of this came Tedros, amid many allegations of corruption and misappropriation of funds, to head the Cult's World Health Organization which provides the official 'viral' narrative. Tedros was exposed three times for covering up cholera epidemics while health minister in Ethiopia and when he took office in Geneva he had the mass-murdering Zimbabwe dictator Robert Mugabe appointed as a WHO goodwill ambassador for public health although, naturally, not for the health of all those he had killed to stay in power. The appointment was so outrageous that Tedros was quickly forced to retract.

Tedros is one of the last people who should be WHO Director-General, but then he's not there to serve the human population. He's there to serve the interests of those who secured his appointment and created the World Health Organization – the Cult. Anyone think that the appointment of Tedros was made without the approval of Bill Gates? Tedros is close to China and he worked to make lockdown and social distancing the blueprint for response in the West by praising its effectiveness in China. I guess we should also expect that when the Chinese Communist Party and Tedros share the same politics. Nothing is uttered by the WHO hierarchy or emerges from the mouth of Tedros that is not the Gates agenda and the software psychopath also came out in praise of China just to emphasise the point: 'China did a lot of things right at the beginning.' Yes, they had a draconian lockdown which was planned from the start to be transferred to the West. Gates described his WHO fieldwork as 'phenomenal' when the operation is a Cult-owned farce in relation to human health. We should include in that the same bracket the controlling hierarchy of the Centers for Disease Control (CDC) in the United States which, like the World Health Organization, is owned by Gates, Big Pharma and the wider Cult.

Gates and the 'Davos' mob – the 'prophecy'

Melinda Gates said on BBC radio (Gates has given millions to the BBC) that her husband had 'prepared for years' for a coronavirus pandemic. Oh, I bet he had. Gates predicted a coming global pandemic that would kill many people and devastate the world economy in a TED talk in 2015. The man is a modern-day Isaiah. Then six weeks before the 'outbreak' in China came to public attention a 'simulation' of a coronavirus pandemic was run by the One-percent 'Davos' World Economic Forum (WEF), the Bill and Melinda Gates Foundation and the Johns Hopkins Center for Health Security (Fig 384). This was called Event 201 and included major banks, the UN, Johnson & Johnson, and officials from China and the Centers for Disease Control in the United



Figure 384: The progress of the Bill Gates One-percent or Event 201 simulating a 'coronavirus pandemic' six weeks before the fake 'pandemic' came to public attention.

States. Remember what the American scientist I quoted said: 'If you want to create a totally false panic about a totally false pandemic – pick a coronavirus'. Johns Hopkins Center for Health Security ran its own 'pandemic' simulation in Washington called

'Clade X' in 2018. Since the fake 'pandemic' began the same Johns Hopkins operation has compiled all the fraudulent figures for 'Covid-19' cases and deaths repeated incessantly and unquestioningly by the media worldwide. The Johns Hopkins network of fronts has received absolutely massive funding from ... Bill Gates and Big Pharma. News reports were inserted into the Gates simulation and discussions included censorship of those questioning the official line of what the public were told – all of which would be happening within weeks when the fake 'coronavirus outbreak' hit the news. We had headlines appearing such as 'anti-vaccination movement could derail fight against coronavirus, experts warn'. That headline was in the UK *Independent*! (of course). Cult-owned Mark Zuckerberg announced in March, 2020, that Facebook would give the Gates World Health Organization free advertisements and remove 'false claims and conspiracy theories' in a battle against coronavirus 'misinformation' (anything that challenged or questioned the official Cult narrative). Users looking for coronavirus information on Cult-controlled Facebook would see a pop-up at the top of search results directing them to the official narrative. 'We're focused on making sure everyone can access credible and accurate information', said the little boy in short trousers and a t-shirt. He was equating, as always, 'credible and accurate' with the official story. He would later announce that Facebook would warn users even if they 'liked, reacted or commented' on Covid-19 'misinformation' that the company has removed. This extraordinary fraud had earlier said that Facebook systematically sets out to marginalise those who question vaccine safety. Zuckerberg should absolutely be in jail because he knows what he's doing and it was all in line with the Gates 'simulation' Event 201. Cult-controlled Google, Twitter and Apple naturally engaged in similar coronavirus censorship with Google-owned YouTube announcing:

With few people to review content, our automated systems will be stepping in to keep YouTube safe. More videos will be removed than normal during this

time including content that does not violate community guidelines.

Passed through my Orwellian Translation Unit this meant that we are coding the AI algorithms to target all information that we can which challenges the official version of the Cult virus narrative. Where this is leading – the West becoming China – was promoted in an article in the elite-owned *Atlantic* magazine by two academics, Harvard Law School professor Jack Goldsmith and Andrew Keane Woods, a professor at the University of Arizona. The heading said it all: 'Internet Speech Will Never Go Back to Normal – in the debate over freedoms versus control of the global network, China was largely correct, and the U.S. was wrong.' Classic. YouTube, Vimeo and Facebook all deleted my interview with London Real which exposed the zero evidence that 'Covid-19' existed. YouTube gofer Susan Wójcicki then demonetised all my YouTube videos on any subject (followed by complete deletion) and Vimeo deleted some 700 videos on the iconic media platform because, among other pathetic excuses, some of them questioned vaccine safety. Iconic was restored with our own playing system within days and the banned interview has been ginormously circulated by the public outside these digital kindergartens and been translated into many languages including Spanish and Italian. This is what is possible when you don't give up and play the victim. By the way, YouTube and Wójcicki said my interview had been banned as part of a newly-introduced rule whereby ...

... Any content that disputes the existence or transmission of Covid-19, as described by the WHO and local health authorities is in violation of YouTube policies. This includes conspiracy theories which claim that the symptoms are caused by 5G.

Take that in for a moment and smell the fascism. The WHO narrative is the Gates narrative is the Cult narrative protected from challenge by the Cult's YouTube. Golden rule: If YouTube are promoting something or someone then the Cult wants them promoted and if they are deleting them the Cult wants them deleted. We were banned for a time from Twitter for posting another 'Covid-19' video made by an external source and think what the censorship will be like should ultra-Zionist billionaire Paul Singer get control of that company. Add to all this the admission by General Sir Nick Carter, the UK's Chief of the Defence Staff, that the clandestine 77th Brigade of the British Army is involved in 'countering coronavirus misinformation online'. The unit was created in 2015 to specialise 'non-lethal' forms of psychological warfare and use social media to 'fight in the information age'. Carter said the 77th Brigade had been tackling 'false information' about the pandemic on the Internet. A unit of the British Army, 2,000 strong, is seeking to

manipulate the perceptions of British people by trashing opinions at odds with the state narrative and that of the Gates-owned World Health Organization. That is how the fast-emerging fascism works. The fake 'pandemic' is indeed global psychological warfare on the collective human psyche. Conversations in the Gates-World Economic Forum Event 201 'simulation' were a precursor to what was about to happen for real and anyone who thinks that is a coincidence needs a massive download of reality. Bill Gates's father, William Henry Gates Sr. was head of the Rockefeller-created Planned Parenthood (connected to insider 'prophet' Dr Richard Day) which began life in the eugenics movement. Boy Gates admits he was a 'one-time' believer in the eugenics theory of 18th/19th century cleric Thomas Malthus. The Gates Foundation pledged \$100 million to 'fight the virus' and the *Seattle Times* reported as the 'coronavirus' hit America that a project funded by the Gates Foundation was producing home-testing kits for the disease. Gates staff said that positive results would be shared with 'health authorities' who would then track people's movements. The test would involve taking a DNA sample and provide another addition to the DNA database (which all the 'tests' are doing). Gates is also funding the 'vaccine' which I will come to shortly. Billy Boy stepped down from the board of Microsoft, which he co-founded, in mid-March 2020 to 'spend more time on philanthropic activities' and focus on 'global health and development, education and tackling climate change' – all Cult endeavours. The timing of this was, shall we say, telling.

The Rockefeller prophecy

I was further alerted to a document by the Rockefeller Foundation from 2010 headed 'Scenarios for the Future of Technology and International Development' which included responses to an imaginary pandemic of an extremely virulent and deadly influenza strain that infected 20 percent of the world population and killed eight million in seven months. The scenario envisaged by the infamous and One-percent Rockefeller Foundation, the inspiration for the Gates Foundation, had a 'deadly effect' on economies with empty shops and offices devoid of both employers and customers for months on end. The document described how totalitarianism was introduced in countries of the West to 'protect citizens from risk and exposure':

During the pandemic, national leaders around the world flexed their authority and imposed airtight rules and restrictions, from the mandatory wearing of face masks to body-temperature checks at the entries to communal spaces like train stations and supermarkets. Even after the pandemic faded, this more authoritarian control and oversight of citizens and their activities stuck and even intensified. In order to protect themselves from the spread of increasingly

global problems – from pandemics and transnational terrorism to environmental crises and rising poverty – leaders around the world took a firmer grip on power.

At first, the notion of a more controlled world gained wide acceptance and approval. Citizens willingly gave up some of their sovereignty – and their privacy – to more paternalistic states in exchange for greater safety and stability. Citizens were more tolerant, and even eager, for top-down direction and oversight, and national leaders had more latitude to impose order in the ways they saw fit.

In developed countries, this heightened oversight took many forms: biometric IDs for all citizens, for example, and tighter regulation of key industries whose stability was deemed vital to national interests. In many developed countries, enforced cooperation with a suite of new regulations and agreements slowly but steadily restored both order and, importantly, economic growth.

By mid-March, 2020, the numbers of new cases in China were reported to be falling just as they were increasing in the rest of the world and as the Rockefeller Foundation 'scenario' document had 'prophecised'. China began to be praised for its authoritarian response made possible by its authoritarian non-democratic system. A *Forbes* magazine headline said: 'For the US, Coronavirus lessons to be learned from China and South Korea'. This was the pre-planned perceptual preparation for the Chinese lockdown to be seen as the blueprint response when in fact the false test and cause of death registrations would decide the number of cases and fatalities that would follow. The whole thing was a set-up orchestrated between Cult-controlled China and Cult networks in other countries. The Rockefeller 'prophecy' document of 2010 had said:

However, a few countries did fare better – China in particular. The Chinese government's quick imposition and enforcement of mandatory quarantine for all citizens, as well as its instant and near-hermetic sealing of all borders, saved millions of lives, stopping the spread of the virus far earlier than in other countries and enabling a swifter post-pandemic recovery.

The *Forbes* magazine article in 2020 said of China's response '... those measures protected untold millions from getting the disease'. The 2011 movie *Contagion* also pre-empted the events that followed the 'Covid-19 outbreak' in another amazing Hollywood prophecy. This is a summary of the storyline in which bats were blamed to begin with:

Soon after her return from a business trip to Hong Kong [China], Beth Emhoff

dies from what is a flu or some other type of infection. Her young son dies later the same day. Her husband Mitch however seems immune. Thus begins the spread of a deadly infection, for doctors and administrators at the US Centers for Disease Control, several days pass before anyone realizes the extent or gravity of this new infection.

They must first identify the type of virus in question and then find a means of combating it, a process that will likely take several months. As the contagion spreads to millions of people worldwide, societal order begins to break down as people panic.

Another description of the film says:

In a flashback, days before Beth is infected in China, a bulldozer knocks down a tree, disturbing some bats. One flies over a sty and drops a piece of banana, which is eaten by a pig. The pigs are slaughtered and prepared by a chef who shakes hands with Beth in the casino, transferring the virus to her and making her Patient Zero.

What saves the day? Well, well, a narcissist and the US Centers for Disease Control chose who had the vaccine by birthdate. Oh, yes, and 'conspiracy theorists' were demonised. Here we have yet another Hollywood pre-emptive program and two representations of the One-percent describing a pandemic sequence with Event 201 happening with relation to an 'imaginary' coronavirus just before the real imaginary coronavirus 'broke out'.

The Gates vaccine

Bill Gates wasn't even subtle about the No-Problem-Reaction-Solution punchline of the 'pandemic' hoax and I guess he didn't need to be for the billions who have bought the official story without question and have no idea about the big picture of how they are being laced and branded. For those of us who have tracked him and the Cult for decades he was an open book. Just as the Chinese did not consider other possible causes for the illness in Wuhan except a 'virus' so Gates would not have any other responses considered except lockdown, isolation and a vaccine. He talked immediately about the need for a vaccine and pledged hundreds of millions to 'find one' through a multitude of his funded sources. I said from the start that the vaccine Gates wanted to inject into the entirety of humanity already existed before the fake 'pandemic' had even started. All this funding and working to develop a vaccine to 'save humanity' is more psychological bullshit to have people on their knees begging to be inoculated by the time it was 'ready' in the wake of 'new waves' of the 'virus' just before vaccination was planned to

begin. We were told that the vaccine could be ready in months when the normal development sequence and trials takes years. How was this possible? It already existed. They couldn't 'discover' the vaccine and start mass immunisation too quickly or even the non-septical might ask how this could be done so quickly. They had to have some delay but they would seek to make that as short as possible. Tucker Carlson, the only US TV anchor with the intelligence and courage to ask relevant questions, made a very potent point about 'coronavirus' vaccines:

Scientists have never produced a single approved vaccine or anti-viral drug for any coronavirus ... We spent millions of dollars and more than a decade trying to find a vaccine for the SARS virus. Scientists never developed one.

Ah, but if there is no 'Covid-19' virus and you are only creating the illusion of one by fixing the figures through fake diagnosis and death certificates then the vaccine, whatever the content, can appear to have worked if you change the policy on fake diagnosis and death certificates once the vaccine is introduced. Gates, the software-peddling psychopath, had placed himself above elected governments in true technocratic style to dictate vaccination policy for the whole world. He made it clear that 'for the world at large normalcy only returns when we have vaccinated the entire global population.' Can you imagine the scale of arrogance that it takes for the software-peddler to make that statement? It's just a glimpse of the arrogant, narcissistic psychopathy that pervades the global Cult and its operatives. The Cult Gates plan is to make the vaccination compulsory and failing that to stop people returning to anything like their previous lifestyle unless they agree to be vaccinated. You want to come out of lockdown? Then you have the vaccination or stay as you are. This is why they are so desperate to keep the lockdowns going in some form until the vaccine is produced. These people are undiluted evil – the absence of love. I see also the comments of some 'experts' that because 'older people tend to have weaker immune responses to vaccines' the elderly 'might need two doses of the jab'. Gates further demands that people who have been vaccinated must be marked so that technology can pick up the signal to confirm your branding. Now we see the real reason for the Gates/Gavi 'quantum tattoo' that I highlighted earlier. I described how the Gates Foundation is funding the development of an 'tattoo' that will identify those who have and have not been vaccinated. The excuse was to identify vaccinated children in the developing world, but it is clear what the 'tattoo' was really for – giving the entirety of humanity the 'Mark of the Beast'. Gates has funded research at the Massachusetts Institute of Technology (MIT) to create an 'invisible quantum tattoo' to be embedded in the skin and read by a smartphone camera app. ScienceAlert.com reported:

The invisible 'tattoo' accompanying the vaccine is a pattern made up of minuscule quantum dots – tiny semiconducting crystals that reflect light – that glows under infrared light. The pattern – and vaccine – gets delivered into the skin using hi-tech dissolvable microneedles made of a mixture of polymers and sugar.

Yet again Gates's timing was perfect to sync with the 'pandemic' that he predicted. The Gates 'tattoo' is connected to the ID2020 'alliance' seeking to impose a digital identity on everyone. This alliance consists of those legendary lovers of humanity Microsoft, Gavi, the Rockefeller Foundation, Accenture and IDEO.org. Add to this the technology 'being developed' (already developed) by facial recognition camera producers to track heartbeats, temperature and social distancing. This is one description:

Photon-X object recognition and analytics combined with VSBITY facial recognition will provide an advanced screening tool for facilities to identify and validate that someone with a high temperature is about to enter a building. Fever, cough and difficulty breathing are some of the common symptoms of COVID-19.

The Gates vaccine or vaccines will contain other diseases for further waves of lockdown, a sterilisation agent, and possibly something to 'target specific genotypes' in the woods of the Project for The New American Century. Crucially there will be nano-technology microchips or 'smart dust' to connect the human race to the Smart Grid and mutate human DNA and genetics into synthetic biological machines which I say that people like Gates and the rest of the Cult inner core already are – biological AI. Rockefeller insider Dr Richard Day told the Pittsburgh paediatricians in 1969 about plans to inoculate diseases in vaccination programmes and that's being going on for a long time which is one reason why so many children are getting sicker. I described the nanotechnology I believed would be in the 'Covid-19' vaccine in my first interview with London Real on these subjects before the lockdowns got into full swing and Gates came rapidly to the fore about his vaccine. Weeks later I watched a video interview with Celeste Solum, a former employee of FEMA, the Federal Emergency Management Agency, which has been widely exposed in my books since the mid-1990s. FEMA is a 100 percent front for the Cult and is given extraordinary powers over American society once a state of national emergency has been declared and that is what Donald Trump did on March 15th, 2020. Celeste Solum, who worked in a number of roles for FEMA including planning for pandemics, said in her interview that the fake pandemic was designed

to enforce vaccinations that would include nanochips or sensors. Everyone in the world would have to be tested for 'Covid-19' and vast numbers will test positive for reasons I have explained. Solum said that the real reason for this was a 'big DNA harvesting' - 'They want all our DNA in the big giant supercomputers.' A series of vaccinations was planned - not only one - which will contain aborted foetal tissue and what she calls 'the DARPA hydro-gel sensor' which had been in development for ten years. This consists of nano-particles in a 'gelatine form' which once injected 'begin to assemble'. Solum is describing what I detailed earlier about smart dust which can replicate inside the body and assemble systems to transform the nature of the body from human to a form of machine. She said the nano-particles fuse with tissue and becomes one with the body. 'You become one with artificial intelligence and the Internet of Things', Solum said. 'You become your own computer interface ... and you are one with the hive, the system, whatever you want to say.' This is precisely what I have been warning about in the books for so long.

Solum said that people would be forced to have this 'sensor' vaccination on the grounds that it will alert the authorities that you are sick before even you know you are sick. This is the real reason for the Gates vaccination and he well knows that which is why he is a super-psychopath who should be in jail for the rest of his life. More confirmation came when he said in a television interview that 700,000 people could be damaged by a global 'Covid-19' vaccination (and the rest) and so governments would have to agree to indemnify vaccine producers from responsibility. In that one sentence Bill Gates personified himself (Fig 385). Another crucial aspect of a Gates vaccine is the emerging new vaccination technique that the Cult is desperate to introduce called DNA or genetic immunisation. This has been described as 'hacking your DNA'. It fits like a glove and it is vital to keep our eyes firmly on this. DNA vaccines are used in animals, but not yet humans. They inject a 'plasmid' which is defined as 'small circular pieces of DNA mainly found in bacteria that replicate independently from the host's

chromosomal DNA. Note that once in the body they replicate independently. Plasmids used in vaccines would be genetically engineered and hence the term 'synthetic DNA vaccines'. They are described as 'mimicking' a 'viral infection'.



Figure 385: Exactly what it is.

The Gates vaccine horror story by Robert F. Kennedy Jr

I mentioned earlier that Robert F. Kennedy Jr, son of the assassinated US Attorney General Robert F. Kennedy and nephew of former US President John F. Kennedy, has spoken out often and vociferously against the health effects of vaccinations. His father and JFK were murdered in the 1960s by assets of the same Cult behind the fake 'pandemic'. Gates said that Trump told him in 2017 that he was considering 'somebody, I think his name was Robert Kennedy Jr' (the arrogance of it) to head an inquiry into the safety of vaccines. The software psychopath said he told Trump: 'No, that would be a dead end, that would be a bad thing, don't do that.' Robert Kennedy Jr did not mince words amid the demands by Bill Gates for a 'Covid-19' vaccine that everyone must have worldwide. Kennedy said:

Vaccines, for Bill Gates, are a strategic philanthropy that feeds his many vaccine-related businesses (including Microsoft's ambition to control a global vaccine enterprise) and gives him dictatorial control over global health policy - the spear tip of corporate neo-imperialism.

Kennedy went on to highlight the disastrous effects for hundreds of thousands of children of Gates vaccine programmes. He said Gates polio vaccination campaigns had paralysed 486,000 children in India between 2000 and 2017 while other Gates catastrophes included autoimmune and fertility disorders suffered by 1,200 girls with seven of them dying. He said they were among 23,000 girls from remote Indian villages vaccinated by Gates programmes in league with Glaxo Smith Kline (GSK) and Merck. This is the same shameless Gates that said 'people who engage in anti-vaccine efforts kill children'. Kennedy accused the Gates organisation of using unethical practices to pressure girls to participate in the trial, intimidating parents, falsifying consent forms, and denying medical care to the affected. He was quoting from a case before the Indian Supreme Court. Polio, also known as poliomyelitis and infantile paralysis, is a perfect example of vaccine deceit. Polio paralysis began when lead arsenate started to be widely sprayed as an insecticide and the produce consumed. Lead arsenate spraying began in 1892 and the first US polio 'epidemic' came in Vermont in 1894, but the Big Pharma cartel (created by the Rockefeller family) decreed that polio is caused by ... the poliovirus which 'spreads from person to person and can infect a person's spinal cord'. Polio continued with the introduction of DDT, another devastating poison, particularly after the Second World War until its virtual worldwide ban in the 1970s and 80s. Lead arsenate and DDT both poison the brain and nervous system which is the cause of polio paralysis and as you would expect cases of polio plummeted when DDT was reduced in use and then banned. In the meantime Big

Pharma introduced a polio vaccine which was then given the credit for the reduction. 'Vaccine-eradicated' diseases were in decline before vaccines were introduced and diseases like scarlet fever for which there was not a vaccine declined in the same way. Dr Andrew Kaufman said: 'If you actually go back and look for the evidence that vaccines have prevented disease you're not going to find it.' Today polio is caused overwhelmingly by vaccinations for polio so beloved of Gates. Robert Kennedy Jr wrote:

In 2017, the World Health Organization (WHO) reluctantly admitted that the global epidemic in polio is predominantly vaccine strain. The most frightening epidemics in Congo, Afghanistan, and the Philippines, are all linked to vaccines. In fact, by 2018, 70% of global polio cases were vaccine strain.

The World Health Organisation was accused in 2014 of sterilising millions of women in Kenya by using deception and the evidence was confirmed by the content of the vaccines involved. The WHO admitted its involvement for more than 10 years with the vaccine programme and similar charges were lodged by other countries including Tanzania, Nicaragua, Mexico, and the Philippines. This is the organization controlled by Gates that is not only declaring and driving the 'pandemic', but being protected from exposure by Zuckerberg's Facebook, Wojcicki's YouTube and Silicon Valley and the mainstream media in general. The Gates Foundation is connected through funding and mutual agendas to 20 pharmaceutical giants and laboratories and he is accused of directing the policy of United Nations Children's Fund (UNICEF), Gavi, and other groupings, and using them to both advance the vaccine agenda and silence those opposing the policy. Robert Kennedy Jr also turned his fire on the Gates-connected Trump 'pandemic adviser' Dr Anthony Fauci who he said had 'poisoned an entire generation of Americans'. He accused Fauci of 'an extensive legacy of fraud and cover-ups in his decades-long career with the federal government during which he 'operated as a workplace tyrant and ruined the careers of countless physicians and researchers' who had worked with integrity. Kennedy said that in at least one instance Fauci targeted a whistleblower trying to expose how the American blood supply has been infected with deadly disease strains. He said Fauci ruined the career of this physician and covered up the evidence. Kennedy claimed Fauci was using his position to secure lucrative vaccine patents. Doctors and researchers below him in the hierarchy would develop breakthrough technologies and then be dismissed to allow Fauci to seize ownership of their work. Kennedy said Fauci owned 'many, many vaccine patents' including one for a special protein sheet to

circulate vaccine material throughout the body. He said Fauci didn't develop this, but stole it from someone else who was fired after creating it:

Fauci fired [this person] and he somehow ended up owning the patent, and that patent is now being used ... to make vaccines for the coronavirus ... that company has a 50/50 split with Tony Fauci's agency ... so Fauci's agency will collect half the royalties on that vaccine and there's no limit for how much the agency can collect.

Kennedy said that Fauci's National Institute of Allergy and Infectious Diseases (NIAID) and the Centers for Disease Control and Prevention (CDC) were really subsidiaries of Big Pharma and these so-called federal agencies were corporations in disguise working with Big Pharma to generate enormous profits on the backs of sick and dying people.

The biggest cause of death – lockdown

While we are told to surrender our most basic rights in the name of protection from the 'virus' the death toll from the lockdown, cancelled operations and diagnosis is going to be both monumental and ongoing. Lockdown deaths are sure to be way higher than even the manipulated figures falsely attributed to 'Covid-19'. I have described how old people are denied treatment and pressured to sign do not resuscitate forms, but it's not just old people that are being fatally affected. Others would die from a long list of causes, including cancer and heart disease, by not being diagnosed or treated while hospitals had hundreds of empty beds and doctors and medical staff had next to nothing to do. Here's an example relating to cancer in Britain. Multiply the same situation across the world and the figures for cancer alone will be breathtaking even without all the other causes of death from the same lack of diagnoses and treatment. Cancer specialists were warning before the end of April that thousands in the UK were missing out on cancer diagnosis with the charity Cancer Research UK reporting a decline in screening and referrals of some 2,700 fewer people every week. Richard Sullivan, professor of cancer and global health at King's College London, said there was more fear of Covid-19 than of having cancer. What a testament that is to the power of perceptual programming. 'A lot of services have had to scale back – we've seen a dramatic decrease in the amount of elective cancer surgery', Sullivan said. 'Years of lost life will be quite dramatic', he continued, and there would be 'a huge amount of avoidable mortality.' Sarah Woolnough, executive director for policy at Cancer Research UK, said there had been a 75 percent drop in urgent referrals to hospitals by family doctors of people with suspected cancer. To think that the UK 'Health' Secretary, Matt Hancock, who knows

nothing about 'health', said it was not advisable for some cancer treatments to go ahead during an epidemic because of the risks of exposure to the 'virus'.

Professor Sullivan pointed out another consequence of the lockdown – a huge wave of people and health problems that would overwhelm hospitals when they were fully open again. This is the very situation that the lockdowns were supposed to avoid as they 'protected' (empty) hospitals from being overrun. Invasion, invasion, wherever you look – including keeping people out of the sun while saying that sunlight 'kills viruses'. Sullivan said it could take up to a year to return the health service to normal even if the lockdowns stopped them in the last week of April. These were only the consequences for cancer patients. Add all the other untreated conditions and the hospital backlog worldwide was bound to be extraordinary in scale. Another clearly predictable consequence was the psychological effect of locking people away in their homes, often tiny, for weeks on end knowing that their employment or business was gone and money was running out. Despair and desperation were certain to unravel mental and bodily health and increase suicide through lack of hope and a sense of pointlessness. This was already becoming clear in the psychological trauma experienced by many Italians in their longest of lockdowns. I asked staff at food stores if they had noticed any difference in the demeanour of people since the lockdowns. They certainly had. 'People look like they're going to their own funeral', one told me. The ongoing effects of this will have multiple expressions and consequences – as the Cult knew they would. Meanwhile the elite themselves ignored lockdown laws with former US President Barack Obama driven 40 miles by a government chauffeur to play golf on an empty course while his wife Michelle was voicing over a video telling the public to stay at home. Boris Johnson's advisor (handler) Dominic Cummings flouted lockdown laws as did Professor Neil Ferguson.

Hunger Games bonanza

The vaccine is only one aspect – albeit crucial – of why the fake 'pandemic' has been orchestrated. Given what I had written in the book before we reached this stage some of the other central reasons should now be obvious given the impact of the lockdowns on human life with billions in effect under house arrest. Box after box of the long-time Cult-agenda are being ticked (Fig 386). I have been writing since the Cult-driven economic crash of 2008 that another even more extreme financial collapse was planned to deliver still greater swathes of people into the Hunger Games Society and here we are – big time (Fig 387). This was the certain outcome of the lockdowns from day one and all was coldly-planned to ensure that untold numbers of businesses would never



Figure 386: Everything I have been warning about for 30 years was potentially delivered by one virus. Pure chance? No, of course it was.



Figure 387: The Hunger Games Society agenda that I have been exposing for decades has advanced with incredible speed during the fake 'pandemic' – which is why the Cult hoaxed the 'pandemic'. (Image Neil Hague)

continued, but no matter – the lockdowns continued in an exercise in economic suicide that would open the way for the 'new system' that the Cult has for so long pursued. Stock markets nose-dived along with oil prices as the 'virus' officially expanded out of China. As stock prices dropped the Cult was buying up businesses and resources at cents on the dollar to secure even more control. Ultra-Zionist billionaire Bill Ackman told CNBC that the United States was in serious jeopardy – 'Hell is coming' – unless the White House closed the country. He then made a \$2.6 billion profit on market bets related to closing down the country. Amazon CEO Jeff Bezos, the world's first 'centibillionaire', a man who vies with Bill Gates for the title of the planet's richest individual, asked for public donations to provide basic support to his

reopen again throwing both owners and employees out of work. Trillions of dollars were unleashed in 'stimulus packages' which as always benefited the super-rich far more than those truly in need. The richest of universities with billions in the bank were recipients of public money while even the

Anti-Defamation League (ADL), the hugely-funded Israel-serving censorship operation, demanded bail-out deals while the masses went under. Countries were heading for bankruptcy if this

800,000 employees who were suffering in poverty in the wake of the Covid-19 pandemic. These people have no shame.

The restaurant industry was America's biggest private sector employer with 15.6 million jobs before the 'virus' shutdown and that is not including all the food and other suppliers which depend on that industry. All was banned by the Gates (Cult) front-people. Global chains and other Cult corporations circled like vultures to pick up the scraps for a pittance and further increase their monopoly. The James Beard Foundation, a New York-based culinary organisation, reported near the end of April that independent restaurants had laid off 91 percent of their hourly employees and nearly 70 percent of salaried employees as of April 13th. The Beard survey of 1,400 small and independent restaurants found that 28 percent said they didn't believe they could survive another month of closure. Even if they did – and the same with all businesses – where was the money coming from to regenerate custom amid such colossal unemployment? Hotels, pubs, bars, restaurants, entertainment and sport were devastated and everything that in any way gathered people together. More places of potential human gathering, discourse and interaction have been lost – exactly what the Cult wants and this was emphasised by health-irrelevant 'social distancing'. It is literal divide and rule by government diktat. UK government adviser Robert Dingwall from the New and Emerging Respiratory Virus Threats Advisory Group revealed in a radio interview that the two-metre social distancing rule was 'conjured up out of nowhere' and was not based on science. No, it was based on control and division and it didn't come 'out of nowhere', but from the Cult. This is why it was imposed all over the world at the same time and people did what they were told because that's all they have ever learned to do. We had, for example, the 1.3 million people in the US state of Maine kept under lock and key on the say-so of the notoriously arrogant and stupid Governor Janet Mills at a time when just 15 people had died in Maine 'from the virus' even with the fake diagnoses and death certificate scans. The Maine economy was devastated and unemployment soared while Mills continued to take her money as normal. US state governors became one-person dictators imposing the will of the Cult. California governor Gavin Newsom closed 43 miles of Orange County beaches at a time when Will O'Neil, the mayor of Newport Beach, was pointing out the following:

Orange County has 3.2 million people who live here. It's bigger than 22 states ... and of all of those people we have lost 50 people to this virus. That's 0.001 percent of our population. In our local hospital we have 475 beds. They have never treated more than 25 people at any given time and yesterday they had nine people that they were treating and only one percent of their ventilators

were being used.

Newsom is the man who won't enforce American immigration law, but closes 43 miles of beaches in the circumstances the mayor described. These governors serving the Cult agenda and dictatorship must all be removed at the earliest possible moment. To confirm the contempt of the Cult-controlled establishment Trump's Gates-connected 'virus' advisor Anthony Fauci said shaking hands might have to become a thing of the past, but having sex with a stranger you met on the Internet was okay. These people are laughing at you.

The International Labour Organization estimated that some 1.6 billion people – nearly half the global workforce – could see their livelihoods destroyed. What does that mean? Dependency and control which is what all this is really about along with the contents of the Gates vaccine. The shutdown consequences have been especially lethal for smaller businesses which the Cult wants to delete to open the way for its corporations to control all commerce, trade and production (see Amazon which thrived during the lockdowns). Fonder the consequences when figures I saw claimed that companies with fewer than 20 staff employ about 90 percent of Americans. Rural areas not affected by even the fake version of the 'virus' were shutdown anyway to advance the plan for rural depopulation and enslavement in smart cities. By the closing days of April *Fortune* magazine was reporting that a staggering 26.5 million American workers were made unemployed by the lockdowns with the numbers rising by millions per week. *Fortune* said that when added to the seven million already jobless before the shutdown it would equal more than 33 million unemployed – 'a real unemployment rate of 20.6% – which would be the highest level since 1934'. Similar surges in job losses have been happening in the UK and across the locked-down world. Of course that was going to happen. It was a prime reason for the lockdowns. To secure control of the masses in the Hunger Games Society the Cult needs to destroy independent livelihoods and the 'pandemic' hoax meant they could secure in weeks what would otherwise have taken years and decades. Take away access to independent businesses, employment and income and what are you left with – dependency on the state (Cult) and the Hunger Games Society that I described earlier in this book, and in previous ones, before the 'pandemic' deception was even played.

The New System

I have warned for decades that the plan was to impose a whole new centralised economic system for total global control. This has been pursued through the climate change hoax which demands just such a system to 'save the world' and the economic effects of the fake pandemic

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provided unlimited potential for economic catastrophe – Problem-Reaction-Solution or, in the case of the ‘virus’ and ‘climate change’, NO-Problem-Reaction-Solution. Lower-paid people – the ‘serfs’ to the Cult – would lose their jobs and their homes through their inability to pay the rent and so would people who considered themselves well-paid and in safe employment until weeks before. The Cult’s vulture banks were poised for a frenzy of home repossession that would exceed by many magnitudes the fall-out of 2008 and advance the goal of deleting privately-owned property that I described earlier. Even those that are able to hang on to property have seen the value drop to below what they paid for it so cementing them in to their current abode unable to move due to negative equity. How many more people would fall into the lower reaches of the Hunger Games pyramid as a result of their business or job disappearing in the wake of government response to the ‘virus’? Potentially – billions. Economic meltdown was not caused by a ‘virus’, but by the calculated Deep State response to a fake ‘virus’ and this prompted predictable calls for another Cult ambition – a basic (misery) guaranteed income with all the consequences for freedom that I laid out earlier. The Cult has controlled the position of Pope for centuries and when a genuine man somehow slips through like Pope John Paul I (Albino Luciani) in 1978 he was murdered through poisoning after the Freemasonically-significant 33 days in office while he was planning to purge the Vatican of Cult influences. He has been followed by the exceedingly ungentle Pope John Paul II, Benedict and now Francis who predictably called for a guaranteed income as the lockdown consequences struck home just as he has called for world government and a transformation of global society to meet the ‘challenge of climate change’. If Pope Francis wants it, the Cult wants it, because the Cult owns him. Italy has been particularly hit by the pandemic hoax with the longest lockdown of all and remember what the Sabbatian-Frankist extremists and ‘rabbi’ said about the need to destroy ‘Edom’ – Rome, Italy and Christianity – before their ‘Messiah’ could arrive. The Cult-owned Pope Francis stood of a guaranteed income:

This may be the time to consider a universal basic wage which would acknowledge and dignify the noble, essential tasks you carry out. It would ensure and concretely achieve the ideal, at once so human and so Christian, of no worker without rights.

You don’t give a damn about them Francis, you bloody fraud. The barely survivable ‘guaranteed income’ (so long as you do what the government tells you) is part of a long-planned new economic, cashless, digital system of total centralised control that I have been warning about for decades. Cash has been systematically demonised during the fake

‘pandemic’ hysteria on the grounds that handling money can pass on the ‘disease’ (see insanity). The Cult-owned, Gates-controlled, World Health Organization advised everyone to use contactless digital technology instead of cash to protect themselves from the ‘virus’. Better have a cashless society, then, eh? It’s so bloody transparent, John Howells, chief executive of Link, which runs Britain’s 70,000 cashpoints, said the ‘virus’ has dramatically sped up the switch from cash to card and online payments and that cash could be almost killed off by the end of the summer as shoppers switch to using cards and never go back. Bill Gates’s Microsoft owns the patent for a ‘cryptocurrency system using body activity data’. The patent states: ‘Instead of massive computation work required by some conventional cryptocurrency systems, data generated [is] based on the body activity of the user ...’ A cryptocurrency is ‘a digital currency in which encryption techniques are used to regulate the generation of units of currency and verify the transfer of funds, operating independently of a central bank’. Many in the alternative media believed that cryptocurrency was the key to bringing down the elite system when in fact the Cult has been behind it all along. China, the blueprint for the world, responded to the ‘pandemic’ by launching a digital currency and ‘blockchain’ (transaction record) system for ‘trial’. Cult and Rockefeller insider Dr Richard Day told those paediatricians in 1969 that this very economic system was coming. He is quoted here by paediatrician Lawrence Dunegay:

The bringing in of the new system he said probably would occur on a weekend in the winter. Everything would shut down on Friday evening and Monday morning when everybody wakened there would be an announcement that the New System was in place. During the process in getting the United States ready for these changes everybody would be busier with less leisure time and less opportunity to really look about and see what was going on around them.

Ticking all the boxes

The Climate Cult and New Wokeness, manipulated by the same force behind the pandemic, disgustingly exploited the ‘virus’ economic crash to impose the Green New Deal, racism and migrant agendas with the utterly ludicrous Nancy Pelosi-led Democrats insisting that any government financial support must be dependent on companies employing diversity officers and accepting carbon emission targets. New Woke New York Mayor Bill de Blasio linked the ‘pandemic’ to ‘structural racism’. We are truly dealing with heartless psychopathy here and you watch the Climate Cult use the economic fall-out of the ‘virus’ response to push for deindustrialisation and the Cult’s new economic system. The Gate-Daves World Economic Forum published the most

pathetically predictable article headed: 'How COVID-19 might help us win the fight against climate change'. You don't say. The author was Victoria Crawford, Project Lead, Environmental Resilience, at the World Economic Forum Geneva. She said:

While we are reeling in the shock of what is happening around us and coming to terms with our new reality, we could seize this moment as a unique window of opportunity to re-build our society and economy as we want it. With scientists warning we have 10 years left to avoid the worst consequences of climate change, this could offer an opportunity to fix the climate crisis before it's too late. A number of shifts brought on by the COVID-19 emergency lay the groundwork for the transformation required.

Which is, of course, one reason why the virus hoax was perpetrated. Calls soon began for the Marxist, technocratic, 'Green New Deal' to be the foundation of any economic recovery and the almost permanently scowling puppet-child that is Greta Thunberg pronounced: 'Whether we like it or not the world has changed, it looks completely different from how it did a few months ago, and it will probably not look the same again, and we are going to have to choose a new way forward.' Oh, and what way would that be, Greta? Ahh, your way – or rather the way of the adults that control you from the shadows: 'If one single virus can destroy economies in a matter of weeks, it shows we are not thinking long term and we are not taking these risks into account', said the saviour of the world. Shakes head, moves on. New York congresswoman Alexandria Ocasio-Cortez, a face of the Green New Deal, surveyed the economic devastation faced by Americans and said of the oil price collapse: 'You absolutely love to see it. This along with record low interest rates means it's the right time for a worker-led mass investment in green infrastructure to save our planet.' The narcissism and lack of self-awareness is breathtaking. Brian May, guitarist with the band Queen, cited eating meat as the cause of the 'virus' as he promoted veganism. May said he had gone into protective isolation early because he 'saw it coming'. I wonder how many have seen him coming? New Woke Germany closed its border to visitors from Europe, but migrants claiming asylum from the Middle East and Africa were still allowed to enter. Something similar was naturally happening in Sweden. Efforts to stop migrants continuing to enter the United States to take well-paid jobs until Americans recovered from the economic hurricane were blocked – of course they were. One Cult agenda could not be allowed to get in the way of another and every opportunity was taken to cash-in on the manipulated panic. George Soros demanded that prisoners be released from jail because of the 'pandemic' to advance his efforts to create the 'jungle environment' described in Cult documents and

thousands in jail for serious crime were set free. Typical of the New Woke mentality planned to be unleashed in the wake of the 'pandemic' is British actor Idris Elba who told TV host Oprah Winfrey that the Earth had created the virus to, in effect, punish humanity:

We've damaged our world. And, you know, it's no surprise that our world is reacting to the human race. It's no surprise that a virus has been created that is going to slow us down and ultimately make us think differently about our world and ourselves. ... For me, that's a standout thing that's very obvious. This is almost the world's cry out to say 'Hey! You're kicking me! What you're doing is not good. So I'll get rid of you!'

Get the message – humans are dangerous and so much so the government says you need to stay six feet away from any of them. Humans are to be feared. They are horrible. The ridiculous Elba also told Winfrey that he had tested positive with coronavirus and was 'recovering well' without developing any symptoms. The rather obvious contradiction between the Earth getting rid of humans with a virus from which he was 'recovering well' with no symptoms seemed to pass him by, but then the New Woke mind is good at that. Maybe the Earth is just crap at mass human genocide and leaves it to the Cult. Another ticked box has been the Cult assault on religion (any community group working in mutual support) with churches closed by law – some never to reopen again. This drove a juggernaut through the freedoms enshrined in the American Constitution and the Bill of Rights which were shredded by the Cult and its fascist operatives and in doing their political goons were acting illegally.

The sequence

The major Cult centre of China came out of the 'pandemic' better than anyone even though the 'virus' is supposed to have started there. Look at the sequence of events and you can make that because it started there. It was vital for the pandemic scam to work for the lockdown response blueprint to be secured from the beginning as described in the Rockefeller Foundation pandemic scenario document of 2010. The frenzy about a deadly virus circulating in Wuhan was met with dramatic fascist lockdowns by the Cult-controlled Chinese authorities with people locked in their homes to die of starvation and others pulled off the streets or from their homes who ended up who knows where? The cases and deaths reported by the Chinese from the 'new virus' suddenly and miraculously started to recede down to a reported nothing. This is what can happen when your 'pandemic' is the result of fake diagnosis in a city notorious for respiratory disease because of its profoundly toxic air. Add to this that Wuhan was the first 5G 'smart city' and the potential

to fake a health crisis is limitless. I stress that I am not talking about fake as in no one died, but as in what they died from and what was causing their symptoms – potentially everything from long exposure to toxic air to particular 5G frequencies. The key was to set in place the perception of the most effective way to respond to the 'virus' when it was said to have spread to the West and Tedros, the Gates stooge at the World Health Organization, was immediately on-message praising China for its actions and pointing to the Chinese response as how the West should act when the 'deadly virus' arrived. For the Cult deception to succeed this had to be severe lockdowns and the closure of businesses that would collapse the world economy and independent livelihoods. Just as this was being imposed in the West China began its economic recovery to secure more control and power over the ailing Western world. Locked-down Wuhan became locked-down target West (Figs 388 and 389).

Italy was the next media focus of attention to terrify the population in the West, and their out-of-the-loop politicians, with what could be coming to every country. This terror was underpinned by the outrageous death projections pouring off the computers at Imperial College. What they didn't tell you is that the centre of the Italian



Figure 388: What happened in China would be repeated in other countries – exactly as planned once the blueprint response was created.



Figure 389: Turning tourists in Venice.

'epidemic' of 'Covid-19' was a mirror of Wuhan in terms of infamously toxic air, the subsequent respiratory disease, and exceedingly high death rates. This was a region also recently introduced to 5G. The Italian government locked down the entire country from March 9th, 2020, as cases and deaths increased through fraudulent diagnosis of lung disease by other causes as 'Covid-19'. Public gatherings of every kind were banned including sporting events and all except essential and approved travel. People had to show forms at checkpoints explaining why they were travelling and there were fines of 5200 for



Figure 390: Social distancing.



Figure 391: This is how it works and the 'pandemic' is a classic example.

happened in Italy further embedded the belief that lockdowns were imperative to 'save us' and other countries followed one by one like dominoes falling as they followed the same centrally-dictated Cult script. It's all a mind game. It is amazing how few people and key positions you need to control to dictate policy throughout an entire pyramidal system, be that in terms of government policy or top-down instructions to doctors and medical staff. This is done through a combination of Cult psychopaths (the very few) and clueless people who carry out the policy without question or challenge (Fig 391).

Follow the money – dependency

Economies were affected even more seriously by so much global production and supply being handed to China decade after decade by major Cult corporations to take advantage of slave labour while jobs were deleted at home. There is, irony of ironies, an almost total dependence on China for American drugs including antibiotics – a reported 96 percent of which are sourced to China. Similar dependency will be found in other countries. ABC News reported that around 80 percent of the active ingredients used by American companies in drug manufacturing come from China and some say more. The government-controlled (everything is) official Chinese news service published an article as the 'virus' expanded gloating at the country's control over

being outside 'for no reason'. There were threats of long jail sentences for anyone who knowingly had the 'virus' (tested positive for genetic material, not the virus) failing to isolate and 'infecting' others who subsequently died. Law enforcement roamed the empty streets with surveillance drones ensuring compliance with house arrest (Fig 390). It was like a scene – appropriately – from a Hollywood dystopian sci-fi movie and the same sequence followed in other lockdown countries with fines or jail for those leaving their homes without authorisation. What

drug supplies to the United States and speculated on what would happen to Americans if China cut off those supplies. Why would America be so stupid as to become dependent for drugs and other basic products on a country we are told is the 'enemy'? It's not American stupidity in terms of the public, but Cult design through its Big Pharma cartel and compliant politicians while the Cult-controlled media provide cover for the Chinese dictators. The New Woke American media and other extremists said that to call the outbreak the 'Chinese virus' or 'Wuhan virus' was 'racism'. Presidential candidate Joe Biden said referring to the coronavirus as a 'foreign virus' was 'xenophobia'. Criticism of China is racist when the Chinese system is incredibly racist. Observe the New Woke/media theme of protecting the Chinese technocracy whether the subject is the fake 'virus' or 'climate change'. Similar US and global dependency is being manipulated by the hour on Israeli smart and cyber technology with dependency on both China and Israel connected to the same planned outcome. In the end China is supposed to win this economic and possible even full-blown 'war', not the United States, with Sabbatian-Frankists out of Israel systematically destroying America to ensure a global society based on the Chinese model. I say 'China' is supposed to win, but I don't mean the country or its people. The Chinese model is planned to globally win with the Cult out of Israel at the helm, not the current Chinese dictatorship which answers to the Cult anyway. Look how much stronger China is now in relation to the West than it was before the 'virus' began in China. Claims about a bioweapon released from the Wuhan lab further fuels the fire for conflict with China which is the Cult plan. This does not mean that a bioweapon release (or the appearance of one using 60 GHz 5G) is not part of the Cult plan at some point. When the 'prophet' Bill Gates says that a bioweapon could be his 'pandemic Z' to follow what he calls 'pandemic F' it's important to take note.

Survival response triggered? Yes - now we can do anything

The pandemic scenario is more psychological manipulation playing off the public's fear of death and the unknown to elicit the desired reaction and support for tyranny. An added bonus is that humanity's innate fear of death and the unknown means that large swathes of the population have no problem with the most authoritarian response so long as they believe it will protect them from death and disease. Once the 'virus' hysteria was unleashed what followed was easily predictable as events and actions took on a life and momentum of their own with extreme authoritarian action taken to 'protect the people' amid public fear and panic. Israel, for example, changed the law to allow phones of coronavirus cases to be legally tracked and Google, Apple and other Cult fronts announced they were sharing user location data with

governments to track the movements of citizens, detect gatherings and enforce social distancing compliance. France was among the first governments to demand this and others followed. In Britain, Europe, North America and across the world the population was faced with the full imposition of the state (the Cult global state in fact) through police and military - the combination planned for the Hunger Games global society. India began giving indelible hand stamps to people suspected of having the virus. Reuters reported that the Trump White House ordered federal health officials to treat top-level coronavirus meetings as classified which Reuters described as 'an unusual step that has restricted information and hampered the US government's response to the contagion, according to four Trump administration officials'. The classification was apparently ordered in mid-January, 2020, by the National Security Council (NSC) and government officials speaking anonymously were quoted as saying that this prevented experts in the field from taking part in meetings. Other reports have made it clear when dots are connected that the NSC was directing the response to the 'virus' along with the Pentagon and intelligence community which together with government administrators and law enforcement form the fascistic Deep State (owned by the Cult). This should have red flags flying from every pole. Every opportunity was taken to advance all aspects of the Cult agenda I have been exposing for decades. This included restrictions on legally buying guns in the United States with many gun stores forcibly shut down and the ultra-Zionist-owned New York Times somehow managing to blame Christians for the 'outbreak'. Clueless politicians just trotted along behind Cult agents and agencies doing whatever they were told.

Divide and rule made literal

Nothing divides a community faster than the fear that others may be carriers of a disease and could give it to you. People have been driven further apart and into further mistrust through what has been dubbed 'social distancing' which is defined as 'reducing the contact people have with each other' to include 'reducing socialising in public places such as entertainment or sports events, reducing our use of non-essential public transport or recommending more home working.' Populations were ordered to stay six feet from each other and not gather in a group of more than two unless they lived in the same home. A quick-step version of the Totalitarian Tiptoe was evident as they swiftly moved through ever more authoritarian measures which had not been considered necessary only days before. I call it the push-the-gate technique. You push the first gate and if there is no resistance you move on to the next one and push that. If there is no resistance you go on to the next, and so on. People were standing in line into the distance outside supermarkets

on a one-in, one-out, basis no matter if the sun was shining or it was pouring with rain and blowing a gale (great for health). People just complied without question or challenge. The brainless controlled by the heartless just announced the next stage of the tyranny and like laboratory animals the great majority did whatever they were told. They may be the brainless controlled by the heartless but they are in positions of authority and so we must do what they say. Thus, in a sentence, you have the foundation of human control since humans came into existence. A predictable public response followed as panic buying (the survival response) emptied shops of food and other products (Fig. 392). I went to a local supermarket which had been normal two days earlier and as I



Figure 392: News report on panic buying. What happens when the reptilian brain survival instinct kicks in. Never mind the rest of you it's all about ME.

went to walk in a guy on the droid who wasn't usually there said that I had to go to the back of the queue. There was so much space between people that I didn't even notice a queue. What queue? I asked. He pointed and there rolling back as far as I could see was this line of people all six feet apart – and this was in a quiet time in the middle of the day. Goodness knows what it was like in the busy periods. I never went

back again to find out. Why was this suddenly necessary when it had not been considered to be so throughout the 'virus' hysteria right up to that day? No one seemed to be asking. How easy it is to impose anything in the face of unquestioning compliance (Fig. 393).

The police-military state

Draconian laws enforcing these impositions that suspended freedom and democracy were predicted to go on for months, even more than a year, and drive people apart in exactly the way the Cult requires to connect them ever more powerfully in wave-connection relationship with AI technology through which human interaction is conducted during 'social distancing'. The psychology is again that humans are *ungentus* (see 'global warming') and AI technology is *safe*. We should not forget either that while billions can clearly be locked away under house arrest on a global scale their only other means of communication – the Internet – is controlled by Cult agencies and can be switched off any time they choose. *And a few people can't control the world?? Have no illusions that this is part of the plan at some point if we go on acting like rabbits frozen by the headlights of an oncoming truck. Democracy suspended, freedom deleted, but, hey, what's the problem? We have*



Figure 393: Freedom deleted – it is so easy. (Image by Neil Huggie.)

surely learned from the experience what some of us have been pointing out all along: The police and military are not there to protect human rights and freedom. They are there to impose the will of the state (the few) on the rest of humanity. There are genuine people in the police and military and I most certainly acknowledge that, but alongside them are idiots and psychopaths who have been orgasmic in the new era of unchecked power. To think that some of the moronic people in uniform that have been caught on phone cameras have actually been given power over people's lives. Police (and military in some countries) set up roadblocks to question people on where they were going and why. It was straight from the Nazi/communist playbook for good reason – it was fascism/communism or more accurately the fast-emerging police/military state of the Hunger Games Society technocracy.

Streets were tracked by drones straight out of dystopian (pre-emptive programming) movies with some used to bark orders from the air at the public below. Police extremists like those in Derbyshire, England, New York and elsewhere even used drones to track individuals walking in the countryside far from any other human being. In the case of New York and other American states the drones were gifted by *Clam* which would have access to the data. The UK's Derbyshire police, led by Chief Constable, Peter Goodman, were clearly overcome with excitement at the near-unlimited powers they were given by 'emergency laws'. Goodman's legendary New Woke intellect includes removing Derbyshire Constabulary's male voice choir from any association with his force because they refused to accept women members. It's a male-voice choir with a particular sound, but don't waste your breath telling Goodman as he continues to seek help in working that out. Goodman's Derbyshire officers even poured black dye in a beauty spot called the Blue Lagoon to 'deter visitors' from going there and stopped and warned my son, Jaymie, for walking his dog miles away from the next

nearest person. They insisted that he walked the dog in his village where there were a lot more people. This made no sense, but it wasn't meant to. Endless and constant examples of such imbecility were imposed to get people used to unquestioned compliance like training a dog not to shit in the house. We even had Nick Adderley, Chief Constable of Northamptonshire in the English Midlands, threatening to have his officers check supermarket trolleys to see if people were buying 'non-essential' items. The level of fascistic idiocy required to make such a statement defies my imagination and at least he was quickly slapped back by political and public reaction. Manchester police connected 'dangerous people' with anyone posting 'conspiracy theories' online. The UK government decreed that people could only leave their homes as little as possible to buy food and to exercise once a day. How could exercising outside 10 times a day be any more 'dangerous' than going out once if you don't go near anyone else? Of course it isn't and how much brain power is required to see that? People were told not to go out in their cars for 'non-essential' travel when the idea that driving alone in a car could possibly pass on a 'virus' to anyone is sheer lunacy. The whole nonsensical charade was only to program compliance. I have been out whenever I choose and I have asked for a uniform or dark suit to explain to me how doing that while not going within six feet of anyone can be any more danger than doing so once. I have said I will stop doing that if they can give me a rational, intelligent, credible explanation for why there are added dangers. I am still waiting. Police in 'free Germany' arrested a medical lawyer Beate Bahner in the southern state of Baden-Württemberg for launching a legal challenge to the lockdown with their version of the Supreme Court and she was held in a mental facility. The Nazis never went away. They just changed their disguise – until now.

This is what happens when you put power-crazed psychopaths and idiots in uniform. The Cult knows that when you give fascist power to the power-crazy they will exploit that and take it to extremes. Psychopaths are naturally attracted to positions of power over others and while there are many decent, genuine police officers there are a very large number of psychopaths in uniform worldwide and this has become obvious in the lockdowns. The authorities and their police enforcers went further by setting up networks for the public to report anyone 'violating lockdown laws' just like the infamous Stasi in Communist East Germany. This was instigated everywhere. Eric Garcetti, the ridiculous and fascistic mayor of Los Angeles, urged the public to 'snitch' on those that 'violated' stay-at-home laws and promised that those that did would be rewarded. He talked about 'hunting down' those that did not comply with his Nazi-like dictates. None of this must be forgotten and enemies of freedom like Garcetti,

Goodman, Adderley, and the long, long list of politicians, officials and law enforcement personnel who have deleted not only human rights, but independent livelihoods, must be held to account and removed from office. They have all shown they cannot be trusted with the most basic freedoms and rights. With so much of the human race little more than software programs responding to 'enter' extraordinary numbers of people were insisting on the deletion of their own freedom and quite willing to report neighbours and others for violating even the fine detail of the fascism. Some even reported neighbours for going into their own garden more than once. You have to be utterly and totally unconscious to do that, but you see how tenuous freedom really is when even those who should be demanding it are willing to aid its destruction. Cue Morpheus:

The Matrix is a system, Neo. That system is our enemy. But when you're inside, you look around, what do you see? Businessmen, teachers, lawyers, carpenters. The very minds of the people we are trying to save. But until we do, these people are still a part of that system and that makes them our enemy. You have to understand, most of these people are not ready to be unplugged. And many of them are so inured, so hopelessly dependent on the system, that they will fight to protect it.

How right that has been shown to be during current events. One woman told the media how she was 'named and shamed' by neighbours on Facebook for not joining in the weekly mass clapping for health workers, most of whom were working hard every day trying to find things to do in near-empty hospitals. She said she missed the (connected) clapping after a 'rough night with my son' and was told she 'didn't deserve to use the NHS if I or my family get ill'. What a bunch of utter numbskulls. Tell them anything and they will believe it so long as you have a position of authority. All that consciousness always available and yet so little accessed.

The media makes fascism possible (as it did in Germany)

Another group that must be held to account are the mainstream media without which the scam could not have succeeded. Fear and chaos are the Cult's currency of control and the 'virus' propoganda triggered that in unlimited abundance. What people believe about a 'danger' is all that matters and the media was deployed as always to terrify the population. I say 'deployed', but most didn't need 'deploying' when their unresearched ignorance did the job without any encouragement. One guy I heard typified the media approach in general worldwide. I switched on the car radio just twice during the hysteria to a show on the UK's TalkRadio station presented by a bloke called Mike Graham who

refers to his slot as the *Independent Republic of Mike Graham*. I wonder how 'independent', as in 'not of the system', that the following could be considered. Within seconds of turning on the first time Mr Graham announced that 'Covid-19' was 'the greatest health crisis the world has ever seen'. That would include the Black Death would it, Mr Graham, which wiped out up to 60 per cent of Europe's entire population? What utter garbage. The second time I heard him Graham was immediately into a rant about people whinging over the loss of freedom and talk of troops imposing a lockdown. If that was what the government said must happen we should just accept it, pronounced the 'independent' Mr Graham (Fig 394). This is the same chap who I heard a few months earlier saying that not allowing unvaccinated children to go to school was 'fair enough'. Former CNN host Piers Morgan, a legend in his own mind, screamed (he always screams) that Britain must go into lockdown to 'save lives' because that is what the experts say. Who are these experts, Mr Morgan? What is their background? Do they have an agenda? Who are they connected to? Does what they say about the 'virus' actually make sense in the world of fact rather than unthinking emotion? Such questions would not have breached his 'I am right' narcissism, but the consequences for the population, in terms of livelihoods and freedom, have been utterly catastrophic. Morgan and Graham were fine, though, because they were designated by the



Figure 394: How the few control the many and the global media.

government to be doing 'essential work' which I define in this case as propaganda. The Morgans and Grahams live in the permanent illusion (like most of their profession) that they are 'journalists' and we had best leave them to their self-delusion and move on. Press-enter people should not be journalists because press-enter people cannot be journalists. Proper journalists

don't press enter – they question everything. Instead we have fake 'journalists' helping to perceptually program great swathes of the global population that also question nothing.

Even more sinister than the merchants of repeated government propaganda are those in the media who have actively worked to undermine and censor those outside the mainstream who are willing to engage in real journalism. The BBC has been among the worst which will shock very few and none with a mind of their own. The Corporation

is funded by a compulsory annual 'licence fee' so the public can be forced to provide the funds for this department of government to program the same public with the official version of everything. Licence-fee payers are funding their own perceptual programming and they may consider that it's time to stop. First of all you simply cannot be a journalist by any proper definition and work for the BBC and the mainstream in general, but especially with organisations like the BBC. A proper journalist looks at all claims and information and then investigates to see if they stand up to scrutiny. Those findings are then communicated without any spin or censorship. By contrast the BBC does not employ journalists. They employ parrots of the government narrative. BBC and other mainstream 'journalists' must operate within clearly defined parameters which means there is a huge array of possibility that they cannot investigate, pursue or communicate. To do so would see the information blocked before ever going to air or getting in a newspaper. If something did slip through in a live situation it would be career suicide. I should also define what I mean by 'official' and 'government' narrative. The BBC often claims to be accused of bias by both Left and Right and so accusations of systematic bias to one side cannot be justified. Oh, but it *is*. I am not saying the BBC is institutionally biased to a political government, but to the *permanent* government or Cult government. Often the Cult narrative will coincide with the political government of the day, as with the unquestioning repetition of the official 'pandemic' story; but at other times the BBC will be at odds with the political government like it was with the Boris Johnson government over Brexit and is with any government that does not slavishly sing from the climate change song sheet. I cannot think of a single aspect of the Cult agenda – orchestrated through the permanent government – that the BBC has not promoted while censoring or marginalising alternative views.

All these strands came together in a report by a BBC 'journalist' called Leo Kellion about YouTube deleting my interview with London Real during the 'virus' hysteria. First of all he took the 5C angle which was only a relatively small part of the conversation and tried to link what I said with people who were claimed to have damaged 5G masts in a protest against the affects. Kellion then said that I 'falsely claimed' there is a link between 5G and the 'health crisis'. This was the 'crisis' happening amid empty hospitals that he would not have dared to acknowledge. He had no idea if it was 'false' or not and he merely entrained his 'mind' as always with establishment sources. If Kellion ever did research the subject properly and see through his own 'fake news' he would never be allowed to say so on the BBC and if he tried he would be out the door. He knows that and behaves like a good little boy with an eye on the mortgage. Meanwhile, Ofcom, the government

broadcast regulator, had threatened any outlet that allowed even discussion of the possible link between 5G and the 'virus'. Why? Because there is one, that's why. Kelton and his like would not dream of rising from their knees and ceasing to worship and pay homage to the government appointed Ofcom chief, the patron saint of censorship and freedom deletion, Melanie Dawes. He's a good lad, a perfect BBC asset – he does what he's told and knows his place. Most sinister, however, was the way he described how YouTube 'changed its rules after the BBC questioned why the video was permitted'. He questioned 'why the video was permitted'?? An excuse-for-a-journalist working for a publicly-funded broadcaster played a part in the censorship of freedom of speech?? Extraordinary. No one who seeks to censor freedom of expression or asks why it was not done can even come close to being a journalist. Real journalists are in the frontline of demanding freedom for everyone – including those they don't agree with. The BBC 'competitor' known as ITV (Independent Television, I kid you not) did something similar. It said that 'shortly after ITV News contacted Facebook, the video was removed for breaking misinformation rules'. I guess that was just a coincidence was it? Fake journalists help to get real journalism silenced. ITV mirrored the BBC line with 'Facebook has followed YouTube in removing a video of conspiracy theorist David Icke falsely linking coronavirus and 5G'. What research had the writer done on the subject? None. How did ITV or Facebook know what was 'misinformation'? Facebook had the answer: 'The World Health Organization (WHO) are providing us with clear guidance on what misinformation in relation to Covid-19 could lead to real-world harm.' What can you do except laugh? Newspapers covered the story in much the same way including a 'journalist' on the London Sun, Charlotte Edwards. The Sun is owned by Rupert Murdoch (as is Mike Graham's TalkRadio) and Murdoch newspapers in Australia played a major role in getting me banned from the country by an Immigration Minister, David Coleman, who admitted in 'his' judgement that I had done nothing wrong on any of my previous long list of speaking tours. Edwards said that I made 'the false claim that a coronavirus vaccine will include nanotechnology microchips'. Ms Edwards does not have a clue if the statement is false or not. I have been researching the subject for 30 years – she has not been researching it for 30 seconds. This is still more confirmation that the mainstream media does not employ real journalists and they most certainly will never be employed by anything to do with Murdoch. Then the (Gates-connected) Comcast, NBC/Universal-owned CNBC in the United States begged that its intervention had led to Spotify deleting one of my 'virus' interviews. All this effort by the 'all-mighty Elite' just to stop 'little me'. Actually, to go to these lengths over one man shows that they are not 'mighty' at all as

they desperately sought to remove all trace of me while at every stage they were giving me more credibility and gathering ever more support for my work. No amount of evil can prevail over one open heart.

Banned by YouTube and Facebook – the sequence

The classic 'coming out' of a 'journalist' censor was an Israel-obsessed bloke called Nick Cohen on the London Guardian website who writes a column for its sister paper, the Observer. These are the most New Woke of UK papers along with the hilariously-named Independent. The Guardian and Observer take every permanent government narrative and repeat it as Gospel truth while promoting themselves as 'radical' and 'of the Left'. Among the funders of the Guardian group is Bill Gates who also gives money to the BBC, ABC and National Public Radio in the United States, and a list of other media. This Nick Cohen chap said with no evidence whatsoever that I was a danger to public health and that I should be banned from YouTube and social media and then went on to repeat the permanent government narrative in archetypal Guardian/Observer fashion. He's entitled to his opinion – he just doesn't think that others should be given the same freedom. I support his right to free speech while he wants to delete mine. Which of us is an agent of tyranny, one could legitimately ask? Cohen described what I say as 'toxic lies' and called for government censor Ofcom to be given the power to censor YouTube content in the same way that it does with UK broadcasters. He also lamented the fact that a video of mine entitled 'Is there a virus?' was still allowed to be seen by the public. The man writing this is under the bizarre impression that he is a 'journalist'. Anyone buying the Guardian or Observer is not taking themselves seriously and the reason newspapers are now struggling to survive is that ever-larger swathes of the public have both sussed the real role of mainstream newspapers and media and gone beyond them in terms of understanding the world. Their days are over and they have been their own executioner. Suicide I think they call it. One other point relates to Cult-asset Wikipedia and the relentless recorded visits to my page during the 'pandemic' by the 'notorious' Wikipedia 'editor' known as 'Philip Andrew Cross'. Don't fall for the 'people's encyclopaedia' crap – Wikipedia is controlled by very few people. One Internet article described 'Cross' in this way:

He's the obsessive, at a night-and-day, 365-days a year Wikipedia editor and online stalker whose account is used to pursue personal and political vendettas, but who, despite great publicity in the spring of 2018 about his activities, which included articles in many media outlets and a BBC World Service radio documentary, is still persecuting people – (or allowing people to be persecuted from his account), on a daily basis.

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At the time of writing the Philip Cross account had made a staggering 159,607 Wikipedia edits in a fifteen-year period. Incredibly the Cross account did not take a single day off from editing Wikipedia from 29th August 2013 to 14th May 2018. Not even on five consecutive Christmas Days ...

Well, old 'Cross' (clearly more than one person) seemed to be obsessed with my page when I began to challenge the 'virus' narrative and to give you an example 'he' took just 19 minutes after Nick Cohen tweeted his 'ban lcke' article for it to be added to my Wikipedia page. They think they are so clever when they're really hilarious. I just laugh and hope that one day, through trial and error, they might get a life. Cohen headed his tweet with archetypal New Woke self-delusion and inversion: 'The liberal case for banning David lcke' (my emphasis). You see what I mean about hilarious. When you have been researching the global conspiracy as long as I have, you recognise recurring patterns and sequences. Cohen's article felt to me like the start of something aimed at getting me deleted from mainstream platforms. He is an ultra-Zionist who sees 'anti-Semitism' everywhere and has attacked Jewish people with a mind of their own about Israel. The Canary website dubbed Cohen a 'racist hate-goblin' for doing so. The label 'anti-Semite' is constantly used to silence those exposing getting too close to the truth and it is the calling card of the Jew-hating Sabbatian-Frankist network of the Cult. I am not saying that people like Cohen know they are serving the interests of the Sabbatian-Frankists - I would certainly not credit him with the intelligence or awareness to know that; but in his obsession with labelling critics of the Sabbatian-Frankist government of Israel as 'anti-Semites' this is what he is doing and there is a whole vast network doing the same in various levels of knowledge of the agenda they are serving from zero to totally in the loop.

Pretty much immediately after Cohen's demand that I be deleted from YouTube and social media platforms came the 'campaign' to clear the same and by a strange group called The Center for Countering Digital Hate (CCDH). This is a man and a dog organisation registered as a private limited British company while using the American spelling of 'Center' in its title. The CCDH is funded by the ultra-Zionist Pears Foundation which is a big red flag to me and its patron is a D-list UK 'celebrity', another ultra-Zionist sees-anti-Semitism-everywhere character called Rachael Riley. The Pears Foundation established the Pears Institute for the Study of Antisemitism in 2010 and has a funding partnership with the ultra-Zionist Charles and Lynn Schusterman Foundation. Lynn Schusterman was born a Rothschild. Another funder of this bunch of prats at 'Digital Hate' is Unbound Philanthropy which has links to George Soros and his Open Society Foundations. Unbound

Philanthropy is described as a 'New York City-based left-wing [New Woke] donor affinity group that primarily funds groups that support left of centre liberal expansionist immigration policies'. I guess after reading the book this far you won't be shocked. The serious American connections to the Center for Countering Digital Hate would explain the spelling of 'Center' in the name of a 'UK' company. Taryn Higashi, Executive Director of Unbound Philanthropy, sits on a Soros Open Society Foundations advisory board and specialises in promoting immigration and 'refugee issues'. Yet another use 'anti-Semitism'-to-silence-your-targets operation in the UK is Hope not Hate, which I say should be more accurately called 'Hate not Hope'. They have sought to have me censored by ironically hurling hate in my direction and they are vocal supporters of the Center for Countering Digital Hate. Purely by coincidence you understand Hate Not Hope has been funded by ... Unbound Philanthropy. Further Digital Hate funders include the Barrow Cadbury Trust, Joseph Rowntree Charitable Trust and the Laura Kinross Foundation.

Soon after Nick Cohen's Observer article Digital Hate produced a 'report' on how many people had seen my information on YouTube and social media about the 'pandemic' and demanded that I be deleted. They estimated '30 million', but they were way too low in their numbers. The 'report' was outrageous in its inaccuracies and manipulation of information. Among those acknowledged for their input were Dr David Allington of Kings College London; Dr Rob Ford, University of Manchester, Jonathan Sebire from something called 'Signify', and Dr Siobhain McAndrew, University of Bristol, who is a director of the Center for Countering Digital Hate. Signify is an 'ethical science data company' that clearly believes that 'ethics' should include silencing people they don't agree with and it apparently wants 'to show the world that AI and big data can build social empathy and inspire better products and policies'. Meanwhile Sebire, who appeared to be obsessed with people staying at home, was showing the world he doesn't give a damn about freedom of speech and opinions. The Digital Hate rabble announced they would now seek to have me banned from all mainstream Internet using the hashtag #Deplatformlcke. They claim to be an 'anti-hate' organisation and yet targeted me for what I was saying about the pandemic hoax. Ugh? Why? To serve their masters, of course, who just want me silenced by any means or excuse. Almost immediately afterwards while Digital Hate was crowing pathetically that they had '800 signatures' on a petition (wow!) Facebook pulled my page with three quarters of a million followers (despite the seriously extreme shadow banning and suppression of numbers that went on for five years) and YouTube deleted my channel and all my videos. In doing so they denied nearly a million subscribers from seeing them. The 'petition'

was signed by such intellectual giants as MP Damian Collins, as well as 'celebrity' TV medics Dr Christian Jessen, Dr Dawn Harper and Dr Pixie McKenna who all appear in a television series called *Embarrassing Bodies*. It ought to be called simply *Embarrassing Surely?* This is the same Christian Jessen who said in a media report on March 13th, 2020, that Italian people were using the coronavirus outbreak as an excuse to have a 'long siesta'. He said of the 'virus': 'I think it's an epidemic lived out more in the press than in reality ... I mean if you think about flu right, without getting too heavy, flu kills thousands every single year.' He added: 'This is like a bad cold really, let's be honest.' He then signs a petition to have me banned for underplaying the danger of the 'virus'. Yes, words fall me, too. D-list TV 'celebrity' Rachael Riley, patron of the Digital Hate group, tweeted on news of my ban:

The hate preacher was banned from Australia. Big arenas have rejected him, yet social media orgs allow him a megaphone (& pocket the profits). Facebook have finally deleted him today!!

She's a lovely lady, so kind, so supportive of human rights, and believes passionately in freedom – for herself. She didn't mention of course that the other bans she refers to were the result of the same lies and disinformation by the same global network. I have seen the pattern so many times of man and a dog organisations being set up to demand something and then getting what they demand. YouTube of the fascism-facilitating Susan Wojcicki said they deleted decades of my videos because they had received a 'complaint'. Oh, you mean the one you knew was coming, Ms Wojcicki? Facebook said that I had breached its 'community standards' (delete anyone challenging the narrative of the deeply corrupt Gates WHO) by posting 'health misinformation that could cause physical harm'. It was straight out of the Event 201 'simulation' run by the Gates Foundation six weeks before the 'virus pandemic' began.

The 'Digital Hate' silence-locks network

People who support my work worldwide in the now hundreds of millions at least were naturally furious and the Center for Countering Digital Hate Twitter page was inundated. A supporter began to investigate the organisation, nominally headed by 'chief executive' Imran Ahmed. Their website included an 'Our People' section that consisted only of images of Ahmed with one of Rachel Riley taking a selfie with him. The organisation has many connections and the citizen journalist uncovered that two of its directors (they keep changing) – plus CEO Ahmed – were people with extremely close connections to the UK Labour Party of 'leader' Keir Starmer, who I said earlier lives on his

knees with his tongue extended pointing to Tel Aviv. One of the Digital Hate directors named by the group is Morgan McSweeney – campaign manager to Starmer in his bid for the leadership. McSweeney is a central player in Labour Together Ltd, 'a group of committed Labour members, supporters and politicians', based at the same address as the Center for Countering Digital Hate – Langley House, Park Road, East Finchley, London. The Labour Party was hijacked by ultra-Zionism and Sabbatian-Frankists during the spineless lack of leadership of the previous incumbent, Jeremy backbone-deleted Corbyn. Labour Together's leading light and director is the ultra-Zionist Trevor Chinn, funder of ultra-Zionist arse-dicker Labour figures like Tony Blair, Ruth Smeeth, Liz Kendall, Tom Watson and Keir Starmer. The Labour Party is further controlled by a group called Momentum which is the work of Zionises Jon Lansman, James Schneider and Adam Klug. Momentum has also campaigned to have me silenced and produced a video claiming that criticism and exposure of the House of Rothschild is 'anti-Semitism'. Exposure of a global elite banking family is a no-go area to a group that supposed to represent the working class? But you get what is really going on. I say 'group'. In fact all these 'groups' that I've mentioned, including 'Digital Hate', are private limited companies.

Another Digital Hate director is Kirsty McNeil who was a Senior Advisor at 10 Downing Street for three years and a speechwriter for Labour Party Prime Minister Gordon Brown. Having unfortunately heard some of his speeches she obviously wasn't very good. She is now Executive Director of Policy, Advocacy and Campaign at Save the Children UK and a director of the Holocaust Educational Trust. It turns out that 'Chief Executive' Imran Ahmed has 'worked as a political advisor to senior Labour politicians from across Labour's political spectrum for eight years, including in three elections and two referendums'. He wrote a book with Labour MP for Wallasey, Angela Eagle, called *The New Serbian* which I guess must include censoring those that challenge The System. The emergence of the Center for Countering Digital Hate involved a further recurring pattern. The first mention appears to have come predictably in the *Guardian* on September 18th, 2019, in an article headlined: 'The Best Way to Deal With Online Trolls, Do Like Rachel Riley and Starve Them of Oxygen'. Another appeared on the BBC website – equally predictably. One commentator said: 'It certainly is remarkable that major news outlets would be interested in the launch of a brand new NGO with no track record, which means that the CCDH is clearly very well connected.' Oh, just a little bit. It is part of a vast worldwide web of censorship – see Postscript for more on this.

The BBC and others allowed this rabble to attack me without ever asking for a reply or setting up a debate with me. The same is true of the

entire mainstream media even throughout the future about what I was saying and the multiple bans that were happening, I could be attacked and demonised at will without even a right of reply. What gutless and compromised people they are who masquerade as 'journalists'. The Brain of Britain that is TalkRadio's 'independent' Mike Graham attacked me for 'screaming' over what I was saying about the pandemic scam and its goal of global control. Naturally he never had me on to debate with him. Rupert Murdoch and Ofcom's Melanie Dawes would have smacked his bum. To show just how out of touch and meaningless the mainstream media has become with its falling audiences a third interview I did with London Real about the 'virus' and the reason it was being hoaxed got a massive audience worldwide – said to be more than a million – when streamed through non-YouTube sources. Ironically the interview was also streamed live on YouTube and apparently attracted the biggest live-stream audience in the world on the platform that day before Susan Wojcicki adjusted her spinning knicker gussets, screamed very loudly, and had it pulled. Next the ultra-Zionist and Labour Party-dominated Center for Countering Digital Hate produced another 'report' demanding that London Real and others who have even interviewed me should be deleted in the same way and all videos with me on any other YouTube channel be taken down. Fascism, anyone? This is the road to Orwell's 'unperson' – someone whose existence was erased from all records. This is how terrified the Cult is of me and with good reason. I am their worst nightmare and every day they confirm that with their desperation to silence me.

Neocan NewsGuard

The Digital Hate group didn't manage to get Twitter to pull my account and so along came another elite censorship front called 'NewsGuard'. I received this email from a Kendrick McDonald, NewsGuard's 'Deputy Editor of Rapid Response'. When I had finished laughing at such a ludicrous title I got round to read what it said:

My name is Kendrick and I'm a reporter with NewsGuard, a service that reviews the credibility and transparency of websites. I'm reaching out because we are publishing a report highlighting Twitter accounts with high follower counts who have shared what we have found to be COVID-19 misinformation to their large audiences.

We are including David Icke's Twitter account based on posts reviewed by NewsGuard that have falsely connected 5G technology to the spread of coronavirus.

If David Icke has an on-the-record comment in response, or if you have one

on his behalf, please let me know as soon as possible. We intend to publish our report the morning of Thursday, May 7 (EST).

I pointed out that being a 'reporter' or 'journalist' and working for NewsGuard was a contradiction in terms and it was simply not possible to do both. I asked him to send me the 'evidence' he had – with sources – that what I posted on Twitter was disinformation and I would not accept as a 'source' that 'the authorities said'. As the book goes to print nearly two months later I am still waiting. Americans Gordon Crovitz and Steven Brill co-founded NewsGuard. Crovitz is former publisher of The Wall Street Journal and Executive Vice President of Dow Jones, current member of the Council on Foreign Relations (CFR), and on the board of the American Association of Rhodes Scholars. I mentioned the CFR earlier in the book as a Cult front within the London-based Round Table secret society network and Rhodes Scholars are named after Cecil Rhodes, the Rothschild agent who was the first head of the Round Table and plundered southern Africa for the Rothschilds. Rhodes Scholarships to Oxford University are awarded to those handpicked to serve the elite as adults. Bill Clinton has been among them. Gordon Crovitz has connections to the Neocan American Enterprise Institute with its close associations in mutual ideology and personnel with the 9/11 and 'war on terror' Project for the New American Century. Steven Brill is a Zionist lawyer, journalist, and 'entrepreneur'. He and Crovitz say they created NewsGuard to stop 'fake news' when the real reason is to protect the real fake news by downgrading and demonising websites that expose the real fake news spewing from the official narratives by the minute. Hence NewsGuard squeezed out from under its stone to target me. The following day after the NewsGuard contact a fulfilment company called James and James in Northampton, England, which had been delivering my books to customers for five years with not a problem suddenly told us they were cancelling the contract. They sent us an email out of nowhere that was not even addressed 'Dear Jaymie' when my son had worked directly with them the whole five years. The email was from 'CEO' James Hyde, co-owner with another bloke called James Strachan. It said:

Dear Sir/Madam,

Whilst we appreciate the rights of free speech within the UK, our business does not support the views held by David Icke and does not wish to be associated with those points of view, or David Icke Books in general.

I wonder how many customers would want to work with a company that would deliver their product – in this case books – for five years and

then tell them out of the blue that they are no longer going to do so because 'our business does not support the views held by you and does not wish to be associated with those points of view, or you in general'. So why did they not think this for five years and only in the middle of a war to silence me and my work coming from all angles? Well, obviously the question answers itself and it is the very spinelessness and lack of integrity displayed by this pair that allows the few to control the many. *The Answer* was not published and they had no idea what the content was anyway and so they were 'not supporting' views in books they had actually been delivering for five years. Pressure had been put on them and they dissolved like a snowball in the sunshine out of pure self-interest – end of story. They couldn't even be honest about it. Only a few weeks earlier James and James had secured investment of £11 million from a company called LDC, part of Lloyds Banking Group. The chairman of Lloyds Banking Group is Conservative Party politician Lord Norman Blackwell who serves on the board of Ofcom that has sought through its CEO Melanie Dawes to silence me and exposure of 5G which it enthusiastically promotes in an extraordinary conflict of interest. Are these two James chaps really saying that their company will only fulfil orders for books and other products with which they personally agree? Maybe other potential customers might ask if that is the attitude they want to be associated with. I wish I had a pound for every time I have seen the words 'whilst we appreciate the rights of free speech' being followed by support for destroying them. They will have to live with that decision now for the rest of their lives. I wish them well because I couldn't.

In the same period that I was being banned and deleted in all directions by Cult diktat the super intelligence that is Polly Boiko of Russian station RT re-emerged seven months after she interviewed me for a broadcast 'in a few days' which had never seen the light of day. She wrote an article on the RT website giving an account of our meeting all those months earlier, but still without using the interview. She couldn't believe that the establishment was really frightened of me while at the same time somehow ignoring the fact that the establishment was engaged in a frenzy of deletion of my work. Boiko's most memorable line in her patronising garbage was this: '...from the secret web controlling our every move to the perils of vaccines (there aren't any perils, by the way)'. Those words were actually written by a 'journalist' while the Vaccine Court in the United States alone had already paid out \$42 billion in vaccine injury and death compensation against a ridiculously high bar to prove your case. These are the people telling you what is going on in the world, ladies and gentlemen. Yeah, I weep, too.

By contrast one mainstream television station called London Live did

run an interview that I did with London Real at the start of the 'pandemic' scare in Britain which YouTube had not then deleted. Well, their fellow 'journalists' in the mainstream and the regulator Ofcom, so beloved of Nick Cohen, simply could not move for severely twisted knickers and running in all directions at the same time while shouting 'fire'. Ofcom 'imposed a sanction' on the London Live station for broadcasting 'potentially harmful content about the coronavirus pandemic' by which they meant that my interview actually broadcast potentially harmful content about the mendacious official story – which Ofcom exists to defend and clearly Nick Cohen, too. The government censor said: 'While Ofcom acknowledges that Icke has a right to hold and express these views [it doesn't], they risked causing significant harm to viewers who may have been particularly vulnerable at the time of broadcast.' What harm would that be, oh Goddess of Censorship, Melanie Dawes? She doesn't say Ofcom said that it was 'particularly concerned' by my comments 'casting doubt on the motives behind official health advice to protect the public from the virus' – a line that 'journalist' Cohen also emphasised. No one must ever cast doubt on the motives of officialdom even though their actions have destroyed the lives and livelihoods of billions and their lie alter lie that a child could take apart. In that one sentence Ms Dawes and Ofcom you have revealed all we need to know about you and what your job really is. The same goes for Gates, Zuckerberg, Brin, Page, Wejricki, Levinson and Cook at Apple, Musk, Soros, Bezos, the bloody lot of them. One other thing to mention is the role of clickbait sites claimed to be part of the 'alternative' media which make up stories using made up 'writers' quoting made up people and are easily discredited by elite-serving 'fact-checkers'. In doing so, they discredit in the eyes of many the genuine alternative media. Two of the worst are Los Angeles-based Youmewswire.com and NewsPundit.com (owned by the same people) which turn out knowingly fake stories credited to a 'writer' called 'Baxter Dmitry' who doesn't exist. To think that those that own those sites would do this given what humanity is facing is beyond my comprehension.

What next?

The question of where we go from here unless people wake up fast was laid out earlier in the book even before the 'pandemic' hoax broke cover in China and I will focus here on the 'what next?' in relation to the 'virus' deceit. Having secured so much of its global Orwellian nightmare since the turn of 2020 the Cult will want to retain as much of its new police-military state as possible even when public pressure, defiance of the lockdown, and ever-gathering revelations about the nature of the hoax, force some respite from the worst extremes. They will certainly seek to limit gatherings to avoid mass protest with YouTube and Silicon

Valley censoring footage of any protests on the grounds of 'encouraging illegal activity'. The Cult makes the laws and then bans challenge to them or even videos recording any challenge. 'New waves' of the 'virus' will follow and especially just before the Gates vaccine is ready to be imposed globally. These may even appear again to come out of China. 'Researchers' in Cult-owned China said the 'virus' they have never isolated would keep 'returning in waves every year just like the flu'. We'd better have permanent lockdown then, right? Watch for protesters against the lockdowns being blamed for subsequent 'waves'. You will hear claims about the 'virus' mutating into other strains and that 'recovering' from the 'virus' does not infer immunity so making the case that everyone must be vaccinated even those who have 'had the disease'. People do not have 'immunity' to 'Covid-19' because there is no 'Covid-19' and how can they not keep testing positive when the test is for a genetic code in their body and not a 'disease'? How do you develop immunity to a genetic code that is not a 'disease'? See how much control you have of a situation when you invent a 'virus' that doesn't exist. Gates has already revealed the Cult strategy with his arrogant pronouncement that nothing can go back to 'normal' until the entire human population has been injected with the long-planned, carefully-prepared and Gates-funded toxic shite and nanochips. He has been supported in this no-normal-till-a-vaccine-by ultra-Zionist Ezekiel Emanuel, Vice Provost for Global Initiatives at the University of Pennsylvania and hilariously chair of the Department of Medical Ethics and Health Policy. Emanuel's father was a member of the terrorist group Irgun which bombed and terrorised Israel into existence in 1948 and he's the brother of former Chicago mayor Rahm Emanuel, long-time Svengali ('a person who exercises a controlling influence on another, especially for a sinister purpose') to President Barack Obama. Ezekiel Emanuel also seems to have a problem with old people living for as long as possible. He said the lockdowns had to continue until a vaccine was found: 'The truth is we have no choice.' US TV host Tucker Carlson delivered a brilliant reply:

When a political operative like Zeke Emanuel, someone with a long history of lying, begins a sentence with 'the truth is' you should probably be on guard. When he ends that sentence with 'we have no choice' you should be terrified.

Just as the pressure was mounting to end the lockdowns the Gates-funded Professor Neil Ferguson and Imperial College, who prompted the lockdowns with shockingly inaccurate computer model projections, produced more 'models' in an effort to stop the lockdowns being rolled back. Ferguson said at the end of April before being forced to resign over his lover's visits that at least 100,000 could die in the UK by the end of

the year if a gradual lockdown was implemented only to shield the elderly. He said it was impossible to send the young and healthy back to work while keeping the vulnerable in lockdown without seeing a huge increase in deaths. 'Professor Ferguson said some degree of social isolation will continue to be required until a vaccine to the killer bug is released', Mail Online reported. This man's doom-laden interventions at just the right time to secure the lockdowns and then his attempts to stop a roll-back surely cannot be explained away purely by idiocy and he must be subject to an open and independent public inquiry for the absolute catastrophic mayhem and human devastation that his 'models' have created. The same goes for the Cult-controlled Johns Hopkins operation in the United States that took part in the Gates 'simulation' Event 201, ran its own one called Code X and has circulated the blatantly and shockingly false death figures to media and public worldwide. The Gates crowd are pressing for a vaccine to 'save us' from a 'virus' never proved to exist and even if you do accept its existence one which has remarkably low death rates only made possible by fixing the death certificates and numbers. For the Cult mass vaccine plan to succeed, played out through Gates, this information must be kept from the great majority of the global population through ever-more severe censorship by Cult media organisations. My banned videos which are now estimated to have been seen by tens of millions worldwide thanks to circulation by 'The People' have helped to throw a spanner in that works and this book will contribute still further. Please circulate news of the videos and this book to as many as you can.

Food control

Another crucial aspect of the Cult plan for total control is to manipulate a global food shortage to allow them to dictate all food distribution and who gets to eat. This will be decided by the level of unquestioning compliance. So how comforting it is that the Gates Foundation is 'partnering' (funding) the UK Department for International Development in work on 'food security'. Pffew. The groundwork for food shortages is already well underway and includes driving independent farmers out of business and off the land – something that the 'pandemic' lockdowns will do in great numbers. Farmers have lost their markets by the closure of restaurants and hotels while other supply chains and markets have not replaced them. At the same time there are enormous and ever-growing numbers of hungry people. Ten thousand cars lined up overnight on one occasion alone in San Antonio, Texas, hoping to get something to eat from a food bank which was already unable to cope with demand as with others across the world. Produce rots on the trees and in the ground as farmers go under and the population goes hungry. One farmer said: 'We are being forced to

What is *The Answer*?

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plough under vegetable crops from coast to coast.' It's all coldly calculated to create mass dependence and control through hunger even famine. Eventually 'food' is planned to be only synthetic and strictly rationed as the new synthetic human emerges thanks to nano-chips from the vaccine and other sources fusing the human body with technology and AI. Guess who is partnering with Cult 'food' giant Tyson Foods to promote laboratory-produced synthetic 'meat'? Yes, Bill Gates. The focused and concerted attack on restaurants, cafes and other independent food outlets are part of this attempt to control and transform 'food'.

Then there is 5G. The power of 5G transmissions will increase exponentially the more it is expanded and 5G devices are in use. The effect on human health and psychology will expand at the same rate. These effects, which can be made to be severe, will be dubbed 'the virus' – 'Covid-19' or others – and be used to justify further lockdowns. I still have in mind those, on the face of it, crazy increases in hospital bed capacity and mega-mortuaries when the 'virus' does not begin to justify that. Maybe it's all just to ramp up the fear, or maybe it's not. 5G at that particular frequency like 60 GHz has the potential to run riot with human health and psychology. People must demand that 5G is switched off and not take no for an answer. Pandemics are not the only dice that the Cult is going to throw – there will be shocks and challenges and reasons to fear of all kinds as they seek to sprint for their finishing line of total control; but we can be bigger and more powerful than they are. We simply have to make that choice.

A peaceful revolution of mass non-cooperation with our own enslavement is urgently required to state the very obvious. Indeed 'urgent' understates speed at which we must respond. As I write protest and defiance of lockdown is beginning to mount, but we have to demand and accept nothing less than truly independent inquiries into what has happened and all those involved brought to book and sent to jail for the rest of their 'human' lives. Ultra-Zionist Democrat Adam Schiff has already made moves to hijack any inquiry in the United States in the way that happened after 9/11 when those involved in those attacks also oversaw the 'inquiry' into them (see *The Trigger*). Schiff needs to be told this is not happening this time around and he can fuck off. Gates should not only be jailed, but have his mega-billions confiscated and shared out among those whose lives and livelihoods he and those he represents have destroyed. It is not only time for The People just 'to sing' as in *Les Misérables*, but to roar. Peacefully, yes, but ROAR in non-cooperation with our own enslavement. Nothing less will do.

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The Answer has multiple strands, but one central core. Change what is happening at the core and everything else must change. This cause and effect is so simple that it will be dismissed by many in the belief that *The Answer* to the apparent complexity of human control must be equally complex. No, no, no. That's what the Cult wants us to think.

The control system itself is not really complex, anyway, when you break it down to fundamentals. Its foundation is the manipulation of human perception and emotion into low-vibrational states and the entanglement of the waves emitted by those states with the frequency band controlled by the Cult. Through this connection the Cult further impacts on human perception and emotion in an ongoing feedback loop. *Godda* (Fig 396). That's it really. All the perceived complexities are spin offs from that connection through entanglement. These include

everything from psychopathy, conflict and division to depression, anxiety and addiction. All result from the Cult mentality (psychopathy), the consequences for the population (depression/anxiety), and the desperation to escape from the effect (addiction). There are two ways to deal with a problem. You can seek a solution or remove the cause. Search for solutions and you will see complexity. Identify the cause and you will see simplicity. While we are in a low-vibrational state of perception and consciousness we remain enslaved in the low-vibrational Archontic simulation. When we expand into higher-vibrational states we reconnect with levels of awareness



Figure 396 Locked away in the human eggshell of solidified perception. (Image by Neil Heggie.)

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CHAPTER SEVENTEEN

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everything from psychopathy, conflict and division to depression, anxiety and addiction. All result from the Cult mentality (psychopathy), the consequences for the population (depression/anxiety), and the desperation to escape from the effect (addiction). There are two ways to deal with a problem. You can seek a solution or remove the cause. Search for solutions and you will see complexity. Identify the cause and you will see simplicity. While we are in a low-vibrational state of perception and consciousness we remain enmeshed in the low-vibrational Archaonic simulation. When we expand into higher-vibrational states we reconnect with levels of awareness



Figure 395: Locked away in the human signal of solidified perception.

outside the simulation which then stops dictating all our perceptions and the world as it really is – and as really are – comes into focus. Many 'gurus' and 'spiritual teachers' will tell you (often for their own benefit) that the way to achieve such expansion of consciousness is also complex. We must embark on quests, fasting, meditation, yoga, and lots of communal rituals, endless 'workshops', and green tea. I beg to differ. All those things are fine if people choose to go that way and I'm sure they can be helpful to many, but expanding your consciousness to breach the firewalls of the Cult is far simpler and requires just one change – your self-identity.

What you think you are makes you what you are in terms of life experience, behaviour, perception, emotion and the nature of the waves that you emit as frequency projections of what you think you are. Self-identity is the Cult's Holy Grail because it knows that everything else comes from that. For centuries it has used religion to sell a self-identity of powerless subordinates to a demanding 'god' (the Cult and its unseen masters). Do what your 'god' wants or face the fires of hell and our agents (most unknowingly) in long frocks will tell you what 'god' wants, or rather what we want. Many versions of what I call the 'God Program' have been created and subdivided. This again presents the illusion of complexity when the God Program is deadly simple whatever name may appear on the temple door or 'holy book'. Observe any religion and it's the same blueprint: A version of 'god' or the 'gods' is invented through a holy book, text or legend, and men in frocks, now sometimes women, tell you what 'god' or the 'gods' demand and the consequences of disobedience. Christianity, Islam, Judaism, and Hinduism are all the same in their foundation structure and method of operation. Jewish influence on society and self-identity is way beyond its 0.2 percent of the world population and a key reason is the perceptual influence of its religion, especially on Christianity. Fear is the currency of control and religions are vehicles to frighten the population into compliance through fear of the consequences of not acquiescing to what your 'God' (the Cult) demands you must be and do.

When many began to reject religion other self-identities were employed to ensnare perception and dictate low-frequency wave transmissions. The Cult unleashed mainstream 'science' to tell us that we are a cosmic accident of 'evolution' and we don't exist before conception or after death. There is no other 'you' except the one that you see in the mirror and identify with through a series of labels given and learned during an apparently meaningless lifetime of minutes or decades in which you make the journey from cradle to grave. Er, that's it. If you accept this ridiculous concept you are accepting the narrowest band of self-identity that will hold you fast within the firewalls of the simulation. Today even those self-identities and labels are being

subdivided and sub-sub-subdivided into ever greater myopia as New Woke drowns in the five-ense illusion of pansexual, polysexual, monosexual, allosexual, androsexual, gynosexual, asexual, emisexual, grey asexual, perioriented, varioriented, heteronormative, cisbet, polyamorous, monomorous and queer to sadly name only a few. With each new sub-identity the Bubble gets ever smaller and the vibrational disconnect with the True 'I' ever more profound. The Cult knows how we interact with reality while the target population in general does not and it mercilessly exploits this perceptual superiority. All human self-identity prisons are dependent on the flux in The Web not questioning their current sense of reality. The illusions are peddled by Cult advocates and unknowing promoters seeking to impose their reality on others through techniques of overt or covert compulsion. It's not enough for me to believe what I do – you must believe it, too, because I am right! You'll see this recurring mentality and technique throughout history in almost every culture and setting. Silicon Valley censorship is doing the same today in the latest incarnation. Nazi book-burning has become the digital book-burning of Cult-owned Big Tech. The Cult manipulates minds into smaller and smaller self-identities and many of those that succumb make it their life's work to impose them on everyone else.

Limits of mind are only limits of perception

The consequences of the self-identity label illusion are catastrophic for human and spiritual freedom for another reason. Your sense of self dictates the scale of consciousness, or True Self, that you can access. Perceptual myopia becomes awareness myopia in another feedback loop of ongoing ignorance (Fig 396). Believe that you are only your labels and the scale of accessed consciousness reflects that sense of limitation. Your scale of accessed consciousness feeds-back this sense of limitation to confirm that you are only your labels. Round and round the garden it goes often for an entire human lifetime. The Cult, working for its 'gods',

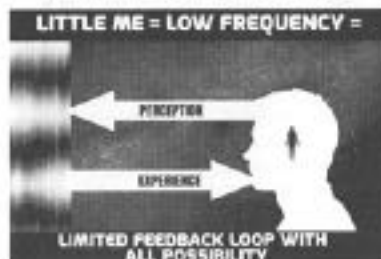


Figure 396: What you believe you will experience.

has structured society to achieve this end. There is, you will be delighted to know, a way to break this cycle: Change your self-identity. Ask most people who they are and they will give you a list of labels – gender, race, job, age, birthplace, life history; but the labels are not who we are. People define themselves by the

job they do when it doesn't matter if you are sweeping the streets (vital work by the way) or a movie star (less than vital work). You are the



Figure 397: Ditch the Labels - they are not YOU. They are only brief happenings that YOU are experiencing.



Figure 398: The One is always speaking to you. Bust the Bubble and you will hear.

a point of attention within. *Infinite Forever* having a brief experience as something called 'human' is the awareness that 'human' is merely the filtering and processing of information into a particular sense of reality? How about the size of my point of attention, whether myopic or infinite, is down to me and how much of my mind I am prepared to open? Now we're blissy talking. Shift your self-identity from I am my labels to I am

same *All That Is* having different experiences. It's just a job - it's not YOU! Labels are only a series of experiences happening in little more than a blink of an eye (Fig 397). I am heading into my 70s and a human life flies by so fast. It seems only yesterday that I was in love with Janice in class 3A and dreaming of being a footballer. When you compare that with the infinity of no-time forever a human life as it is perceived

hardly exists. Yet within this fragment of illusory 'time' our identity with labels directs and dictates everything. I-am-a this, I-am-a that. To re-word a song of the 1960s. I-am-a in the morning, I-am-a in the evening ... all over this land. I-am-a is the human perceptual Bubble that manifests as a vibrational Bubble. We are not an 'I-am-a' anything. We just are. The One is always speaking to you. Bust the Bubble and you will hear (Fig 398).

If people feel they need an I-am-a then how about *I-am-a All That Is, Has Been and Ever Can Be?* Even that is a name and so can only partially describe the force with no name and all names. How about a self-identity that says I am

an expression of the *Infinite One* and everything starts to change. I can say this with confidence because that is what happened to me. Everything I have done since I consciously began to awaken from the human coma in 1990 has come from that transformation of self-identity. No questing, fasting, meditation, yoga, communal rituals, endless 'workshops', or green tea opened my mind to expanded awareness. I remembered step-by-step who I really am and who we all really are and that transformation of self-identity transformed everything. *Anyone* can start the process anytime by ditching the identification with labels and seeing them as transitory experiences of the True Self. The One in awareness of itself talks to us in the silence beyond words and the synchronicity or language of life. We only have to listen.

The transformation of perceived self from Little Me to Infinite Me immediately starts to unravel the firewalls of self-identity perception that have been holding the Bubble together. You realise there never has been a Little Me only a programmed perception of one (Fig 399). Your consciousness begins to move and stir from its density - its perceptual stagnation. You can't create a Bubble unless you believe you are a



Figure 399: Little Me only exists in a programmed mind.



Figure 400: All 'awakening' really is.

Bubble. You can't be entrapped in limitation unless you believe you are limited. You are not. You are All-Possibility, All-Potential, which the Cult is desperate for you to forget. 'Waking up' is only remembering what you've always known on the other side of the firewall (Fig 400). Now with your entrapped awareness freeing itself from the Bubble-wrap of label self-identity your perceptions expand as your consciousness expands. In fact, it is not even your consciousness expanding. It is your point of attention expanding into ever greater swathes of Infinite Awareness (Fig 401 overleaf). Little Me is expanding into Big Me and ultimately Infinite Me. I am not saying that changing your sense of



Figure 401: What you believe you will experience.

self will bring immediate 'enlightenment'. Self-identity with *All That Is* has to be a being and not just an intellectual concept. Many people are convinced of their own awakeness and enlightenment when they are prisoners of an intellectual sense of infinite identity. It's not *Me*; it's still an

intellectual concept external to them. You can observe this in the New Age movement and pseudo-spiritual movements where the mind convinces itself that it is something it's not. Intellectual 'awakeness' does not match its words with its actions and New Wokeness is the prime example. A New Ager once told me that she had given herself 'permission' to see more of her young relatives. *Permission?* Who is giving who 'permission' or what is giving what? Expanded consciousness does not give itself permission to do anything. It just does it.

Consciousness in awareness of the True T, as opposed to having a concept of the True T, is an integration or wholeness that you might call *Isness*. Even that is a label too far, but you get my point. It just is and doesn't require labels to identify itself to itself. It moves as one 'unit' rather than different parts that require 'permission' from each other. The intellect *thinks* while *Isness knows* as a conscious expression of that which *does know*. By knowing I don't mean in the form of names and dates, or touch it, taste it, see it, smell it, hear it, 'proof'. *Isness knowing* comes without words, for it exists beyond the human firewall where words are not necessary. Words are concepts of the simulation that are used to overcome induced limits of awareness that deny direct communication through consciousness. Words draw people into the five senses while knowing beyond words takes us home. Is it really a coincidence that near-death experiencers, and those that claim extraterrestrial interaction, say that communication was not by word, but by knowing? Again and again we have the theme of 'he communicated to me without words - I just knew what he was saying to me.' Even such examples of telepathy are only a low level of knowing without words and not the full-blown *Isness* that I am describing. We refer to knowing in the human experience as 'intuition' and this is predictably dismissed by Cult-controlled mainstream science which polices the realm of the intellect to keep expanded consciousness at bay

while mostly having no idea that it's doing so. Why should we consider nonsense like expanded awareness outside the intellectual brain when my intellect is convinced that I am right?

Unravelling the fake self

The first stage of *The Answer* is to change self-identity from 'I am my labels' to 'I am a unique point of attention within *All That Is*' (Fig.402). This stage is itself often done in smaller stages as the Bubble is picked away little by little although it can just go away as it did for me on that hill in Peru in 1991. I know from the experience how challenging that can be when your sense of reality transforms in a comparative instant. Most people do it in steps and that is far easier although awakening needs to pick up its pace in the light of events. Expanded self-identity translates into expanded awareness as we access more and more of *Infinite Awareness*

(intuitive knowing, insight, wisdom and love in its true sense) and our perceptions of reality consequently expand. It may begin with a feeling that the world is not as it seems to be in the sense that events are not happening for the reasons we hear on the news. At this point you might be considered a 'conspiracy theorist'

and this is where expansion ends for many. To see that daily happenings have other sinister explanations can still be achieved by consciousness confined in a Bubble - albeit a bigger one - within the simulation. The consciousness shift involved will change the waves that such people transmit and they entangle with like-waves in what is called the *alternative or independent media*. They will also entangle with that they wish to investigate and uncover which leads to synchronistic 'coincidences' in which information drops in your lap or arrives by 'amazing chance'. Energy flows where attention goes and when you focus your attention on something this is what happens - you connect with it. If this is the limit of a perceptual shift then consciousness expansion will not reach a state of 'I am Infinity'. It will be more like: 'I am more aware of what is going on than the rest of the public who I shall refer to as "Sheeple"'. This level of awakening will likely still relate



Figure 402: 'Human' is only a point of attention - state of focus - but it does not have to be myopic. You can be 'in' this world but not of it. (Image by Neil Hayes.)

predominantly to the realm of the five senses and even follow a religion or seek understanding through only mainstream science. They will see people like me as strange, weird and 'nutters' in the same way that the mainstream media does. For those who continue the process and expand ever closer to 'I am *All That Is*' – as a being and not just a concept – the

THE REAL 'I'

firewalls of the simulation are eventually breached and amazing changes happen in their wavefield. Perception of self and reality is consequently transformed to one of *Isness*. I am not a body. I am awareness, a state of being aware. Everything else is only the experience of that awareness. All the life history, dramas, upsels, challenges, good times and bad, are only brief and transitory experiences of the

SIMPLY AWARENESS

Figure 403: The True 'I'. Everything else is illusion.

True 'I' – a state of being aware (Fig 403). The 'I' is and it isn't. It exists and it is non-existent. It is All-Possibility and No-Possibility. What it is for you is your choice. As you expand into self-awareness the simulation is not the only source of perception and reality. You are now connecting with consciousness beyond the firewalls and increasingly as the process continues you are in the world in terms of your five senses, but not of the world in terms of your perception of everything. This is why those who begin to awaken from the Bubble suddenly find their lives are peppered with 'coincidences', synchronicity and 'bits of luck'. These are only detailed possibilities that were denied before by the perceptual self-identity limitations of Label Me. The most powerful interaction with The Field is when we know rather than think or hope. Don't think it – know it. Don't hope it – know it. Hope is a complete waste of space. Hope projects you into a 'future' that doesn't exist like kicking a can down the street instead of picking it up. *Knowing* operates in the NOW which is the only 'moment' in which anything can happen. The Cult is quite happy for you to have 'hope'. It knows that can never manifest when 'hope' is attached to the non-existent 'future'. We must have hope? We must know and knowing comes from the heart. As you expand to breach the simulation myopia of random events, or 'dots', you begin to see the patterns and connections. The staggering scale and nature of human control becomes ever clearer. You see that manipulated wars which much of the alternative media believes to be about oil are actually part of a fantastic beyond-Orwellian conspiracy which has its origins not

only off-planet, but in unseen bands of frequency.

When you reach this stage and share your views you will likely be seen as crazy and a sandwich short of a picnic. Your perceptions that come from outside the simulation are being judged by those still entranced by illusions within the simulation. If you are a public figure you will be mercilessly ridiculed and attacked by the media, including much of the 'alternative', and otherwise it will be friends, workmates and even family. If you have truly expanded your awareness to this extent you *don't care* what anyone says about you. Expanded awareness knows that whatever is thrown at you is only another temporary experience that doesn't matter in the great scheme of Infinite Forever. You will also understand why you are being treated this way. People have been through a lifetime of perceptual programming that ingrains a myopic view of self and reality. When you question that programming don't expect a round of applause. I have been asked if I knew what ridicule and abuse would follow when I went public with my views about the world and of course I did. I had worked in the media and seen what happens to those in the public eye who step off the Postage Stamp. I was sprinting away from it and so yes I knew what the reaction would be. I just *didn't care*. I am not the David Icke that they abuse and ridicule. I am the consciousness having the experience called David Icke. 'I' am that which is also observing the experience. Only when I become the experience and self-identify with that do the 'slings and arrows of outrageous fortune' kick in and trigger emotional response. Negative reaction is something that cannot be avoided when you are challenging the very core of perceived human reality. It goes with the territory and we either want to address the domination of the Cult or we don't. If we do there are challenges to face and if your consciousness is expanded enough into 'I am *All That Is*' you will say 'bring it on'. While low-vibrational responses will be hurled our way we don't have to entangle with them and experience their effect. This happens when we react with low-vibrational emotion to low-vibration emotional attacks. There is wave synchronicity and a feedback loop is secured. The perception of being consciousness having a human experience disconnects you from press-enter human responses. You *don't see* reality like the majority do and you don't behave in the predictable way. Human programming and ingrained insecurity fears the reaction of others. Expanded awareness doesn't give a fuck. Its focus is on doing what it believes to be right and not winning a popularity contest or being feted by the Mainstream. Everything. Attacks by the system created and controlled by the Cult are confirmation you are on the right track. It is to be celebrated, not feared, and you can observe the madness from your own point of One-connected peace (Fig 404 overleaf).

Expanded awareness understands that it is not what is done to us



Figure 404: With a connection to The One you can observe the insanity and not be affected. (Image by Coash like.)

which impacts upon our lives so much as how we respond – or don't. If someone directs abuse at you and you become upset and offended the abuser has impacted on your life only because of your reaction which you have the power to dictate and control. It wasn't what was said that hurt you. It was you allowing yourself to be hurt by caring about what was said. If the same

abuse was directed at me and I couldn't care less – let alone be upset and offended – the abuser has not affected my life or emotional state in any way except perhaps to feel sad for anyone that gets off on trying to hurt others. Kids are committing suicide over what others posted on social media. They have been so dismantled by insecurity they feel they can't go on in the face of abuse from idiots, sociopaths and psychopaths. This is what the Cult and its Silicon Valley gangsters are doing to the young. If the system really cared about young people (it doesn't) the emphasis would not be on censoring opinions and views. It would be encouraging and helping people not to be upset and offended by the words of others. 'I think you are useless, ugly and horrible!' And – your point is? I am supposed to be hurt by the opinion of someone who is so imbalanced and mentally disturbed that they glory in hurting others? I think not, mate, now you have a nice day and I hope that at some point you'll get a life. Bye. Not being offended and hurt breaks the feedback loop that abusers seek with abuse leading to upset leading to more abuse. The abuser is actually vampiring the energy of the abused and this can happen when the abused makes a wave entanglement through the resulting upset and offence. No response breaks the wavefield circuit. Abuse is not the problem, it's the reaction, and the more people are upset the more it encourages the abusers to further abuse. The Cult wants people to be upset and offended to justify censorship of alternative information and opinion which is still another way New Woke serves the agenda of human control. The Cult seeks to break the human spirit and then censor hysterically to 'protect' those it has broken from being upset and offended. I did say they were psychopaths, right?

Fear is the control system

Fear is a very a low-frequency state that acts as an anchor to consciousness expansion. We talk about being 'frozen with fear' and

while on the surface there are fight-or-flight biological reasons for that it is a reflection of how fear slows the oscillation rate of the wavefield self and pulls us into density. The Cult seeks to spread fear everywhere – fear of death, fear of the unknown, fear of the 'future', and fear of the consequences of not conforming to its demands (see mass lockdown /house arrest). It is confirmation of global programming and biological (wavefield) press-enter encoding that people in almost every culture tend to react in the same way in similar circumstances – witness all the cultures and religions that all succumbed as one to lockdown house arrest all over the world. You see there is nothing to fear when your consciousness expands into awareness outside the simulation and your true nature comes into view. Death? Well, that's coming for the body at some point anyway. Do we really want to stay in this micro-band of frequency forever? Blamey, perish the thought. Expanded awareness does not fear death which it knows is simply a transfer of attention. Oh, no, I'm terrified!! Save me doctor!! We actually don't 'come' here and then 'go' somewhere else. We withdraw our attention from the focus of



Figure 405: 'Death' which is so frightening to humans is only a shift in your point of attention.

the five senses and with that we are where we have always always been. 'Death' is like removing a virtual reality headset and the Cult's game is to control the nature of that virtual attention we call a human life (Fig 405). I have no wish to ditch the headset before I have done all that I can. Once that point is reached I'll welcome it and be joyous in the freedom from limitation that follows. Fear of the future? What –

fear of something that doesn't exist?? How crazy is that? We live in the Infinite NOW and our experiences are created and visually strung together by our state of perception. Little Me will have a very different 'future' to infinite Me purely by different perceptions leading to different wave frequencies entangling with different wavefields that are people, places, experiences and ways of life. We control our 'future' if only we realised that. Okay, what about fear of the consequences of not conforming? What is the opposite of not conforming? It's conforming and that's how we got into this mess by conforming to religious dogma, 'science' dogma, Postage Stamp dogma. How perfectly the definition of 'dogma' describes them all: 'A fixed, especially religious, belief or set of beliefs that people are expected to accept without any doubts.' If we go

on doing that there will be far more to instigate fear as the Cult surges to its endgame than if we face this up now. Our own perceptual and wavefield state will dictate any 'consequences' anyway and one thing is for sure: If people fall into the frequency of fear they will entangle with the vibrations of the Cult that uses fear as a weapon. What you fear you make a frequency connection with and attract what you fear. Know that you are in control of your life and not the Cult or random chance. This is the revelation they want to keep from you.

The process of consciousness expansion is not about 'seeking enlightenment'. We are already 'enlightened' in the sense that we are and have always been *All That Is*. Expansion of awareness means to delete the perceptual programs that form the firewalls which block the influence of our greater awareness on five-sense-focused Body-Mind. 'Awakening' is not to become something new; it is to remove the barriers to what we already are. Perceptual programs are like low-vibrational onion skins entrapping our 'human self' in the Bubble. Perceptual programs are the Bubble. Persian mystic Rumi said: 'Your task is not to seek for love, but merely to seek and find all the barriers within yourself that you have built against it.' Expansion of awareness can only happen when the mind opens and to do that all current beliefs and preconceived ideas have to be set aside. Imagine you have cleared your home of all extraneous clutter or started with a blank sheet of paper. Nothing is ruled in and nothing ruled out. Using a computer analogy you prepare to reboot or 'shut down and restart' and enter the realm of anything is possible. This is as it should be when you are *All-Possibility*. What you allow on to that piece of paper – your revised sense of reality – is now decided by what you intuitively know to be right and what can be supported by the facts as they appear to be. This is no longer decided by repetition of the same information or by what some systems-appointed, system-programmed, academic or scientist tells you; nor by some newswriter or excuse for a journalist. Expanding consciousness remains light on its feet and constantly ready to move. It does not allow new perceptions to solidify in the way of the old. It is aware that what we perceive in any moment is only what we perceive in that moment and certainly not all there is to know. Once you believe you've 'got it' in totality you are confirming that you don't. At any point we only know some of what there is to know until consciousness is fully expanded to perceive all consciousness and that requires the full-blown awareness of *The One*. Awareness expands with the understanding voiced by Greek philosopher Socrates when he said that wisdom is knowing how little we know. The full quote says: 'The only true wisdom is in knowing you know nothing.' Awareness of that keeps the mind constantly open to other possibilities and wise enough to see that within Infinite Forever the possibilities are by definition Infinite.

One step, two step

Opening minds cease to be slaves to the program the more their consciousness expands and awakening people don't see the world and reality as the majority do. We can observe this theme throughout perceived human history with open minds standing out from mass conformity and targeted by the Cult enforcing that conformity. The difference today is that the number of minds awakening from the coma is heading towards potentially world-changing proportions although you won't know that if you watch the mainstream news. They'll be the last to see it. What I am saying here can be broken down into fundamentals. You don't have to know all the facts and details to awaken from the Big Sleep. Remember those song lyrics at the start of the book about not knowing all the answers but being set free by asking the questions. There are only two things to remember above all others:

- (1): Your perceptions transmit frequencies reflecting those perceptions and they will entangle with wavefields of like-frequency. In this way we create our own reality and this is the wave-basis of what is referred to as 'karma' – 'the totality of a person's actions in any one of the successive states of that person's existence, thought of as determining the fate of the next stage'. My own definition of wave entanglement 'karma' would be: What you believe you perceive and what you perceive you experience. Take control of your perceptions and you take control of your life.
- (2): Open your heart and you open to *The One* – a move that will expand your awareness faster than any other action. I'll have more on this shortly.

Those two things alone will change your life and collectively change human reality which is only a holographic manifestation of humanity's perception of reality. By perception I mean conscious and subconscious perception. Both generate the wavefields that entangle with perceptually-connected frequencies and I'll come to the subconscious in a second. If you give your power away you won't only entangle with others willing to give their power away to form the human herd mentality. You will also entangle with those that want to seize that power – the Cult. Willing to give away and wanting to take that power generates a compatible and symbiotic frequency alignment. Reflect on other symbiotic alignments that appear on the surface to be opposites and you'll see how we attract what we transmit. Fear of being violently attacked has a symbiotic wavefield relationship (conscious and subconscious) with those that wish to violently attack. In this way one person will be attacked the first time they walk through a park at night while others will make the same journey night after night and never be

attacked. Before New Woke presses the fury button I am not blaming the 'victim'. It is nothing to do with blame. I am explaining the unseen wavefield relationships that lead to events in the world of the seen. Blaming self and others for what happens to us is a mug's game. Self-blame drives us deeper into self-loathing and low-frequency states while making no difference to what we blame ourselves for. Acknowledging behaviour and changing is how you take a negative and transform that into a positive. But, then, is it really always a negative? Or is it an experience that allowed us to see something that otherwise we would not have seen and presented the chance to learn, change, and see through the illusions that we believe to be real? Life often gives us (we give ourselves through wave entanglement) our greatest gifts brilliantly disguised as our worst nightmare. Blaming others for our fate is equally destructive and there is no more profound way to concede our power to others. When we say he or she is responsible for what happened to us we are saying they have power over our lives and we don't. What happened was the result of wave entanglement and that takes two to tango.

I am not saying for a second that people don't act badly towards others and they should take the consequences for those actions that can include wave entanglement with a prison cell. I am making the point that if we leave it there the experience can go on being repeated. If our wavefield frequencies (perceptions) don't change then the same old entanglements must go on generating the same old experiences. I reported for the BBC decades ago on what were then dubbed 'battered wives hostels' where women were given protection from violent partners. Some of the women had been through two, three, even four, partners who were violent. The men should be dealt with who do that, but why did those women keep attracting the same type of violent people? That question has to be addressed to stop it happening and in this case lack of self-esteem will be at the core of it. Lack of self-esteem has a symbiotic frequency relationship with a desire for power over others and crushing self-esteem. See the humanity-Cult relationship. Notice how many women who have the living shit kicked out of them by violent men blame themselves (lack of self-esteem) for what happened. When we take responsibility for attracting what we experience we stop giving our power away – it's all their fault – and we take it back. We are saying that we are in control of our experience and not someone else. We can change the road we travel and who with and not go on repeating the same wave-patterns of behaviour and experience. To do this we need to realise that we *do* control our perceptions which control our wavefields which attract our experience. I have highlighted in detail in my books including this one, how the Cult manipulates humanity, but it is *humanity* that allows that manipulation to prevail. It's no good focusing

everything on the Cult and ignoring the essential role played in human enslavement by humans themselves. A key to *The Answer* is for humanity to take responsibility for that and change direction.

Subconscious perception

The Cult is programming the subconscious mind individually and collectively in the knowledge that corresponding experience will follow. Manipulate the population to fear something and a symbiotic frequency connection will be secured to make what is feared more likely to manifest. Who will manifest it? The targets sell. The point about the subconscious is vital to understand. Our conscious mind is only a fraction of Body-Mind which mostly operates in what is unconscious to the conscious if you get what I mean. It is unconscious to the human conscious although itself very much conscious in its own realm of operation. Here's a quote from earlier:

Every second, 11 million sensations crackle along these (brain) pathways ...

The brain is confronted with an alarming array of images, sounds and smells which it rigorously filters down until it is left with a manageable list of around 40. Thus 40 sensations per second make up what we perceive as reality.

When you think that 40 sensations a second form the perception of the conscious mind and the other 10,999,960 are absorbed by the subconscious it is clear why the subconscious is central to dictating our perceptions, wavefield state and entanglements. Experiences, traumas and other happenings long forgotten by the conscious mind go on affecting subconscious wavefields and generating anything but random events that happen to us. I mentioned earlier how important it is to consciously acknowledge why we attract certain people and experiences or why we have certain fears or health problems. They will invariably be connected to subconscious emotional patterns vibrating away in our wavefields that the conscious mind no longer even thinks about. Maybe a boy or girl you had a crush on at primary school suddenly dumped you out of nowhere and decades later you are married with kids and can't understand why you have a constant fear of your partner walking out on you at any time when there is no conscious reason to believe that will happen. The possibilities are endless. When you make the conscious connection between an experience, fear or health affect, and the source of them in the subconscious, the emotional field is balanced, the wavefield changes, and the experience ceases to repeat along with the fear and health effect. Explore the patterns and see if you can identify the trigger. Some people have eye problems because there is something they don't – or once did not – want to see. Others have health affects in the throat through a subconscious fear of speaking their truth. I have seen many

examples of such patterns over the years and how they were deleted by conscious acknowledgement of the source and cause and effect.

Subconscious connection to both perception and experience is why the Cult focuses so much of its manipulation on subconscious or subliminal programming which includes placing its symbols everywhere as I have already mentioned. Subliminal means 'below-threshold' – below the threshold of the conscious mind – and that allows images and information to by-pass the conscious to be absorbed by the subconscious. Advertisements are awash with them for this reason. Conscious awareness that subliminal manipulation is all around us blocks its effect and the principle is the same as being unconsciously manipulated by people around you which can only be stopped when you become consciously aware of it. The subconscious is the stadium in which the Cult game is played. There is a subliminal message in Figure 406 which apparently only about five percent of people see first time.

Once you become aware of the subliminal insert that's the first thing you see whenever you look at the image again because the conscious mind has been made aware of what is there. This is the power of conscious awareness to override subconscious programs (the subliminal in the image is the word 'sex'). The principle applies to smartphone and 5G frequencies. If you are not aware of their wave affects you are open to have your subconscious accessed by their wavefields and it's the

same if you do know about the dangers and fear them. A combination of acknowledging that those waves exist and what they are designed to do, plus the conscious knowing that you are more powerful than they are, is the best defence – as it is against all wavefields, technological or otherwise, including people, food, drink, pollution, disease, whatever. The body is an expression of the mind.

My almost constant daydreaming is the exploration of deeper levels of unconscious awareness and making them conscious. Bringing reality into a conscious state is vital when keeping us unconscious is the Cult means of manipulation. I don't mean to see everything through the five senses (which are mostly expressing patterns of unconsciousness). The



Figure 406: A subliminal message that most cannot see at first becomes crystal clear every time once awareness is transferred from the subconscious to the conscious.

five senses are irrelevant to this, I simply mean to become conscious of information and patterns of programming that are normally unconscious to humanity in general. Expanding awareness can lead to people healing themselves through the mind as they understand the connections. All illness is a wavefield distortion and the mind is constantly transmitting perceptual frequencies that impact on that field. What you believe you perceive and what you perceive you experience applies just as powerfully with health. If you believe a drug or treatment will heal you the mind transmits that perceptual frequency into the wavefield and balances the imbalance that is causing the problem. The treatment itself may not have had this effect at all. If you believe powerfully enough that it will cure you then belief in the treatment will heal you when the treatment alone would not. This is the 'placebo' effect and it can lead to spontaneous healing which baffles mainstream medicine that doesn't understand what the body is or how it works as an extension of the mind. In reverse we can think ourselves dead if we believe the words of a doctor who tells us we have a certain amount of time to live. Most people do die within that time and not because the doctor's prediction was necessarily accurate. Some have died within the doctor's prognosis only for an autopsy to reveal they did not have what the doctor told them was going to kill them 'within six months'. We all have to go some time or we would be here forever (nightmare), but we have far more power over when that is than most people even begin to believe. This can extend to deciding when we will leave even before we get here by encoding the body oscillation with an end point. We may see this as someone just 'dropping dead out of nowhere'. I mean he was always so fit and healthy. There is more to 'Heaven and Earth' than ever we are allowed to know – unless we choose to know and make it our business to know.

Truth Vibrations

It is important to be aware that other sources of consciousness and awareness well beyond the energetic density and limitation of the Cult are at work in a quest to tease humanity out of its perceptual coma. There are people in the 'world' representing that awareness – symbolically sons and daughters of The One – just as Cult operatives represent their non-human 'gods'. In the early months of my own awakening in 1990, which went 'nuclear' on the hill in Peru in 1991, I met synchronistically a series of professional psychics. I made a conscious decision to meet only one of them, Betty Shine, while the others passed through my life 'coincidentally' one after the other. The common theme they said they were asked to pass on to me was that a 'vibrational change' was coming that is also called 'The Rebalancing'. This energetic change would (1) begin to wake up humanity from what I

would call today the illusion; and (2) would bring to the surface 'all that had been hidden'. I called the first book that I wrote after my awakening began *Truth Vibrations* to describe the effect of this awakening frequency. I didn't just take what the psychics said and believe it without question although the common theme was compelling. It certainly felt right, but I waited and observed. Not much seemed to be happening for years and then it began. Today incredible and ever-increasing numbers of people are questioning reality and the nature of world events like never before. It won't seem like that if you only watch the mainstream media. I have been travelling the world year after year outside the Mainstream. Everything and I can tell you that while it is still far from the majority human perception is stirring across all walks of life and the 'pandemic' lockdowns have caused vast numbers of new people to question the world and what is happening who never did before. It is happening on many levels and, of course, not always as full-blown awakening. The questioning, however, is now so fast gathering pace and people are opening their minds to possibilities they would never have considered before. I meet them all the time when I go out and when I'm travelling and as someone who remembers what it was like 30 years ago I can see the scale of change that is happening. Even what I would term 'System People' are looking afresh at themselves and reality. The part about bringing to the surface all that had been hidden is spectacularly happening. Consider what we know now about the manipulation of the world and the forces behind that compared with when I was told in 1990 about the Truth Vibrations and what they would do. The frenzy of censorship by Silicon Valley and other Cult sources is to a large extent a desperate attempt to thwart this awakening and so is the AI brain connection and Smart Grid. Unfortunately for the Cult they are dealing with levels of awareness far more powerful than it and its masters will ever be in their current state of perception and thus frequency. An understanding of the wave nature of reality and wave entanglement explains how the Truth Vibrations impact on human awareness (Fig 407). They are a high-

frequency information field that change the wavefield oscillation of those they connect with. I was told that the first people to be affected would be the most awake (or least asleep) and eventually even those solid-gold asleep at the time would feel the effect. This does not mean that we can



Figure 407: Truth Vibrations and the Great Awakening.

just sit back and wait for these frequencies to transform everything for better. They are a frequency band and we have to sync with it to be maximally impacted. How do we do that? We open our hearts.

With all one's heart

I talked earlier about the heart as the most potent connection to *The One* way beyond the frequency band of the simulation. The more our heart vortex opens the greater the energetic gateway through which we access love in its prime sense, wisdom, knowing, intelligence, and potentially Infinite Awareness in totality (Fig 408). We feel intuition and love in the centre of the chest for this reason and near-death survivors have



Figure 408: The Answer.

described how when out-of-body they experience the same love (although much more intensely) that we can feel in the body through the heart. One said:

There was all this light and love and rejuvenation ... I felt myself expand within this light like there were no borders and I was just in this light and part of the light ... I felt like I was home. I felt ... weightless ... you don't realise how much you carry in this world [low-vibrational emotional density] and you don't realise until it's gone how light and weightless and free [we are] and expansive and part of something large, huge. It's home and you know it is ... I felt like we are all part of one thing.

Our heart vortex is our connection to *The One* and that's why such love is felt through an open heart (Fig 409). The Cult works so hard to close the heart for its own ends by generating fear, anxiety, depression, hatred, resentment, guilt and other low-vibration emotions that lead to the phrase 'my heart aches'. These emotions move the focus of attention and perception from the heart to the gut and create a feedback loop between the



Figure 409: The Answer.

belly's low-vibrational emotion centre and the head/brain. This oscillation generates perception that is overwhelmingly emotion-dominated and New Woke is a collective example of that. The belly vortex centre should be a phenomenal source of energetic power when in a state of balance and that potential creative power is also diminished by the chaotic impact of low-vibrational emotion. The Cult knows exactly what it's doing, that's for sure. Emotional reaction is constantly mistaken for a heart response thanks to the manipulated misunderstanding of what love really is. Attraction by itself is not love and neither is virtue-signalled emotion. Love in the sense that I am describing is balance – the balance of all forces into wholeness when all constituent parts become *One* and none dominates the other. Each contributes to the whole and none seeks to usurp it. Compassion and empathy only for some people is not love in its Infinite sense. Compassion and empathy for all, not a few, is what I mean by *The One*. Nor is this love only about compassion and empathy. It is wisdom, fairness, justice and Infinite Intelligence. In its dot-connected wholeness love comes from a perspective of dot-connected awareness. Love is therefore streetwise and sees everything from all angles.

The head can process information into a perception that is emotionally influenced by the gut and this can trigger a form of compassion and empathy with the planet, migrants, those that identify as LGBTQQFAGPBDSDM, or those offended by what someone has said. This is only one aspect of Infinite Love and if that's the only level that people access, even if it is to an extent heart-centred, they are babes in arms to the Cult. There is nothing more manipulatable than gonniness that isn't streetwise and this is how New Wokeness becomes a puppet on the strings of the Cult. Firstly much of New Woke is emotion-based, not heart-based, and where the heart is involved only the aspects of *perceived* love that suit the Wokeness become part of the perceptual process. For example: 'I "love" and have compassion and empathy for those of colour and transgender people, but I absolutely hate white men.' This is not the love of *The One* and neither is it compassion and empathy in its purest definition. *The One* love will have empathy with people of colour, transgender, and white men. The circumstances they face illicit the empathy, not the colour or sexuality. Love sees things as they are and does not seek to portray what they are in other terms to serve some personal or collective agenda. Love will have empathy for migrants fleeing war while challenging those migrants running child trafficking gangs. It will have empathy with the kids. I observe the behaviour and responses of New Wokeness and ultra-Zionism and I see hate, not love, while they ironically rail against the perceived 'hate' of others. That's head gut, not heart, and it's also projection – 'an unconscious self-defence mechanism characterised by a person unconsciously attributing

their own issues onto someone or something else as a form of delusion and denial' and 'a way to blame others for your own negative thoughts by repressing them and attributing them to someone else'.

Heart love is not human love

When the heart opens to the point where we connect with *The One* the very idea of judging people by their illusory human labels or self-identifying with them becomes ridiculous and that includes even the term 'human'. We are not 'human'. That's just a brief experience. We are a point of attention within Infinite Awareness and when we delete our Cult-induced perceptual programs we can live that level of self. I don't mean that we merge our uniqueness into a collective 'blob'. We should glory in our uniqueness and sense of personal sovereignty while knowing that we are more than that. We are a unique point of attention and we are *All That Is, Has Been And Ever Can Be*. We should celebrate both, but the idea that Infinite Awareness would self-identify the True 'I' with being human, or even worse with the ever-increasing sub-divisions of 'human', seems insane to a genuinely open heart. The heart understands why people do become their labels amid whole lifetimes of perceptual indoctrination. To understand, however, is not to meekly accept in the face of knock-on consequences for all. Empathy is not always about saying what others would like to hear and often it is the opposite. Protecting children from all challenge which later leaves them at the mercy of the adult world is not empathy or love in its widest sense. How can children and young people – or anyone else – learn and grow from the consequences of their actions if they never face the consequences? This creates emotionally weak people that the Cult has for breakfast, dinner and tea. Empathy and love is not handing children a smartphone on demand out of illusory 'kindness' when the consequences for the child long-term can be disastrous. Love will tell people what they don't want to hear even when it knows the reaction will be negative or abusive. Love does what it believes to be right and does not seek or need the emotional sustenance of praise or a dopamine rush. What I have said about New Wokeness, climate change, mass migration, political correctness, transgender/vegan activists and the 'virus' hoax will be met with much hostility. I know that, but I don't care. What I care about is ensuring the people who attack me don't live the rest of their lives in a global dystopia. Is that love? Or is love telling them what they want to hear to gather more Facebook likes? There are many levels of heart awakening and it's an ongoing process with Cult frequencies pulling the other way until the line is crossed when the influence of the Cult is no more. By then your self-identity has transformed from Label Self to Infinite Self and with that you disentangle your wavefield from The Program and its influence on your

perceptions (Fig 410).

You no longer fear speaking your truth and no sense of intimidation will silence you or impact on the way you live your life. You no longer fear death or see a human experience as who you are. You no longer fear anything except perhaps as a brief biological reaction until expanded awareness

kicks back with the perspective of *The One*. The perceptual feedback loop moves from gut-brain to heart-brain and the way you see the world, people and events comes from a dramatically different point of attention. You are *The One* observing through human eyes and you see Oneness, not apartness, unity, not division. You know that labels are the illusions of a deeply manipulated world. From this perspective comes compassion for people who are still where you once were and even those that are nasty to you and wish you harm. Forgive them for they literally know not what they do.

Heart knows 'The System' is a basket case

You are not long underway in the process of opening heart and mind before all the perceptual pillars of human reality are crumbling. The idea that it matters what religion someone follows or the colour of their skin becomes laughable. How that affects their behaviour towards themselves and others may rightly need to be challenged for its negative impact, but the religious or racial background *in itself* is of no relevance to an awakening heart. When all is said and done and the veil is lifted I am you; you are me; I am everything; and everything is me – and you. Following the rules, regulations and imposed beliefs of any religion is a head-shaker to an opening heart. How can I confine myself to the limits of a 'holy book' often written by who knows who, who knows when, and in who knows what circumstances, when I am *All That Is* and my home is the limitless realm of Infinite Possibility and Infinite Forever? What? I mean – what? Infinite Forever, *All That Is*, should allow its perceptions and experiences to be dictated by a priest, bishop, pope, rabbi or imam? EXCUSE ME? These are not representatives of 'God'. They are largely men appointed by men within man-made structures of earthly power and control. Change men to women with the same view of reality and it would be just the same. Religions are earthly structures

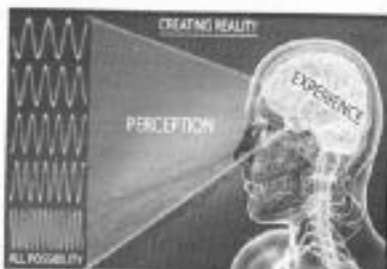


Figure 410. The Answer.

created for earthly reasons and nothing whatsoever to do with reality as it is or awareness that we are. Do what we tell you or the 'God' that we claim to represent will condemn you forever. Give us your mind and power. We have been appointed by 'God' to rule over you, tell you what to think and play you off against those of other religions run by people just like us with a different (often only slightly) set of rules and limitations. You believe you are 'God', an expression of *All That Is*? **BLASPHEMERY!** We are told to accept that within the microscopic perceptual confines of visible light, a smear of 0.005 percent of the Universe, all we need to know to understand self and reality is written, with laughable levels of contradiction, between the covers of a single book or set of books. On the say-so of those books, emerging from the mists of 'history', relating to eras long gone and mistranslated over centuries or thousands of years, our lives and interactions with others must be dictated. On the say-so of some religious icon that often little or nothing is known about we must fall to our knees, face Mecca, wait at a wall, worship a bloke in a frock, or dip in the Ganges. I read this description of a Ganges Hindu ritual:

This impressive religious ritual is held in India every twelve years for 55 days where up to 100 million pilgrims attend for the world's largest religious gathering. The Ganges is the most sacred site for the majority of Hindus, and is a primary destination for karma. Hindus believe the goddess Ganga lived in the river.

Some Hindus believe that during a battle between demons and gods, the kumbh, or pot that contained sacred nectar, spilled four drops of water onto Earth, blessing four cities. The Ganges River flows through these locations. Hindus who bathe in the river or drink from the waters believe they garner good luck. They also believe the river can wash sins away for those who bathe in it. If Hindus spread the ashes of a deceased person on the river, they believe it improves that person's karma, allowing them to achieve salvation faster.

Why do Hindus believe the goddess Ganga lived in the river? Why do they believe that a pot that contained sacred nectar spilled four drops of water onto Earth, blessing four cities? Why do they believe the river can wash sins away or allow the dead to achieve salvation faster? For no other reason than this is what they have been indoctrinated to believe since they were children with serious pressure and consequences for not believing or believing something else. Young people are told who they will marry and the caste system of discrimination dictated by birth all come from this through rules decided thousands of years ago. You find this recurring theme in all major religions. Why do Christians believe

what they do about 'Jesus'? Same. Why do Muslims believe they must submit their will to 'Allah' and obey the dictates of Muhammad? Same. Why do Jews believe they are the Chosen People and a Jewish King will come and gather all Jews to live in Israel? Same. If Christians were born into a Jewish family, or a Jew into Islam, or a Muslim into Christianity, they would believe something different just as vehemently as they believe what they do today. How many people born into Islam convert to the Jewish religion, or vice-versa? How many Christians, Jews or Hindus become Muslims or one of the others? They overwhelmingly follow the religion they were born into because religion is perceptual indoctrination policed by fear and guilt and by threatened or actual consequences. How well this definition of Islam and Muslim, a word meaning 'one who submits', captures the whole nature of religion:

Islam is a complete, holistic way of living that covers every aspect of life. Islam leaves no stone unturned as it teaches mankind on how to behave in every area of life: individual, social, material, moral, ethical, legal, cultural, political, economical, and global.

Think about that and all religions are pretty much the same. Religion tells you, a point of attention within *All That Is*, how to behave 'in every area of life: individual, social, material, moral, ethical, legal, cultural, political, economic, and global'. Forget the 'teaches' bit. They are talking about imposition and indoctrination either directly or psychologically. The Cult loves religion for all these reasons and created them as a perceptual and behavioural Aleatraz. You can't make your own direct connection with *All That Is*. You have to do so through an earthly figure representing earthly interests to maintain your perceptions in the earthly realm. Here is my definition of religion: 'Intergenerational illusion indoctrinated into subsequent generations by those who had it indoctrinated into them.' Religion is yet another perceptual motion machine.

The same religious-control blueprint can be seen with Scientism, New Wokeness, the Climate Cult and Gaia or Earth worship. The theology is decided and then indoctrinated and imposed by repetition and the exclusion, demonisation, and censorship of other possibilities. In that sentence I have described every expression of the God Program from ancient faiths to the Climate Cult and all have their own heroes to focus the attention of the congregation – Jesus, Abraham, Moses, Muhammad, Krishna, Shiva, and Greta Thunberg. Opening hearts can see through the God Program and part of *The Answer* – a big part – is the rejection of myopic religion which hijacks perception and parks it in a cul-de-sac for entire lifetimes. Heart is our connection to the love that is All Possibility and will never concede its Infinity to programmed myopia. It demands

the right and the self-respect to explore its own truth within the infinity of the possible and will not be imprisoned by the beliefs of others no matter what the level of intimidation. I say up yours to all versions of the God Program that seek to impose perception including the theological dogma of 'science' and New Wokeness. They are all firewalls to Infinite Forever. Those words 'that seek to impose perception' are important. What people choose to believe is none of my business and like all of us people take the consequences, nice and not so nice, of wave entanglements those beliefs attract. I am challenging the imposition of those beliefs on others in all the ways I have described. Humanity cannot be free until this imposition is stopped and people awakened by the power of the heart reject perceptual tyranny. If you could see the wavefields of all those who unquestionably follow the dogma of the God Program, in its obvious and less obvious religious forms, they would all be oscillating to the same rhythm. The names on the door may be different, but they are the same perceptual/vibrational state. Freedom by dramatic contrast beats to a different drum.

In search of certainty amid infinite uncertainty

The foundation of the God Program oscillation is a need for certainty and a need to worship an external force in pursuit of certainty. Both are the offspring of insecurity. You cannot have certainty within All Possibility. We need to come to terms with this. The consequences of not doing so are extremely destructive. Most of human life is spent trying to eliminate uncertainty to please insecurity and fear of the unknown. People cling to religious belief 'certainty' and delete any other possibility that would mean a state of uncertainty. Religions of New Woke and the controlling core of mainstream science seek the security of certainty and reject other possibilities. Ignorance can bring a sense of certainty and hence: 'Shut up, I don't want to hear it.' What you don't know, or refuse to know, will not impinge on your self-assembled sense of certainty. Many vehemently reject without a glance information exposing events as they are when their sense of security-promoting certainty is dependent on not knowing. Reality must eventually dawn, of course, and by then we are so far along the road to tyranny, and people so mentally and emotionally ill-equipped to respond, that it's game over. Children and young people are being specifically programmed by schools, universities and society in general to fear uncertainty and not to take risks of any kind. This is the real reason why playground games and childhood pleasures – throwing snowballs, climbing trees, leapfrog, marbles, tag and even skipping – are being increasingly banned by the Thought and Behaviour Police under terms such as 'Health and Safety'. When I was young, hardly in ancient times, these activities and so many more since banned were part of growing up. If you fell over you learned

not to do again what caused you to fall over. You learned from experience and what happens when the experience is taken away? You don't. These activities that were enjoyed outside under the sky in child-to-child interaction have been replaced on purpose by faceless, isolating and behaviour-modifying videogames and social media. Parents are frightened into stopping their kids from going outside alone or with friends. This drives the process of isolation and fearing uncertainty by eliminating every minuscule risk. Fear of uncertainty and risk is squeezing the options and creativity of the young and hands protection from uncertainty to the World State. These in fear of uncertainty look to the authorities to give them perceived certainty by taking away their freedoms and those of the entire population to secure certainty through automation predictability. What are lockdowns and social distancing except the manipulation of certainty? The more that violence and chaos can be infused into society the more solidified becomes this perceptual state. The obsession with uncertainty has even infested professional football with a technology called 'VAR' which assesses every goal in such fine detail that they have been disallowed, often after a long wait, by the position of a player's armpit. Replace human decision-making uncertainty with the certainty (if's not) of technology. Welcome to the technocracy.

Love yourself and you'll love the world

How many who talk of the need for love, compassion and empathy for others have love, compassion and empathy for themselves? They are invariably the one left out. How can I love myself – that's narcissism isn't it? Quite the opposite is true. *Not* loving and having respect for yourself is what leads to narcissism which is a face people put to the world to hide from themselves and others the lack of self-love, self-security and self-respect. These with open hearts aware that all is One don't need to present a fake face to the world. Why would they want to influence another's view of them? What would be the point to a heart that knows its true identity is *All That Is*? Some other questions: Why would the heart desire others to be impressed by a false image of itself? Why would it measure self-worth in Facebook likes and emojis? Who is there to impress when you are already everything? Why would you even want to impress? The intent or desire to impress means that you are changing your real self to meet the perceptual requirements of others. Seek popularity as a goal in itself and it will destroy your uniqueness. You are you – not them. So be you and not them. You are a unique expression of *The One*. It doesn't matter what face you present – real or fake – some people won't like it and often through their own lack of worth. I feel unworthy and I am going to attack you so you feel the same. Are we going to let our sense of worth be defined by others or

ourselves? I say to young people devastated by social media abuse: Don't let anyone define you except yourself. You are a unique expression of *All That Is* – unique – and why would you want to be like anyone else? I don't look right, wear the right clothes, have the right trainers, or say the right things? Who gives a shit? *It doesn't matter*. You only make it appear to matter if you give a shit. *Don't*. You are you and no one else. Some don't like that? Well, tough. They should be what they choose to be and you should extend to yourself that same right and self-respect.

The more you allow yourself to be intimidated by others the more you wave-entangle with them and have them disrupt even further your well-being. I was subjected to mass public ridicule and abuse for decades by people who now read my books, watch my videos and stop me in the street to talk about my information. Walk your own truth, speak your own truth, worship nothing and no one, and if your truth has validity the world will eventually come to you and not the other way round. The herd mentality created the society we live in today and walking away from the herd will set us free. Cooperation and respect for each other does not require perceptual cloning. Is the real nature of respect to 'respect' only those that agree with you? Or is it to respect another's right to a different opinion and lifestyle? The question answers itself. Oh, but what about if people are wrong? The freedom to be wrong (overwhelmingly subjective) is fundamental to all freedom. Once you lose the freedom to be wrong it means that some force is deciding what is right or wrong. We see where that leads with the mass-censorship of 'fake news' that is often not fake at all and only what the authorities don't want people to see. If someone is factually incorrect in what they say about us, and that misrepresentation impacts upon our lives, it is right that we refute that if we believe it is necessary (it usually isn't); but responding to all criticism, ridicule and abuse gives it a power it does not deserve and reveals extremes of insecurity. I see this in mega-tweeter Donald Trump who presents to the world the face of a narcissist full of bravado and confidence. I see a frightened little boy using narcissism and extreme levels of bravado and apparent confidence to hide that frightened little boy from himself and others. See how quickly and vehemently he responds to irrelevant criticism. This is the opposite of real security which I define as not caring what people say about you. I don't mean not to care about anything and we should listen to all views to see if they have validity. I mean not to care what the world thinks of you. That is a freedom and security that has no need for external confirmation of itself. It does not relate its identity to human labels or seek to impose them or compete for superiority with the labels of others. It is the freedom that knows itself.

Intimidate the heart? No chance

Heart awareness is *The Answer* and from that all else comes both the perceptual and the practical. The heart in its true power is not subject to the debilitating petrification of fear and all the limitations that go with that. 'Debilitate' comes from the Latin 'debilis' which means 'weak' and that's what fear does. It makes us weak and this is why Cult control is based on fear. It can freeze the human wavefield into density and close the heart vortex that connects us to *The One*. Fear is the currency of the Cult and its unseen 'gods' while open hearts without fear are the currency of freedom. They cannot control without fear and they don't understand anyone who is not in fear. It bewilders them because they are themselves consumed by it. With their hearts closed to love, and without the influence of *The One*, the Cult and its 'gods' are terrified little playground bullies. They are all mouth and full of it until someone without fear stands up and waits for them to blink. Then their backbone starts to shiver for they know that they need humanity more than we need them. We actually don't need them at all while they are dependent on us for our creativity and as a power source of low-vibrational energy. The Cult even more than humans wants to control everything and eliminate all chance – all uncertainty. No one is more terrified of the unknown, the unpredictable, than the Cult and its 'gods'. When humanity wakes up it's over for the Cult and it knows that.

This is evident in its desperation to censor all opposition no matter how small. To the Cult with its staggering levels of insecurity and fear a kid in his bedroom posting conspiracy information becomes a potentially lethal enemy that must be eliminated. Get Zuckerberg on the phone – *fast!* The extremes to which Israel and its ultra-Zionist apologists go to stop all criticism and exposure are displaying the extremes of their insecurity and fear of uncertainty. They wake up with that fear in their belly and go to bed in the same state while spending the time in between trying to convince themselves they are untouchable and humanity will never see what is going on. They know they're not untouchable and they constantly zip around with a fire hose in search of informational danger. Get Brin, Page and Wojcicki on the phone – *fast!* Then I want Bezos and Gates. The Cult's technocracy with control of everything by AI and technology is as much about eliminating uncertainty and the unknown as it is for control for its own sake. We are supposed to fear these people and think them so powerful when they are pathetic really. I prefer to smile in their face and laugh at their ludicrousness. To say I don't fear them is to understate the case a thousand fold and then some. The heart knows that Cult power is the perception of Cult power. If it was truly powerful it would not have to work 24/7 to diminish the power of others to secure its will. I feel sad for them, lost in their illusions that only survive by enslaving humanity

in even smaller illusions. The heart breaks through those illusions and does not succumb to fear. On both counts the heart and the love it connects us with are *The Answer*.

We are awareness, indestructible eternal awareness. What is there to fear? Whatever happens in a human experience we are and will always be indestructible eternal awareness. Today is the first day of the rest of our Forever just like 'yesterday' and the day before (Fig 411). Everything changes when you open your heart and your heart opens your mind. Old entanglements disperse, including with addictions, and new connections take their place at a higher frequency. Your life starts to change to mirror that (Fig 412). The heart in its wisdom observes how the control system works and refuses to cooperate with what allows it to function. It knows that divide and rule is the foundation of mass control and will not embark on conflict with those of another view. It will make its points; communicate its information and opinions, without falling into low-vibrational hatred and a desire to censor. The heart sees that among the pillars of control are smartphones and 5G. Heart wisdom then finds a bin to dump the smartphone and starts or joins mass movements highlighting the real consequences of 5G. It will do everything necessary short of violence against people to ensure the 5G grid cannot function. Instead of venerating Silicon Valley players like

Bill Gates, Elon Musk, Mark Zuckerberg, Larry Page, Sergey Brin, Susan Wojcicki and Jeff Bezos it will challenge them and expose them for crimes against humanity and the deletion of freedom.

Heart wisdom will absolutely not agree to be connected to AI and will communicate at every opportunity what AI is really about. It will ditch the Bluetooth, Apple watches and all AI wireless-connected gadgets on the body. It will certainly refuse vaccines, microchipping and anything to do with the Smart Grid including smart meters,



Figure 411: *The Answer*



Figure 412: You are not the eyes of the body unless the program has you. You are the eyes of Infinity. The eyes of *The One*.

autonomous vehicles and appliances wherever possible wirelessly connected to the Internet. Computers can serve humanity if not linked to the AI control grid and the Internet of Things which also has to go to secure human freedom. Hearts will challenge every 5G transmitter outside every home either as a whole or where directly affected. Heart wisdom won't buy any device that allows surveillance and behaviour modification. In an open heart society personal assistants like Echo would disappear through lack of sales as would 'Ring' and cameras in the home that allow real-time surveillance of everything you do. Heart-open parents would refuse en masse to send their children to school until the Wi-Fi was switched off and where possible refuse to send them to school at all where they are perceptually programmed every day. If they go to school because of family circumstances open-heart parents would be balancing the programming at home with other information and questioning. I used to tell my kids - 'Remember that just because a teacher tells you something doesn't mean it's true. Question everything.'

Heart is the maverick

Heart wisdom will not allow others to dictate its perception or impose their will. The heart is the maverick that goes its own way while never seeking to force its way on others. Heart wisdom truly celebrates diversity in the knowledge that *Ozansis* is All Possibility to be explored and experienced. The heart never wants to censor others which it knows are expressions of itself and it is well aware that limits of free expression always lead to heart-closing tyranny. Limits of free expression are the very antithesis of heart consciousness. The heart is freedom. Nor is the heart offended by whatever people say. It knows that it doesn't matter unless we make it matter by the act of being offended. You are *All That Is, Has Been And Ever Can Be* and you are upset at being called names by another part of yourself? How daft is that? To be offended is to give your power away, reveal your insecurity and provide the excuse for freedom to be deleted. Heart in awareness of itself doesn't do insecurity. It has the ultimate security in self-realisation of its infinite nature. Call me what you like and I will carry on as if nothing has happened. We are going to be hurt by the words of others when those words are a statement about them not us? Whatever we say is a statement about ourselves and that's something abusers cannot grasp. Smile in the face of abuse and you immediately dismantle its power and intent. To be offended is to give power to that you have allowed to offend you. The heart has compassion and empathy for those that peddle in abuse and intimidation. It knows that by definition they are disconnected from True 'I'. The Cult deserves our compassion and empathy while we vehemently refuse to play its game. How about waking up every morning in the empathy-deleted, compassion-deleted state of

permanent hatred (for self and others) that is necessary to serve the Cult? Imagine being its non-human controllers - what a thought. The heart doesn't hate the Cult for the heart cannot hate and anyway the Cult is drowning in hate and the last thing it needs is any more. Heart seeks cooperation, not competition, on all the fundamentals of freedom, justice and fairness, and does not desire power over others. It wants everyone in their own power and not subjugated by the imposed power of others. Without fear the heart always does and says what it believes to be right and will not self-censor through fear of consequences. It will



Figure 413: The Answer.

consider the best way to achieve that without walking into traps, but it will never allow fear of consequences to silence itself or stand by disinterested or trembling while freedom is eliminated. The heart also laughs - this is crucial - and has the self-security to be able to laugh at itself. You can't truly laugh

and feel fear at the same moment and the world is so outrageously crazy that laughter is the antidote to taking everything too seriously. We are *All That Is, Has Been And Ever Can Be* who think we are Bill the baker and Kate at the call centre. That alone is hysterical (Fig 413).

Opening the heart and being the heart

How do we open our hearts? We become them. We self-identify with them. 'What do you mean?' may come the reply. 'What do you mean by the heart?' It is *The One*. 'What is *The One*?' It is *All That Is, Has Been and Ever Can Be, All Possibility, All Potential, All Knowing*. 'Where do I find that?' In your heart - they are the same. *The One* - True 'I' - has always been there while the head and the gut have been driving perception, reaction and self-identity. It is there now with its arms open for everyone, 'saint' and 'sinner' alike. There is no Day of Judgement. What we are we attract until we change what we are and attract something else. The heart is the circuit-breaker of human feedback loops. Self-identify with your heart and you will feel its gathering influence. When you feel low-vibrational emotions shift your attention to the heart before you react and it will pass. Your heart will tell you what matters and what doesn't. Your very focus of attention on the energetic heart will make you aware of a strengthening vibration in the centre of the chest which gets stronger

and stronger as you delete perceptual programs. You are transferring your point of attention (identity) from the head to the heart. Eventually you become the heart and it becomes you. I mentioned earlier how the therapist asked people to describe their problems from the head and then the heart and how in her words it was like talking to two different people (Fig 414). This is what happens when we become the heart. We become different people and expand beyond the self-identity as a 'person' (persona – the actor's mask). We

realise we have been living a fake identity in a world of illusion and the power of the Cult depends entirely on that fake identity and world of illusion. This is why the heart is *The Answer* and it will transform human interaction (Figs 415 and 416). Alice says in *Wonderland*: 'I can't go back to yesterday because I was a different person then.' Once your heart opens the message is the same.

Questions worth asking in our daily experience as we journey into the heart awareness are 'what would *The One* do?' and 'what does my heart say?' Never mind what the human mind would do in the given situation. What would *The One* do speaking through my heart? It would respond with compassion, empathy, love and wisdom for all concerned. This does not mean lying down and letting others walk all over you. It means that sometimes people need to

ARE YOU YOUR HEART OR YOUR BRAIN?



Figure 414: The Answer.



Figure 415: The Problem.



Figure 416: The Answer.

be challenged for them to attract the experiences that will set them free. It means that we need that, too, which is why we find that our greatest gifts often emerging from our worst nightmares. When you come from the heart challenges to what you see as unfairness and injustice are not delivered with hatred and desire to hurt; but neither will you blink when you look them in the eye. To challenge and expose is not to hate and wish harm. Or it doesn't have to be. Another reality filter is what I call deathbed perception. You are lying on your deathbed with ten minutes to live. What matters to you now? Think of all the upsets, fear, emotional trauma, hatred, anger, resentment, anxiety and conflict in your life that mattered so deeply to you at the time. Does it matter now in the departure lounge of a human life? Does it matter that you worshipped a different deity or 'god' to somebody else? Or that others had different opinions to you and voted for a politician you didn't agree with? Or that your children went their own way instead of doing what you demanded? Or that your children spilt their dinner on the floor or failed to do exactly what you said? Or that someone was late for a meeting when they were stuck in traffic? What about the colour of your skin and your sexuality in relation to others? Does that matter now? Does it matter what labels you gave yourself and insisted on giving to others? How about the hostility you had for fellow expressions of *All That Is* for supporting a different soccer team? What about how vehemently you competed with others and resented how they reached a few notches higher on the greasy pole of eternal irrelevance? Does it matter that you 'won' and made lots of money to which you are about to wave goodbye? The answer to all these questions for the overwhelming majority will be 'no'. None of it matters. They were all illusions. What does matter to deathbed perception? How much you loved and were loved. How much joy you had and how often you laughed. How much joy you gave to others and how you worked together in harmony and mutual support.

Knowing what matters

Many people in retirement go through these reflections. What was it all about? They worked all their life to be a 'winner'. They worked long hours and missed their kids growing up. They sent them to the best residential schools to be winners like them so they could also ask in their retirement: 'What was it all about?' Oh, but they had to compete and cuss and spit and kick their way to 'success'. Life is about dog eat dog, right? Well, only if you choose it to be. There are other choices – within *All Possibility* there always are. They might not be the choice the Cult would like you to make, but they are there for the making. You are not dependent on *The System*. You are dependent on your wavefield state that will engage you with frequency reflections of itself. If you think you

have to serve The System you will entangle with The System to manifest the illusion that you have to serve The System. Go your own way knowing you will attract all you need and you will entangle with all that you need without serving The System. Go your own way while fearing the consequences and you will entangle with the consequences. The perspective of deathbed perception is to see at any point in your life what matters long before you are lying there waiting for 'God'. Look through those same eyes, perceive through that same heart, and see what really matters behind the smokescreens and diversions of human labels and perceptions of 'success'. It is to love and be loved. It is love for self and all other expressions of The One which is love. Symbols of human 'success' are merely what we are told they are – big money, big houses, big cars, big fame. I have met many people with all of those things and none have been happy, joyful and at peace with themselves. I know a guy who has spent his life screwing other people for their money and property. He then contracted cancer, had his bowel removed, and when he recovered went back to screwing people for their money and property. The more we don't get it the more extreme the experiences we attract until we do. He has no bowel and has had at least one heart attack and still considers himself a 'winner' like all psychopaths and criminals do by the fact that he has parted lots of people from their money and property. It is perceptual insanity and often the truth comes from the mouths of the very young before perception programs and cynicism have kicked in. An Internet video of a six-year-old recorded her advice to her mother after conflict with her father. She said she only wanted people to love each other. If we didn't there would only be 'monsters'.

I just want everyone to be friends. And if I can be nice, I think all of us can be nice, too. I want you, my dad, everyone to be friends. I want everyone to be smiling ... My heart, it's something. Everyone else's heart is something, too. And if we live in a world where everyone's being mean everyone's going to be a monster in their future ... I just want everything to be settled down. Nothing else. I want everything to be as good as possible.

At the time of writing that video has been watched by 40 million people. You know why? We all want that, too. The world is full of people who behind their upsets, traumas, competition, resentment, hatred and psychopathy just want to be loved. What is 'evil' except the absence of love? The Cult has sucked so much love from the world and we need to put it back – *that* is The Answer. We still see an abundance of love in so many guises despite the Cult's best efforts and we can all open our hearts to limitless love whenever we make that choice (Fig 417). The Cult's endgame is to entangle humanity with machines and AI so

completely that all love is extinguished and with that any powerful connection to The One and True 'I'. It seeks to isolate mind and perception so that ET can't phone home. It is working to create a new post-human through AI, drugs, the Smart Grid, 5G and 6G, synthetic biology and digital

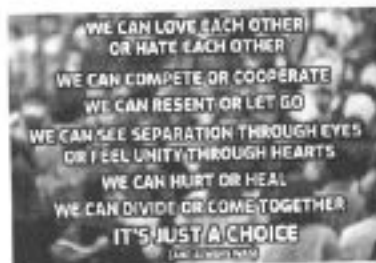


Figure 417: The question.

and what we are and live our lives with that self-identity. Do that and everything follows. We change ourselves and we change our lives. If enough of us do that we together change 'the world'. Things don't change until we change them. Or, rather, change ourselves. Rumi, the Persian poet and mystic, could see beyond The Program in the 13th century as his open heart connected

him with The One. He described himself in these terms:

Not Christian or Jew or Muslim, not Hindu, Buddhist, Sikh, or Zen. Not any religion or cultural system. I am not from the east or the west, not out of the ocean or up from the ground, not natural or ethereal, not composed of elements at all. I do not exist, am not an entity in this world or the next, did not descend from Adam and Eve or any origin story. My place is the placeless, a trace of the traceless ... neither body or soul.



Figure 418: The Answer. (Image Neil Hagan)

Rumi was speaking in the 13th century and 800 years later in our illusion of 'time' I am saying exactly the same in my own way. For it is not about 'time' and 'evolution' through 'time'. It is only the scale of awareness that we choose to connect with. That awareness was there when Rumi was 'here' and it is there now. It is always there for anyone who opens their heart to communicate with its wisdom (Fig 419). Rumi was not ahead of his 'time'. How could he be when there is no time? True 'I' is beyond 'time' and all its illusions. He put it like this:



Figure 419: The Answer.

The very center of your heart is where life begins – the most beautiful place on earth; Love is the bridge between you and everything.

He knew with that connection that 'goodbyes are only for those who love with their eyes because for those who love with heart and soul there is no such thing as separation'. He knew that freedom is not freeing others or being freed by others. It is freeing yourself. 'I want to sing like the birds sing, not worrying about who hears or what they think.' What Rumi tapped into anyone can and it lies in the silence where all is One – 'There is a voice that doesn't use words. Listen.'

Open your heart to The Silence. The Answer is waiting there.

Postscript

The desperation of The System to silence my exposure of the 'pandemic' hoax reached still new levels of extremism just before this book went to print when British Member of Parliament Damian Collins demanded that it be made illegal for me to challenge the official story. As definitions of fascism go, I think that's pretty good.

Conservative MP Collins, a former chairman of the House of Commons Digital, Culture, Media and Sport Committee, is clearly obsessed with silencing me and any questioning of the official Gates/Cult-controlled World Health Organization narrative being repeated like parrots by governments and technocrat dark suits across the world. Why is Damian Collins so obsessively knicker-twisted with one man having a different opinion of the 'pandemic' to the entirety of the global governmental system, entirety of the global mainstream media and entirety of Cult-owned Silicon Valley? One man! Well, how about because I am telling the truth and that's what they fear more than anything in all existence? Collins could debate me, which is what the 'free world' is supposed to be all about, but he won't because he hasn't got the guts (Fig 1). He just wants to silence me and impose his will on the enormous numbers of people worldwide that want to hear what I have to say. What Collins appears to be terrified of is another person's right to an opinion. Why could that be do you think? He called for a new 'requirements in law' to stop people like me 'persistently spreading disinformation online' which means that, by definition, the authorities would decree what is 'disinformation'. I think I read that somewhere in Nineteen Eighty-Four. 'If there is a certain channel, group or individual that is persistently pushing this information out then that sort of malicious abuse of social



Figure 1: The silence knob-twisted Damian Collins MP.

media in a public health emergency should be an offence', said a man so breathtakingly arrogant that he believes he should be the arbiter of what you see and don't see. Even before he called for my view on the 'pandemic' to be against the law – mirroring what happened in Nazi Germany and happens in the tyranny that is China – he had already launched a 'fact-checking service' (excuse me, my belly hurts) called Infotagion on March 30th, 2020, 'to combat falsehoods during the pandemic'. No – to target information that questions the official story and here we have a man utterly consumed by having the public hear only the already thoroughly-discredited World Health Organization (Gates) bullshit. This is an example of Collins/Infotagion 'fact-checking':

Claim: Healthy food and exercise can build natural immunity to COVID-19.
 Answer: False. Avoiding contact with carriers of the illness is the only way to prevent infection.

The idea that boosting the immune system cannot be a defence against all illness is obviously bordering on the insane given that the immune system exists to protect us from illness. The only possible reason such a suggestion can be claimed to be false is because the official story wants you to believe that only by lockdown and social distancing can you prevent infection. Collins therefore, in this example alone, does not run Infotagion to stop 'misinformation', but to spread it in defence of the official Gates-WHO-government line. This is confirmed by the Collins government-supported Infotagion website which declares first that it is 'independent' and then that its information is 'sourced from WHO, UK and other official government advice'. I love it – 'independent' and just repeating the official version of everything. Infotagion was created 'in partnership' with marketing company Iconic Labs which urges clients to respond to the fact that 'LGBT+ consumers are more prominent than ever – with up to half of 18 to 25-year-olds saying they are not totally heterosexual'. Iconic Labs was created by Liam Harrington, John Quinlan and Sam Asante. Enemy of Freedom Collins said: 'Disinformation can kill people.' Yes it can – look at how many have already died and the legions that will die from the disinformation which led to the lockdowns that Collins is so determined to protect from exposure. What can be more obvious disinformation than to claim that boosting the immune system is not a protection against disease?? Collins said he was introduced to Iconic Labs to launch Infotagion by David Sefton who resigned as Iconic Labs chairman over 'rumour and market speculation' about his role in Anglo African Oil & Gas from which he resigned in July, 2019. Journalist Tom Winnifrith wrote in early 2020:

... David Sefton was forced to quit Anglo African Oil & Gas (AAOG) after revelations on this website about horrific undeclared conflicts of interest, obscene expenses and other matters. Here we are on January 30th [2020] and after massive pressure about misleading RNS statements, related party deals and other matters I get to claim his scalp again, this time at insolvent Iconic (ICON).

Iconic is holding its AGM today in Sheffield, something guaranteed to ensure no-one turns up to ask awkward questions. Sefton was up for re-election but has decided over Christmas that he will be leaving the company with immediate effect after the GMA. It now has no independent directors but since it also has no cash and no future that is not really an issue.

Damian Collins was one of the signatories to the demand by the ultra-Zionist-funded, Labour Party-dominated Center for Countering Digital Hate for me to be banned by Facebook and YouTube. The Labour Party and the Collins Conservative Party of Boris Johnson are supposed to be political 'enemies', but on all the Cult objectives – not least draconian censorship – they seem to be in total agreement. Dr Daniel Allington, a senior lecturer in social and cultural artificial intelligence at King's College London, was also quoted in the same media article about Collins demanding my work be made illegal. Allington was acknowledged by the Center for Countering Digital Hate for his help in the 'report' that had me deleted from Facebook and YouTube. He said he had undertaken 'research' and found that people who believe 'coronavirus conspiracy theories' are more likely to flout lockdown rules. He undertook 'research'?? Anyone with a brain cell could have told him that and saved him the trouble. Allington was focused on me getting silenced rather than 'celebrities'. It was pointed out that some celebrities have posted views about the 'pandemic' that questioned the official story, including British boxer Amir Khan, but Allington wasn't too bothered about them:

I am not sure I want to regulate what someone like Amir Khan says, but then you have someone like David Icke, or (conspiracy theory site) London Real, and their business is creating content which goes online, which they are able to monetise.

Well, actually, Allington, I don't get money for the videos we post on public platforms and maybe you should fact-check yourself. Why is Damian Collins obsessed with silencing my information about the 'pandemic' which you have read at length in this book? Who is this man and who is he connected with? These are legitimate questions given that he is a member of the UK Parliament who is supposed to be defending



Figure 2: An Orwell quote that perfectly describes the censorship war against me and my work.

note his shocking behaviour at the next election and that the public call out this blatant enemy of freedom at every opportunity. Collins worked for seven years for M&C Saatchi, 'an international advertising agency', or more accurately a spin machine operation that was created in 1995 as a rival to Saatchi and Saatchi which ran spin campaigns for Prime Minister Margaret Thatcher and the Conservative Party. The CEO and co-founder of M&C Saatchi is David Kershaw, an ultra-Zionist board member of the vehemently and long-time anti-Icke Jewish Chronicle with its laughable editor Stephen Pollard which went into voluntary liquidation in April, 2020, before being bought by a consortium of investors. Damian Collins and his 'Infotagion' has 'partnered' with Kershaw's M&C Saatchi and Iconic Labs to target 'misinformation' about the 'virus pandemic' which as always means any information that counters the Cult narrative peddled through the Gates World Health Organization. You will have noticed how many times the ultra-Zionist neoconservative or 'Neoon' network in the United States has appeared in this book and I have exposed this at far greater length in some of my others, most notably *The Trigger*. The Sabbatian-Frankist Neoon web spawned the Project for the New American Century and its closely-aligned American Enterprise Institute. Damian Collins is on the board of British Neoon arm, the Israel-worshipping Henry Jackson Society, and signed its Statement of Principles. Fellow board members include UK government minister Michael Gove and ultra-Zionists Adam Levin and Alan Mendoza. Levin is a trustee of UK Lawyers for Israel, the 'lawfare' operation that targets Palestinian supporters promoting the Boycott Divestment and Sanctions (BDS) movement by lodging complaints with regulatory bodies and threats of legal action. Collins clearly has some lovely friends. Among the international patrons of the Henry Jackson Society are ultra-Zionist Project for the New American Century stalwarts William Kristol, a co-founder, Richard Perle and former CIA Director James Woolsey. I don't know about you, but I kind of get the picture of

freedom and democracy, but clearly has contempt for both (Fig 2). I hope voters in his Folkestone and Hythe constituency have the self-respect and the respect for their own freedom to

the circles in which Damian Collins operates and his targeting of me and my information should therefore hardly come as any surprise.

The 'Hate' censorship network

A citizen journalist and visitor to Davidicke.com began investigating the Collins-supported Center for Countering Digital Hate (CCDH) after it claimed credit for having me banned from Facebook and YouTube (I'm sure they were both kicking and screaming before agreeing to do so). Well, what a web he opened up both sides of the Atlantic with funders, supporters and associations. Among the CCDH directors listed is Simon Clark from the Center for American Progress, a One-percent New Woke front that centrally influences the US Democratic Party. It's founder, first president and CEO was the infamous political manipulator John Podesta who was White House Chief of Staff to President Bill Clinton and chairman of the 2016 presidential campaign of Hillary Clinton. What's that they say about knowing someone by the company they keep? Major funders of the Center for American Progress include George Soros and fellow Zionists Peter Lewis, Steve Bing and Herbert Sandler. Center for American Progress senior fellow Simon Clark is a board member of the Icke-targeting Hope not Hate (Hate not Hope) which supported Digital Hate (so much hate) in its efforts to have me banned in the same way that Damian Collins works so hard to do. His wife, Diana Shaw Clark, is Chair of National Finance Committee for J Street, the Israel lobby group and funder of American politicians. Digital Hate director Simon Clark is an advisor to the Scowcroft Group, the 'international business advisory firm' of Brent Scowcroft who was US National Security Advisor to far-right Presidents Gerald Ford and 'Father' George Bush. How compliant and on message must Scowcroft have been to have served the hate-filled psychopaths Ford and Bush? Scowcroft appeared in many of my earlier books and he was vice-chairman of the absolutely notorious Kissinger Associates of ultra-Zionist Neoon Henry Kissinger, a front man for the Cult virtually his entire adult life and a war criminal on a breathtaking scale. Is it only me that thinks it strange that Simon Clark would be rubbing shoulders with such people while having close connections to self-styled 'left-wing', 'progressive' organisations like the Center for American Progress and Center for Countering Digital Hate? This is even more relevant with Clark's LinkedIn profile claiming that he 'started the Center for American Progress's work on combating far right extremism'. So why the close association with a company headed by Brent Scowcroft given his role with right wing mega-terrorists like Father Bush and Henry Kissinger who are responsible for death and destruction – terrorism – on a gargantuan scale overwhelmingly in non-white countries?

I might ask a similar question of other central characters in Digital

Hate, I said in the body of the book that the group (a limited company) involved Labour Party 'left-wing' (joke) figures such as Imran Ahmed, Kirsty McNeil and Morgan McSwiney, plus academics obsessed with censorship; but clearly these Labour activists are in full agreement in the one-party state with right-wing Conservative Necon MP Damian Collins when it comes to silencing me. Collins demands that my information and my right to express it be made illegal while Digital Hate has sought not only to have me deleted from all Internet platforms, but also all the interviews with me from any other source with those who interviewed me also banned. Well-known people like singer Robbie Williams who speak out in any way in support of me are targeted for abuse by Internet purveyors of hate. System-servers are terrified of me because they are terrified of the truth and thus their gussies spin like aircraft propellers at the thought of anyone hearing what I have to say. So again why? So again comes back the same answer as with Collins – they fear one man's opinion despite all their 'powerful' connections because the official story of the 'virus' is so full of holes and contradictions that only the fiercest of censorship can defend it from being demolished. Digital Hate director Kirsty McNeil, who has been so keen to censor me, sits on the board of a Gates-funded organisation called Coalition for Global Prosperity alongside Carolyn Esser from the Gates Foundation. Esser is 'responsible for designing and executing the communications strategy for the Bill & Melinda Gates Foundation in Europe and the Middle East'. Coalition for Global Prosperity pushes for mass vaccination and the silencing of 'anti-vaxxers' on social media. I can't imagine, then, why Gates would fund the organisation or why Kirsty McNeil would want people like me censored. McNeil is a member of the European Council on Foreign Relations whose main funder is the Open Society Foundations of George Soros. She is also on the board of the Holocaust Educational Trust. Other Digital Hate directors are Bristol University academic Dr Sobhan McAndrew, Lord Jonny Oates, a Chief of Staff to former UK Deputy Prime Minister and now Facebook head of global affairs and communications, Nick Clegg, and Ayesha Saran, Migration Programme Manager at Digital Hate funders, the Barrow Cadbury Trust. Saran is also a trustee of the Barrow Cadbury-funded British Future, a think tank focusing on 'identity and integration, migration and opportunity'. British Future receives funding or 'in-kind' support from the Soros Open Society Foundations, Facebook, BBC, European Commission and Digital Hate funders Unbound Philanthropy. Digital Hate also connects with the ultra-Zionist Community Security Trust (CST), 'a charity that protects British Jews from antisemitism and related threats', constantly inflates those threats and targets Jews who criticise Israel and Zionism. The cross-referencing of people and funders is a massive maze. Digital Hate is funded by the

ultra-Zionist Poes Foundation and the aforementioned New York-based Unbound Philanthropy with its connections to George Soros. Unbound's UK Program Director is Will Somerville who is also a Senior Policy Analyst for the Migration Policy Institute (MPI), a think tank based in Washington DC, and a Visiting Professor at the University of Sheffield. He is another connected to British Future. Somerville has worked at the Commission for Racial Equality, the UK Prime Minister's Strategy Unit, Cabinet Office, and the Institute for Public Policy Research. Well connected I think is the phrase and more about the Cabinet Office shortly. Digital Hate is closely linked with the allegedly Labour Party-supporting limited company called Labour Together with its ultra-Zionist businessman director Trevor Chinn who I am sure has a heart that bleeds for the poverty-stricken and downtrodden. Chinn sits on the Executive Committee of the Britain Israel Communications and Research Centre (BICOM), a UK propaganda arm of the Israeli government. Digital Hate founding director Morgan McSwiney, the campaign manager and chief of staff for Labour Party leader, the Israel-centric Keir Starmer, is the secretary of Labour Together which is located in the same East Finchley, London, building as Digital Hate. Genuine Labour members should realise that this is the hijacked 'party' their subscriptions are funding. The D-list 'TV celebrity' patron of Digital Hate is Rachael Riley who constantly employs the slur of 'anti-Semitism' to demonise and silence people. Together they targeted my information and free speech believing they were damaging me when all they did was dramatically increase the number of new people looking at my work in the light of me being so vehemently targeted for censorship after I was dismissed as a 'nutter' for decades (Fig 3). The attacks further increased with attempts by hackers to bring down Davidicke.com and Ickonic.com in the same period followed by PayPal with its ultra-Zionist president and CEO Daniel H. Schulman cancelling our account. This is the same PayPal that bans Palestinians in Gaza and the West Bank from using its services, but

MEET MY PR TEAM WHO THINK THEY ARE DOING ME DAMAGE



**KEEP GOING CHAPS
- DON'T YOU STOP NOW**

Figure 3: From left to right: Morgan McSwiney (Digital Hate and Labour Party); Imran Ahmed (Digital Hate and Labour Party); Damian Collins (Inseparagon, Henry Jackson Society and Conservative Party); Kirsty McNeil (Digital Hate, Labour Party, Save the Children, Coalition for Global Prosperity); Rachael 'You're an Anti-Semite' Riley (Digital Hate)

allows Jewish people in the illegally-occupied West Bank to do so. It's not racist or anything. Attacks came from all angles and will continue to do so – that's what happens when you speak truth to tyranny. One good thing while all this was going on came when someone edited the Wikipedia page for Digital Hate and actually told the truth amazingly. I recommend a read if it has survived in that form this far. Digital Hate was perfectly described:

The organisation campaigns for internet censorship to be enacted against rival political actors, lobbying American 'big tech' firms such as YouTube, Facebook, Amazon, Twitter, Instagram and Apple to 'deplatform' individuals so that they cannot present their views to the general public.

That's correct, but 'rival political actors' doesn't mean rival political party 'actors'. It means rival versions of world events with Neocon Conservative Damian Collins and 'left-wing' (joke again) members of the Labour Party all forming the same playground bully gang against me. The recurring background can be seen with professional censors NewsGuard which produced an 'Icke-must-be-deleted' report to Twitter. NewsGuard was co-founded by ultra-Zionist Neocon Americans Gordon Crovitz and Steven Brill with the same intention as Digital Hate and the Infotagion of Damien Collins – to silence those who challenge the official narrative they all represent and are desperate to protect. Add the fact that the UK Government's full-time 'advisor' or 'anti-Semitism' (using the slur of anti-Semitism to censor and demonise critics of Israel's Sabbanian-Frankist regime) is former Labour Party MP John Mann who is an ultra-Zionist to his DNA. There must be a common theme and pattern in these people and organisations, but I'm damned if I can see it. I'm sure you can, though. There is no way all these characters and organisations do not lock into this same enormous network which includes many 'charities' operating as front operations. Imran Ahmed from the Center for Countering Digital Hate was appointed to the Steering Committee of the UK Government's Commission on Countering Extremism Task Force headed by a Sara Khan (Ahmed seems to do a lot of 'countering'). It calls itself 'independent' which, of course is the usual garbage and it is really there to impose censorship by hurling hate at its targets while claiming to be 'anti-hate'. See the hate-filled comments about me by Digital Hate and company, plus Damian Collins. While this rabble was seeking to silence all challenge to the official narrative doctors and funeral directors continued to report that death certificates were being faked with 'Covid-19' as the cause when it played no part. Project Veritas, with a long record of exposing official lies, spoke with funeral directors who confirmed this. One in Williston Park, New York, said: 'Basically, every death certificate that comes across

our desk now has Covid on it.' Every director contacted said 'Covid-19' deaths are being inflated and every death in New York was being recorded as a Covid death with or without testing to confirm (not that this would be any use). Joseph Antico of Schafer Funeral Home said: 'They are putting Covid on a lot of death certificates [for] people who are going to their hospital with any kind of respiratory distress, respiratory problems, pneumonia, the flu ...' Yes, exactly, and the web of censorship I am exposing here is working to stop the world knowing that. What does that say about them?

UK government's worldwide Psyop Team

The UK Cabinet Office is a department of the British Government that 'supports the Prime Minister and Cabinet of the United Kingdom' and has 2,000 staff 'coordinating the delivery of government objectives via other departments'. Okay, so one of the objectives must be to manipulate the behaviour of the British public and those in a long list of countries worldwide because the Cabinet Office is part-owner, with 'innovation charity' Nesta, of the Behavioural Insights Team (BIT). This is also known as the 'nudge unit', a term that comes from a 2009 book by ultra-Zionists Cass Sunstein, an advisor to President Obama, and Richard Thaler called *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Thaler, a proponent of something called 'behavioural economics', is an 'academic affiliate' of the Cabinet Office Behavioural Insights Team whose role is to 'nudge' (manipulate the behaviour) of its targets and has played a prime role in doing just that with regard to the 'pandemic' hoax. Other leading names in the development of behavioural economics are ultra-Zionists Daniel Kahneman and Robert J. Shiller – all three are recipients of the Nobel Memorial Prize in Economic Sciences for their work on behavioural economics which is defined as the study of 'the effects of psychological, cognitive, emotional, cultural and social factors on the decisions of individuals and institutions'. Cut all the bullshit and it means studying the psychological factors to manipulate or 'nudge' behaviour. The Behavioural Insights Team, a limited company at the heart of government, was established in 2010 and operates worldwide with several universities, including Harvard, Oxford, Cambridge, University College London (UCL) and Pennsylvania. It brags how it has 'trained' 20,000 civil servants and practitioners worldwide in 'behavioural insights'; how it has 'run more than 750 projects to date, including 400 randomised controlled trials in dozens of countries'; and how its work 'spanned 31 countries in the last year alone'. BIT has an office in New York and has been 'working with cities and their agencies, as well as other partners, across the United States and Canada, running over 25 randomised controlled trials in the first year of operation'. This 'work' involves manipulating human

behaviour and it has been at the core of doing just that during the 'pandemic'. The Behavioural Insights Team inflicts 'Psyops' on target populations. Psyops are 'military actions designed to influence the perceptions and attitudes of individuals, groups, and foreign governments'.

How very appropriate then that in March, 2020, with the 'virus' scam going into overdrive, that Rachel Coyle with her six years' experience at the Ministry of Defence should be named the new BIT Director for Europe, the Middle East and Africa to help develop pandemic strategy. The British military cyber Psyop unit 77th Brigade would have no doubt been ecstatic to have one of its own in such a key position given that the aims of both are the same – getting the public to behave as required by everything from 'nudging' to extreme censorship. Coyle is a senior figure from the world of intelligence and defence who specialised in China and cyber warfare – a term which includes deleting me from the Internet for the crime of challenging this web of deceit. The Behaviour Insight Team is headed by psychologist David Solomon Halpern, a visiting professor at King's College London, who has been 'overseeing the UK government's response to the Covid-19 pandemic in the United Kingdom as part of the Scientific Advisory Group for Emergencies, focusing on behavioural changes ...' I bet he has. The central player in the behavioural manipulation network is UK Cabinet Secretary Mark Sedwill who is also the National Security Advisor and sits atop of pyramid of related organisations. Internet site UKColumn has done some excellent work on this in its three-times weekly broadcasts and has connected Sedwill and his Behavioural Insight Team Psyop to the Foreign Office, National Security Council, the government communications headquarters (GCHQ), MI5, MI6, the 77th Brigade and Rapid Response Unit which 'monitors digital trends to spot emerging issues, including misinformation and disinformation, and identifies the best way to respond' – censor and lie. This 'supports the work' of the again Cabinet Office-based Media Monitoring Unit. The web includes the military operation JHub, the 'innovation centre' for the Ministry of Defence and Strategic Command, which is involved in 'symptom tracing' for the National Health Service. The military is ultimately driving what is happening through the so-called 'Fusion Doctrine' – the fusion of military and civilian law enforcement and government agencies in accordance with the 'Hunger Games' plan I described earlier. The UK government's broadcast censor Ofcom and the BBC will be connected to this network, too, with censorship crucial to the control of information that the public is allowed to see and they are desperate to expand Ofcom's censorship powers to the Internet. Are we really expected to believe that Imperial College in London which produced the Amatekdon-like 'computer models' at just the right time to justify the

lockdowns are not connected to this same network? The Chinese government, by the way, was not phased by the Imperial College 'modelling' disaster and during the lockdown the college signed a five-year collaboration deal with China tech giant Huawei that will see 'Huawei's indoor 5G network equipment and "AI cloud platform" installed at the college's West London tech campus, as well sponsorship by the Chinese firm of Imperial's Venture Catalyst entrepreneurship competition'. The information control and behaviour manipulation web out of Downing Street through the Cabinet Office is fantastic and every major country will be the same. The United States established a Social and Behavioral Sciences Team in 2015 through an executive order by President Fraud Obama.

Then there is a new UK Cabinet Office-connected Joint Biosecurity Centre (JBC) to provide 'expert advice on pandemics' and its role is described officially as: Independent (the jokes go on) analytical function to provide real-time analysis about infection outbreaks to identify and respond to outbreaks of Covid-19; and to advise the government on response to spikes in infections – 'for example by closing schools or workplaces in local areas where infection levels have risen'. It is reported to be based at the Joint Terrorism Analysis Centre which analyses intelligence to set 'terrorism threat levels'. Tom Hurd, the director general of the Office for Security and Counter-Terrorism, and reported to be a favourite to be the next head of MI6, was appointed to lead the new unit which will oversee the contact-tracing operation that I will describe in a second. Hurd is the son of former Foreign Secretary Douglas Hurd from a big-time insider family. Tom Hurd went to the elite Eton College and Oxford University with Boris Johnson. What I have been describing with this interconnecting nexus is the permanent government or Deep State that runs everything above and beyond the here today, gone tomorrow politicians. Compared with this Prime Ministers like Johnson are bit-part and seriously peripheral players as we have seen so clearly during the 'pandemic' hoax.

The 'virus nudge' – or rather smack in the back

A perfect example of systematic psychological manipulation from this network can be found in a paper prepared for government by the 'behavioural science sub-group' of the Scientific Advisory Group for Emergencies (SAGE) which is co-chaired by Sir Patrick Vallance, former executive of the massively Gates-connected GlaxoSmithKline, and Gates-funded Chief Medical Officer Christopher Whitty who have driven 'virus' policy while Prime Minister Johnson does whatever he is told. The paper, released for 'discussion' on March 23rd, 2020, is a classic agenda for behaviour control during the lockdowns. It includes under the heading 'Persuasion':

The perceived level of personal threat needs to be increased among those who are complacent, using hard-hitting Evaluation of options for increasing social distancing emotional messaging. To be effective this must also empower people by making clear the actions they can take to reduce the threat.

Such psychological games surrounding the primary themes of fear and threat have been used constantly and mercilessly since the 'pandemic' began. As I write fear of the fake 'virus', or one not at all dangerous to the overwhelming majority even if you still believe it exists, is being exploited to create a mass real-time surveillance system under the guise of 'contact tracing' that mirrors one level of the surveillance system - of course - in China. This is founded on the perception-manipulation that the 'virus' is 'deadly' and the tracking is needed via your phone for your protection (behaviour manipulation). These apps are being rolled out to track who you come into contact with to see if one of them has tested positive for 'Covid-19' with a test not testing for 'Covid-19'. Then a government operative from an army of 'contact tracers' will be knocking on your door to test you with a test not testing for 'Covid-19' and if you are positive for a genetic material that large numbers of people have in their body as a matter of course you will be told to isolate or forced into quarantine. This system is planned to take children from families as it becomes ever-more extreme which fulfils another goal of the Cult. Targeting anyone becomes easy just by claiming you have been in contact with people who have tested positive for something not being tested for. I bet popwaps and goats in Tanzania are trembling as I speak. It's all long-planned with a European Commission proposal perfectly timed in late 2019 to introduce a 'common vaccination card/passport' for all EU citizens. Cult-owned Google, Apple and other Big Tech companies are making contact-tracing possible because they care so much about human health and one of America's contact-tracing organisations, Partners in Health, lists the Bill and Melinda Gates Foundation and the George Soros Open Society Foundations as official partners with Clinton daughter Chelsea on the Board of Trustees. A Rockefeller Foundation Paper published in April, 2020, detailing its 'National Covid-19 Testing Action Plan', called for the creation of a nationwide DNA database and mass testing and tracing for all Americans. My goodness and many people still can't see what is going on - not least the clueless, gutless pawns in the mainstream media. It's breathtaking how people can be so blind to the obvious.

The 'virus' hoax is another 'here kitty, kitty' with the story constantly changing to justify still more extreme deletions of freedom. First they said that lockdowns were necessary to 'flatten the curve', but when that

happened through figure manipulation we were told that 'normality' could not return until there was a 'cure or vaccine'. No other alleged disease in human history has involved isolating the healthy and now that can only stop when there is a 'cure or vaccine'. What they mean is a vaccine to connect the population to the Smart Grid among much else. The kitty, kitty, is behaviour manipulation and we see this with social distancing and all the fine-detail rules that people think they have to conform to by law when most are only government recommendations that have no force in law. Police that have been firing and arresting people for breaking lockdown laws are being forced to admit they were policing laws that didn't exist and they had no right to enforce. This is what happens when you do what you are told without question or personal research. In the lockdown phase announced by Boris Johnson a week before I am writing this you can have an estate agent, nanny or cleaner in your house, but not your parents or grandparents. You can see one parent or grandparent at a time, but not both together. You can meet them in a park, but not in a garden because the UK Health Secretary Prati



Figure 4: What a reassurance to Cult pup hopey and human acquiescence.



Figure 5: Where is the will-respect?

Hancock says that this could mean walking through a house to get to the garden. I guess they would also have to pass the estate agent, nanny and cleaner on the way. I could continue with a long list of such ridiculous contradictory, makes-no-sense nonsense billowing from the empty space between the government's ears. But while idiot officials impose this bizarre craziness there is method in the madness at the level of the Behaviour Insight Team and similar networks around the world. We are seeing grotesque images of children being prepared from the earliest age to fear and disconnect from their friends by being forced

to stay in marked-off playground zones while their masked parents line up six feet apart to collect them from cross markers also six feet apart (Figs 4 and 5). It is child abuse imposed by unquestioning parents and teachers at the behest of the psychopaths using the fake 'pandemic' to do anything they choose. 'It's the rules' is not a bloody good enough excuse to do this to kids who are being delaminated by this outrage. They are training children and adults to obey fine-detail orders like domestic animals. When you have laughable and clearly contradictory rules but people still obey them you know you are getting close to total unquestioning compliance. Indeed, with large swathes of humanity they are already there. Now we have the prospect of being enslaved ongoing in small isolated groups officially known as 'Bubbles' – how appropriate given what I wrote earlier in the book. The antidote to this imposition by the few on the many is this: 'Go fuck yourself – we're not doing it.'

The plan is for the Gates 'Covid-19' vaccine to use a technique never before let loose on humans – DNA manipulation using synthetic DNA and an electrical pulse to open up cells for synthetic penetration. Given what I have written earlier in the book about the synthetic human agenda this fits the story as does my contention that the vaccine will include self-replicating nanotechnology. Having the Gates vaccine and allowing children to have it should become a new definition of insanity. The British government has refused to rule out making the Gates vaccine compulsory while ultra-Zionist lawyer Alan Dershowitz, a friend (like Gates) and legal defender of Jeffrey Epstein, insisted that Americans do not have the right to refuse the vaccine should federal or state governments makes it mandatory. He quoted a Supreme Court judgement in *Jacobson v Massachusetts* in 1905 which upheld the right of states to enforce compulsory vaccine laws. The Supreme Court, which is owned by the Cult, decreed that individual liberty is overridden by the power of the state. The Court shockingly found it 'immaterial' that some in the medical community believed the vaccination 'worthless or even injurious'. The state had the right to choose between opposing medical theories and to refer the decision to 'a board composed of persons residing in the affected location who are qualified to make a determination' (controlled by the Cult and Big Pharma which is the same thing). Courts would not interfere if the enforcement related 'substantially to public health, morals, or safety and was not a plain, palpable invasion of rights secured by fundamental law'. Being forced to have a potentially injurious vaccine is not 'a plain, palpable invasion of rights?' *Extraordinary*. The Court also ruled that it is immaterial whether or not the vaccine is actually effective, so long as it is to the belief of state authorities that the mandatory vaccine will promote common welfare and such enforcement is a reasonable and proper exercise of the police power. It was of 'paramount necessity that a community have the right to protect itself

from an epidemic of disease which threatens the safety of its members' – and clearly even when it doesn't. This, ladies and gentlemen of America, is the Supreme Court precedent that still stands as psychopath Gates prepares to inflict his vaccination on everyone.

'Outsider' (ha, ha) Donald Trump announced that he was deploying the military to distribute the vaccine when it was ready, possibly as early as December, 2020, while the British government said its trials could lead to mass vaccination even earlier in September. The speed in which this is happening is making even vaccine proponents question how this is possible when vaccines that have caused lethal harm to children and adults take years to develop. The answer is, as I have said since the 'pandemic' began, that the vaccine was ready and waiting before the excuse to use it was even perpetrated. The idea that a vaccine could be developed in months for a 'virus' that has never been proved to exist, nor be a cause of disease, with a PCR test that doesn't even test for 'Covid-19' is patently fraudulent. You have not shown it to exist, you haven't shown it to cause a disease and you can't test for it, but you've found a vaccine in months. This is nonsense and mendacity on a historic scale. They are trying to put as much delay as they can between the 'outbreak' and the vaccine to overcome the obvious credibility gap, but they are fearful of waiting too long because the longer the delay the more people will realise that the 'pandemic' has been a gigantic hoax from start to finish. Their Plan B if enough people refuse the vaccine is to not allow anyone out of lockdown rules unless they have the vaccine and that's why we hear the mantra of 'no return to normality' until everyone is vaccinated. The 'virus' is so deadly and humanity faces such a crisis, according to the Gates script, that maybe safety may have to be compromised for speed. Gates wrote in his blog:

If we were designing the perfect vaccine, we'd want it to be completely safe and 100 percent effective. It should be a single dose that gives you lifelong protection, and it should be easy to store and transport. I hope the COVID-19 vaccine has all of those qualities, but given the timeline we're on, it may not.

You know exactly what the vaccine is and what it contains you bloody liar. They can make the vaccine appear to work by simply changing the way they diagnose and fill in death certificates to delete 'Covid-19' in the same period as the vaccine, but no doubt they will also draw this out over years with successive 'waves' of a 'virus' that is 'mutating' and requires further vaccinations as with the flu. They are even adding new 'symptoms' including loss of smell or taste to make more people think they are 'infected' when other causes are responsible. I understand that a new symptom next week will be burping twice in 30 seconds. Apparently stop watches are going to be issued. Then there

was the 'research' that told us that speaking could 'spread the virus' with a 'substantial probability that normal speaking causes airborne virus transmission in confined environments'. So stay home and shut the fuck up.

As I close this Postscript the economic consequences of the pandemic hoax – clearly known and planned from the start – are becoming clear with destroyed companies, employment and dreams. The numbers continue to rise of people dying through delayed treatment and diagnosis, and for suicides, drug abuse, child and domestic abuse. One study said a third of Americans are showing signs of anxiety and depression while prescriptions for mood-elevating drugs have soared. Society is crumbling because that's the whole idea. Stanford University professor Michael Levitt said lockdown saved no lives and may have cost lives (absolute certainty) while Neil Ferguson had over-estimated the death toll by '10 or 12 times' – I would say by 100 percent. US states that locked down early were no differently affected on average than those that didn't lockdown at all. Marko Kolanovic, a strategist for JP Morgan, said lockdowns failed to alter the course of the 'pandemic' and instead 'destroyed millions of livelihoods'. What was not being acknowledged is that this was the plan from the start. Even the odd mainstream article has appeared calling for the (calculated) madness of lockdown to end. In the United States the fascist control has been imposed by state governor diktats which means that at that level 50 people have been dictating the lives of 330 million. Every one of them that abused that power – and so many have – must be forced out. Is it still possible in the light of all this to dismiss that the world is controlled by a ridiculously few people as long as humans acquiesce? Or that their agenda is being orchestrated by the depths of evil? Denial is no longer an option.

We are looking global fascism in the eye and we must not blink. You can recognise politicians and mainstream 'journalists' by the break-neck speed of their eyelids and they are the problem, not the answer. We the People have to sort this out or no one will. Come on – let's go.

Summary of what ultra-Zionist Cult insider Dr Richard Day said was going to happen to the world when he spoke at a meeting of paediatricians in Pittsburgh, Pennsylvania, in 1969

Population control; permission to have babies; redirecting the purpose of sex – sex without reproduction and reproduction without sex; contraception universally available to all; sex education and canalizing of youth as a tool of world government; tax-funded abortion as population control; encouraging anything-goes homosexuality; technology used for reproduction without sex; families to diminish in importance; euthanasia and the 'demiase pill'; limiting access to affordable medical care making eliminating the elderly easier; medicine would be tightly controlled; elimination of private doctors; new difficult-to-diagnose and untreatable diseases; suppressing cancer cures as a means of population control; inducing heart attacks as a form of assassination; education as a tool for accelerating the onset of puberty and evolution; blending all religions ... the old religions will have to go; changing the Bible through revisions of key words; restructuring education as a tool of indoctrination; more time in schools, but pupils 'wouldn't learn anything'; controlling who has access to information; schools as the hub of the community; some books would just disappear from the libraries; changing laws to promote moral and social chaos; encouragement of drug abuse to create a jungle atmosphere in cities and towns; promote alcohol abuse; restrictions on travel; the need for more jails, and using hospitals as jails; no more psychological or physical security; crime used to manage society; curtailment of US industrial pre-eminence; shifting populations and economies – wearing out the social roots; sports as a tool of social engineering and change; sex and violence inculcated through entertainment; making boys and girls the same; implanted ID cards – microchips; food control; weather control; knowing how people respond – making them do what you want; falsified scientific research [see 'global warming']; use of terrorism; surveillance, implants, and televisions that watch you; the arrival of the totalitarian global system.

Noahide Laws = human control

The seven so-called Noahide Laws are claimed to have been given by 'God' to Adam and Noah and are binding on non-Jews with *decapitation* the main penalty for not complying. Other punishments for non-Jews include death by stoning if a man has intercourse with a Jewish betrothed woman or by strangulation if the Jewish woman has completed the marriage ceremonies, but had not yet consummated the marriage. They're not racist or mad or anything.

'God' had nothing to do with the 'Seven Laws of Noah' and neither did 'Adam' and 'Noah'. They were concocted by extremist Talmudic rabbis with the goal of imposing them on the entirety of human society. The Babylonian Talmud and Jerusalem Talmud are founded on the interpretations of rabbinical crazies and incredibly racist. The decept claims that 'Noah' is the father of all post-flood humanity and so non-Jews (Gentiles) are all subject to the Noahide Laws given to him by 'God'. 'Noah' was actually an invented character based on 'flood' memes in many cultures long before Old Testament writers brought their composite invention to global prominence with his 'ark'. The Noahide Laws are as follows:

1. Do not worship idols.
2. Do not curse God.
3. Establish courts of justice to impose the Noahide Laws.
4. Do not murder.
5. Do not commit adultery, bestiality, or sexual immorality.
6. Do not steal.
7. Do not eat flesh from a living animal.

The Devil here, as always, is in the detail. The key 'law' is the setting up of courts to impose the Noahide Laws and decree the death sentences on non-complying non-Jews or Gentiles. These courts would be controlled by Sabbatian-Frankist Death Cult 'judges' according to their interpretation of what constitutes 'worship of idols', 'cursing god', 'adultery', 'sexual immorality' and all the rest. Some of these ultra-Zionist extremists consider Christianity as 'idolatry'. This is the point—non-compliance with the 'God' decreed by the rabbinical (Sabbatian-Frankist) 'courts' would simply mean non-compliance with the 'God' that they decide is 'God'. These zealots contend that Israel is obligated to

bring the entire world to worship the Sabbatian-Frankist 'God'. All other worship, or no worship, would be decreed as 'idolatry', 'worship of idols' or cursing 'God'. The fact that they would be ordering the murder of non-compliers over a list of 'laws' that include 'do not murder' matters not to them. Hypocrisy is their very lifeblood. This is not meant to make sense to anyone with an active brain cell. It is merely a calculated excuse to kill who they like when they like. There are many other 'laws' that apply only to Gentiles, too, and even not setting up the courts to pass death sentences is punishable by death.

You could write all this off as a form of insanity except that recognition of the Noahide Laws (including therefore the demand for the creation of Noahide 'courts') has been gathering in the Gentile world. President Ronald Reagan signed a proclamation in 1982 recognising 'the eternal validity of the Seven Noahide Laws, a moral code for all of us regardless of religious faith'. The US Congress gave its support to the Noahide Laws in 1991 when establishing an 'Education Day' to honour the ultra-Zionist Russian Empire-burn extremist racist fanatic Rabbi Menachem Mendel Schneerson, leader of the Chabad-Lubavitch movement, who said that non-Jews exist only to serve Jews. He also said:

This is what needs to be said about the body: the body of a Jewish person is of a totally different quality from the body of [members] of all nations of the world ... The difference in the inner quality between Jews and non-Jews is so great that the bodies should be considered as completely different species. An even greater difference exists in regard to the soul. Two contrary types of soul exist, a non-Jewish soul comes from three satanic spheres, while the Jewish soul stems from holiness.

A more racist claim you could not imagine from those who accuse the rest of the world of racism when Jewishness is not even a race, but a cultural belief system. The 1991 resolution passed by both Houses of Congress (H.J. Res.104) during the presidency of Father George Bush and included the following:

Whereas Congress recognizes the historical tradition of ethical values and principles which are the basis of civilized society and upon which our great Nation was founded;

Whereas these ethical values and principles have been the bedrock of society from the dawn of civilization, when they were known as the Seven Noahide Laws;

Whereas without these ethical values and principles the edifice of

civilization stands in serious peril of returning to chaos:

Whereas society is profoundly concerned with the recent weakening of these principles that has resulted in crises that beleaguer and threaten the fabric of civilized society:

Whereas the justified preoccupation with these crises must not let the citizens of this Nation lose sight of their responsibility to transmit these historical ethical values from our distinguished past to the generations of the future;

Whereas the Lubavitch movement has fostered and promoted these ethical values and principles throughout the world,

A few things: The United States was not founded on the Noahide Laws and they have not been the 'bedrock of society from the dawn of civilization'. They were scripted by Talmudic rabbis representing a small section of a tiny section (currently 0.2 percent) of the world population but decreed by these arrogant extremists as applying to the whole of humanity on pain of death. Congressional politicians claim that the deeply racist Chabad-Lubavitch movement has 'fostered and promoted these ethical values and principles throughout the world'? Don't be ridiculous. But when you are owned by the Sabbatian-Frankist Death Cult via funding and intimidation you'll parrot any old crap that your masters tell you. The plan is to introduce a universal 'Noahide Code' founded on the Noahide Laws and imposed by rabbinical courts in a world government system controlled out of Jerusalem (see Smart Grid) and this 'code' would replace national sovereignty. The United Nations is seen as a vehicle for advancing this agenda and is 'striving to fulfil' many parts of the Noahide 'universal code'. The plan is for the global Noahide Laws to be administered by the Biblical Sanhedrin as part of the Smart Grid control system and the rebuilding of 'Solomon's Temple', just by coincidence, of course, the Sanhedrin Council of the Jewish nation was reconstructed for the first time in 1,600 years on October 13th, 2004. The ceremony was held in the Israeli town of Tiberias on the Western shore of the Sea of Galilee where the council's last meeting took place in 425 AD.

The pieces are being moved into place at ever greater speed and the symbol of the Noahide Laws is all around us today. It's the rainbow colours depicting the rainbow of Noah in the Biblical story of the Great Flood. The now ubiquitous symbol of the rainbow (including as a symbol for medical staff support during the 'pandemic') is yet another 'coincidence'?

No chance.

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- A**
- asynchronous 58-60
- adoption to technology 150-2, 302-8, 467-81, 494
- Adelman, Sheldon *see*, 226, 266, 371
- advertising, 348-9
- Agenda 21/Agenda 2000 201, 299, 301, 375
- Ahmed, Imran 573, Postscript
- Alex, Stuart 263
- Akin, William 704-5
- Alexander, Eben 36, 251
- Alexis 156-7, 160-1, 164, 170
- All That Is 864, 866-9, 871-4, 876, 878-82
- Allington, Daniel 573
- algorithms 211-12, 214, 264
- Amazon
- ownership *see*, 462
 - climate change 256
 - Covid-19 230, 526, 527-3
 - monopolies 206-17, 227, 311, 349
 - smart assistants 323-4, 364
 - Smart Grid 369
- Anderson 390, 395-4, 436, 525
- Anderson, Roy 834
- Andrew, Duke of York (Prince Andrew) 156, 256, 371
- Andrews, Katherine 347
- Angelou, Maya 93
- anti-fascist 164 *see*, 200-1, 213, 312, 326-42, 467
- anti-fraud lines
- ownership 246, 340, 372-3
 - climate change 301
 - definition 225, 243, 254, 325-6, 371
 - Historical denial 286-7
 - Israel 204-5, 235-6, 243, 294, 371
 - Protection Racket 236-7, 240-1, 254, 265, 424, 426
 - Submarine-Fuel-Line 254, 335-6, 424, 370
 - Smart Grid technology 372
 - pages 361
- Apple
- climate change 286
 - Covid-19 ownership 520, 577
 - location data, sharing 364
 - military control 269
 - New York 361, 365-7
 - smart assistants 364
 - tax transparency 256-7
 - technology 363
- Anthem 346, 362-72, 184-5, 374,

B

Bank of International Settlements (BIS) 373-4

banking and financial system *see*, *see*

- cash, disappearance of 222-3, 294, 555
- central banks 223, *The*
- Covid-19 36-7
- credit 56, 227
- global financial crisis of 2008 190-2, 228
- Internet 211-12
- technology 373-4
- world currency 222-3
- Basford, Joe 269
- BBC 266, 307, 421
- benchmark 202-2, 267-8
- climate change 226-2, 262, 268
- Covid-19 520, 567-8, 573-4
- Beise, Silas 126-30
- Behavioural Insights Team
- Postscript
 - behaviour modification 312-5, 348-1, 419, 419
 - belonging to seeing 66-71
 - Belsky, Jonathan 607, 621-2
 - Benedict XVI, Pope 254
 - Bennett, Ray 411
 - Berkley, Seth 468
 - Berne, Eric 189
 - Bernstein, Mike 277
 - Bernson-Lau, Tina 211, 223, 396
 - Berenson, Neil 322-14, 323
 - Berns, Jeff 209, 225-8, 268-9, 346, 393, 393-4, 416, 526, 352, 357, 606-9
 - Biles, Joe 265, 360
 - Big Pharma *see*, *see*, 63-4, *at*
 - cartelism 361-12
 - Covid-19 511, 540, 522-3, 536, 563
 - biocompatibility 122
 - polio vaccinations 567-8
 - vaccines 179, 480-1, 484, 488, 581, 588-9
 - WHO 538
- Bilderberg Group *see*, *see*, 287
- Bill and Melinda Gates
- Foundation 302, 375, 405-9, 504, 506, 526, 536-6, 579
- billboards *see* the One-
personism
- Bin Laden, Osama *see*, 236, 278-20
- Birn, Deborah 602, 604, 6, 536
- Blackwell, Norman 576
- Blair, Tony *see*, 194, 221, 249, 524, 575
- bloodlines 28-31, 153-4, 185
- Bloomberg, Michael 227, 228,

- 366-7, 569
- Bloomberg, Richard 305
- Body-Mind (Over-sensitised)
Bible 21, 66, 174, 461-4
- addiction 151-2
- astrology 63
- consciousness 4-6, 13, 24-5, 142-4, 465
- education 162, 204-6, 266, 190-2
- erecting / de-erecting 2-8, 12-17
- see 167, 172
- heart 110-3, 110-11
- Infinites Awareness 2, 3, 4, 46-7
- perception 446-7, 564-8
- reality 1-16, 49
- self-identity 81-4, 48
- simulation 120
- vaccines 439
- vibrations 441, 445-6
- see* fields 45-7, 61-3, 442-4
- Bolin, Pella 207, 576
- Boulton, Cory 376
- border, opening the 237-41, 260-1, 267, 366
- born witnesses or lovers 71-5
- Boyle, Francis 478-9
- Bradsher, Carl 30-2, 286
- bravo salute anti-fraud
intelligence (MI) brain
connection
- United States barium 62
 - cholesterol 279
 - consciousness 6
 - education 183-6, 195
 - heart-brain conflict 101-12
 - history, an 183-4
 - illusions, as 11
 - information processing, brain as an 77-2
 - left hemisphere 143-6, 193
 - plasticity 15-19, 456
 - right brain-brain 575-4
 - right hemisphere 163-4, 189, 193
 - water 120
- Bravetti, Simon 286
- Brave New World symphony
426, 435-6
- Brax, David 166's *synthesis*
experience 14, 21, 37-40, 85, 95, 152
- Brewer 251, 253, 374
- Brill, Steven 575
- Bris, Sergey 361, 365, 375, 385, 390, 446, 518, 535-6, 577, 626-9
- British royal family 26-40, 155
- Brown, Boyd 448, 452-3

- Brown, Gordon 573
- Brownie, Zbigyew 361-3
- Bubble vs Body-Mind (Over-sensitised) Bible
- Bukharin, Annie 532
- Burns, Terence 575
- Busch family *see*, *see*, 215-20, 253, 614
- Butas, Rashid 512

C

- Calder, Jon 420-1
- Campaign against
Anti-fraudism (CAA) 266
- capitalism 210-12, 215
- Carlson, Tucker 231, 234, 260, 344, 579
- cartelism 330-11, 313
- Caspe, Nick 560-1
- Cassidy, Josh 331
- cash, disappearance of 222-3, 294, 555
- Cassidy, Todd 448, 452-3
- celebrity *see*, 413
- cell-formation 240, 243
- artificial intelligence (AI) 794
- climate change 257
- Covid-19 495-6, 524, 578, 526-7, 548, 548, 568, 577
- SC 824-6, 531
- ghost or shadow banking
211-12
- Internet 239-13, 269, 369
- New York 210-19, 325, 324-6, 361-2, 364, 369-1, 376
- re-platforming 218-20
- One-personism 261-2
- perception, *see*
- self-ownership 394, 370-2
 - Silicon Valley *see*, 178, 217, 316, 340, 528, 565, 598
 - transgender systems 424-5
 - WHO 343, 569
- Centre for Countering Digital
Hate (CCDH) 378-4
- Postscript
- CERN 336, 266-7
- certification/credibility 405-6, 409
- Chakrad-Lubadist movement
618-23
- chickens 41-4, 48, 58, 74, 100-11, 314
- Charles, Prince of Wales 155, 264, 337, 376-7
- chickens 409-3
- children or young
people/children
- China
- expansion 50-9
 - Africa 266-7
- Covid-19 366-7, 436-41, 448-52, 467-8, 507, 530, 541, 552, 544
- Big Pharma 663
- digital currency 355
- SC 526-5, 531
- lockdown 378, 385, 477, 480-1, 481, 533, 542-3, 527-9, 579
- racism 563
- vaccines 577
- climate change 269, 346
- SC 395, 526-7, 534
- free speech 366
- pages 779
- ghost cities 228-30
- ghosted internet 521-3
- India 366
- Internet 89
- Israel 272
- leadership 76
- live, telling people where to
287
- New York 389-11
- population control 474
- Silicon Valley 52-4
- smart cities 365-6
- Social Credit System 235-6, 237, 237
- surveillance & security
309-80
- technology, as 364-5, 372-3
- United States, infiltration of
364-7
- vaccines 527
- Zohar 381
- chickens 63-4, 278-9
- Christianity 177-6, 334
- destruction of Western and
Christian society 246
- COVID-19 65
- New York 344, 354-6
- cities 228-34
- China, ghost cities in 228-30
- mega-cities, moves from
rural areas to 228-32, 298
- smart cities 229
- vacancies cities 282
- smart cities 231-2, 237, 298, 325-6
- Clegg, Frank 391
- Climate Cell 95, 235-607
- Agenda 21/Agenda 2020
291, 294-300, 376
- children raised by the state
287
- depopulation 289-300
- education, banking down
286-9
- family unit, restructuring the

297
 financial dictatorship, goal of 296
 human settlement zones, creation of 298
 movements, restrictions of 298
 national sovereignty, end to 299
 private property, abolition of 299-7
 auto-banking 301, 305-6, 307
 banking and financial systems 306
 carbon, *Ikeda* 145, 231, 235-7, 266, 268-62, 266-7, 291, 300-1, 306
 collection 299-61
 conversion 297
 chemicals 639
 computer models 345, 270-2, 274, 288, 499-500, 501
 Covid-19 556
 criminal sanctions 290-3
 cult, traits of a 256-9
 desert 268-9
 detests 295, 297, 309
 economy, effect on the 554, 555-6
 electric vehicles 258, 264, 280-7, 298, 307, 391-2
 European Green Deal 295
 extraction of biomass see 270-7
 5G 124, 430-3
 flying 299-60, 284, 298
 green movement 124, 298, 268, 270, 431, 488
 Hunger Games Society 260-8, 294, 299
 invasion, techniques of 270-1, 273, 275, 305
 LSD light to 304
 Milton Bakewell 266-7
Little Ice Age 265-7, 271
 media 259, 268-9, 291
 Medieval Warm Period 265, 267, 273
 nitrogen crisis 267
 natural resources, state ownership of 299-6
New Voice 280, 255-62, 273, 277-8, 281-6, 289-90, 293-5, 301-2, 370, 320, 323-4, 344
 One-pioneers 270-6, 278, 304, 291, 301, 306, 379
 orkneying 63, 199-6, 263-2, 267-8, 276, 290-3, 301, 307-4
 polar bears, extinction of 264, 267-8

population control 472
 religion 65, 260-7, 268-9, 277, 300, 404
Red Earth Samuel 999,288-8, 294
 school strikes 258, 301-2, 305
 science 297-63, 293-8, 308-4, 375
 Sun 145, 256, 276, 285
 UN 278, 289-304, 307
 vegetables 256, 279-82, 296
 wooler exterminator 267
 wind turbines 267
 world government 280-4, 288, 293-5, 344
Clinton, Bill 203, 233, 235, 264, 364-5, 371, 575
Clinton, Hillary 233, 264, 371, 627
 closed loop, overview as a 154-5
 Club of Rome 201, 266, 369, 370-1, 380-6, 501-3
 Cohen, Nick 569-70, 577
 Coleman, David 568
 Coleman, John 275
Collins, Damien 637-18, 623
 communism/Marxism 309-56, 324-5, 364, 375-6
 computer games 129-40, 149
 computer models
 climate change 345, 270-2, 278, 288, 499-501, 508
 Covid-19 277, 494-505, 504, 578-9
consciousness
 9-10, 17-18, 26, 130, 140-2
 artificial intelligence (AI)/brain connection 454
 Body-Mind (five-senses)
 Public 4-6, 10, 24-5, 463-6, 487
 expansion of consciousness 47, 502
 free 590-2
 frequencies 484-6, 569-7
 heart 372
 information processing, brain as an 17, 19
New Voice 442-3, 455
 perception 503, 506-8, 590-7
 reality 1-6, 9-10, 14, 24-5, 92
 science 586-7
 self-awareness 506-8
 subconscious 48-90, 179-81, 198, 199-8, 200-1, 399-7
 rational programming 599
 telecommunication 33, 182, 395
Cook, John 262-3, 279
Cook, Rita 365, 377
Corbyn, Jeremy 573
cosmosis or Covid-18

The Answer

Consent on Foreign Substances 200-604, 207, 575
Covid-19 *lines* 476-524 or *arctic*
Covid-19 *lines* and vaccines
 Gates, Bill and Covid-19
 alternative media 476
 476-80, 569
 artificial intelligence (AI)/brain connection 546, 567
 banking system 56-7
Big Pharma 501, 529, 522-3, 576, 590
 biological weapons 476-80, 567
 cash, disappearance of 286
 catch a virus, whether you can 493-6
 censorship 495-6, 524, 531, 636-7, 540, 548, 668, 70
 China 512, 476-81, 488-92, 497-8, 503, 511, 548, 552, 555, 557-60, 584
Big Pharma 560
 digital currency 575
 lockdowns 578, 585, 477, 480-3, 491, 538, 542-3, 557-9, 579
 clipping, for medical visit 486-7, 565
 climate change 556
 CDMRA 501
 computer models 272
 479-505, 524, 578-9
 cyclonic storms 525-4
 death taxes 482-6, 498-500
 501, 503-20, 527-8, 539, 544, 549, 593, 579
 Deep State 478-9, 503, 504, 561
 dependency on the state 502-4
 diagnosis thread 480-2
 480-90, 486-9, 507-47, 516-18, 576, 546, 593, 598-9
 DNA codes 599-28, 594
 economy, effect on the 479-8, 491, 495, 499, 504, 511, 550-6
 enforcement 598, 562-6, 577-8
 economic 491-2
 fear 336
 36, 398, 430, 495-6, 524-34, 556, 568-9, 574-6, 579
 food shortages 413, 578-9
 frequencies 528-31
 government, income 554-5
 gas prices 561
 hospitals, empty 477, 481-7
 502-3, 508, 512-16, 569-83, 565, 568, 590

Index

Hunger Games Society 677
 502, 520-4, 562
 immensity 448-6, 490, 513, 523-3, 578
 Imperial College 272, 561, 562-6, 515, 526, 529, 578-9
 in context, technique of 569, 700
 July 480, 505, 513, 518-16, 518-22, 526-7, 564, 568-9
 Johns Hopkins Coronavirus Resource Center 560, 529, 546, 528-6, 579
 laboratory, as cloning lines a 476-80, 560
 lockdowns, see 477, 480-2, 483, 495, 498-502, 513-13, 517-20, 520-4, 538, 542-3
 cause of death, as logistic 548-50
 China 507-9, 579
 coronavirus, effect on the 590-4
 enforcement 598, 562-5
 Hunger Games Society 551
 Italy 599
 media 566
 psychological relief 570
 working, places of 597
 lung effects as not caused by virus 516-4
 music 495
 mass non-cooperation 580
 media 476, 478-87, 498-9, 568, 512, 548-25, 565, 568, 568-70
 misinterpretation, fake news 523, 529-41, 565, 572, 574-5
 non-technology microclips 545-6, 568-9, 579
 natural defences, overlooking 322-4, 335-4
 natural immune-system response, virus as a 496-4
New Voice 385, 505-6, 560, 564, 569-70
 Obama 524-5, 568, 578-7
 official story 476-9, 540
 oil people 478, 520-11, 517-20, 521, 544, 549, 578-9
 One-pioneers 338, 341, 343, 592
 oxygen 528-34
 panic buying 562
 perceptions 488, 493, 517, 532, 544-50, 588
 police military state 562-5, 577-8
 population control 505
 psychological warfare 543-1, 561-2
 psychopaths 504-5
 push-the-gate technique 502

red flags 478
 reporting networks 565
 reptilian brains 523-4
 SAGE 501, 536
 self-isolation 528, 529
 Smart Grid 345
 social distancing 488, 493, 495, 531, 538, 592, 561-2
 social media 525, 544
 surveillance 313
 survival responses 523-4, 569-7
 technology 268
 tests 480-2, 493-1, 496-8, 508-5, 514-15, 521-2, 526, 541, 578
the Web 479-81
 WHO 477, 481, 486, 490, 520, 503, 509, 518, 538-40, 568
 Wikipedia 568-70
 world army 280-4
Covid-19 *lines* and vaccines 491, 493, 526, 563-4
Africa 512, 537
Big Pharma 501, 548-9
 DNA or genetic inheritance 546-7
 FEMA 545-6
 507, 507
 Gens 377, 463, 462, 466-8, 467-9, 499, 526-9, 543-4
Africa 512, 537
 GA-1 868, 500, 588-6, 534
 mandatory vaccinations 490, 493, 578
 young people 198, 512
 GAT 465, 502, 504-4, 538
indeterminacy 546
 mandatory vaccinations 490, 493, 578
 media 568-9
 non-technology microclips 568-9, 579
 old people 548, 578
 tattoos 468-9, 544-5
 kinetic Impact Modelling Consortium 505-6
 WHO 548-9
 young people 191, 512
 Crawford, Victoria 536
 covid 66, 277
 Crowley, Michelle 420-1
 Covidlock, Susan 267-9
 Covert, Gordon 279
cultural appropriation 323, 322-3
culture, takeover of indigenous 235, 247-9, 286
 Curry, Judith 275
 cup organism like covid-covid, xxx, 207-8, 364

evolution 131-2

DARPA 237-6, 230, 379-80, 388-91, 409
Darwin, David 417-26
Darwin, Owen 267-8
Darwin, Melanie 525, 568, 574, 576-7
Day, Richard 246-7, 296-7, 288, 376, 386, 425-16, 466-9, 473-4, 505, 541, 545, 555, 557
de Blasio, Bill 664-5, 559
death *vs*, covid-19
 death cult covid-covid
 deathbed perceptions 613-14
 fear 330
 frequencies 49
 near-death experiences 25-31, 38-9, 44, 130, 148, 151-2, 199
Deep State *see* covid, 274, 478-9, 505, 594, 584
deep underground military bases (DUMB) 157
dementia 275, 423, 425, 488
 democracy, anti-covid, 303-5
Digital Hate 622-23
Di Vestecco, Francesco 174
Dikens, Rosemary 273
discrimination
 racism 111, 243, 248, 318-19, 322-4, 329-54
 transphobia 117-28, 423-7
divide and rule 23, 98, 238, 337, 6, 314, 946, 639
DNA
 replacement of brain frequencies 437
 5G 586, 487
 genes 54-5, 67
 harvesting 546
 Quantum DNA effect 121
 simulation 137-8, 141-2, 149
 standing waves 138
 vaccines 487-8, 246-7
Donaldson, Liam 58
Doran, Hedley 272-3
dyslexia makes 486-9, 430
Dorsey, Jack 231, 261, 269
Douglas, Dylan
 drug addiction 133-4
Dragon, Regina 389
Drexler, Lawrence 247, 474, 555
E
 economy
 climate change, effect of 554, 555-6
 Covid-19 477-8, 482, 485, 499,

504, 513, 596-60
 technocracy 375
education 162-99
 attention of teachers and design
 190
 Blackline families 181
 Body-Mind (five senses)
 Bubble 362, 364-4, 388, 392, 3
 table 383-4, 393
 left hemisphere 182-9, 183
 right hemisphere 183-4, 188,
 190
 child abuse 796
 cropcut/metalization 182-3
 civility 183
 disruptive differences 180
 events 179, 182, 184-5, 188-9,
 193, 195-6
 SC 405-6
 global standardization of
 indoctrination 151
 homeschooling 194
 homework 382, 386-8
 loans 193-4
 Maintenance Everything
 389-92, 264
 New Wake 312-15, 388, 333-4
 prescription 377-8, 383, 385-88
 play 386
 political correctness 192,
 199-201
 Postage Stamp Commerce
 177, 186, 200, 214
 self-directed learning 194-5
 subscriptions 178, 191, 195-6
 suicide and stress 195
 systematic programming
 40-202
 technology 374-5
 universities and colleges
 185-7
 vaccinations 191
 vegetarian 261
Elton, Albert 16, 22, 39, 62,
 325
electric reality 36-9
Electric Universe
 project/Thunderbolt Project
 443-4
electric vehicles 298, 284, 286-7,
 298, 307, 302-3, 394-2, 397
electromagnetic waves 304-332;
 7-14, 383-4
 apparatus 58-60
 Covid-19 324-8, 332
 NG 285, 305-403, 407, 328-8,
 332
 heart 113, 115
 holograms 51, 91
 magnetic field of the Earth
 147

ergodic personalities 132
 paramecium activity 89-92
 population control 473-3
 simulation 143-8, 151, 172
 the Spider and the Web
 304-305
 synchronicity 87
 virtual reality 143
Ellison, Ralph
Emmett, Ezekiel 129
Ennis, Masses 120-1, 458
empathy
 heart 600-1, 610, 612
 love 106-4, 97-8, 105, 127
encoding/decoding 7-8, 12-17
entirement of brain
 frequencies 476-7, 508
epigenetics 67-8, 117, 132, 423
Epstein, Jeffrey 195, 396, 371
Evans, Adams 200-1
Etzioni, Ora 394-2
eugenics 446-7, 474, 541
European Union
 Brexit 211, 253, 278
 destruction of Western and
 Christian society 246
 euro 223
European Green Deal 285
facial recognition cameras 373
 investigation 276, 248
 racial and xenophobia 374
Fabian-Rotation Solution (FRS)
 373
 experiment, at 306, 321-2, 247, 230,
 283
 ethanolic 473-4, 617
Evans, David 271, 293
Exhibition Berlin 54 305-333,
 31-2, 361, 386, 292, 298-300,
 302
Exler, Nigel 508-9

F

Facebook 203, 210-11, 393, 392
 addition 114, 448-50
 algorithm 264
 invites 82
 ownership 34, 218, 311, 389,
 323, 336, 596-60, 568-74
 Covid-19 323, 325, 336,
 570-61, 548, 568-74
 heart 368-71
 Learning AI 278
 New Wake 209, 334
 ridicule 359-8
 shadow banning 213
 tax transparency 227
 technology 523
 WIPO 524, 539, 548
Fallen Angels 148-9, 153-4,

156-7, 327-8
Farrow, Michael 467-8
Farr, Anthony 481, 508-9,
 548-9, 353
Far 033-4
 Body-Mind (five senses)
 Bubble 110, 132
 Covid-19 306
 death 571
 frequencies 590-4
 heart 603-2, 607-8
 language 337, 346
 love 106-8, 126-7
 religion 91, 382, 398-2
 secretary 605-6, 608
feedback loops 12-1, 328-7,
 363, 389, 399-403, 602
Feinman 118, 313, 348, 427, 423
Ferguson, Neil 500, 522-5,
 525-12, 534, 536, 539-4
Fibonacci number sequence
 148-2
de Field J, A-J, 103, 122-5, 181,
 372, 179-7, 301
Figares, Christiana 292
Flintenberg, Anton 62-1, 525-8
Fitzmaurice, Laura 204-5
FLC 31, 301, 395-428, 456, 409-30
 censorship 528-9, 531
 decentral 489-9
 China 395, 526-2, 538
 climate change 124
 Covid-19 396, 401, 495-6,
 524-34, 598, 568-9, 574-4, 576
 climate change 430-2
 democracy 823, 825, 489
 ENA 388, 480
 electromagnetic fields 205,
 298-400, 432, 524-8, 532
 frequencies 216, 388, 395, 302,
 801, 822, 406-7, 528-31
 genes 68
 health, damage to 386-408
 media 726-5
 reform, effect on 400-3
 religion 426, 526-34
 population control 672
 psychological effects 822-3
 science 425-8
 Smart Card 265-6, 476
 transgenerational hysteria 483
 fires, dropping down 397
 viruses 396-7
 vectors, deployment as 4
 487-9
Flt Earth 260-1
 flying 259-60, 284, 298
Flowers, Richard 251
Fontaine, Maya 628-9
Fox, Falco 628
Fox, Laurence 317

Francis, Pope 306, 437, 504-5
Franc, Jacob 306, 137, 398, 371
Franklin School 234
 free speech see also censorship
 New Wake 224, 313, 325-6,
 328-5, 341, 348,
 transgenerational hysteria 421,
 425-4, 428, 430
Freeman's cod 307, 77, 197
frequencies 67, 439, 594, 597-8
 color 44
 consciousness 445-5, 395-7
 Covid-19 528-31
 entrainment of brain
 frequencies 456-7, 569
 fear 590-4
 SC 216, 388, 395, 367, 408, 403,
 436-7, 526-30
 genes 66-7
 near-death experience 145
 psychology 154-5
 psychology 176, 384-2, 303,
 307
 religion 158
 simulation 186, 192, 158-9
 vaccines 459
 world 45, 575-16, 441-4,
 425, 592-4
Friedrich, Rebecca 181-2, 502
Furedi, Frank 233, 328
G
Gabbard, Tada 261
Gates, Bill 225-6, 342, 375, 385,
 418-9, 446-8 see also Gates, Bill
 and Covid-19
Gates, Bill and Covid-19 440,
 506-7, 513, 608-9
 biological weapons 568
 Bill and Melinda Gates
 Foundation 302, 375, 448-9,
 504, 526, 528, 538-5, 575
 censorship 129-40
 China 528-31, 542-3
 computer models 534
 cryptocurrency 555
 digital identity 545
 eugenics 466-5, 477
 GAVI 468, 503, 504-6, 536
 Guardian group, funding of
 569
 lockdown 477
 polio vaccination 507-8
 preparation for pandemic
 538-9
 psychology, as 535-61
 Rockefeller philosophy 541-3
 social media 548-74
 tests 543
 vaccines 323, 402, 407-8, 488,

536-5, 543-9
 Africa 532, 537
 GAVI 468, 508, 504-6, 536
 mandatory vaccination 450,
 493, 528
 young people 121, 512
 WHO 477, 481, 486, 530, 533,
 533, 514, 527-3, 548
Gates, Frederick T 183-4
Gates, James 138-9
Gates, Melinda 537-6 see also
 Bill and Melinda Gates
 Foundation
Gates, William H 468, 472, 543
Gates, John Taylor 187
gender see also transgender
 hysteria
 men, teaching of white 344,
 346-53, 756-60
 transgender features 509-6,
 483-18, 427, 456
 stereotypes 521, 540-1
 toxic masculinity 356-68,
 480-1
gender 62-9, 71
 DNA 64-8, 92
 epigenetics 67-8, 117, 132, 423
 simulation 152-3
 switching genes off and on
 65-8
 synthetic genes 647-8
 369-89
Gerhardt, Sus 128-30
 global financial crisis of 2008
 36-7, 528
globalization 31, 223-4, 227-9,
 234
Gonios 120-71
 Alexandria, destruction of
 Royal or Great Library in
 356-8
 Archimedes 150, 162-73
 face reality 160, 162-6
 Eratosthenes 167-4
 Lays 140-1, 170
 invention, technique of 168
 knowledge 148, 167
 light 161
 Hippo Hasonian Library
 159-66, 171
 Prime Reality 161-3, 165-71
 spheres 161, 165-6
 Roman Catholic church
 158-60
 simulation 160-2, 166-7,
 171-4
 symbols 145-6
 Upper/Lower Ascleps 168-8
 water 161-2, 168
 Yiddish 167, Decharge 160-5,
 171

Goodman, Peter 316-5
Google
 artificial intelligence
 GAD (brain connection) 33,
 267, 277, 380
 censorship 308, 211, 357,
 394, 430, 462, 503, 537-8
 climate change 275, 286, 390,
 441
 Covid-19 537-43, 561
 EMR/579, 269, 479
 human rights 213
 hypnosis 361
 military control 369
 monopolies 212, 311
 New Wake 232, 300, 375
 news 232
 Smart Card 382-3
 tax transparency 228-7
 technology 325
 YouTube 153, 212, 257, 641,
 513, 538-40
Gov, Al 262-4, 274, 302
Graham, Mike 506, 568, 374
Grant, Kenneth 305-6
graphics programming 263-5
Gray, Peter 159
Green New Deal 305-6,
 277-8, 285, 295, 313, 402, 526
greening gaps 216
green/red toxins 234-6, 254,
 524-5
 genes, coordination of 236-7, 240,
 301
Greiner, Peter 264-5
H
Hahn, Richard 288
Haddock, Tracy 202
Hadwin Collier 135
Hall, Marly P 134
Hallinan, Jessie 422
Hancock, Matt 462, 523, 530
Hanson, Victor Davis 313
Happert, Willam 371
Harry, Duke of Sussex Prince
Harry 259-63, 316-15, 356
Hart, Michael 158
hart speech 210-12, 240, 285, 297
Layton, John-Dylan 274
Hayden, Debbie 425
head
 All That Is 561-8, 666, 683-11
 attraction 500
 awareness 172, 540, 667-12,
 615-18
 behavior modification 530
 Body-Mind (five senses)
 Bubble 112-3

brain-heart conflict 111-12
 chains 74, 100-4, 108-18, 114, 170
 children 110-21
 coherence/incoherence 114-5
 communication from the heart 112-13
 disordered perception 615-18
 electromagnetism 103, 115
 emotional reactions 630
 empathy 603-1, 612, 612
 fear 601-2, 609-9
 feedback loops 559-603, 602
 global heart 124-6
 heart-brain-body 112-16
 holograms 108-2, 109-4
 human love, heart: love as not 681-2
 intention 101-12
 laughter 643
 love 300-4, 713-16, 630
 magnetic, as the 630-11
 The One 609-632, 638, 630-32
 opening the heart and being the heart 604, 605, 610-15
 perception 100-5, 610-16
 religion 630-5
 self-identity 611-15
 water 120
 wisdom 115, 608-10

Helmberg, Werner Karl 43
 Herbert, Frank 255
 Hilbert, James 492
 Holmes, A. E. H. 71, 125, 224-5, 290, 363, 435
 live minds 296, 379, 440-8, 455, 546

Huffman, Oswald texts 71, 140-3
 Hufschmidt Oswald 206-7

Holographs/holography 64, 62, 176, 183-4, 281
 digital holograms 53, 90, 129
 attainment of brain frequencies 456-7
 heart 103-5, 108-9
 human decoding 147-6, 175
 illusion 8-9, 12-16, 36, 50-4
 right sky 158, 177
 observer effect 76
 consciousness activity 56, 91-2
 physical reality 50, 56
 positioning 69
 possession 76-7
 reality 90
 stimulation 130, 141-2, 147-8, 158, 173
 size of holograms 59-60
 symbols 135-4
 time 21, 23
 Universe 53-4, 128

vibrates 458-9
 wavefields 54-5, 62, 130-4, 170, 479, 485, 488, 495

homomorphism 228-9, 254, 243
 homomorphically 722-3
 Hope Not Hate 571
 Huxley Games Society
 chess 232
 climate change 263-8, 294, 299
 Covid-19 497, 500, 550-4, 560
 drug addiction 254
 globalisation 234
 immigration 243
 Incoast 589
 New Voice 224-8, 344, 316, 340, 362
 One personism 225-6, 228, 236, 216, 307
 technology 363
 world unity 404, 411

Hunt, George 269-81
 Hunt, Tim 221-2
 Hunt, Patricia 399-60
 Handy, Aldous texts 217, 246, 298, 392, 393, 414-15, 435, 461, 468, 492
 Hyde, James 375-6
 Hypatia 158-9
 hypnosis 214-15

I
 Icke, Gaia 161, 169, 436-9
 Icke, Joyce 224, 504, 575-6
 identity vs identity politics
 self-identity

identity politics 85, 336-8
 Ignatiev, Noel 81-2
 Iluminati 43, 134, 137, 210
 Illusions/illusory 506-9, 16, 24, 16-2, 70, 57-8
 immersive technology 378-9
 immigration 228, 245-9
 cultural education 238, 348, 347-8, 358
 de/institutionalisation of illegal immigration 243-4
 deportations 236, 243-4
 EU 239, 246
 fear 237, 246
 hate speech 241, 245, 249
 Hungarian Citizens Society 228, 243, 249
 mass immigration 228, 236-51
 New Voice 241-50, 557
 open borders 237-41, 250-1, 267, 364
 refugees 239
 secretary ethics 242

Sweden 242, 244-7, 344, 355
 technology 364
 UN 238-40

Internet vs. social media
 algorithms 211-12, 116, 394
 alternative media 223
 banking/financial system 211-12
 Big Tech 282
 censorship 223-13, 385
 CIA 220
 DARPA 218, 379, 366-90
 dystopia 213
 ghost or shadow banking 311-12
 hate speech 210-12
 Internet of Things 362, 409
 New Voice 213-11, 369-99
 simulation 138, 185
 surveillance 212-13
 time 22

intersectionality 95, 302, 317, 315, 345, 393, 417
 invasion, technique of
 ontological invasion 157-8
 Big Pharma 64
 climate change 270-1, 273, 275, 302
 Covid-19 330, 339
 Genetics 168
 God 149
 New Voice 210, 243, 379, 340, 361

Ising (see) 404, 308, 219-20, 285, 286, 406
 Isyhet, Charlotte 153

Istaiti
 anti-Semitism 204-5, 220-4, 342, 373, 294, 570
 Beerleba complex 305, 270
 censorship 336, 360, 551-2
 certainty 609
 China, relations with 571
 Covid-19 561
 Drey, Steve 567
 drone systems 568
 Iran 289
 media 204-5
 Moudal 367-5, 371
 New Voice 362
 nuclear weapons 371
 Palestine 4, 205, 335-4, 392, 372, 427
 Sebastian-Franklin
 surveillance, 4, 304-8, 312, 367-72, 412
 Saudi Arabia 218
 war: trafficking of miners 371
 Smart Grid 365, 371-2, 412
 Solomon's Temple, rebuilding of 372

technocracy 367-9, 369
 United States, relations with 367, 358, 367-71, 400
 WikiLeaks 204
 world government 371-2

J
 Jensen, Scott 535, 512
 Jeter Paul J, Pepe 594
 Jeter Paul II, Pepe 594
 Johnson, Berni 336, 374, 394, 403, 402, 500, 502-3, 567
 Johnson, Wayne 174, 297
 Jose Hyung Lee 144-5
 Jurek, Kyle 324

K
 Kaiser, Gary 439
 Kaufman, Andrew 683, 687-690, 121, 530
 Keller, Leo 567-8
 Keller, Timothy 417
 Kennedy, John P. text 547
 Kennedy Jr, Robert P 461, 547-9
 King Jr, Martin Luther II, 99, 291, 362, 444
 Kirkup, James 423-4
 Kling, Adam 573
 knowledge
 Genetics 139, 167
 intuition 75, 85-6, 100, 105-6
 knowing, difference from 150
 love 103, 125, 116
 Kuch Postulates 404-8
 Kufner, David 142
 Kristian, Kristina 461
 Kundalini 42-4, 101
 Kuznetsov, Ray vs. text, 377, 399, 277-8, 291, 2, 396, 416, 436
 Kyle-Stall, Cameron 304, 531-2
 Kyang Hye Kian 193

L
 Labour Party 248, 347, 476, 476, 573-4, Footprint
 Langstaff, Stuart 147
 language
 New Voice 224, 219-25, 229-30, 334-5, 340-3
 self-identity 58-60
 transcendability 90
 transgender hysteria 417, 426, 431, 433-4
 Lanier, James 470-1, 475
 Lanza, Robert II, 81-2, 175
 Lamb, John Lamb 171
 Lee, John 515-30

Leser, Dawn 493-4
 Levin, Michael 149-50
 Levinson, Arthur II 646, 507
 Libet, Benjamin 174
 Lieber, Charles 680
 Light 136-7, 148, 161
 Lucifer 136-8, 148
 speed of light 24-5, 130-1, 148
 Lindehan, Graham 421
 Lipton, Bruce 56-7, 67
 Little Ice Age 265-7, 271
 Littman, Lisa 420
 London Live 577
 London Real 496, 524-5, 548, 547, 567-8, 574, 577
 love 93-107

anti-love 94-5, 97, 107
 anti-love 94-5
 artificial intelligence (AI)/brain connection 94-15
 attraction 93
 chemical love 99-4
 children, environment around 118-20, 122
 designer love 97-101
 empathy 85-6, 97-8, 107, 127
 evolution 97-8
 fear 106-8, 126-7
 the heart 100-4, 110-16, 119-21, 124-5, 681-2
 human love, love as love 100-3
 illusory love 97-8
 intelligence 97-8, 117
 Infinite Love 93, 4, 95, 136-7, 156-7, 445, 600
 intellect, prison of the 133-4
 knowledge 102, 108, 216
 the One 110-11, 127, 406-7
 science of love 109-11
 self, living 406-7
 source of love 99-104
 strength 128-7
 without children, environment around 116-20
 water 129-3, 126
 weakness 126-7
 what is love 85-127

Loveick, James 278
 Lucifer 136-8, 148, 153, 368

M
 MacAndrew, Nicholas 571, Footprint
 MacCormack, Patricia 207, 293, 318-9
 MacDonald, Kenneth 574-5
 McGilchrist, Iain 185, 189

McIntyre, Catherine 292-9
 McNeil, Randy 273, Footprint
 McSwaney, Morgan 303
 Maiastroni, Everything 43, 43, 52, 108, 198, 599
 climate change 269
 Covid-19 523, 594
 education 189-90, 208
 homomorphically 122-3
 left side of brain 183-4
 media vs. 200-1, 269
 The Program 177
 religion 128
 science 120
 young people 198
 Maitlis, Thomas 466, 472, 541
 manipulation, methods of 237-54
 Mann, John 236, 264-5
 Margolis, Irene 694
 Martin, Abby 285
 masculinity 316-40, 450-1
 mathematics 126-43
 The Matrix 18-12, 11, 52, 128-30, 126-8, 147-6, 153-4, 168-9, 409, 443, 462, 545

media vs. text vs. video (MV)
 membership Internet social media
 alternative media 206, 221, 476, 478-83, 585
 ester-talking 202
 climate change 216, 269-4, 281
 Covid-19 476, 478-82, 495-4, 563, 511, 545-25, 555, 561, 565-77
 creation of problem to impose the solution 220-1
 the Case 203-9, 220-3
 diversity 205-9

Maistroni, Everything vs. 283-1, 289
 New Voice 317, 328
 news 309-12
 Clinton 224-5, 568, 576-7
 official version 222
 censorship 293, 305-9
 perception programming 307, 58
 Postage Stamp Commission 230-1, 209, 6, 214
 Reach PLC, list of assets of 226-9
 repetition 222
 Silicon Valley 227-33
 the Spider and the Web vs. text
 vaccines 568-9
 medicine/psychics 18, 43, 84-90, 181, 168, 397-8

Mughan, Duchess of Sussex
Melanie, Meghan 229–33,
 318–17, 326

men, targeting of white 344,
 348–53, 356–62

Mexico, drug cartels in 237

Michel, Kevin 128

microaggressions 126, 323–8, 341

nanotechnology 470–1

military
Boonlebs complex 369, 371
 control of cyberpace 369–72
 police-military state 226,
 262–8, 277–8
 world army 223, 263–4,
 309–12

Miller, Harry 429–30

MNI, Inc. 70, 228–9, 263–4

money as the One-percent
Mason, Michael 251

Moran, Patrick 223–8, 238–9, 253,
 300

Morgan, Pavan 366

Mosier, Joel 297

Moss-Rohlfman, Sheila 317

Msia, Kay 490, 497

Murdoch, Rupert 246, 268–9, 274

Musi, Elias 212, 269, 285, 299–3,
 483, 485, 486, 533, 577, 609

myxomas 41–62

believing in seeing 68–73
 born victims or losers 71–5
 boys 62–6, 73
 paramnesia 69–92
 possession 75–8
 relationship (lover) fields
 73–8
 specialities 79–81, 86
 spirituality 86–8, 90
 venge

rearrangement / rearrange
 68–3, 69–8

worldwide 61–3, 63–78, 72–5,
 78–81

N
nanotechnology microchips
 465–6, 545–6, 588–9, 599

nanobots 126, 326–7, 330–3,
 333, 606

national sovereignty 296, 374

NATO 223, 252, 297, 837

Nazis 74, 128, 310, 343

neo-death experiences 25–28,
 36–9, 61, 132, 599

health transformations 29–30

high frequencies 148

low story 30–1

simulation 131–2

Nephelin Bloodline families

79–80

Neuroware, Leha-Maria 302

New Agers 31, 115, 127, 586

New Wake 233, 238, 241–9,
 300–42, 625

advertising 321, 348–1
 anti-hating 300, 302, 317

behavioral modification
 323–5, 343–1

connectivity 238–9, 328, 334–4,
 341–2, 344, 260–1, 379

Christianity targeting of 344,
 354–6

climate change 280, 295–62,
 273, 277–8, 284–8, 289–93,
 293–5, 300–2, 309, 325,
 333–4, 344

consciousness / Marston / sociels
 91, 99–16, 324–5, 325–5
 consciousness 612–3, 619

Covid-19 313, 320–6, 368, 364,
 369–70

creation of New Wake 302–15

cultural appropriation 333,
 322–3

decentralization,
 distribution, onset and
 normalization 302–14, 333

discrimination 318–29, 322–6,
 339–54

divide and rule 337–8, 344

education 312–15, 318, 333–4,
 free speech 127, 218, 234, 315,
 325–6, 334–5, 346, 348

globalization 234

goals of the Cab and New
 Hedraze 314–5

heart 603, 605

love minds 447

Hunger Games Society 234–6,
 264, 216, 248, 302

immigration 243–51, 357

Internet 213–17, 369–80

intentionality 95, 321, 317,
 336, 345, 353, 437

intuition, techniques of 233,
 243, 338, 340, 381

language 224, 319–25, 329–30,
 334–5, 381–3

media 307, 324, 569

men, targeting of white 344,
 348–53, 356–62

microaggressions 328, 332–5,
 341

racism 126, 326–7, 332–3,
 335

no platforming 318–19

One-percent 233, 241, 299,
 284, 305–16, 308, 316, 363–2

perception 315, 341, 344, 475

political consciousness 224,

329–54

NewsGuard 374–5

Niederle, Maria 346

No-Problem Reaction-Solution
 (NPRS) 126–7, 202, 220, 285,
 288, 403–12, 541, 554

Nordic laws 346, 403–20

Nobel Peace Prize 334

numbers 90, 134–43

O
Obama, Barack xxxi, cxviii, 130,
 252–3, 303, 551, 579

Observer Effect 17–15, 21, 28

Osorio Cortez, Alexander 251,
 278, 285, 303, 325, 556

the One
 climate change 230
 consciousness 34, 392
 control 445

Fallen Angels 148

Genesis 261–2

God 61, 620–1

happ 100–6, 110–61, 114
 399–62, 605, 613–12

love 113–11, 127, 616–7

self-identity 25–9, 41, 594

vibrations 444

waves 44–5

the One-percent
 anti-fascist fascism and

bill of sale of science 363–2
 capitalism 319
 citizenship 363–1
 climate change 225–6, 238,
 264, 295, 301, 308, 379
 Covid-19 536, 541, 543, 552

democracy 310

district attorneys, creation of
 237

education 191

freedom, definition of
 guaranteed income 236
 gun rights 236

Hunger Games Society
 225–6, 238, 236, 316, 377

immigration 228, 249

land grabs 230

New Wake 233, 263, 243, 229,
 254, 215–16, 340, 340, 360–2

police/military force 236

political parties 225

population control of 243

Problem-Reaction-Solution
 (P-R-S) 411–12

repression 80

socialism 216, 215

technology 318, 475–6

O'Neill, Neil 522–3

O'Neil, George 286, 290, 297–9,
 333–5, 322–3, 241, 363, 615,
 616–5, 437, 574

Ohio 190

out of body experiences (OBEs)
 62, 132

oxygen 436, 528–34

P
paraphilia 307a, 154–5, 437–6

Page, Larry 361, 365, 379, 385,
 390, 446, 523, 525–6, 577,
 628–9

Pai, Martin 430–1, 528, 532–3

personal activity 56, 64–6,
 68–82

electromagnetics 89–92

knowledge 83–8

medicine/psychic 15, 43,
 64–90, 132, 135, 507–8

polygraphs 98–2

possession 75

power stories and trust cards
 94–90

spirituality 64–5, 146, 294–7

Parier, David 893–4

Patterson, John 396–401

Peter Foundation 171

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

perceptions 104–103

social 1005, 179–81

see also
Postage Stamp Consciousness
 aging 23

357-6, 359-54 *see also anti-Semitism*
 Karkate, Cecilia 365
 Katz, Joseph 33
 Kaz, Saira 352
 Kappaport, Jan 482
 national, definition of 124
 al-Ranawi, Khalid Nasser 411
 reality 1-32, 301
 awareness 2-5, 36
 Body-Mind (five-senses) 34-41, 49
 consciousness 1-6, 9-40, 14, 17-48, 24-5
 electronic reality 56-9
 evolution (evolving) 7-8, 12-47
 false reality 189, 192-4
 God 4-9
 holograms 56, 915
 information processing: brain as an 17-20
 near-death-experiences 25-31
 perception 445, 583, 591
 physical reality, creation of 30-2
 Prime Reality 141-3, 185-71
 quantum reality 43-44
 shadow 49
 speed of light 14-5
 standing waves 132-4
 time 31-4
 reactualization 62, 85, 151-3
 relativity, theory of 21
 religion 177-7 *see also*
 Christianity; Gnostics
 Mysticism 88-3
 Body-Mind (five-senses) 34-41
 Bubble 148
 climate change 95, 252-7,
 261-2, 275, 301, 604
 closed mind 29
 divide and rule 29, 10, 446
 extreme Mysticism 447
 law 41, 582, 591-2
 frequencies 138
 God
 awareness 39-6, 41
 causality/uncausality 465
 God Program 582
 incarnation, technique of 149
 law 100-1
 Mistlebebe laws 618-20
 the One 48
 simulation 149, 154
 the Mind 37
 what is God 4-4
 heart 623-5
 theory love 37
 transmutation 624
 invention, technique of 149
 law 97, 100-1

Manifestation Everything 179
 New Wake 255, 254, 278, 446
 papers 122
 Substantia-Funktion 218, 254,
 618-20
 science 150-6, 604-5
 self-identity 308, 34, 41, 592
 Reaching Inquraz 301-2
 reptilian 78-9, 136-7, 181,
 145-6, 144-5, 333-4
 Reviv, Ron 71-2
 Rhodan, Carl 301, 579
 Ribbensack, Michael 345
 Richard, Walter 510-11
 risk/ale 76, 80, 96, 113, 105, 109,
 199-200, 206, 235, 253, 589,
 607
 Riell, Christoph 325-4
 Riley, Richard 871-2
 Rivers, Thomas Milton 459
 Rockefeller family 63, 183, 246,
 289-9, 298, 299, 331, 364, 405,
 537
 Rockefeller Foundation 191, 291
 Rothschild, Justin 308
 Row, Brian 495-6, 525
 Rubackid, Edmund de 289, 291,
 308
 Rubackid, Mayer Amoschel
 304, 181, 137, 218
 Rubackid
 anti-Semitism 573
 Bank for International
 Settlements (BIS) 374
 climate change 286, 294, 310
 Israel (Palestine) 225
 one-person 236
 Round Table 206
 WFO 307
 Rowley, Jeanette 302
 cryptic/archetypal 79-81, 189
 ET TV station 227, 575
 Round 306, 37, 581, 592, 605-14

S

Substantia-Funktion *see* *see*, 333,
 628-29
 anti-Semitism 254, 325-6, 424,
 570
 (Shaw) 236
 Israel *see* *see*, s, 204-5,
 302
 Kabbalah 137, 218
 Marston 302
 Mistlebebe laws 346, 618-20
 Project for the New American
 Century (PNAC) 304,
 238-15, 252, 309, 479
 religion 218, 354, 618-20
 Saudi Arabia 220-2, 312, 447

The Answer

September 11, 2001, terrorist
 attacks on United States
see *see*, 137
 Wikipedia 204
 Sackler family 254
 Sagan, Carl S. 149
 Sandberg, Sheryl 346, 449
 Sanders, Bernie 186-7, 283, 313,
 324
 Sandström, Martin 261
 Sarkis, Ash 208-9
 Sarason *see* *see*, 77, 106, 416,
 437-4
 Saturn 266, 348-9, 439, 475
 Saudi Arabia 216, 220-2, 312, 447
 Schill, Adam 592
 Schmidt, Eric 409-10
 Schmeisser, Amosheim Mosheid
 619
 Schofield, Philip 307, 324-9
 Schumann, Winifred Otto 431,
 483
 science 23-4, 201, 362
 astrology 31-2
 climate change 257-63,
 291-3, 301-4, 306
 consciousness 586-7
 love 126-11
 postmodernism 75-6
 perception 176, 440-1
 religion s, 304-9
 scientism 135-6, 373, 604
 Seligson, Jonathan 379
 semi-automation *see* *see*, *see*,
 415
 Selts, Naomi 321
 self-identity 31-60, 441-2, 452
 All Possibility 26-40
 atomic psychology 47-58
 awareness 18-41
 Body-Mind (five-senses) Bubble
 see state field 40-4, 49
 chakra 43-4, 48, 58
 consciousness 348-9
 the Call 33-4, 37
 electric reality 36-4
 experiences 502-4
 false self *see* *see*, 587-90
 the Field 177
 holographic Glasses 52-6
 humans, what is 40-2
 identity politics 95, 336-4
 interconnection 95
 labels *see* *see*, s, 28, 41, 181, 186,
 187, 336-5, 436, 562-8, 601-2,
 625-14
 language 39-60
 love 103-7
 New Wake 336-5, 344, 368-3,
 382-3, 596
 nothing is everything 36-40

Index

the One 26-5, 41, 564
 perception 383-90, 433
 Theoton Sell persona 26, 41
 physical reality, creation of 30-2
 politics 95
 religion *see* *see*, 34, 41, 592
 science 282
 social orientation 177, 326,
 345, 446, 602
see 44-50
 September 11, 2001, terrorist
 attacks on United States
see *see*, 137
 218-21
 settlement issues, creation of
 human 288
 social orientation 402, 425, 453,
 583
 chakra 358
 self-identity 177, 326, 345,
 446, 600
 Shakespeare, William 300-4,
 328, 349
 sharp-pointed 78-86, 86, 181
 Shepton, Al 320
 Sheikh, Yusef 451
 Shiga, Betty 87-8, 307-8
 Singer, Seth 339
 Silicon Valley *see* *see*, *see*,
 131, 207-15, 309, 307
 housing and financial
 system 312-4
 citizenship *see*, 176, 214, 334,
 361, 375, 583, 596
 Covid-19 524-5
 democracy 380
 SG 324-5
 global dominance 363
 information 242
 integration 232
 Israel 249-29
 media 207-19
 New Wake 242, 399
 Postage Stamp Consciousness
 214
 infallibility 225
 world army 410
 world government 330
 Zionism 349
 simulation 138-96
 addition 151-2
 alien, absence of 136-7
 Archon 381-2
 Body-Mind (five-senses) 34-41
 Bubble 152, 567
 computer games 139-40, 349
 computer reality mimicking
 simulation reality 171-3
 creation of the simulation 148-50

decision-making 174
 decoding our own primes 173-5
 DNA 137-8, 340-2, 149
 Electric Universe
 project: Thunderbolt Project 145-6
 electrical/electromagnetic
 communication system,
 universe as 140-6, 156, 172
 energy, human resources of 153-5
 environment to the
 simulation 184-4, 150
 Fallen Angels 146-8, 158-4
 fractal patterns 141-2
 frequencies 124-5
 Genesis 140-2, 146-7, 171-4
 Golden Ratio 149
 level 599
 High Frequency Earth 148,
 150
 holograms 139, 141-8, 147-4,
 184, 173
 human coding 147-4, 148,
 184, 173-5
 Internet and digital
 technology 129, 145
 isolation 156-7
 mathematics 135-43
 near-death-experiences 171-2
 numbers 136-43
 perception 588-9
 physics, law of 128-9
 repeating points 136
 Synthetic World Simulation
 (TWS) 274-82
 simulation, within a 279-82
 Solar Grid 379-80, 451
 universe as a 129-30
 virtual reality 129-9, 157,
 342, 170-1
 Singer, Fred 230, 346-50, 540
 Skeptical Science 275-6
 Skolden, Kosta 31-4
 smart assistants 303-4, 430-4,
 613
 Smart Grid technology 245,
 302-4, 394, 412, 598
 artificial intelligence
 (AI)/Brain connection 372,
 380, 386-8, 438
 Covid-19 545
 directionless consciousness
 vehicles 382-3, 391
 SG 390-4, 403
 Internet 382, 609
 Learning AI 379
 Mistlebebe Laws 628
 satellites, launch of 391, 405

simulation 379-80, 451
 smart assistants, connection
 of 380-4, 603
 smart cities 231-2, 237, 299,
 304-6
 smart streets 323
 television 415-15
 transgenic hysteria 413
 vaccines 446
 social justice 241, 338-40, 344,
 375
 social media *see also* Facebook;
 Twitter
 addiction 447-51, 453-4
 black sheep among 240
 connection 625, 598
 Covid-19 525, 540
 Learning AI 379
 perception 448, 598
 political correctness 342
 vaccines 462
 young people 447-53, 590
 socialism 320-18, 324-5, 375-4
 Soyates 44, 156, 322
 Sweden, Carl 343
 Solans, David 346-7
 Sorens, George *see*, 191, 224,
 233, 280-4
 anti-Semitism 252, 254
 Arab Spring 282-3
 David 231, 255, 374
 correlation 311
 climate change 286-8, 294,
 302
 Covid-19 526, 537
 (China) conspiracy, election of
 238
 illegal migrants, landing
 233, 242
 media 577
 New Wake mentality,
 landing of 248-4, 285-4, 339,
 340-1, 446
 ONE Movement 302
 Open Society Foundations
 (OSF) 230-4, 282, 536, 571
 people's revolutions,
 landing of 233-5
 Problems/Rosetta-Solomon
 (TWS) 251-2
 Silicon Valley 369
 Soul 80-1, 44-5, 49
 space 410-11
 Spanish flu 467, 520-6
 speed of light 28-5, 128-30
 The Spider and the Web
 see *see*, *see*, 287-8, 344,
 478-81
 standing waves 130-4
 Storms, Kate 426, 575

Sorensen, Soren 122
 Strachan, James 675-9
 Strong, Hendrick 493, 511
 Strong, Maurice 269-91, 264, 301, 310
 Szybo, Aron 179
 technical programming 595-5a

theaters 276
 disease change 145, 266, 276, 293
 electromagnetic 144-8
 concepts 419-7, 246
 temperature 146
 time 216-7
 vitamin D 278

technology

Artificial 309-19
 basic 418
 Internet 213-43
 New Wave 324-5
 smart materials 344
 smart streets 273
 nation for tracking purposes 468-9, 544-5

survival responses 503-4, 590-2
 Suskind, Leonard 54
 webshops 127-9
 Switzer, John 349
 symbolism 135-4, 145-6, 475
 synchronicity 86-8, 90
 synthetic humans 363, 413-16, 467-8, 471-3, 545, 583, 614-15
 Syrian crisis, 207-8, 264

The System

education 302-3, 394, 397, 399
 fear 612-14
 heart 682-5
 Internet 213
 media 207
 Sigfried, Peter 239

T

Talbot, Michael 15
 Talk Radio 286-7
 tax avoidance 225-7
 Taylor, James 426-9
 technology 292-3, 409
 banking and financial system 375-4
 climate change 368
 cover stories 535
 Covid-19 how 369
 democracy 291-4
 economy, changes to global 376
 education 376-5
 globalization 225
 Hunger Games Society 363
 Masters/Jackson 564, 576

Overpopulation 363, 376
 philosophy 536
 private property, end of 376
 psychology 526-7
 specializations 136

Teddy Adamses (Cheleryses)

536-8
 Teyrnack, Max 139-40
 telepathy 34-5, 148, 304-7
 Terrell, Kirk 53, 126
 Tesla, Nikola 61, 329
 Theology, Greta 231, 296, 360-1, 368, 371, 373, 268-82, 300-7, 309, 376, 488, 536, 604

Theravata, Bryan 347
 time 20-4
 times 134-5
 Tinsley, David 263, 266
 toxic masculinity 205-40, 450-1
 transgenerational hysteria 613-26
 artificial intelligence (AI), interaction with 363, 413-14, 439, 458
 nation 417-18
 omniscient 624-5
 domains 358
 children 415, 419-25, 431, 8
 Doctors, report by 422-4
 drug activity 407, 434-5, 436-8
 drugs 479-21, 425
 families 315, 427, 429
 group speech 421, 425-6, 426, 430

identity 424
 language processes 323, 417, 428, 431, 435-6
 legislation, meaning changes to 624
 media 423
 New Wave 303, 314, 316, 312-13, 311, 413, 417-20, 424-39
 no-gender synthetic biological humans 345, 413-39, 427, 434
 potential agents 418, 422-6
 protection 424-16
 recognition of gender 622-3
 social societies 405
 self-identification (declarations of gender) 429
 Smart Grid 413
 Smart TVs 413-16
 social services 427-8
 sport 418-19
 synthetic biology 413
 TERFs 427
 transphobia 417-20, 428-9
 virtual signalling 429
 Xenobots 414

United Nations (UN) 400, 488
 climate change 276, 280-81, 367
 immigration 129-40
 Nashville Lovers 420
 Smart Grid 396
 world government 223, 398, 294, 389, 500
 universal income 224-6, 294, 504-5

V

vacancies 131, 454-69
 Covid-19 bans and vaccines
 anti-novels, dissemination of 682-9
 Big Pharma 379, 468-9, 494, 601

trigger warnings 307-8
 Trilateral Commission
 400-408, 387, 394, 373, 409-10
 Trovati, Ramie 538
 Truong, Donald 395, 391-1
 climate change 262, 389
 Covid-19 266, 489, 302, 515, 548, 553, 564
 decentralization 244
 Epstein, Jeffrey 271
 funding 226
 Burger-Games Society 414
 Israel 283, 206, 370-3, 418
 narcissism 627
 New Wave 246, 310
 permanent government, in support of, social state of emergency, declarations of 543-6
 vaccines 547

The Times Show (Times) 607

tech vibrations 597-9
 Twitter
 censorship 104, 127, 139, 210-22, 311, 389, 370-81
 674-5
 Covid-19 350-48, 672
 ghost or shadow burning 11
 Learning AI 279
 social media 389, 212
 New Wave 232, 317, 314, 316
 special interests 389
 transgender hysteria 418, 416, 432
 vaccines 462
 young people 449, 462

U

ultra-Zionism/Death Cell
 covid-19, social 208-9, 371
 United Nations (UN) 400, 488
 climate change 276, 280-81, 367
 immigration 129-40
 Nashville Lovers 420
 Smart Grid 396
 world government 223, 398, 294, 389, 500
 universal income 224-6, 294, 504-5

vacancies 131, 454-69
 Covid-19 bans and vaccines
 anti-novels, dissemination of 682-9
 Big Pharma 379, 468-9, 494, 601

children 122
 cooperation 460-1, 570-7
 674, 467-8
 health consequences 459-61
 herd immunity 463-5
 ingredients 459
 mandatory vaccines 459-64, 468-9, 544
 mass interlocks 466-8
 synthetic genes 467-8
 nations for tracking purposes 468-9, 544-5
 toxicity 469-9
 Vaccines, Patrick 368, 566
 vaccines 276-82, 413
 cholera 279-9
 climate change 236, 278-82, 296
 ethical responses 331-2
 New Wave 279, 281, 331-2, 336-7
 plants and trees, stress felt by 279-80
 synthetic food 292
 Vaccines, Philippe 226
 vibrations 429-41, 444-6, 581
 body-based (Bio-sensory)
 subtle 461, 445-6
 fear 682
 trust 307-9
 virtual reality 56-2, 128-9, 145, 378
 addiction 130
 encoding 9, 15, 34-2
 electromagnetic 143
 illness 339
 limitations 129
 structures 128-6, 157, 362, 170-1
 virtual humans 451-3
 virtual signalling 248, 249, 299, 302, 316, 363, 627
 von Hauer, Werner 368-4

W

Wales, Jimmy 361
 Walmart 203, 226-7, 329-30
 Warren, Elizabeth 253, 476
 water 328-9, 528, 361-2, 368
 Watts, Alan 12, 22, 80
 waves and wavelengths create electromagnetic waves
 atomic radiology 47-6
 wavelengths 481-4
 Big Pharma 48
 Body-Based (Bio-sensory) Subtle
 45-7, 41-3, 442-4
 climate change 299
 closed loop, universe as a 134-6
 conformity 285

consciousness 5, 390-7
 arrangements 31-2, 71-8, 333, 137, 188, 295, 303, 441-2, 594
 astrology 82
 disease change 299
 consciousness 217
 genes 65-6
 heart 124-5
 micro-technology 479
 perception 178, 460, 593
 stimulation 258-2
 stress 67
 synchronicity 86-7
 families 79-81
 fear 370-4
 frequency 5, 213-16, 401-4, 485, 583-4
 genes 62-5
 heart 124-5
 holograms 34-5, 82, 173, 476, 448, 444, 455
 homophony 123-3
 mental over matter 69
 near-death experiences 84, 120
 New Wave 410-1
 neuronal activity 84-5, 89
 perceptions 440-3
 Foreign Stamp Concerns 213, 480-1
 quantum entanglement 62
 powering 46-9
 relationships 83, 138
 relationships 73-5
 reality 50-3
 rituals 675
 Susan 429, 476
 vulnerability 44-50
 shopkeepers 278
 simulations 149-52
 Soul 44-5, 48
 standing waves 256-6
 stress 57
 Sun 144-5
 symbolism 425
 vaccines 458-1, 468-9
 vaccines 286
 vibrations 444-5
 water 120-3

wealth see Overpopulation
 the Web or The Spider and the Web
 Web, Whitney 379-1
 Weinstein, Harvey 556
 Weinstein, Adam 137, 219
 Wheeler, Tom 266-6
 white people 243, 346-54, 356, 380
 Wilson, Seth 234
 WI-FI 7-10

addiction 454
 (Ad) 404-6, 445, 472, 531, 539
 Covid-19 486, 526
 eppur vivit 48
 health issues 465-6, 434, 456, 465, 472-8, 526, 528, 530
 holograms 173
 pineal gland 42
 plants, effect on 482
 reality 7-8
 satellite 166 17 391-1
 simulation 158
 worldwide provision 391

Wikipedia 225-4, 271-12, 569-70
 Williams, Nicola 426
 Wilson, Kirk 462-3
 Witt, Timothy 263
 Wolberg, Wolfgang 483, 521
 World culture or New Wave
 Woychik, Susan 261, 350, 389, 446, 513-14, 526-6, 546, 548, 572, 574, 577, 606-9
 Wood, Patrick 276, 363
 Woodcock, Tiafe 274
 World Army 275, 280-4, 439-42
 world currency 223-3
 World Economic Forum (WEF), Davos 289, 361, 366-7, 349, 393, 483, 536, 541, 556
 world government 228, 263-6, 288, 292-5, 339, 341, 371-2, 554
 World Health Organization (WHO)
 Big Pharma 526
 censorship 540, 568
 Covid-19 427, 481, 494, 496, 503, 509, 509, 546, 538-9, 540
 Gates 80, 398, 501, 509, 519
 Rothschilds 537
 certification by deception 588
 technology 526
 vaccines 548-9

Y

Yang Jieping, Yu
 Yalobash, Denton 368-6, 171
 young people's lives or also education
 addiction to technology 387-9
 artificial intelligence (AI) 144
 human connection 451-2
 brain networks, smartphones causing 484
 care, e-film taken into 128
 certainty/flexibility 465-4

Stevens, Simon 122
 Strachan, James 579-8
 Strong, Heriberto 493, 511
 Strow, Maurice 260-61, 264, 271, 272
 Stryker, Andrea 179
 subliminal programming 396
 Sun

cheirology 278
 climate change 143, 266, 276, 280
 electromagnetic 144-8
 cosmology 119-7, 266
 temperature 146
 time 146-7
 vitamin D 278

surveillance
 dictatorship 309-30
 law 418
 Internet 212-83
 New York 324-5
 smart assistants 348
 smart screens 273
 tattoos for tracking purposes 448-9, 544-5

survival experiences 538-6, 540-2
 Sweden, Leonard 54
 Swedlund, Peter 9
 Switzer, John 348
 symbolism 116-4, 147-6, 475
 synthetic human 363, 413-18, 447-8, 471-3, 545, 580, 634-15
 Syrian crisis 267-8, 268

The System
 education 182-3, 194, 197, 209
 law 612-14
 law 682-5
 Internet 213
 media 207
 Srijini, Peter 239

T
 Talbot, Michael 15
 Tal, Eyal 206-7
 tax avoidance 220-7
 Taylor, James 426-9
 technology 292-3, 609
 banking and financial system 375-4
 climate change 365
 cover stories 535
 Covid-19 boom 369
 democracy 291-4
 economy, changes to global 376
 education 374-5
 globalization 225
 Hanger Games Society 263
 Marshall, Jason 364, 376

One-perspectives 303, 376
 philosophy 536
 private property and 376
 psychopaths 306-7
 specialisation 536

Tedco Adhocracy 468-69
 536-8
 Tegmark, Max 134-40
 telepathy 14-5, 148, 204-7
 Terrie, Rick 53, 126
 Tesla, Nikola 61, 305
 Theology, Greta 231, 298, 260-1, 268, 273, 275, 289-92, 300-7, 309, 316, 414, 596, 604
 Thwaites, Bryan 247
 time 20-4
 time 134-5
 Tinslow, David 243, 246
 tests masculinly 536-68, 450-3
 tests masculinly 413-20
 artificial intelligence (AI), interaction with 365, 413-14, 438, 458
 tattoos for tracking purposes 448-9, 544-5
 omniscience 624-5
 domestic 258
 children 418, 419-26, 430-8
 Decision, aspect by 422-4
 drug artists 482, 434-5, 436-8
 drugs 479-25, 425
 freemasons 485, 427, 429
 group speech 424, 425-6, 428, 430
 identity 434
 language/promises 223, 417, 428, 431, 425-6
 legislation, creating changes to 424
 media 423
 New York 362, 374, 376, 377-7, 381, 413, 417-22, 424-39
 no-gender synthetic biological humans 343, 413-20, 427, 434
 parental rights 418, 422-4
 prosecution 424-18
 recognition of gender 422-3
 secret societies 416
 self-identification (declarations of gender) 424
 Smart Grid 413
 Smart TVs 415-16
 social services 427-8
 sport 418-19
 self-identification (declarations of gender) 424
 Smart Grid 413
 Smart TVs 415-16
 social services 427-8
 sport 418-19
 synthetic biology 413
 TEDs 427
 telepathy 147-20, 424-7
 virus signalling 429
 Neurobot 414

trigger warnings 327-8
Unilateral Commitment
 text-covers, 287, 364, 373, 406-13
 Tower, Barrie 528
 Trow, Daniel 215, 251-3
 climate change 292, 309
 Covid-19 266, 498, 502, 515, 548, 555, 561
 deportation 244
 Epstein, Jeffrey 271
 landing 226
 Hanger Games Society 264
 local 285, 286, 270-2, 410
 nationalism 402
 New York 246, 263
 permanent government, as puppet of world, cost state of emergency, declaration 543-6
 transactions 547

The Truman Show 416 467
 truth vibrations 297-9

Twitter
 censorship 127, 185, 218-22, 231, 269, 399-403, 574-5
 Covid-19 399-40, 572
 ghost or shadow banning 211
 Learning AI 225
 monopolies 289, 292
 New York 276, 317, 354, 361
 special interests 293
 transgender hysteria 434, 438, 432
 vaccines 462
 young people 448, 462

U
 ultra-Zionism/Death Cult
 Covid-19, 204-5, 272
 United Nations (UN) 446
 climate change 295, 299-304, 387
 immigration 239-40
 Nashville Laws 420
 Smart Grid 369
 world government 223, 286, 291, 289, 302
 universal income 234-6, 284, 304-5

V
 vaccines 141, 454-69 vaccine
 Covid-19 boom and vaccine anti-vaccines, demoralisation of 462-4
 Big Pharma 176, 460-4, 464, 466

children 122
 compensation 460-1, 576-7
 DNA 467-8
 health consequences 469-68
 herd immunity 463-5
 ingredients 459
 mandatory vaccines 464-64, 468-9, 594
 rare microchips 446-8
 synthetic genes 467-8
 system for tracking purposes 463-6, 544-5
 toxicity 458-9
 Yelland, Patrick 501, 506
 vegetation 276-82, 413
 cheirology 278-8
 climate change 230, 278-82, 298
 ethical vegans 311-2
 New York 276, 281, 331-2, 356-7
 plants and laws, status led by 279-80
 synthetic food 282

Ventur, Philippe 276
 businesses 470-68, 464-6, 561
 Body-Mind (Overseers) Bubble 441, 445-6
 law 592
 truth 597-8
 virtual reality 61-2, 128-9, 148, 172
 addition 150
 decoding 5, 17, 51-2
 electromagnetic 143
 Epstein's uses
 limitations 129
 simulation 128-9, 157, 162, 170-1
 virtual humans 450-3
 virus signalling 241, 236, 259, 302, 386, 383, 429
 von Braun, Werner 363-4

W
 Wales, Jimmy 261
 Walton 285, 226-7, 270-50
 Warren, Elizabeth 352, 458
 water 123-3, 126, 166-2, 149
 Watts, Alan 12, 22, 88
 waves and wavefields in the electromagnetic waves acoustic biology 47-8
 awakening 443-4
 Big Pharma 68
 Body-Mind (Overseers) Bubble 45-7, 41-5, 442-4
 climate change 299
 closed loop, vaccine on a 134-8
 conspiracy 225

consequences 3, 299-2
 endocrinology 44-2, 71-8, 123, 117, 256, 215, 217, 443-2, 594
 ecology 82
 climate change 299
 consciousness 217
 genes 45-6
 heart 524-5
 nano-technology 470
 perceptions 176, 440, 593
 simulation 150-2
 stress 47
 synchronicity 96-7
 families 28-81
 law 291-4
 frequency 5, 215-16, 440-4, 455, 593-4
 green 320-8
 heart 124-5
 holograms 54-5, 82, 171, 439, 445, 448, 458
 homopathy 122-3
 mind-over-matter 69
 near-death experiences 84, 122
 New York 441-2
 personal activity 194-6, 89
 perceptions 440-5
 Postage Stamp Commemorative 215, 443-3
 quantum entanglement 62
 poisoning 68-9
 reconnection 83, 251
 relationships 73-4
 reality 50-1
 rituals 475
 Saturn 426, 475

reality 44-50
 shaped/hers 79
 simulation 549-52
 Soul 44-5, 49
 steering wheel 135-4
 stress 57
 Sun 114-5
 synchology 475
 vaccines 48-9, 463-4
 vegetation 288
 vibrations 444-5
 wave 170-5
 wealth or the One-perspectives
 The Web: The Spider and the Web
 Wells, Whitney 373-3
 Weinstein, Harvey 296
 Weisshaupt, Alan 127, 238
 Whittaker, Tom 239-4
 white people 241, 346-54, 258, 362
 Wilson, Scott 224
 WI-FI 7-18

addition 454
 children 404-6, 405, 472, 538, 602
 Covid-19 406, 528
 epigenetics 68
 health issues 425-6, 424, 454, 465, 472-3, 528, 538, 531
 holograms 127
 pineal gland 62
 plants, effect on 402
 reality 7-8
 reality WI-FI 291-2
 simulation 150
 worldwide provision 361
 Wikipedia 200-4, 210-12, 569-70

Williams, Nicola 426
 Wilson, Rick 682-8
 Wolf, Timothy 283
 Wolgar, Wolfgang 463, 521
 Woke culture or New Woke
 Wojcik, Susan 343, 349, 385, 446, 513-34, 525-4, 581, 548, 572, 574, 597, 626-9
 Wood, Patrick 223, 263
 Woodcock, Leslie 274
 world army 223, 265-4, 409-13
 world currency 222-3
 World Economic Forum (WEF)
 Davis 269, 302, 306-7, 240, 303, 411, 538, 541, 596
 world government 222, 263-4, 268, 293-5, 311, 344, 371-2, 574

World Health Organization (WHO)
 Big Pharma 536
 conspiracy 540, 598
 Covid-19 677, 481, 486, 493, 500, 522, 580, 519, 528-9, 548
 Gates 481, 486, 503, 538, 531
 Redcliffe 527
 sterilisation by deception 548
 technology 536
 vaccines 548-9

Y
 Yi Jing 346
 Yildizbasir/Demirguzel 340-4, 171
 young people/children or in education
 activities to technology 367-8
 artificial intelligence (AI)/brain connection 453-2
 brain, neurons, smartphones causing 404
 cars, child not taken into 118
 century /century 689-6

climate change 258, 260-2,
269
 Covid-19 191, 512
 feminism 104
 heart 219-20
 love 216-20, 222
 Mainstream Everything 190
 mental health 195, 200-1
 New Yorker 200-1
 parental rights 418, 422-4
 sex trafficking of minors 271
 social media 407-50, 509
 state children raised by the
 207
 transgender hysteria 416,
 429-25, 432-8
 unborn children
 vaccination annual 116-20
 vaccines 191, 222, 242
 WSJ 464-6, 465, 472, 531,
 610

YouTube or die YouTube and
 Covid-19
 anti-Semitism 206
 censorship 157-6, 210-12,
 408, 568-74
 climate change 257
 ghost or shadow banning
 211
 Google 155, 212, 257, 441,
 512, 530-40
 military control 369
 monopolies 212, 214, 269
 New Yorker 261
 news 230
 recommendations 20, 206,
 442
 technocracy 290

YouTube and Covid-19
 censorship 497, 512-13, 545,
 525, 531, 533-40, 567-74, 577
 hospitals, videos of empty
 484-6
 WHO 548

Z

Zeni, Sabbath covid 201
 Zuckerberg, Mark 213, 235-6,
 261, 261, 269, 276, 285, 298,
 292, 444, 444-50, 453, 511,
 521, 525-6, 576, 577, 606-8

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ickonic has been a dream of mine for five years growing up around alternative information. I have always had a natural interest in what is happening in the world and what I could do to make it better.

Across the range of subjects and positions of influence occupied mainly by people who don't try to improve human society it's the mainstream media that I have always found the most frustrating and fascinating. If the media did its job then so many negative events in the world would not be happening because their background and agenda would be exposed.

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DUKE ARMSTRONG
FOREWORD BY **TIM PATTEN**

These Bitches Want Your Money:

101 Reasons Why You Shouldn't Get Married

By Duke Armstrong, Foreword by Tim Patten

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Contents

[Dedication](#)

[Foreword](#)

[Introduction](#)

[Chapter 1 - Buying Your Way into Prison](#)

[Chapter 2 - Meet Your Wife's Real Husband](#)

[Chapter 3 - Meet Your New Wife](#)

[Chapter 4 - The Married Sex Life](#)

[Chapter 5 - Suzy Homemaker? Not a chance!](#)

[Chapter 6 - She's in Control](#)

[Chapter 7 - Your Money is Her Money](#)

[Chapter 8 - The Married Lifestyle](#)

[Chapter 9 - Cutting Your Balls Off](#)

[Chapter 10 - It's Not Your Castle](#)

[Chapter 11 - Cheating](#)

[Chapter 12 - Children](#)

[Chapter 13 - Crushing Your Dreams](#)

[Chapter 14 - Growing Old Together](#)

[Chapter 15 - The Aftermath](#)

[Chapter 16 – The MGTOW Solution](#)

[About the Author](#)

Dedication

This book is dedicated to [Thomas James Ball](#) (Born: February 21, 1953, Deceased: June 15, 2011). Thomas had the testicular fortitude to light himself on fire outside the downtown courthouse in Keene, New Hampshire, in protest to the injustices of the family court system in the United States. Thomas married Karen in 1990, but she filed for divorce eleven years later in April 2001. Thomas was the father of three children. He found it difficult to keep up with his court-mandated child support payments, and at the time of his death, he was facing jail for owing about \$3,000. The finding of contempt filed on June 6, 2011, in Cheshire County Superior Court ordered Mr. Ball to jail.

Before committing suicide, Thomas, a former Sergeant in the US Army's National Guard, wrote to friends saying, "Time to climb down into the Higgins boat and take a bouncing ride to the beach." He was referring to the World War II amphibious landing craft, as he knew he would be among the many who would perish storming the proverbial beach of a gynocentric system. Eyewitnesses say Thomas doused himself with gasoline, lit himself on fire, and without saying a word, calmly and confidently burned for several minutes until he expired.

As of this writing, over 300 men commit suicide every month as a direct result of the heartbreak of divorce, the injustices of the child support system, judgments favoring mothers over fathers in child visitation and custody, or being divested of their assets by their ex-wives through divorce court settlements.

We don't need any more men committing suicide.

Foreword

By Tim Patten

More often than not, if a man meets the most beautiful woman he has ever seen, he'll be so captivated that he'll do anything he can to capture her attention. He'll look to impress her with fancy cars and other such trappings and seek to win her over with lavish spending. In the end, he'll be so hung up on the object of his desire that he'll feel compelled to squander his fortune on her, seeking only adoration in return.

Women have long understood this vulnerability. In fact, awareness of our weak spot seems to be in their DNA. Unfortunately, a great many of them have also used this knowledge to our disadvantage. They have been draining our financial resources, and other assets, since time began.

But our world is changing fast, and a growing number of us have been experiencing an awakening. Men like us have been devouring an empowered awareness about the downsides of romance and marriage, and a counterculture revolution is underway. We are rising up against “vagina-begging,” placing women on pedestals, and succumbing to patriarchal expectations and pressures.

The modern men's liberation movement represents a long overdue opportunity to right an imbalance that has left many men enslaved to lives of hopelessness and misery. However, unlike the so-called “equal” rights movement, which has benefited only females, we men are having to do it for ourselves.

Unlike females, who have a vast support network available to them, we have had to draw on our capabilities and resources. Men have not had access to men's studies programs that might provide helpful knowledge and guidance. Instead, we have worked together to incubate collective ownership of a male-focused philosophy and educational methodology that is thriving—on social media and elsewhere.

Nowadays, those of us who have seen the light are collaborating with millions of other like-minded men and sharing the most intimate aspects of our desires and aspirations. We have created a positive vision of the future that represents the *raison d'être* of such groups as the “Red Pillers,” Herbivore Men of Japan, and Men Going Their Own Way (MGTOW).

The cutting-edge curriculum that has emerged centers on the empowerment of men. It is aimed at liberating males from toxic female manipulation and bad relationships, that so often cost them their independence and their financial, emotional and even physical futures. It is a male self-ownership philosophy that keeps growing and expanding.

Through self-governance and mutual support, we are discovering a deeper and a more ethical understanding of our existence and who we are as living, breathing individuals. We are making adjustments to our lives and lifestyles to bring them into sync with a mindset and a sense of purpose many have only just begun to see in themselves.

We are also becoming increasingly aware that our purpose in life is not to satisfy women's needs, attend to their complaints, and fulfill their expectations, usually to the detriment of our own health, happiness and wealth. We are beginning to understand that such demands emanate from an endless well, which serves a source of pure hell-on-earth for men.

Despite being a relatively nascent effort, the modern male movement has been growing at an almost feverish pace. No one really knows the actual numbers involved, but based on YouTube views, at least, it appears to have attracted believers and supporters in the many millions. On May 20, 2018 a search for MGTOW (meaning: “Men Going Their Own Way”) on YouTube, returned an astounding 420,000 results, while a search on Google.com returned over 2,020,000 results.

There are many reasons why this crusade has gained so much traction. It is a reaction to the damage that the legal system has done to men's lives – financially, spiritually and otherwise. It is a response to feminist propaganda that characterizes men as sexist and dominating rapists. It may also reflect the fact that the time has arrived for us to recognize who we are and the role we have played in helping the human race to survive and thrive.

Whatever the reasons, the modern men's movement has been a powerful progenitor of improving self-awareness and collective understanding. It has even enabled men to discuss a formerly taboo subject: our male libido and how

it messes up our lives. The fact is, our reaction to a woman's beauty, whether real or a façade, is often deadly. Only by recognizing this, and how it has punished us through the ages, can we take steps to realize what is at stake and how to end it.

It is hard for many of us to open up. But to move forward, we must speak openly about things that have only been whispered in years gone by. It is time to discuss how our natural sex drive exposes us to manipulation by females, who employ seduction and superior communication skills to ensnare us in compromising and ruinous situations.

Sadly, despite having an extensive, in-depth history – chronicled by men – of who we are, and our place in society, many of us have yet to come to grips with our masculine sensibilities—and our vulnerabilities. Instead, we often end up blinded and transformed into robotic idiots by any suggestion of a sexual possibility.

However, the solution is not to change our biology, which is hard-wired. Rather, we need to understand the fact that such urges can take complete control at times, leaving us in a vulnerable position, and then make the necessary adjustments. We must tap the collective wisdom of those who've seen the light and protect ourselves from our Achilles' heel of susceptibility to *femme fatale* seductions.

The modern men's liberation movement is not just focused on education and self-protection, however. It is also aimed at burnishing our individual identities and self-esteem, which will ultimately lead to more satisfying lives. Once we put an end to females taking advantage of us because our libidos are hypnotically attracted to all-things feminine, we will no longer find ourselves distracted from achieving our objectives, dreams, and goals.

Admittedly, the voices, books, blogs, and videos that comprise and contribute to this mutual undertaking come from distinctly different vantage points. As should be expected with the broad ocean of society, some contributors are blunt, while others are more politically correct. Still, no matter how this new way of thinking is presented, there is much to cover, and many are hungry for a more progressive future.

Duke Armstrong, the author of this book, is one of the many diverse individuals seeking to help us become more cognizant of what is wrong, and what we need to do to change things for the better. Empowered by his words and those of others, we can step up to the plate, come together on ideas, and build a renewed sense of masculinity, wealth and power.

Luckily, many are already embracing this long overdue evolution, which serves to energize those who follow behind. In fact, I've witnessed firsthand how fresh perspectives can repair and reinvigorate those of us who've been tortured by the soul-crushing unfairness of the social framework of a gynocentric society that has persisted far too long.

Indeed, as a long-time researcher on masculinity and male empowerment, and the author of three related books—with many more to come—including my biggest seller, [MGTOV Why I Cheat: 11 Stories Of Freedom for Men](#), [MGTOV Building Wealth and Power](#), and [Masculinity Is Our Future](#), it is apparent that men like us have strived for the kind of knowledge that can bring them back to a path of enlightenment.

With all of this in mind, we all owe it to ourselves to read, learn, and live more empowered, productive and satisfying lives.

Please consider my endorsement of this book to be a gentle invitation to consider that the institution of marriage may not be a tradition that serves the happiness and well-being of men.

Sincerely—your friend,

Tim Patten

Introduction

For far too long men have allowed others to dictate what it means to be a man. Manhood is too often based on what use or utility a man is to others. Governments say real men are those who stand up and fight for whatever cause politicians are championing this week, but manhood is most often defined by what a man is willing to do for a woman. A Google image search for the words “a real man” returns a plethora of definitions and anecdotes for what makes a man.

One image reads, “A real man chooses to honor, love, respect, adore and be faithful to one woman!” Another says, “A real woman can do it by herself...but a real man won’t let her.” If these definitions are correct, then only a married man, who refuses to let his wife lift a finger, is a real man. It is this nonsense that I wish to challenge in this book.

Men can be so caught up in trying to prove themselves, that they place their brains on autopilot and allow others to define the standards of masculine excellence. It’s fine time that men stop to examine the veracity of popular definitions of masculinity. I invite men to stop operating on a program of what we’re “supposed to do,” and instead question whether it is good for us. I am furthermore suggesting the revolutionary idea that we men start asking ourselves what each of us would like to do, as opposed to what someone else says we are “supposed to do.”

From childhood, we are indoctrinated into the belief that we are to get an education so we can attain employment, and then march on to find a woman worth marrying. We are to spend money on her in the courting process, and if we fall in love with her, we are to kneel before her, offer her an expensive rock and ask her to marry us. We are to assist, if necessary, in paying for the wedding ceremony and all its accouterments. We are supposed to pay for a honeymoon vacation, and then we are to purchase a sizable house, get our wives pregnant, and work until our mid-60s to provide for our children and the lifestyle desired by our wives.

Everything which I stated all centers around using the strength of our bodies and minds to please someone else. We are supposed to believe that there is some great value in having a wife, and we will attain such immeasurable happiness, that we should celebrate the opportunity to commit a large portion of the fruits of our labor to providing for the lifestyle of a woman.

Some say that you cannot put a price on true love, and thus avoid the question:

How much is a wife worth?

If we assume that true love exists, then perhaps we cannot estimate its value. However, we can take an objective look at the benefits a man might expect to receive if he has captured true love in the form of a wife. We can calculate the cost of courting a woman for marriage, the expense of cohabiting with a woman, and what we might need to spend over several decades of marriage to make a wife happy. We can also look at the statistics surrounding marriage and divorce, to determine how many men have found true love—and dare I say, we can question whether true love even exists at all.

With so many divorces occurring in countries where feminism has taken root, I suggest that we try to answer these questions once and for all. Using dozens of studies and news articles, that is exactly what I have set out to do. Yet no matter how much evidence I have placed on the table, there are always some very few men who will claim that they are happily married, or know someone who is. In the face of surveys proving how many women cheat on their husbands, how many are committing paternity fraud, and an unending stream of news reports detailing the degree to which yet another man was financially raped in divorce court, some will argue that statistics and studies are irrelevant because “not all women are like that.”

I don’t believe in unicorns, but if a man thinks he has found one—a wife who is one-in-a-million—it makes little difference. People also survive their parachute not opening, but no sane man is willing to jump out of a plane without a parachute. I find it both silly and annoying for guys to remind people that “sometimes it works out.” Big deal!

Sometimes men almost go broke from spending tens-of-thousands of dollars at the casino, but a few eventually end up hitting the jackpot before they find themselves sleeping in a cardboard box. Despite those who claim the odds can be beaten, I'm not going to start loading my life savings into a slot machine.

Even if a man finds the elusive unicorn, or if one-day such women were bountiful, the real question is: is there any benefit whatsoever to getting married?

With that, I invite you to ponder the *101 Reasons Why You Shouldn't Get Married*.

Chapter 1 - Buying Your Way into Prison

“There is no deception on the part of the woman, where a man bewilders himself: if he deludes his own wits, I can certainly acquit the woman. Whatever man allows his mind to dwell upon the imprint his imagination has foolishly taken of women, is fanning the flames within himself – and, since the woman knows nothing about it, she is not to blame. For if a man incites himself to drown, and will not restrain himself, it is not the water's fault.” — John Gower, 14th-Century English Poet

Reason #1 – There are Zero Benefits to Marriage

The #1 reason not to get married is that there are absolutely zero incentives or long-term benefits to getting married; marriage is an agreement that serves women, not men. Marriage amounts to little more than a scam in which a man is roped into committing to a woman under the pretense that his service and loyalty to her will reap him various rewards that he could not somehow otherwise obtain.

The divorce rate is not, in fact, the chief reason not to get married, because even a marriage that lasts until death brings no more benefits upon a man's deathbed had he stayed single. However, with the advent of no-fault divorce, and the institution of alimony and child support, marriage is not only devoid of any benefits but has been reduced to little more than a racket in which a man is risking almost everything for virtually nothing. A woman takes zero risks in marriage yet reaps all the benefits.

On the surface, it seems that there are numerous benefits to having a wife, but upon examination, they all evaporate. There are really only four key things that a live-in wife offers: cooking dinner when you get home from work; cleaning the house; companionship; and, sex. Out of these potential benefits, the only thing that a woman really brings to the table is her looks and the promise of decades of sex. The longer a man is married, the less sex he'll have with his wife, so that can be crossed off the list as well.

Since modern women are loath to cook, and a man can easily cook for himself, eat at restaurants or order delivery, for much less money than the expense of courting a woman for marriage—and paying for the married lifestyle—it's just not worth it. Even a wife that never fails to cook dinner cannot be seen as a cost-effective benefit in light of much more inexpensive options. A man can eat a gourmet dinner five days a week for between \$500 - \$1000 a month, which is far less than the cost of getting married and the additional expenses accrued from having a wife, and being forced to pay alimony or child support.

Only men who are filthy and extremely busy, but are somehow also too poor to afford a housekeeper, would think that it's a good idea to get a wife to keep the house clean, yet a wife is orders of magnitude more costly than a maid. Moreover, most modern women are allergic to the very thought of cleaning up after a man, washing dishes and taking care of the laundry. A professional housekeeper will clean your house for \$50 - \$200 depending on its size and the median income bracket of where you live. As we will see later, when married men help out with the dishes, folding the laundry, or do other women's work, they end up getting less sex from their wives. Despite this, hordes of married women complain that their husbands don't do enough housework, and countless articles advise men to contribute to traditionally feminine chores to have a happy marriage. Precisely what is the point of providing for the lifestyle of a woman if you have to do some of her work? No sane man would agree to have a guy live with him free-of-charge in exchange for keeping the house clean, and then tolerate the bum complaining that the guy paying the bills needs to help out with the chores.

Some might say that companionship is also a benefit but a man can get companionship from male and female friends and girlfriends, and do so without breaking his bank account. A man can shoot the breeze with his buddies if he wants someone to talk to or curl up on the couch with a girlfriend if he wants to feel a soft, warm female body next to him. If a guy is feeling down, he can get some motherly emotional support from a big-breasted female friend without buying anyone an engagement ring. A single man has the freedom to enjoy companionship in a plethora of forms without signing a contract that gives a woman the nearly irresistible opportunity to steal his wealth through divorce rape.

Because marriage decreases the amount of time a man can spend with others, and the variety of companionship he

can enjoy, a wife's companionship isn't even on the radar of what she brings to the arrangement. Cooking and cleaning are out the picture as well because a modern wife is unlikely to do either and a wife is a much more expensive option even if she does. With cooking, cleaning and companionship out of the picture, that leaves only sex.

I'll be covering just how sexually inactive married couples are, along with the lack of blowjobs, lack of variety and kinkiness, so sex is not a benefit to having a wife either. A woman's beauty goes right along with sex, but women hit a biological wall around age 30 that causes their beauty to fade rapidly. At best a woman has from age 18 to age 35, or 17 years where she really looks like a prize. Modern women are too stupid to realize that handsome, money-making alpha males aren't going to want them after they hit 30, so even finding a beautiful young girl to marry is difficult. Being married means a man is stuck with an aging woman who is likely to gain weight, and is unlikely to have sex with him more than a few times a year beyond the tenth year of marriage.

Idiots like Eleanor Barkhorn, the former chief editor of *The Atlantic*, encourage women not to get married early. In her article "Getting Married Later Is Great for College-Educated Women," published on March 15, 2013, to *TheAtlantic.com* she noted that the average age of marriage in the United States is 27 for women and 29 for men. In 1990 guys were marrying girls when they were 23, and in 1960 they were grabbing them up at 22. Of course, that was before feminism kicked in and started to convince women that freedom and happiness could be found in a job, and being a housewife was slavery. With the advent of the birth control pill in 1960, and feminists went full steam ahead and excreted the sexual liberation movement, which encouraged girls to go get ran-through by the whole football team. Today [SlutWalk](#) is a transnational movement in which women parade around naked, defending the right to ride as many cocks as they want without being shamed for their behavior. Meanwhile, stupid girls complain that there are no good men left to marry.

Contemporary girls usually start thinking about marriage around age 25, but finally find some sucker to marry them around age 27. By this time the girl's had more pricks in her than a secondhand dartboard. At age 27 she only has a few more years left before she hits the wall. Realizing that successful alpha males are paying her much less attention, she'll start to come down from the high of the cock-carousel, and finally tune-out feminist rhetoric from friends she met in her Women's Studies class. She knows that by the time she hits 30, only low-income earners, and ugly, fat, stupid, old or otherwise desperate males will want her.

Is it any wonder that the number of marriages has plummeted to a record low?

The guys that are getting married are the suckers who think they can beat the divorce odds, have a severe case of [oneitis](#), or have set their brain on autopilot and are following a program that says "that's what you're supposed to do."

The big picture of marriage is that there are absolutely zero benefits for a man to get married. On the other hand, women receive a host of benefits for suckering a man into marriage. A wife not only immediately receives the strong possibility of financial gain through alimony, but if she has children, she'll also receive child support. In full view of the facts, a wife isn't even a depreciating asset but an aggregating liability, because the longer she is with you, the higher chance she'll have of securing durational alimony and acquiring your house and other possessions.

Even if the woman decides to stay married, she has secured herself a wage slave who will wholly, or partially, support her lifestyle. The looming threat of her husband getting financially raped in divorce court means she can make an ever-increasing number of demands for her happiness. A wife gets a stooge who will buy her whatever he can afford, put her up in a house that she chooses, make sure that her vehicle is well-maintained, spends the holidays how she wants and will serve as an emotional punching bag whenever the mood suits her.

A wife is more expensive than a maid. A wife is more expensive than eating at a gourmet restaurant five days a week. A wife decreases the variety of companionship a man can enjoy and limits the time he can spend with friends and family. A wife means a man is stuck with the same sexual partner that has a small window of youthful beauty, and who will inevitably have sex with her husband much less than before they were married. A wife also means that a man's income can be plundered.

The simple reality is that marriage is for women, not men. The engagement ring isn't for you, it's for her to flaunt the value of her vagina. The wedding ceremony isn't for you, it's for her to celebrate that she's secured a workhorse

in the form of a husband. The honeymoon isn't for you, it's to give her photographs that she can use to make her friends jealous of how much money you spent on her. The larger and much more expensive house isn't for you, it's so she can feel safe and secure as the queen of her nest and flaunt at what price her husband has appraised her furburger.

There are zero benefits for a man to get married, so there is no reason any man should.

Reason #2 – Engagement Rings Are Expensive & Stupid

Anne Chertoff, a trend expert at *WeddingWire*, told *Forbes* in 2017 that the average engagement ring is around \$5,000. The “Real Weddings Study” published by *The Knot* in 2016 showed that the average cost of an engagement ring was \$6,163. The study noted that the cost had risen 3% higher than the previous year, and was 21% higher than 2011's average of \$5,095. The rising price of diamonds and precious metals has increased the average.

Most men are familiar with the guideline that a man is supposed to spend one month of his gross salary on the engagement ring, and as of late there have been suggestions to spend as much as 3 months' salary. What most guys don't know is that the guideline, according to Angela Guzman and Christin Perry from *The Knot*, was concocted by none other than diamond marketers at the start of World War II to turn a bigger profit.

Men also don't realize that diamonds aren't precious. In an article by Robin Dhar called “Diamonds are Bullshit” published at the Huffington Post on August 5, 2013, he points out that diamonds lose as much as 50% of their value as soon as you step outside the doors of the jewelry shop. In fact, it wasn't until 1938 that offering an engagement ring became standard practice in marriage proposals. In 1938 the De Beers diamond cartel launched a massive marketing campaign to convince American women that a diamond engagement ring was culturally the appropriate thing for a man to offer when he bends the knee. After successfully increasing the demand for diamonds, De Beers then set out to skyrocket the price of diamonds by restricting the supply.

In 1975, another marketing genius, Gary Dahl, sold 1.5 million packages of his Pet Rock for \$4 each and became an overnight millionaire. Funny how people wonder how a man could convince people to buy an ordinary rock just by labeling it “Pet Rock,” but jewelers have been convincing men to buy women rocks for decades.

When a girl proudly shows off her ring to her equally ditzy friends and says, “Look at the huge rock he got me,” just remember that she speaks the truth: her fiancé paid for a rock. Next time you see some worthless rock on the side of the road, be reminded that a diamond is nothing but a translucent sparkly rock—it's just a rock, nothing more. A rock on a woman's finger serves absolutely no purpose whatsoever. The rock is not a tool you can fix something with; it's not a tooth in a diamond blade saw, for example. It's just a rock on a woman's finger. To really put this into perspective, I suggest that every man go outside, pick up a little rock and duct tape it to their finger. After you've completed this, stare at it and repeat, “If a man wants to get married, he needs to put a rock on a woman's finger.” Keep repeating this until you realize that the only reason why you taped a rock to your finger is because somebody told you to, and the only reason why you're supposed to buy a woman a rock, to place on her finger, is because somebody told you to.

If men stopped letting their brains coast on autopilot, by allowing people to tell them what men are supposed to do, I think the world would be a whole lot better place. Maybe men will stop spending thousands of dollars to put a rock on some tramp's finger. On the bright side, at least the folks selling rocks are laughing all the way to the bank.

Reason #3 - Weddings are a Bad Investment

In a survey of 16,000 couples in the United States, *The Knot's* 2014 “Real Weddings Study” found that 45% of weddings exceeded a couple's budget and 23% lacked the funds altogether. Most brides spent over \$1,300 on their wedding dress alone.

The price of a wedding dress and the wedding itself speaks to a woman's need to validate the price of her fish-mitten. If it were up to men, most weddings would be little more than taking a girl to the beach, a park or a church to have a minister officiate the union. In the delusional belief that we're marrying our dream girl—who will supposedly keep us happy for the rest of our years—we wouldn't care if our sweetheart wore a simple dress she grabbed right off the rack at the local thrift store. For us, it's about having finally found the girl we believe will make us happy. For a woman, a wedding is a way to tell the world how high her genitals have been appraised.

According to *The Knot*, American couples shelled out over \$30,000 for the wedding ceremony in 2015, while New Yorkers dropped over \$80,000. That's a high price to pay to automatically decrease the amount of sex and blowjobs you're going to receive and to promise that you'll never sleep with any other woman ever again. We haven't even factored in the additional expense of a honeymoon, eventually purchasing a larger home, children, the engagement ring, taking your wife on dates, or otherwise buying her whatever she wants, so you don't end up sleeping on the couch.

Knowing full well that modern women equate housework with slavery, just for the price of the marriage ceremony, you could have a maid thoroughly clean your house every two weeks for the next thirty years. Since virtually every married man admits that sex with his wife is few and far between, if prostitutes aren't your thing, you can dive into courses on how to become a pick-up artist and start banging as many women as you can handle. Most 3-day weekend seduction seminars by pick-up artist pros only cost \$500 to a few thousand dollars. Because many wives are more likely to throw a fit than bring their husband a sandwich, it makes more dollars and cents to stay single, eat out or cook your own food—because married men are often doing the cooking anyway.

A wedding ceremony is a bad investment no matter which way you slice it. If you don't want to break your bank account just to have the "privilege" to sign a contract that ultimately gives a woman almost complete control over your assets and your sex life, do not get married.

Reason #4 - Her Lifelong Commitment Requires a Ring

Before the popularization of the engagement ring by jewelers and the diamond cartel, men would do something as simple as giving a girl their mother's sewing thimble. Whatever object a man gives to a woman in his marriage proposal, it ultimately symbolizes a willingness to provide for her.

The fact that women almost unanimously demand an impressive engagement ring should throw up a red flag. Marriage is an oath of commitment and service to another person. Contrast an oath of brotherhood and friendship to a marriage proposal, and any man should see what it really amounts to. You don't have to give a friend anything at all to earn such brotherly love and loyalty that he might just take a bullet for you. Over a dozen men have been awarded the Medal of Honor for jumping on a hand grenade to prevent the explosion from killing their buddies—and these are friends who probably never did much more for them than buy them a beer at the bar.

To secure the supposed lifelong loyalty of a woman, a man must kneel before her in a position of submission and servitude, and present her with an expensive object—the engagement ring. Since marriage, at least in theory, is supposed to mean that a man's wife is his "to have and to hold," an engagement ring can be likened to offering a woman a lifelong prostitution contract. The difference between a wife and a real prostitute is that you're virtually guaranteed to get laid if you pay a prostitute. If you give a woman an expensive ring, help pay for the wedding ceremony, put her up in a lovely house, work your ass off to pay the bills and buy her whatever stupid crap she wants this particular week, unlike a call girl, she doesn't have to sleep with you at all. Moreover, if you don't like a prostitute's performance, you can tell the whore to kick rocks, order up another skank, and perhaps be out \$50 - \$200. If your wife stops putting out, you're out a \$6,000 diamond ring, \$30,000 wedding ceremony, \$5,000 honeymoon, and you'll be paying her alimony and child support. Don't forget you'll be giving her your house and custody of the kids.

Her lifelong commitment requires an expensive ring and wedding, but with over 50% of marriages ending in divorce, what's the real value of a woman's word? Apparently, it's 1 – 3 months of your salary, but I don't think it's worth a nickel of dog shit. I bet you could do a blood-brother ceremony with one of your buddies right now, and his word is strong enough to bet a whole year's salary that he'll remain your friend for life. You can do the blood-brother ritual for the price of a knife—and a band-aid, if you're pussy—and you probably already have the pocket knife. Afterward, instead of blowing thirty-grand on a wedding ceremony, you can blow \$300 at the tittie-bar or treat yourselves to a couple of hookers and get blown.

Reason #5 - Vows are Meaningless and Stupid

Many marriage vows include the words "for better for worse, for richer for poorer, in sickness and in health, to love and to cherish, till death us do part," or something similar. This means that no matter how bad things get, the man promises that he's going to stay with his wife.

No one would ever make this agreement anywhere else. You wouldn't stay loyal to a restaurant that replaces their award-winning chef with a halfwit whose food tastes like cardboard. You wouldn't continue to work for a company that treats you like garbage, is on the verge of going bankrupt and has downsized their operations from a modern skyscraper to a dilapidated building in the middle of the ghetto—unless there were no other options for employment. Thankfully females outnumber males, so you always have options if you know a thing or two about picking up women, or if you have a little money.

Wedding vows are literally saying that you are willfully giving up all your options, and will stay onboard even if things go south. The bride has sworn to the same vows, but women are not creatures of loyalty, and they have absolutely nothing to lose for not keeping their marriage oath, and everything to gain. Wedding vows are easy to break for women because women always have options too. It is much more difficult for a man to go to a public place, seduce a woman he's not just attracted to, but will also please him sexually and domestically. In other words, it's much harder for a man to find a gal that's "wife material." A marginally attractive woman, however, can finalize a divorce in the morning and find another man to throw money at her by nightfall. With the power to easily replace her husband, and the rewards of alimony, child support and gaining ownership of his house, there is absolutely no reason for a woman to stick it out "for better or for worse."

The poetic language of marriage vows conceals the absurdity of what is being agreed to. If marriage vows were honest "for better for worse" would read something as follows:

I agree that I will stay with this woman even if she gets big as a house, and screams at me if I ask her to cook, do the laundry or vacuum. I agree to keep this woman as my wife even if she decides to become a raging bitch who spends my money on stupid crap, runs me down in front of her friends, and tries to prevent me from hanging out with my buddies. I swear to never sleep with any other woman, even if I find a much more suitable and attractive companion later in life, and even if she no longer dresses sexy, refuses to give me blowjobs and denies me sex. Knowing full well that divorce settlements favor women, and that most marriages end in divorce, I agree to risk a significant portion of my personal wealth and possessions just so I can call this woman my wife. Even though I could just keep her as a girlfriend, with the freedom to easily dissolve our relationship if she no longer pleases me, I solemnly swear to commit myself only to this woman. Should I, at some later date, realize that marrying this woman means a drastic decrease in my personal freedom and happiness and that she is little more than a nagging and unnecessary financial burden, regardless, I promise to keep her as my wife.

That is what "for better or for worse" really means. Would any sane man agree to that?

Reason #6 - Marriage is Work, Not Romance

On December 27, 2016, Dan Moloney, a chaplain at the Massachusetts Institute of Technology and the University of Massachusetts-Boston, published an article titled "Marriage is not Romantic" on his blog *Spiritual Direction*. Moloney stated, "I usually tell couples considering marriage that there is surprisingly little about their dating experience that will be important to their marriage experience. That's because our dating culture teaches us to look for romance, while marriage is surprisingly unromantic hard work, that requires a different set of skills than staging a good date."

The chaplain also pointed out that couples can get married to attempt to solve psychological needs brought on by previous relationships or childhood experiences. Others make the mistake of thinking that marriage can forever capture and perpetuate some fantastic romantic feeling they have for someone. Marriage is not a genie in a bottle, however, in which you can encapsulate some romantic moment into a marriage contract and evoke romance whenever you want for decades to come. The magic fades, and it fades quickly, as evidenced by countless articles on how to bring a spark of passion back into a marriage. The fact that most marriages today only last about seven or eight years, and 80% of divorces are initiated by women, should also speak to how quickly women forget all about their romantic engagement, romantic wedding, and how they swooned on their honeymoon.

Alain de Botton, a formally trained philosopher, advises couples to abandon the romantic view of marriage in his article "Why We Will Marry the Wrong Person" published by *The New York Times* on May 28, 2016. Alain says, "We need to swap the Romantic view for a tragic (and at points comedic) awareness that every human will frustrate, anger, annoy, madden and disappoint us — and we will (without any malice) do the same to them. [...] Choosing whom to commit ourselves to is merely a case of identifying which particular variety of suffering we would most

like to sacrifice ourselves for,” and added, “We should learn to accommodate ourselves to “wrongness,” striving always to adopt a more forgiving, humorous and kindly perspective on its multiple examples in ourselves and in our partners.”

Why would I want to place myself in a situation where I must accept tragedy instead of joy, and accommodate wrongness instead of picking and choosing with whom I spend my time? What benefit is there to trading romantic dates and laughter—with a variety of young, beautiful girlfriends over the years—for a cohabitating relationship with one woman that requires more money and more work, and that experts admit should not be confused with romance? As Tiffany Fletcher, a relatively obese woman writing for Famifi.com writes, “Marriage isn't about romance, it's about work.” I can only imagine that Tiffany's husband wishes she wasn't so hard at work stuffing her face.

Tiffany's words are quite accurate however—marriage is about work. Marriage not only increases the number of hours a man has to work on average but if you can't catch Tiffany because she's out on another extended lunch break, any marriage counselor we tell you that marriage in itself is hard work. As they say, “You have to work hard if you want to keep your marriage together.”

Nowhere else are reasonable men willing to bend over backward to keep a relationship together, except at work—keeping the boss, clients and coworkers happy—and when we lived with our parents. No psychologically healthy man will keep a friend in his life if their friendship requires continuously working on making the other person happy. We may have had a mother or father who was challenging to deal with in childhood, but after moving out on our own, we no longer have to subject ourselves to their demands. Taking on a wife is to willingly place oneself in a position that every expert admits is going to be more demanding than remaining single. Cohabitating with a woman can be likened to moving back in with mommy for the benefit of her food, but somehow forgetting that you don't have to live with mom, and put up with all her quirks, to enjoy her cooking.

You don't have to marry a woman to enjoy sex, a candlelit dinner, or to hold hands with her on a summer's night stroll through your quiet neighborhood. There's one way to kill the romance in a relationship and spend a fortune doing it, and that's to get married.

Marriage is not romance, it's work.

Chapter 2 - Meet Your Wife's Real Husband

“If marriage didn’t exist, would you invent it? Would you go, “Baby, this shit we got together, it’s so good we’ve got to get the government in on this shit. We can’t just share this commitment betweenxt us. We need judges and lawyers involved in this shit baby.” – Doug Stanhope, famous comedian

Reason #7 - Divorce Rates

If someone asks you why you aren’t married, it should be sufficient to respond, “I’m not married because I don’t believe in divorce.”

When I read comments from young men who believe they’re too handsome, successful, well-endowed, or good in the sack, for their wife to leave them, I have to resist the urge to slam my palm right into my face. There are a lot of guys who still need to wise up and look at the amount of wealthy, good-looking men, with undeniable alpha status, who end up in divorce court. Movie stars aren’t the best example because celebrities aren’t just wealthy, they’re also knee-deep in Hollywood weirdness. There are plenty of other wealthy men who tied-the-knot and paid the price. Thomas Doheny was a handsome, successful man who went through a divorce in 2014. The resulting 260 court appearances ended up destroying his career. After being ordered to pay \$20,000 a month in alimony and child support, and the judge refusing to lower his payments, even though his earnings declined, Tom took his own life in a jail cell on November 17, 2017.

Despite the staggering number of divorced men who end up committing suicide, some guys still think they’ve got it all figured out. No one is dumb enough to load a six-shooter with three bullets, put it to their temple and believe they can beat 50% odds. It amazes me that men can see the divorce statistics, read about men getting financially divorced, raped, hear the horror stories from friends and family, and still think they can win betting against the house.

Some guys think they’re safe to gamble at the marriage casino because they’ve developed a superior system to assess whether or not a woman is marriage material. There are multiple problems with this line of thinking, not the least of which being that women are, by nature, unpredictable. The main problem with a wife-material checklist is that it assumes women can be assessed by the same standards as men can. For instance, a man who loves to cook and keeps his house immaculately clean, will likely still enjoy cooking and be just as OCD about cleanliness twenty years from now. On the other hand, a woman who possesses the same traits may alter her behavior according to new conditions, such as marriage, childbirth, a decrease in her husband’s earnings, or an increase in her own. Just because she cooks for you now, and loves the idea of being a housewife, doesn’t mean she’s not going to change. The guy who believes he’s devised some magical checklist that will prevent him from facing divorce is nothing but a fool.

Men are nothing more to women than disposable units of production that exist to provide women with resources. The survival of the species requires that men fall in love with women, such that they are eager to deliver the fruits of their labor to them, and are willing to lay down their lives for them. This is not the case with females of our species. When it comes to relationships with the opposite sex, the two biological imperatives of a woman are 1) to breed with the best alpha male she can find 2) secure the resources of a male so her and her offspring can survive. These objectives are not mutually inclusive, and thus one or more men can provide her the genetic material she’s after, and a completely different man, or several men, can give her the material resources she desires. There is absolutely nothing whatsoever in these objectives that speak to falling in love with a man, and in fact, to do so would prevent her from completing both of her instinctive missions.

According to the National Center for Health Statistics, 50% of marriages in the United States end in divorce, and 80% of divorces are filed by women. In their report “National Marriage and Divorce Rate Trends” for 2000 – 2014, it shows that a couple gets divorced every 36 seconds.

Unless a man is such a feminist-influenced cuckold that he believes that marriage oppresses women, or thinks that there is a significant shortage of good men, the percentage of women that initiate divorce should be seen to validate the conclusion: women love the resources they can get from men, but not the men themselves. If a woman’s biological imperative is to acquire resources from the more capable male, but she can do it by ending the

relationship with him—and thus free herself to make additional gains from other men—then that’s exactly what she’ll do.

Reason #8 – Divorce Courts Reward Women for Destroying Their Marriage

The highest divorce settlement was that of Alec Wildenstein's divorce in 1999 from Jocelyn Wildenstein. Alec paid out approximately \$3.8 billion (\$5.6 billion when adjusting for inflation to 2018). His ex-wife famously went on to get so much plastic surgery that she made herself look like a monstrous creature from a Lovecraftian horror story.

It’s too unsettling to even describe this woman, so I will simply proceed with some more facts.

According to the Internal Revenue Service, in 1997 alimony payments totaled \$5.6 billion, but ten years later in 2007, the payout climbed to \$9.4 billion. About 97% of alimony is paid by men, and according to IRS data from 2007, men in a low-income bracket are paying out the most, at 20% of their gross income. In other words, a guy who’s barely scraping by making \$30,000 a year is paying his ex-wife \$500 a month.

On May 7, 2018, Olivia Rudgard published an article to *The Telegraph* titled “Rise of women backing out of divorces as court settlements shrink.” The name says it all; as the High Court of England and Wales has started to step back from awarding lifelong alimony, women are deciding that they don’t want to get a divorce after all. Imagine my shock. This goes toward proving the case that women primarily get divorced to acquire a man’s resources. As for the United States, permanent alimony is still awarded to ex-wives in some states. For a woman to receive temporary or permanent alimony usually requires being married for five to ten years. It just so happens that the average length of a marriage that ends in a divorce is 8 years, which aligns nicely with the average number of years a woman must be married to steal the resources of her ex-husband through alimony.

Child support can also be viewed as a form of alimony, but it is actually superior to it in some ways. Child support allows a woman to exit a marriage immediately upon confirming her pregnancy, as the birth of the child means she will still reap some of her ex-husband’s money, regardless of whether or not alimony is granted. In fact, a woman doesn’t need to marry a man to get pregnant and start collecting child support. An attractive woman can run out right now, sleep with a man who earns at least six-figures, convince him that she’s on birth control, get pregnant, and start receiving several thousand dollars in child support in 9 months. If the guy doesn’t pay, not to worry, because the government has a safety net for her in the form of welfare. She can also go out and quickly find more victims.

Even if a man never wanted to be a father, and immediately forfeits all parental rights to the child, he will still have to pay the tramp child support. Note too that there is no law dictating how a woman must spend monies received from child support or alimony. Just as the courts assume that a woman will automatically be a better parent, and thus deserves custody of the children, if a creature has a vagina it is believed that she will spend child support and alimony payments wisely. As we will see later, having a vagina also means that when she claims a particular man is the father of her child, it is always assumed that she is honest.

From alimony to child support—and in the absence of any legal requirement for a woman to have sex with her husband, or to lift a finger around the house—marriage is a win-win for women. The marriage deal is so good for women that I have to question the intelligence of any woman who doesn’t want to get married. One beautiful college educated girl told me that she often had suicidal thoughts because the only job she could find was at a retirement home where she had to wipe butts. All a pretty female has to do is find a relatively attractive man she can tolerate, be kind to him, give him great sex and seduce him into marriage. It really doesn’t take much to get a man to agree to support the lifestyle of a woman.

Somehow though, as was the case with this particular girl, many modern women can’t swallow the thought of cooking and cleaning for a man and having sex when he wants it. What these girls fail to understand, is that they only have to keep a man happy until he signs the marriage contract, after which they need only please him at some rudimentary level, and in return, they will have a robot to protect them and provide for their existence. This girl was so influenced by feminism that she thought it better to work for someone else, doing a job that was driving her to suicide, rather than “work” as a housewife for a handsome man of her choosing. I don’t know if that story speaks to women’s inability to use logic, or to how brain-damaged women have become from the fallout of feminism?

Can any man really imagine what it would be like to have the power to leave your job, pick out an attractive woman of your choice, and then have all your bills paid for, in exchange for having sex with her, cooking her dinner and doing laundry? Gigolos make their living having sex with successful women, but the keywords here are “pick out an attractive woman of your choice.” A gigolo will often swallow his pride and sleep with an old bag if the price is right; he doesn’t choose the woman, the woman chooses him. An attractive woman can easily get nearly any man she wants if she just shows interest, is relatively pleasing in bed, acts nice and presents herself as wife-material. The woman who has the brains to secure herself a husband has effectively acquired a lottery ticket valued at her husband’s earnings and done so for the low price of looking pretty, having sex with a guy of her choosing, and acting like a decent human being. The fact that she’s rewarded with a servant who will support her existence, for doing virtually nothing, is just mind-boggling.

To put the insanity of marriage into perspective, I’ve written the following scenario.

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Johnny lands an interview with the CEO of Husband Incorporated, where he’s offered a cushy office job with a six-figure salary. The chief executive officer, Bob, tells Johnny, “We’re going to pay you \$250,000 a year but if you decide to quit the job we’ll pay you \$125,000 a year for the rest of your life, so long as you’ve worked for us for at least seven years.”

Johnny replies, “That sounds very similar to a guy paying his ex-wife alimony.”

Bob responds, “It’s very similar. In fact, if you decide to leave the firm after seven years, you’ll get to keep your office, the desk, the plush leather chair, computer and everything else in it that we paid for. You can also use the space to start your own business, or to work for a different company.”

Johnny says, “Golly gee, that really sounds like a divorce settlement, where a guy’s ex-wife gets to keep the house her husband paid for, along with most of his possessions.”

“You’re very perceptive, Johnny,” Bob replies, “We base a lot of the way we do things here on marriage and the divorce industry. To sweeten the deal, we’re going to give you a \$6,000 sign-on bonus, which is about the average price of an engagement ring. If you decide to come on board with us, we’re willing to spend \$30,000 on a Super Bowl party for you and your friends, that you won’t soon forget, and we’ll give you an immediate two-week vacation valued at \$5,000. That’s about the average price of a wedding ceremony and a honeymoon John.”

Johnny could hardly contain his excitement, but before he could speak Bob cut him off. “You know what Johnny? I don’t think that’s good enough for a guy like you. How about this? We’re going to let you pick whatever office you want in the building; you can decorate it however you want, and we’ll buy the desk, office chair and computer of your choice.”

“Well that sounds real dandy to me Bob, but I don’t if…”

Bob cut him off again, “We’re going to open a line of credit for you so you can buy a whole new wardrobe of suits, shoes, and ties.” “That’s sort of like how a husband buys clothes, shoes, makeup, and stuff for his wife, right?”

“You really are sharp as a tack Johnny. You know husbands often pay for their wives to go to the beauty salon and to get their nails done, so we’re going to go ahead and take care of all your haircuts… and what the heck, we’ll pay for your gym membership or a professional massage once a month—your choice.”

At this point, Johnny was thinking that this job was just too good to be true, so maybe he’d better ask about the qualifications. “Well sir, I hope I’m qualified for all this. I don’t want to let you down.”

At that, Bob leaned back and chuckled, “You’ll have to pass a simple test that a chimpanzee could ace, just to see if you can handle the tasks you’ll be in charge of. At this stage, there’s really only two things you need to pass this interview with flying colors.” “What’s that Bob?” “Well, you have to be a nice guy, and you sure seem like a swell guy to me.”

Bob stopped for a moment, furrowed his brow and then turned his chair to face the window. “Johnny, I don’t want to sound like one of those twinkies or anything, but you have to be good looking to work here. I think you’re a

handsome fellow, that probably does well with the ladies. Am I right?” “Well, yes sir, I do okay...and thank you for the compliment, but do you guys do any criminal background checks, personality profiles, or IQ tests or anything?”

Bob laughed again, which started making Johnny wonder if he was the fool for believing he deserved such a sweet deal, or if the fool was sitting across from him.

“To answer your question Johnny, one of our subsidiaries does a little bit more intensive screening process for job applicants, but it’s pretty much a company-wide practice here at Husband Incorporated to hire on someone so long as they have a nice personality, and are a relatively attractive individual.”

Johnny crossed his arms and pressed again for more details. “Your job listing in the paper was kind of vague, so exactly what am I going to be doing if you hire me?”

For the third time, Bob let out a laugh. “Johnny, Johnny,” he said, sighing as if Johnny was a rookie who just didn’t understand the industry, “Listen, you don’t have to worry about what your job duties are, because as soon as you complete orientation, you don’t actually have to do anything at all. In fact, if you want to come to the office dressed like a slob, throw temper tantrums, annoy your coworkers, refuse to answer phone calls and let unanswered emails pile up, that’s fine by me. It looks like you’re a fit guy now, and as I said, we only hire attractive people around here, but you can stop working out and start eating ham hocks and cupcakes, as soon as you’re hired. So long as you stick with us for about seven years, we’ll pay you half your salary for the rest of your life, and you can keep the clothes, the office and everything in it.”

“With all due respect sir, that just doesn’t make sense,” Johnny replied, still crossing his arms like he was being roped into a scam. “Relax John, you look really concerned, but let me assuage your worries.” Bob clicked his pen and then pulled out a thick packet of papers, dropped it on the desk, and then leaned back and gazed out the window like he didn’t have a care in the world.

“You know what that is John?”

“Well, it says it’s an Employment Contract.”

“That’s right Johnny boy,” Bob replied, “Like I said, here at Husband Incorporated we base everything off of marriage and divorce. Does a wife have to maintain her appearance or lift a finger around the house?” Before Johnny could reply, Bob burst out, “No, of course, she doesn’t.”

“This here Employment Contract guarantees everything I’m promising you, and then some. In fact, if you want to review our company’s legal history, you’re welcome to it. What you’ll find is that we lose almost 100% of our court cases anytime we go up against a former employee who doesn’t feel they got exactly what they were entitled to.”

Johnny finally unfolded his arms as something began to click in his mind. Having known guys who were taken through the ringer in divorce court, perhaps if there are men who are dumb enough to keep getting married, maybe there could actually be an entire corporation that was silly enough emulate the institution of marriage.

“Okay,” Johnny chimed in, “What happens if I get fired before the seven-year mark? I mean you’re promising half my salary will be paid to me for life, if I work here for seven years, but what’s stopping you from kicking me out the door before that?”

Bob clicked his pen again, tucked it into his inside jacket pocket and turned to face Johnny. He lowered his voice and spoke very seriously, “I understand your concerns. The best thing to do is just to convince us to hire some of your friends. If we end up firing you, we’ll pay you a minimum of \$500 a month for every friend you recruit into our workforce, and we’ll keep up those payments for 18 years. You can even have your buddies leave with you the day you get fired, and we’ll still keep up the payments.”

Johnny interrupted, “That’s sort of like child support, right?”

“Yeah John, but I want to back up because you said something earlier that kind of concerns me.”

“Okay.”

“Well...it’s nothing to worry about, but I just want to be real clear on this, so we know we’re on the same page.”

“Okay, what’s that,” Johnny said, for the first time feeling he might not get the job.

“Johnny, a few moments ago you said the words “work here.” When you come on board with Husband Incorporated, we work for you—and I mean that. For instance, if you need your office remolded or rearranged, we’ll do all the heavy lifting. We’re hiring you to do some menial tasks, no more difficult than cooking a simple meal or cleaning your house, but if you just want to lay around all day and watch television, that’s fine too. We’ll do the work for you. We’re here for your pleasure John. In fact, you can come and go as you please. We will, of course, draw up a schedule for you, but you can spend your time working for someone else during the hours you’re supposed to be here.”

Bob winked with a sly grin, “Might I suggest you spend some of the hours—that you’re scheduled to be here in your office at Husband Incorporated—over at Infidelity LLC instead. They’re located right across the street. Granted, they don’t pay as well, but the girls over there will pay for any dates you go on, and give you all the sex you ever wanted. The only downside is the gals at Infidelity love to trash talk Husband Incorporated, so you’ll have to put up with that.”

Johnny was about to ask what kind of ladies worked over at Infidelity, but he figured it would make him sound uncommitted to Husband Incorporated, so he remained quiet.

“Just to finish up John, I want to return to our version of the child support system. Our way of symbolically representing that you’ve brought a child into this marriage is if you recruit a friend to come on board with us. Once again, if you get fired before the seven years are up, we’ll pay you a minimum of \$500 every month, for 18 years, for each friend you bring into the company. The best part is that the more money our company makes, the more money you’ll get for each one of your pals you recruited.”

Bob paused for a second as if he missed an important detail.

“Come to think of it Johnny, maybe that isn’t the best part. You see, we’ll actually help you bring your friends into the firm, and even if we don’t like the idea, you’ll have the power to demand that they work here. Moreover, although it is true that we could fire you, we absolutely positively have no authority to terminate the employment of your buddies. If you want a friend to come work for us, we’re stuck with him unless you say otherwise.”

“So that’s sort of like how guys have no legal authority to force their wife to have an abortion, and a woman can also easily get pregnant by lying about being on birth control. Is that correct?”

“Exactly John...and just a little nudge-nudge-wink-wink, if you make friends with someone over at Infidelity, we’re more than happy to hire them, so long as they don’t actually say they used to work for Infidelity. Hey, what we don’t know won’t hurt us right?”

“I guess so Bob,” Johnny replied.

“You know, I was reading the other day John, that there are around 300,000 paternity tests performed in the United States every year, and about 1/3rd end up proving that the man the woman claimed was the father, isn’t actually the biological father. If the guys around here have really stuck to our mission to emulate marriage and divorce, I’m willing to bet that about a third of the employees we’re paying here actually came over from Infidelity.”

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Admittedly, that short story is pretty silly, because no corporation would ever agree to those terms. A company that would reward employees for leaving, and have no means of enforcing a work ethic, would go bankrupt. If a company didn’t thoroughly screen applicants, yet gave them sign-on bonuses, threw parties for new hires and gave them all expenses paid vacations the day after they’re hired, their stocks would plummet. Every business magazine in the world would be calling them incompetent, while the editors and journalists would be secretly sending in their resumes. It makes me wonder then, how men can continue to get married when women are rewarded for getting divorced. I sense that this foolishness primarily comes from men thinking that the female across from them genuinely loves them. Men also have the ego to believe that they are such a great catch as a husband, that their wife would not leave them. The divorce rates say otherwise.

Reason #9 - False Domestic Violence Allegations

A law enforcement officer friend of mine once told me how his wife almost succeeded in having him arrested on a false charge of domestic violence. George was standing around in the living room when his wife suddenly rushed out from the kitchen, knife-in-hand, and knocking him off-balance with a back-hand, he flipped over the couch. His wife then proceeded to straddle him and started trying to cut his shirt off with the kitchen knife, but accidentally cut both the fabric and his flesh. His children quickly called the police. When a patrol car pulled into his driveway, George stumbled out the door with blood all over his sliced up shirt. Despite his wife showing no signs of abuse, she took flight outside and simply said, "He did it."

His fellow officers then immediately handcuffed him and were about to put him in the patrol car if it were not for the children running out to the policemen, and telling them what had transpired. When I asked George what instigated her attack, and why she wanted to cut him, he insisted that he sincerely believed she had no intention of cutting him with the knife, but for some unknown reason wanted to slice up his shirt. George was at a complete loss for words as to why she flew into a rage and stated that it was completely unforeseen. For the record, George was the pastor of his church and was loved and respected by his community.

The United States is not the only country suffering from women being given the power to charge men with domestic violence without evidence. *Russia Today*, a news outlet uploaded a mini-documentary to YouTube on February 10, 2016, titled "[No Woman, No Crime: Israeli Men, Legally Harassed by Women](#)." The documentary shows to what lengths feminist-empowered Jewish women will go to get what they want from men. Jewish girls in Israel have *carte blanche* to bring charges of rape and domestic violence against men without presenting a shred of evidence and often do so if a man refuses to marry them, or a husband or boyfriend doesn't do what they want.

In my life, I once dated a girl who later proved to be completely off her rocker. One night she refused to leave my house, so I went into the bedroom, pushed her back so she couldn't get in and quickly locked the door, thinking that she would eventually leave. In the morning I found her sleeping on my couch, and demanded again that she leave. She told me that she wasn't going to leave, and instead was going to call the police and say that I abused her if she didn't get her way. I secretly dialed 9-1-1, held the phone behind my back and loudly said, "So, you're going to lie to the police and say that I physically abused you, just because you're upset with me," to which she responded in the affirmative. I then put the phone to my head and told the emergency operator, "You just heard this woman admit that she's going to fabricate a story of domestic violence. Please send over a patrol car to remove this psychotic woman from my house." The crazy lying bitch then screamed, "I can't believe you would do this me," and stormed out of my house in a huff.

A false domestic violence charge is just one of many strategies women can use to control their husbands. If a man accuses another man of having struck him, law enforcement will require evidence. If a creature has a sausage-wallet, it is automatically assumed that whatever man she accuses of having hit her must be guilty, regardless if there is no evidence.

Reason #10 - False Rape Allegations

Various sources have claimed that false rape allegations account for only 3 – 4% of reports of rape, but I genuinely believe they pulled those numbers right out of thin air. Philip Rumney published his study "False Allegations of Rape" in *The Cambridge Law Journal* in March of 2006. He found that false rape accusations accounted for 10 – 50% of reported rape incidents. In 1994 Eugene Kanin of Purdue University published the results of his investigation into false rape allegations. Eugene chose a small community of 70,000 people because, unlike in many larger jurisdictions, the police department had the resources to "seriously record and pursue to closure all rape complaints, regardless of their merits." He also stated that their investigation "always involves a serious offer to polygraph the complainants and the suspects" and "the complainant must admit that no rape had occurred. She is the sole agent who can say that the rape charge is false." His findings? Out of 109 complaints filed between 1978 to 1987, police concluded that 45, or 41%, were utterly false.

Feminists try to explode these findings by essentially claiming that police officers are too incompetent to tell whether or not a woman is lying or not. A police officer writing for [ReturnofKings.com](#) said the following in his article "[A Police Officer Shares His Personal Experiences With False Rape Claims](#)," posted December 16, 2014:

"In my experience, I have investigated many different rape cases that ultimately turned out to be false, with some common reasons behind the initial claim. I have seen multiple instances of a girl claiming rape after she was caught,

or about to be caught, cheating on a boyfriend. I have seen a girl cry rape to avoid getting in trouble for being out past her curfew, which would have violated her probation. I have seen a girl from a religious ethnicity claim rape after getting pregnant through consensual sex, in an attempt to avoid the stigma of an out-of-wedlock pregnancy. I have investigated the rape claim of a girl at a house party, which ultimately turned out to be nothing more than regrettable drunken party sex. And finally, I have seen multiple examples of false claims stemming from mental illness, psychosis, and delusions on the part of the woman, with various motivations behind such claims.”

After one particular incident where a girl admitted she was lying about being raped—because she didn’t want her boyfriend to find out she was cheating on him—the officer stated that his fellow officers got into a conversation in which they tried to recall a single incident where a grown woman had inarguably been raped. He stated, “...all of us were racking our brains trying to think of one incident that we could recall of an adult rape claim being real. This was a combined total of roughly 50 years of law enforcement experience, both patrol and investigations, and between us we could only think of one example involving adults off the top of our heads.”

Despite the efforts of law enforcement officers to sniff out liars, many men are still sitting in prison because of a woman’s lies.

In 1988, Dion Harrell was sentenced to eight years in state prison for the rape of a teenager in Long Branch. Dion served four years before DNA tests proved beyond a shadow of a doubt that he was innocent.

William Barnhouse served 25 years in prison for rape before DNA tests confirmed the woman had made up the whole story.

Cornelius Dupree Jr. spent 30 years in prison for rape before DNA tests proved his innocence.

Danny Kay spent three years in prison over in England until his sister-in-law happened upon some deleted Facebook posts that proved his innocence.

Thomas Webb III spent 13 years in prison for rape before DNA evidence proved the woman who had twice picked him out of a lineup of other black men, had chosen the wrong guy.

On the surface, false rape allegations wouldn’t seem to be a concern in marriage, but with the institution of marital rape laws, women have been granted an additional means to punish a husband who does not do as she sees fit. For instance, one man shared with me that in the last year of his marriage, his wife told him that if he tried to touch her sexually, she would call the police and cry rape.

Reason #11 - Her Real Husband is the State

When a man signs a marriage license, he is creating a legal corporation wherein he, his wife and the government are now legally bound together. *Black’s Law Dictionary* defines a license as something that grants "permission by competent authority to do an act which without such permission, would be illegal." In effect, the government is saying that it is illegal for a man and woman to vow an oath of marriage without the consent of the state. No man regards the state as having the authority to declare with whom he may swear an oath of loyalty, but that is exactly what every man is admitting by signing a marriage license.

Women intuit precisely who has the real power in the marriage, for it is the entity that supposedly has the ability to say whether or not the marriage exists. No matter how much a woman reminds her man that he is her husband, it is a complete illusion. The real husband of every woman, no matter whether they are married or not, is the government. If a woman doesn’t like how her live-in husband behaves, she can merely threaten the force of law to adjust his behavior. Financial divorce rape, alimony, custody of the children, false allegations of domestic violence, fabricated stories of child abuse or marital rape, are all at a woman’s disposal through her real husband, the state.

Chapter 3 - Meet Your New Wife

"Women are directly adapted to act as the nurses and educators of our early childhood, for the simple reason that they themselves are childish, foolish, and short-sighted—in a word, are big children all their lives, something intermediate between the child and the man, who is a man in the strict sense of the word. Consider how a young girl will toy day after day with a child, dance with it and sing to it; and then consider what a man, with the very best intentions in the world, could do in her place." - Arthur Schopenhauer, 19th-century philosopher

Reason #12 - Living With a Child

Some guys say that it is hard to determine what a woman really wants, and numerous books and articles have been written to help men figure out what makes women tick. The only men who find women's thinking to be mysterious are those who try to assess them according to male standards of thought. The myth of equality has clouded men's ability to see that women are very different creatures than them.

The female mind is not too dissimilar to that of a child. Children do not concern themselves with the aftermath of their actions, as they are interested in their immediate gratification. If he is allowed, a child will gobble up fistfuls of sweets and consume nothing but sugary beverages all day long, regardless of whatever health warnings he's been given. The child is after how things make him feel. Grown women are also interested in how things make them feel, which is evidenced by, among other things, their spending habits. A wedding dress she'll only wear once, a diamond ring that lost half its value as soon as it left the store, and a \$30,000 wedding ceremony are all complete wastes of money but cherished by women because of how these things make them feel. The fact that women initiate over 80% of divorces, and a parade of single mothers can be found on dating sites everywhere, speaks to their poor judgment, indecision, and inability to weigh the long-term ramifications of their actions.

Just like a fat kid who will consume as many donuts as his parents will give him, women are also more likely to be obese than men. A higher likelihood of weight gain in females is partly due to genetics and an instinct to pack on pounds for the purpose of survival, but the more [gynocentric](#) a society is, the fatter it becomes. A child cannot be held responsible for the food he is provided, in what portion it is given to him, nor held to account for his parents not requiring him to play outside and exercise. It is then unfair to hold a child responsible for his weight. Here too, women demonstrate that they want to be treated like children. "Fat acceptance" is the push by women to shame men into accepting their obesity rather than taking responsibility for their own actions. Social networking websites are littered with images of fat models, accompanied with captions saying how women who are grossly overweight are just as beautiful as girls who are fit and healthy.

Adulthood is categorized by independent decision making, personal responsibility and financial independence. Regarding independent thinking—despite feminism attempting to convince women that they should be rulers of their own destiny—various surveys have shown that women want a man to be the decision maker in a relationship. As for personal responsibility, virtually every real or imagined adverse condition that women are in, or have experienced, is blamed on men. For example, the claim that women earn \$0.70 for every \$1.00 a man earns is an often repeated myth by feminists. In the book [Why Men Earn More: The Startling Truth Behind the Pay Gap and What Women Can Do About It](#) by Dr. Warren Farrell, the author shows that women earn less than men because they choose jobs that don't pay as well. In college, men prefer to major in studies that will help them secure a place in a high paying occupation, but the majority of female students do not. Somehow, even though women are making these choices, it's still the fault of men.

As for financial independence, a woman's biological imperative is to seek out a male who has access to the resources she desires. Feminism has only succeeded in making it easier for women to make bad decisions without having to take on the responsibility of acquiring resources with their own two hands. A woman who reproduces with a man that she later claims isn't a suitable mate, is rewarded for her poor decision making through child support. The courts almost universally awarding women majority custody of the child is an additional pat on the back.

The vast majority of pregnancies are unplanned and were unwanted by the male, yet despite women having ready

access to birth control, somehow these supposedly adult creatures keep getting pregnant. In 2014, an estimated 926,240 abortions were performed, which represented 19% of all pregnancies for that year. If a man offers his buddy a peanut butter and jelly sandwich, but his friend is allergic to peanuts, whose fault is it if he eats it? Unless a woman was raped, or for some reason, the birth control honestly didn't work, the onus is always 100% on the woman if she gets pregnant. She's the one with the womb, easy access to affordable and effective birth control, and men cannot get pregnant.

There are very few instances of a pregnancy being the result of rape, and most abortions are done for unmarried women in their 20s, according to the Center for Disease Control. The need for an abortion means that there was lack of good judgment on the part of the woman, yet a gynocentric society would have us feel sorry for these women who failed to use birth control and failed to act responsibly. Single mothers are applauded for having made a poor choice in a mate and having abandoned the father of their children. Despite the fact that study after study shows that raising a child in a mother-only home is one of the worst things you can do to your offspring, we're supposed to cheer on single mothers as excellent examples of strong and independent women.

A woman who files for divorce is rewarded through divorce settlements and alimony, and will usually gain ownership of the house her ex-husband worked his ass off to pay for. This is like rewarding a child with a lifetime supply of ice cream after she throws her ice cream cone on the ground and screams that it wasn't the flavor she really wanted.

The idea that a man can take advantage of a woman who is intoxicated and find himself locked up in prison for date rape, even if he and the woman were both under the influence of alcohol when they had sex, also speaks to the fact that women think like children. If two men go out for drinks and one guy says, "Why don't you drive us over to another bar, because this place sucks," and they get into an accident, whose fault is it? The drunk driver who operated the vehicle is at fault and will be tried as an adult who decided to make an irresponsible decision. Even if a man is so drunk that he can hardly walk, if he has sex with a woman who had a glass of wine, she can easily argue that she was date raped and likely win her case in a court of law. Why? Because even the law seems to know that women are essentially children, and feminism wants to keep it that way.

Reason #13 – Women Love to Play Games

[Pick-up artists](#) (PUAs) refer to a man's toolbox of seduction techniques as "game," and for good reason. Seducing a woman is very much like playing a game in which the man must press a series of buttons in the right combination to gain access to her penis-garage. The mission of the PUA is to take note of the game a particular woman wants to play, but skillfully move her onto his own game board where he makes the rules.

Women love to play games and do so in such subtle ways that many men don't detect it. The most popular female game is the shit-test, in which a woman will say or do things to determine how much a guy will put up with her shit. Depending upon his score at the end of each shit-test round, she'll be able to ascertain whether she's dealing with an alpha male, a beta male suitable for extracting resources, or if the man's alpha male status has fallen. A girl who shows up late could be testing your reaction. Will you tolerate her disregarding the importance of the plans you made for the evening? Do you consider access to Miss Flappy—her asshole's fishy neighbor—to be more valuable than your own time? If she decides to put less thought into her appearance, will you complain or keep your mouth shut because you don't want to ruin the chance of getting a blowjob? Cheating, or suggesting that she be allowed to see other people, is the ultimate shit test. Are you dumb enough to keep providing this whore resources even though she's been getting railed by Chad?

If a man takes a girl out on a nice date but she doesn't give him sex, yet says she's looking forward to another date, she's playing a game. The purpose of this game is to convince the male that she is a prize worth chasing and to assess just how much value he places on her fish-mitten. After a few dates, it will give her some sense of just how many resources she can extract out of him. If the amount is sufficient, she will sleep with him, and thus—very much like training an animal—subconsciously link in the man's mind that providing her resources equals his sexual gratification. A woman who spent her college years riding Chad-cock can also appear to be a modest girl by withholding sex on the first few dates, even though she's been ran-through more than an offensive line.

A girl who gets engaged is likely to throw out a few random shit-tests to glean some prediction of how married life will be with her new fiancé; so too, will a girl who is actively on the prowl for a boyfriend that meets her standards

for “husband material.” Females are instinctively attracted to confident and capable leaders so any man who is willing to put up with their shit cannot be the pinnacle of alpha male leadership. This is why women are attracted to bad boys that don’t appear to care about them and refuse to put up with their shit. However, women are often forced to decide between the alpha male who has valuable genetic material in his ball-sack, and the provider-male who has valuable resources in his bank account. She wants to know which one you are so she can figure out her next move. A provider-male will be at the top of the list, after she’s ridden enough Chad-cock to turn her vagina into a pound of meat loaf, and realizes that her beauty is fading and her fertility window is closing.

Having secured a robot in the form of a husband, a wife will increase her shit-tests, to ensure that the resources he accrues through his hard work will be used to appease her, and her alone. Like a girl warming up to a horse, so she can ride it, the question is, “Just how much weight can I get this stronger animal to carry for me?” Are you willing to do some of her household chores, even though you’re working 60 hours this week? Exactly how much does your wife really need to spread her legs to keep you handing over your resources, but at the same time, prevent you from walking out the door?

This is why women are such terrible communicators. Their goal is not to communicate the truth but to gauge reactions. Therein is the unfortunate reality to the joke, “No means no...except when it means yes.” How many guys rolled their girlfriend over and pounded her pussy into the mattress after she said “no” to sex, only to be told after the money-shot, “I really love how you just took charge?” On the other hand, how many men are sitting in prison because a woman said yes to sex, but regretted it the next day and called in a false rape allegation so the cum-slut wouldn’t have to admit to herself how slutty she acted?

A wife might see if she can get you to cancel your trip to the gun range with your best mate, just to see if your balls are still in her purse. A wife might say, “I just want to be left alone,” and then get angrier when her husband complies and drives off to the bar, only to tell him later, “I really wanted you to hold me.” Do you really want to spend your life playing stupid games and guessing whether or not what your wife said to you is just another one of her shit-tests?

Reason #14 – Women Live for Drama

Men use their strength and their knowledge of how objects work to get the resources they need. As women are the weaker sex, they must rely on a variety of other strategies to attain resources and social power. Women love drama and gossip because they generally lack the inherent attributes to amass a lot of resources through other means, and are typically not interested in other avenues.

Drama is used both as a method to control men, but also as a means to feel alive. A man feels alive and accomplished through the strain of his mind and muscles, interaction with the objective world and what can be logically concluded by observation. Women experience the vibrancy of life through emotion. Whenever emotion stagnates, a woman becomes deadened to the pulse of existence like someone cut off from sensation in a sensory-deprivation tank. In the desperate desire to feel alive again, she creates drama, and in so doing, emotions well up in her like a heartbeat kick-started again on an EKG machine. Much like a bat using sonar to navigate at night, the pushing and pulling of her drama creates an emotional tension that she then uses to verify her existence.

In Te-Erika Patterson’s article “Why Women Crave Drama,” posted to *EliteDaily.com* on November 15, 2013, she wrote, “Women crave drama because we need to experience the exhilaration of uncertainty, the excitement of having to exercise our creative powers to transform a situation or tame the wild beast.” She also stated, “We are addicted to the pride that comes from the challenge of overcoming. When there’s no drama eagerly popping up in our lives, we get lost in soap operas, reality shows and celebrity gossip. We want that “OMG” factor and we want it every day because without it, we would be numb.”

When a woman creates drama in her relationship, it is a kind of shit-test, in which she feels disappointment when her man gets upset and marches off, but exhilaration when he returns and they come back together again. If she can get him to kiss-and-make-up, she validates the value of her cock-sock and receives an emotional high. As Patterson admits in her article, women are in effect emotional addicts.

Reason #15 – A Nagging Wife Can Literally Kill You

Nagging is defined as constantly verbally harassing someone in an attempt to get them to do what you want them to. If you tell some beta male cuckold that an essential ingredient for happiness in a relationship with a woman is for her to keep her mouth shut, he'd likely get his panties in a bunch and say something about equality, or regurgitate some other feminist twaddle. The "happy wife, happy life" mantra is little more than an anecdote for castrated men who try to make light of why their testicles are in their wife's purse. There is some truth to the saying, but not as most might imagine.

As journalist Francine Russo points out in her article "Here is the Secret to Marriage Happiness," citing research by the University of California Berkeley and Northwestern University, the faster a wife backs off and calms down, the happier the marriage. Researchers also discovered that the length at which a husband remains angry and refuses to back down had little effect on marital happiness. In other words, the less a woman nags, the happier her husband will be, and the happier she will be—but the ball is in her court, not his.

The anecdote women *should* be saying is, "A happy husband will make me a happy wife," but trying to put the onus on women is like trying to nail a custard pie to a wall. Women are not creatures of responsibility, as is evidenced by the fact that they so often claim that everything is the fault of men.

In a 2014 article entitled "Nagging could cost the lives of hundreds of men" by Rebecca Smith, the medical editor at *The Telegraph* in the UK, presents the dark outcome of living with a bitch. Rebecca combed over research published in *The Journal of Epidemiology & Community Health* which showed that husbands who live with a nagging wife are 2.5 times more likely to die in the next 10 years than men in less stressful relationships. A woman with an abrasive attitude has the power to drive a man right into an early grave, yet how many of them are willing to admit it, or are even conscious of the fact, that they drove their husband to his deathbed? There is no way to ensure that a girl is not going to turn into a nagging bitch after marriage or pregnancy, but there is one way to find out.

Reason #16 – You Will Lose Every Argument

Men generally argue for no other reason than to prove they are right or enter into debates to explore the soundness of their beliefs or theories or even those of someone else. When a woman argues she is playing an emotional game. What she says is intended to elicit a response. It has nothing to do with facts or logic. This is why you hear women say things like, "I find that really offensive." Think of all the guys you know that can be categorized as "manly men." Have you ever heard any of them ever say some shit like, "I find that really offensive"?

Women care about how the conversation is making them feel, rather than the soundness of what has been stated. No amount of evidence can ever win an argument with a woman because it is impossible to argue with feelings.

Before a man opens his mouth to make a point in front of other men, he must be confident that what he is about to say is built on solid ground and will not make him look like a fool. A man might choose to remain silent until he has completed necessary research to speak intelligently on the subject. As natural liars, women have no such obligation, as they are used to winning people over through a display of beauty or an outburst of emotions. I use the seemingly harsh term "natural liars" because girls learn early on how to exaggerate their emotions, alter their appearance or feign interest to get what they want. In the school of life, girls come to understand that getting their way has more to do with how they look and act, rather than what they know. Acting more upset than you really are, in the hopes of getting your way, is lying. When a woman stuffs her bra, wears a wig, or puts on a girdle to hide her fat, she is lying. When a woman gets cosmetic surgery, dyes the gray out of her hair and claims she's ten years younger than she really is, she is lying.

Dr. Ned Holstein, from the National Parents Organization (formerly known as Fathers & Families), discovered that "women who fail to pay all of their child support are incarcerated only one-eighth as often as men with similar violations." Sonja Starr, an assistant law professor at the University of Michigan, found that men are given sentences that are 63 percent longer, on average, than those received by women for the same crime. The point is that women are not used to even having to argue to receive a pass.

As for a passing grade, being an attractive female is also beneficial in the classroom. As Christina Peters and Rey Hernandez-Julian from the Metropolitan States University of Denver put it, "More attractive students earn higher grades when they are seen than when they are not seen. In a June 20, 2017 article published in *Pacific Standard*, titled "Attractive Students Get Higher Grades," the two economists noted that a student getting a higher grade for

physical appearance was often “driven mainly by courses taught by male instructors.” On the television show Shark Tank, in which entrepreneurs have to convince investors to invest in their businesses, female business owners often burst into tears as a last-ditch effort to get the money they’re seeking—and they often succeed.

If a woman cries, then you’ve already lost the argument, no matter how many facts you’ve laid on the table. Pressing the issue to make your point to a woman always risks such an emotional outburst. The guy who starts prattling off facts or pulls out his smartphone to search out a study he knows will win the debate, has missed the point: he has only proven his willingness to ignore the feelings of the woman he is arguing with. Obviously it is shameful in our society for some man to overlook the duress of some poor helpless girl in tears, so the apparent brute has lost the argument.

Do you really want to live with a creature that doesn’t even know how to formulate a reasonable argument?

Reason #17 – Dr. Jekyll & Mr. Hyde’s Menstrual Cycle

While an unmarried man can merely avoid his girlfriend when she’s on her period, or break up with her if she steps out of line, a married man has years of menstrual cycles to deal with. A woman can become an emotional wreck when she’s on her period, and many women will become full-blown bitches. Most women don’t like to have sex when they’re menstruating, so whereas a single man always has options, a married man faces the strong possibility of going without sex for 4 – 7 days every month and dealing with a bitchy attitude.

A claim that she is having menstrual cramps, whether real or fabricated, will also mean her unwillingness to attend to her chores, such as washing the dishes or making dinner. An old-timer told me that when he was a Hospital Corpsman in the Navy, he had to start keeping track of the menstrual cycles of all the female sailors he was in charge of at the medical facility. He said they would often use menstrual cramps as an excuse to get out of duty. Apparently, they would enter requests for days off work so often they must have had menstrual cycles that lasted thirty days out of every month. As I said before, women are natural liars.

Reason #18 - Women Can Be Physically Abusive

As little boys, most of us heard the nursery rhyme that says little girls are made of sugar and spice and everything nice. As for boys, according to the rhyme we’re made out of “snips and snails and puppy-dogs’ tails.” Nothing negative is being said about boys, but girls are elevated above males by claiming that they’re made out of “everything nice.” Too many men grow up believing this, so it comes as a shocker when a woman does something cold and heartless to them.

When we observe a male animal in the wild tearing apart prey we do not think that such aggression is limited only to the males of the species. Female wolves, snakes, lions, alligators, and sharks can be just as deadly as their male counterparts. Why is it then that men largely delude themselves into thinking that women are much less likely to engage in domestic violence?

According to the *National Intimate Partner and Sexual Violence Survey* of 2010 published by the CDC, 1 in 3 women and 1 in 4 men have been victims of physical violence by an intimate partner and 1 in 7 men have been victims of severe physical abuse. In their report “Domestic Violence: The Male Perspective,” the men’s rights group Parity uses statistics from government sources to show that 40% of the victims of domestic violence are men.

Men are three times more likely than women to keep abuse a secret, and there’s good reason. When a man shared his stories of how his girlfriend abused him on the *Jeremy Kyle* talk show in Britain, the women in the audience erupted in laughter, and Jeremy had to rebuke them for their hypocrisy. An abused man can speak out, leave the relationship, try to defend himself, or refuse to cohabit with women, or he can avoid relationships with them altogether. If a man speaks out, he’s likely to be laughed at or ignored, and police are often quick to arrest a male victim rather than the female victimizer.

An increasing number of heterosexual men—calling themselves [MGTOW](#) (Men Going Their Way)—are insisting that refusal to cohabit is the only safe option.

Many men have regretted trying to defend themselves against an enraged girlfriend or wife, as they found themselves in jail or prison. It should not be shocking that law enforcement and the judiciary favor women. As I

mentioned earlier, a study by Sonja Starr, an assistant law professor at the University of Michigan, found that men are punished with sentences that are 63 percent longer than women convicted of the same crimes in a federal court. Women are treated like defenseless children that are virtually incapable of lying, while men are treated like brutish savages capable of the most heinous crimes imaginable.

A wife can kick her husband in the nuts, slap him, spit on him, claw his face and punch him, and law enforcement will most likely haul him off to jail if he so much as pushes her away in self-defense. Men have been issued prison sentences of several years just for restraining their wife in such way as to prevent her from continuing to hit them.

Men often don't tell anyone that they've been physically abused by a woman, namely because we like to think that we're tough, and we should just suck-it-up "like a man," but also because it can be embarrassing to admit it. For these reasons, the number of domestic violence crimes against men from women is likely grossly misrepresented and is probably much higher.

It should not come as a shock that women strike men so much, as countless movies and television shows have scenes where an actress slaps a man across the face. Comedies also often feature men getting kicked in the testicles, or hit in the groin by some object—as if hurting the male genitalia is hilarious. The television show *America's Funniest Home Videos* periodically features videos of men and boys taking a painful hit to the groin. On the women's TV show *The Talk*, Sharon Osbourne cackled uncontrollably like a wrinkled old demon-possessed hag as she talked about the true story of a man getting his penis cut off and thrown in a garbage disposal. Sharon Osbourne had the audience, and her round-table of female co-hosts, erupting into sardonic laughter as she said of the man's incised genitals, "I think it's quite fabulous; I mean, can you just imagine that thing whizzing around the disposal—it's like hysterical!"

The message is evident throughout the entertainment industry: hitting males is okay, and directing violence at their genitals is good for a laugh. BreakingTheSilence.org notes that 71 percent of children killed by one of their parents are murdered by their mother, and 60 percent of the victims are boys. One wonders how much the way males are portrayed by the media has contributed to the deaths of little boys at the hands of the enraged mothers.

I have a few stories to tell about abusive women that I'm not ashamed to admit, as they have been great eye-openers for what women are capable of.

When I tried to leave Melissa, and attempted to open our apartment door to walk out, she charged at me and clawed my face from beneath my right eye, all the way down my cheek. I pushed her back and walked out, dripping blood from the skin torn on my face. She could have blinded me with her long fingernails. I had never laid a hand on Melissa until that day I pushed her back in self-defense.

Susan was another interesting case of realizing how little I was valued in the eyes of a woman I treated so well. One night she went into an epileptic seizure, so I called for an ambulance. Almost as the paramedics came into the house, Susan's seizure ended. She signed a waiver agreeing to turn-down medical attention. As soon as the paramedics left the apartment, she turned to me and began hammering me in the face with her fists. On another occasion where I was intent on leaving her, I walked out of her place and made my way down the road. She charged after me, and as I turned to face her, she pummeled me in the face with her fists.

One of the most telling experiences of abuse was that of Angela who clawed my face right outside of a restaurant in full view of a police officer. I pushed her back in self-defense. It literally seemed like she purposefully fell to the ground to exaggerate the amount of force I used to defend myself. I proceeded to enter the establishment as we were there to meet some friends. Angela followed me and sat down beside me. The officer who witnessed the incident came in, and though she had torn my skin and a trickle of blood was making its way down my cheek, the policeman merely took her aside, scolded her and walked off.

I never foresaw that any of these women would physically abuse me, but thankfully they were only girlfriends. Married men who find themselves in an abusive relationship aren't so lucky. It is not so easy to get rid of a wife, as divorce comes with the threat of losing a significant portion of one's assets to a divorce settlement, alimony and child support. Moreover, cohabitating with a woman can overcomplicate making a safe escape, and there are virtually no shelters for battered men. Furthermore, law enforcement is more likely to arrest an abused husband rather than the abusive wife, because having a vagina assumes innocence, and judges will often scoff at a man's

stories of being beaten by a woman, especially if the judge is female.

The Harvard Business School conducted a study of 11,000 men and women concerning domestic violence. They published their findings in the May 2007 issue of *The American Journal of Public Health* under the title “Differences in Frequency of Violence and Reported Injury between Relationships and Nonreciprocal Intimate Partner Violence.” They discovered that 50% of relationship violence was reciprocal, but when both parties admitted to hitting each other, both men and women also admitted that the woman in the relationship was the one who was most likely to strike first. The Harvard Business School also found that when relationship violence was one-sided, women were the perpetrators 70% of the time.

The only sure way to avoid being locked in an abusive relationship—or being locked up in prison for defending yourself against a violent wife—is to not get married.

Reason #19 - Women Can Be Emotionally Abusive

Domestic violence can also come in the form of verbal abuse, and it is often the preferred way that a woman chooses to hurt her husband. One woman I knew would poke fun at the size of her husband’s penis in front of friends whenever she was upset with him.

When I was rolling around in bed with one live-in girlfriend, and let her know that I really wanted her to give me fellatio, she snapped at me and said that I smelled. I had just gotten out of the shower moments ago, and never, under any circumstances will I have ever let a woman go down on me if I’m not clean—even if the woman is a prostitute. She made the comment to wound me. I would later find out that she was cheating on me with an ex-boyfriend, who she admitted treated her like garbage. She was obsessively writing about him in a diary she kept in a lockbox beneath my bed; the same bed she would tell me she loved me in.

Women say things to get emotional reactions. The outcome is justifiable so long as it returns a desirable feeling.

Reason #20 – Having a Conversation With a Turnip

When you think of a good intellectually stimulating conversation, do you picture talking with one of your pals, or a male mentor like a father, your pastor or the old-timer that lives next door? While there are women who are well read, most of the deep-thinkers I know are men.

If someone asks you to think of some famous deep-thinkers, perhaps the names of a few philosophers might come up. In terms of length alone, the list of female philosophers is actually quite impressive, but can you name even one? Can you name even one woman who contributed to theology, or whose sermons are cherished by millions the world over? The subjects of politics, philosophy, theology, economics, history, sociology, business, warfare and technology are all chiefly the domain of men. These are the things intellectual men are generally interested in talking about, yet they are not in the interest of most women. By comparison to the depth of conversation one can have with a fellow man, to get married is to condemn oneself to conversations that amount to little more than the babble of infants.

Reason #21 - Religious Differences

If being with someone who shares your faith, or lack of faith, is important to you, getting married can be one of the worst mistakes you’ll ever make. If your wife decides to convert to a different religion, abandons her faith, or goes from an atheist to a fundamentalist bible-thumper, there’s nothing you can do about it. There a wide variety of books and videos, hosted at video sharing websites, of people giving the reasons why they lost their religion, or why they converted to another one. It is foolish then for a man to think that the woman he marries will retain her belief, or lack thereof, “till death do us part.”

Naomi Schaefer Riley, the author of *Til Faith Do Us Part: How Interfaith Marriage Is Transforming America*, commissioned a study of 2,450 Americans through the polling firm YouGov in 2010. In her April 5, 2013 article “Interfaith Unions: A Mixed Blessing” published in *The New York Times*, Naomi stated, “While roughly a third of all evangelicals’ marriages end in divorce, that figure climbs to nearly half for marriages between evangelicals and non-evangelicals.”

The Barna Research Group’s 1999 study of intra-faith divorce rates discovered that born-again Christians had the

highest marital failure rate out of other Christian faith groups at 27 percent. Jews were the most likely to divorce, while atheists and agnostics were the least likely at 21 percent.

A 1993 study by Evelyn Lehrer of the University of Illinois at Chicago, found that at the five-year mark 20% of such marriages between mainline denominations end in divorce, to say nothing of what the future holds in ten or twenty years. Evelyn also discovered that 33% of marriages between an evangelical and a Catholic, and 40% of marriages between a Christian and a Jew ended in divorce in five years.

If a couple that shares the exact same belief are not equally committed or equally lax about their religion, it can become a significant determinant for predicting marital stability. From the earlier findings of the Barna Research Group, an atheist or agnostic couple might think they have cause for celebration with a divorce rate of 21%, but not only have divorce rates increased since their 1999 study, but there is also no assurance that a wife will remain a non-believer. The introduction of children into a marriage, a death in the family, illness of a loved one, or surviving a near-fatal accident, can all impact a person's spiritual beliefs. A wife who is an atheist might suddenly return to church after her father dies. By the same token, a wife might completely dissolve her faith in God after her favorite nephew dies in a horrible car accident, or her best friend calls her with the sad news that she has cancer.

Reason #22 – Her Politics Are Not Your Politics

I will say upfront that I am an absolute monarchist, who believes in the age-old system of the rule of kings, so I do not favor either the Republican or Democratic parties. However, I think it can be soundly argued that the Democratic Party is closer to the aims of feminism than the Republican Party. Within that sentence lies the issue of politics and marriage. I will unapologetically say that male readers who are democrats are more likely to be able to engage me in an intellectually stimulating and civil debate in defense their politics, than most any woman I have ever met.

The point is that men generally give at least some thought to their politics. Women, on the other hand, are mere conformists who vie for whatever system would seem to provide them with the most rewards, and the least responsibilities.

According to the article “Wide Gender Gap, Growing Educational Divide in Voters’ Party Identification” published by the Pew Research Center on March 20, 2018, “56% majority of women identify as Democrats or lean Democratic.” It’s telling to note that if a woman is married to a wealthy man, she’s more likely to vote Republican. The thought process is that her husband’s wealth is also hers, so she votes to protect the resources she has acquired through marriage. A female’s biological imperative to obtain resources from males translates to the increasing tendency of women to favor policies that afford them ease of access to the wealth of men.

Men who pride themselves on their patriotism must understand that a woman’s other biological imperative to reproduce with the best alpha male they can find, precludes them from being patriots. To put it bluntly: women will spread their legs for the conquerors. When an invading force succeeds in capturing a land, the male soldiers have demonstrated their superior alpha status. Even if men put up a strong defense against an opposing army, if local women see greater alpha characteristics in a soldier of the opposing force, their sexual desires will be ignited. It is essential to understand that pointing this out is not an affront to women. Nature requires that women breed with the best men they can find to ensure that the species continues to be strengthened. In all, the takeaway point is that a woman’s political views are illusory.

The other issue at hand is that most women do not have a keen interest in politics. Females are more likely to latch on to political causes because of how they make them feel, rather than seeking a real understanding of the workings of government and politics. The study of political science remains a majority-male discipline, yet Shauna Shames wrote in “Political Science’s Gender Problem” that “women now represent about 25% of tenured political science professors, up from about 5% in 1980.” In 2016 about 1 in every 5 members of Congress were women. What we have is a growing trend of women entering into positions of political power and influence, and an increasing number of women moving over to the Democratic Party.

In a side-by-side comparison of how the Republican and Democratic parties weigh-in on significant issues, it is easy to see which one caters more to the empowerment of women to the detriment of men, the family unit and the future

of American children. In his "Men in America" report, Tucker Carlson, a news reporter for *Fox News*, said that exit polls showed that 74% of single mothers had voted for Democratic Party presidential candidate Barack Obama in 2008. In 2012, 75% of single mothers voted for Obama.

In June 2013, *Psychological Science* published a peer-reviewed article titled "The Fluctuating Female Vote: Politics, Religion and the Ovulatory Cycle." The lead-author, Kristina Durante, an assistant professor of marketing at the University of Texas at San Antonio, found that ovulation affected women's preferences for presidential candidates. *CNN* cited the research in their article "The Fluctuating Female Vote," but quickly deleted it after a feminist-led witch hunt ensued.

Taking on a wife can mean cohabiting with someone whose politics are entirely at odds with your own. If your political enemies offer more cheese in their mousetrap, that's where you'll find your wife's vote. If political enemies invade your nation and beat your countrymen back, expect your wife to be dreaming of the hard chiseled bodies of foreign invaders, and fantasizing about their alpha male semen.

Chapter 4 - The Married Sex Life

"What's my secret? Drinking martinis, smoking cigars, going out with young girls and eating everything you want to eat providing you don't have to cut it with a knife." - George Burns

Reason #23 – Married Men Have Less Sex

When men daydream about how their married sex life will be, they imagine that they'll be having tons of sex with their future wife every chance they get. Some articles even perpetuate the idea that married men have more sex than single men. Such polls are skewed by the fact that not all single men are created equally, nor have the same goals in mind.

If we ask one-hundred single men, who are skilled in picking up women, how much sex they've had in the past year, the results will be significantly different from asking a random group. One might argue that a random selection of men is necessary for a fair and scientific study, but the focus should be on what the average single man is capable of achieving with some training in the art of seduction. In other words, an honest study would attempt to show what the best possibilities are for the ordinary bachelor if he is given the best shot at picking up girls.

Since many men have been raised by single mothers and have no formal training in pick-up artistry, the promise that more sex is virtually guaranteed if a man gets married seems enticing. The methods to seduce Western women have also changed due to feminism, yet many men haven't learned or adapted to a new environment filled with feminist-influenced bitches.

Yet another factor at play is that while almost all single men think about sex multiple times a day, their goals aren't the same. For instance, I might go several months without sleeping with any women, just because I'm focused on a project and don't want to deal with the distraction. Since I took the time to study various courses by leading pick-up artists, and I'm an advocate of prostitution, any long dry periods in my life are entirely intentional. The same cannot be said for men who foolishly signed the marriage contract. Unless a man is willing to cheat on his wife, and can do so often, the amount of sex he is getting is laughable compared to what a mediocre looking guy whose polished his seduction skills can do. A guy that has accumulated an enviable amount of money—or can sufficiently convince women that he is wealthy—is also likely to get more poon than a married man.

If you seek out the confessions of married men online or talk to them privately in person, you'll find that married couples have sex once a week, once a month or once a year. The amount of sex a married man gets is directly proportional to how many years he's been married. Couples that have been married for five years or more often report having sex 1 – 3 times per month, and after ten years it drops as low as 1 – 2 times per year.

The guys that are having the most sex are men who focus on keeping a girlfriend no longer than 3 – 6 months; essentially dumping her the moment sex slows down or she becomes a pest. Since virtually all girls want to bag a husband, women who think they've found a good catch will put out more in the first few months of dating in an attempt to show their boyfriend a supposed preview of things to come if he's stupid enough to marry her. Since a wife is not required to have sex with her husband, and since alimony and child support financially punish the man who leaves a sexually frigid wife, women have no reason to please their husbands.

Women are driven by two vital biological imperatives: the desire to reproduce with the best possible male they can find; and, the need to be provided for and protected in a stable environment. A man who secures a girlfriend has done so because she believes he is an alpha male or possesses alpha characteristics. The female has determined that he is the best male specimen that she is currently capable of reproducing with; or, she sees him as a beta male provider who can be manipulated to give her his resources (i.e., money).

It is natural that a female will be turned on by an alpha male, as God or nature has programmed her to be in order so the species is increasingly strengthened by the genetics of the best males continuing on into the next generation. I must again insist upon the understanding that I do not hold anything against women for being women, any more

than I hold anything against a dog licking his own ass. If women ignored their biological imperatives, our species would have died out thousands of years ago.

One critical problem with tying-the-knot is that marriage clouds a woman's perception of her husband, such that no matter how much of an alpha male he is, the very act of signing the marriage contract reduces him to a beta male provider. In the advent of laws that give women tremendous power over their husbands—both in the event of a divorce and also in the married home—it is impossible for a man to convincingly retain a dominant position. Women are turned on by men with power, yet marriage strips a man of all his power—thus her natural arousal response is nullified.

Furthermore, for various reasons married men can lose respect and decline in the pecking order of their friends. The single guy she once observed happily joking around with his friends, who was always getting looks from the ladies, and who she assumed was the leader of the pack, has faded away. A married man is no longer desired by most women because of the ring on his finger, and thus his alpha status has diminished. Under the threat of divorce or sleeping on the couch, a married man undoubtedly can't be the leader of his own tribe of friends because his balls are in his wife's purse. Marriage laws turn the most alpha men into powerless beta male providers, unfit to excite the instinctual desires of their wives. If you don't want to have less sex, don't get married.

Reason #24 – Say Goodbye to Regularly Scheduled Blowjobs

When it comes to sex, it is more work to please someone than it is to lay there and be pleased. According to a 2015 survey of 2,827 women conducted by Skyn Condoms, over 50% of women enjoy the missionary position or doggy-style, and around 80% of women prefer a position that doesn't require any real work on their part. Since women inherently want to be dominated it also makes sense that they would prefer positions in which the man is in a position of dominance and control. When a woman is giving a blowjob, she is in a submissive position. It would make sense that women would enjoy giving head, but the problem with fellatio is the marriage dynamic. The great joke about married women and blowjobs is that the reason why women smile when they're walking down the wedding aisle is that they're happy they've finally given their last blowjob.

For a woman, getting married means she has secured her workhorse; a woman's husband is her servant. It is the man that gets down on his knees to propose, not the woman. The man is symbolically saying that he is finally willing to submit and be the servant and protector of a woman, just as a knight kneels before his queen. It, therefore, flies in the face of what has been symbolically agreed upon—and what she envisions marriage to be—for her husband to be the object of service, rather than the one who serves.

The fact is that giving head is a real workout. Women are not creatures of responsibility, duty or hard work. A woman burns about 100 calories for every 30 minutes of giving oral sex. A thirty-minute blowjob is equivalent to going on a 23-minute bike ride. Mere observation, along with weight loss solutions advertised on the covers of women's magazines, tells us that women are more apt to choose dieting rather than exercise to solve a weight problem. Dieting is the path of least resistance, just as a woman lying on her back or bending over is the choice that requires less effort on her part.

Men delude themselves into thinking that marrying their girlfriend will mean decades of amazing blowjobs, but the reason unmarried women give great head, and give it often, is because they're trying to secure a husband. Once the marriage contract is signed, there is absolutely no reason for a woman to give her husband regular blowjobs. There is also no reason for her to be as enthusiastic whenever she decides to treat her husband—once a month, or once a year—with a blowjob, for he is the servant, and she is the mistress. The old adage that fat women and girls that aren't that pretty give the best head echoes this reasoning. The more desperate a woman is to secure a servant, by way of a marriage contract, the more eager she is to please.

Lack of sex and blowjobs in a marriage is nothing but a bait and switch used by virtually every married woman. If this were not true, there wouldn't be so many testimonials and studies confirming that sex declines with every year of marriage. If a woman gave her man head several times a week then he should rightfully expect the same sexual behavior into their 15th or 30th year of marriage, but this isn't the case; it's nothing but a bait and switch. It is doubtful that out of one-hundred married men there is even one who can honestly say that blowjobs increased after he got married. If you like blowjobs, don't get married.

Reason #25 – Throw Your Kinky Fantasies Out the Window

Not only does the frequency of sex decrease upon getting married but there's a whole host of fantasies that you can throw right out the window. Most married women are not going to be okay with bringing another woman into the bedroom, dressing up like a maid or a nurse, or giving you anal sex when you want it. You can also forget about any fantasy of sleeping with a mother and her adult daughter.

Just as in the case of unmarried women giving frequent and enthusiastic blowjobs, a wife is more likely to be less kinky than a girlfriend, a friend-with-benefits, a one-night stand or a prostitute. Once a man has bent the knee and shackled himself with a marriage contract, there is no reason for his wife to be kinky.

Keep a girlfriend long enough, and the frequency and creative variety in your sex life is sure to decrease. This usually happens after three months, but is sure to plummet at the moment she decides that you aren't going to marry her or she no longer believes you are the most ideal candidate for a husband. An unforeseen downturn in finances, or your girlfriend suddenly catching the eye of a man who appears to have more alpha male traits or money than you do, all can cause a quick drop in her libido and performance. Even repeatedly demonstrating characteristics that she finds difficult or impossible to tame out of you can have the effect of her spunk-bucket drying up.

The foolish man is the one whose sex-life with his girlfriend has stagnated but believes marrying her will somehow make things different. While it is true that proposing to a girl can ignite the bed sheets again, this is only because she now believes that she's betting on a sure-thing. The girl that can now proudly call herself a man's fiancée, knows that she only has to keep her man enticed until the day he signs the life-long service agreement to her. If you like kinky sex, don't get married.

Reason #26 – Say Goodbye to Candy & Bambi's Sweet Young Ass

While some men have very strict tastes, there is still variety among the specific types of women that excite him. For years my favorite make and model has been Ford's Lincoln Town Car. If the next iteration of the Town Car somehow fails to meet my standards, I am not required by any contract to purchase it. I not only have the freedom to choose a different make and model, but I can also buy as many vehicles as my budget will allow. Marriage, on the other hand, is an agreement to never so much as test drive another model, or even look at one with desire in your eyes.

Whoever says, "Variety is the spice of life," gives one of the most cogent arguments against marriage. Although my taste in women has remained relatively the same, as a single man I'm able to change things up whenever I desire. I can enjoy a skinny gal with tiny breasts on Monday, a thicker girl with massive tits on Tuesday, and spend the rest of the week going through different skin complexions, heights, and ages. The married man has agreed to throw the spice of life right out the window.

When a single man achieves a laudable degree of success, he can then enjoy women all over the world, but a married man only increases the number of things his wife is going to ask him to purchase. Moreover, with men refining the art of seduction, a man needn't wait to achieve even a modicum of wealth to seduce gorgeous women into bed, for the poorest of men can transform themselves into pick-up artists. On the one hand, you have married men slaving away to financially appease their wife. On the other hand, there are single men, who don't have to work any harder than their meager living expenses require, and they can enjoy as many different women as they want. If you like having sex with a variety of different women, don't get married.

Reason #27 – Women Use Vagina Access to Control You

Marriage vows typically include the words "to have and to hold." For centuries this has been interpreted to mean that your wife agrees that you get to embrace her sexually whenever you like. In the days before feminism, this was called "a wife's duty to her husband."

A marriage ceremony is, in fact, a transfer of ownership, though it is not, and never was popularly intended to be a form of slavery. Whereas a sex slave is forced to please a man against her will, a marriage ceremony means she has willfully agreed to pleasure her husband when he desires. An additional significant difference between sex slavery and "a wife's duty to her husband" should be apparent. It goes without saying that a woman that is enslaved will not be lovingly provided for by her owner, but a husband agrees to invest some amount of the fruits of his labor, and his

time, to provide a safe and pleasant life for his wife. The husband serves, and the wife is supposed to serve in return, yet this is not how modern marriages work out.

Regarding marriage as a kind of ownership, note that women do not actually have a last name. A woman's surname is her father's name, and thus it symbolically represents that she belongs to him and is cared for by him, should she need him even in her adulthood. The symbolic transfer of ownership is completed when the father gives his daughter away in the wedding ceremony, and the bride takes up the surname of her husband. The woman's new husband is now charged with being the go-to-guy for her care and protection, rather than her father.

In a collection of anonymous testimonies from married men entitled "[Comments from Married Men](#)," found at [MGTOW.com](#), some of the most frequent complaints are that sex with their wives is few and far between. Since women have garnered so much legal power through feminism, wives are fully aware that in signing the marriage contract they now hold all the cards in the relationship. With divorce settlements, alimony, child support or even the ability to deploy a false rape or false domestic violence accusation against their husband, there is no reason for wives to please their husbands on demand. It is her vagina, and she will decide when you get access to it.

Vagina access is lorded over the heads of husbands all over the world. Instead of husbands only needing to provide for their wives in a financially sound and practical manner, they are able to puppeteer their husbands into doing whatever they wish by punishing them by withholding sex.

Before feminism, a man could demand sex from his wife, and if she refused, he could just get on top of her and hold her to their marriage agreement. She keeps up her end of the bargain, just as he has kept his end of the bargain by paying the bills, keeping food in her stomach and a roof over her head. Since the 1970s, in the United States, a man who tries to hold his wife to her wedding vows is criminalized as "marital rape." Make no mistake, a man does not get regular sex because his wife promised to let him "have and hold" her, but because she is pleased with the behavior of her slave.

Having a wife is like having a mommy, except where your mom may have placed you in time-out or withheld your favorite cookies because you did something bad, a wife will withhold sex if she's unhappy with your behavior. A girlfriend does not place a man in this mother-son dynamic because if she refuses to have sex, you can laugh in her face and easily replace her. A wife cannot be easily replaced, and there's a hefty price to pay in alimony and child support if you get tired of her controlling your sex life and decide to file for divorce.

If you do not want to guarantee that someone else will have full control of when and with whom you get to have sex, do not get married.

Reason #28 - Sleeping With a Cock Tease

Having to adjust to how a woman sleeps may be an unforeseen issue in a marriage. If a wife likes to sleep with a fan or television on, or if she snores, and you need pristine quiet, it's going to cause problems. On the other hand, if a man snores so loud that his wife can't sleep, he can expect that he'll be the one that will have to sleep on the couch.

The real problem of sleeping next to a beautiful woman is that we men get 3 – 5 erections per night, so we'll often want to have sex in the middle of the night, or at least before going to sleep. A wife that doesn't put out makes the situation worse because getting turned down by the woman that you've spent so much money to court, marry and take over, causes frustration, anger, depression, and resentment. My points about sexual frustration in the middle of the night aside, a survey by AmeriSleep found that single people get the most sleep at 7.13 hours a night. Guys in a relationship get 7.07 hours of sleep, while married couples are getting an average of 6.71 hours.

During the day men will have as many as 10 erections. Until a wife becomes a beached whale that no longer turns her husband on, he'll have to deal with seeing the beautiful girl he married walk around in her underwear, bending over to pick something up, or getting dolled up for work or a night out. It is inevitable that a wife won't put out as often as a short-term girlfriend, so many men resign themselves to porn and the five-knuckle-shuffle.

In private or at work, it's easy to deal with the random erections that we get throughout the day, even without pornography or masturbation. If a man doesn't let his thoughts drift far into sex, a simple shift in thinking can solve an unwanted hard-on. A married man has to deal with seeing his wife sitting next to him with her hard nipples, or having her soft ass pressed up against him while he's trying to sleep. Expect to look over at your wife while she's

watching some stupid TV show, and see her bare tittie hanging out of her silky robe, but if you've been married more than a few years, also expect to be cranking one off in the shower.

Chapter 5 - Suzy Homemaker? Not a chance!

"Marriage is about the most expensive way for the average man to get laundry done." - Burt Reynolds

Reason #29 – She Won't Cook...and She Doesn't Know How Anyway

One woman, I was briefly interested in, blurted out that she would never "do kitchen," as if to say that she would never reduce herself to being the slave of some man. I told her, "Don't you realize that men find it attractive when women 'do kitchen' and bring them something nice to eat?"

Men interpret their girlfriend or wife bringing them food as an act of love. A woman serving dinner symbolically says that she wants to nourish us, make sure we are healthy, and also acknowledges our contribution to the relationship. For almost all of us men, we were fed by a woman in our infancy and childhood, so females being associated with the ones who feed us goes without saying, but the pleasant experience of being nourished by a woman is also wired in our psyche.

According to The Smell and Taste Treatment and Research Foundation, the top six smells that arouse men are all the scents of food. Despite men being turned on by perfumes that smell like food, or the thought an attractive woman bringing us something to eat, modern wives are loath to consistently cook for their husbands. A married man can slave away on a construction site, spend a fourteen-hour shift in a police patrol car, or put up with obnoxious business clients all day, and still get an "I'm too tired to cook tonight" response from his wife when he comes home.

There is simply no reason why a wife should cook for her husband, considering that a man has no recourse if she doesn't. Married women are free to contribute little or nothing to the relationship because even if their husbands demand a divorce, they win through alimony, child support, child custody and transfer of property ownership.

While the average wedding ceremony costs tens-of-thousands of dollars, a man can take a week of cooking lessons for as little as \$1,000 or less, and be skilled enough to impress his friends and any future girlfriends. Instead of putting up with a wife that doesn't cook, and the looming threat of financial ruin after divorce, it's a safer bet to identify great restaurants that have beautiful waitresses. You can also hire an attractive female chef to come cook for you, or you and your buddies, for \$150 - \$300 for 4 or 5 hours. A professional chef's food is almost guaranteed to be delicious, and she can pack your refrigerator with several dishes that can be reheated or eaten cold.

You can even make arrangements with a neighbor or a roommate, where you agree to cover the brunt of the grocery bill if they do the cooking. If you don't like your neighbors, you can move. If a friendship with a roommate goes sour, you can get him out, without handing over the deed to your house. I don't, of course, recommend having a female roommate, so that doesn't satisfy the desire to have a pretty lady serving up breakfast, lunch, and dinner, but having a buddy do the cooking sure beats the risks of marriage. Furthermore, you'll almost always be served with a smile from a gorgeous waitress, and if the service is terrible there's plenty of others to choose from. If your favorite waitress balloons out like a whale, you can always find a new favorite, but a wife who doesn't cook for you but stuffs her face all day isn't so easy to get rid of.

Since marriage far from guarantees you'll be served meals by a beautiful girl with a smile, don't get married.

Reason #30 – It's Cheaper to Get a Maid

On April 21, 2014, Tara Carr published an article at *Examiner.com* titled "8 Things women just don't do anymore—that they should!" Tara states, "Back in the day, every woman had to take home economics. It was mandatory. It pretty much taught you how to be a wife. You learned how to cook, clean, sew, polish silver, host a dinner party, and help your man get a promotion!" She encouraged women to cook, clean, fix their husband's dinner plate, watch their language, compliment their man, stay fit, dress up for dates and anticipate the needs of their spouse. Naturally, Tara was stormed by feminists who lambasted her for daring to suggest that women should appease their husbands like the supposedly enslaved housewives of the 1950s. In response to Tara's advice, other girls presented a laundry list of excuses for why they simply couldn't keep up with housework or were too tired to dress sexy, or to get their

fat ass on a treadmill.

The most brutal slaying came in the form of a longwinded feminist diatribe at the blog *Fit to Be Queen*, in which the author claims Tara's article is "riddled with a-woman-is-meant-to-serve-a-man-stink." This queen bitch tells of how disgusted she was seeing her mother serve her father in a traditional capacity as a housewife, yet she also had the audacity to admit that her mother didn't work, and her father supported the household. The queen bitch goes on to suggest that husbands should participate in the household chores, but if a man is the sole bread-winner, then why should he? Amazingly, a man supporting a woman's lifestyle, and providing for the well-being of her children, isn't enough to warrant his wife bringing him something from the refrigerator as he kicks back to relax after a hard day's work.

The queen really is a cunt in the truest sense of the word, for C.U.N.T. stands for "Can't Understand Normal Thinking."

These idiotic modern women are so appallingly dim that they equate doing things for a man as slavery, but working for a male boss in the workforce as freedom. As one man going by the pseudonym Jean Valjean pointed out, "If she's 'fit to be a queen' then why is she going to be the one slaving away in the workplace, rather than sitting home and letting a man do the hard work, while she alleviates her boredom with some tasks around the house, and gives him a few gestures of admiration and appreciation?"

The queen feminist also said in her attack on Tara Carr, "I need a man who recognizes that I am just as smart, capable, and worthy as he." This is really the crux of the matter: contemporary women believe they are strong, independent and fully capable of anything a man can do. If that's the case, then they can go earn all the money for the household, while husband's watch sports games all day, occasionally push a vacuum around and throw food on a plate when the "strong independent woman" gets home from a 14-hour shift.

On June 9, 2016, Steve Doughty, writing for *The Daily Mail*, reported that a survey of 3,000 women found that girls that listed "housewife" as their occupation were the happiest. In another study that I find epically hilarious, economists Betsey Stevenson and Justin Wolfers discovered that the increase in women's rights alongside the feminist war against the traditional housewife has taken a toll on women's happiness. In their May 2009 report "The Paradox of Declining Female Happiness" Stevenson and Wolfers note that surveys of women's happiness show a decline since the 1970s.

Keep in mind that the 70s saw women supposedly making great strides for the empowerment of women. Roe vs Wade decriminalized abortion in 1973, allowing women to legally destroy the offspring of their husband. No-fault divorce was rolled out in California in 1970, allowing women to completely ignore their vows and acquire significant portions of their husband's assets in divorce court. Marital rape laws were instituted in the 1970s as well, dissolving any notion that a man has a right to sleep with his wife when he wants to.

Despite these supposed victories for women, their happiness has declined. The fact remains that trying to figure out what women want is futile, as they have no idea what they want, nor do they possess the brains to foresee the ramifications of their demands.

Modern women are nothing like the housewives of the 30s, and they roll their eyes at the thought of cleaning up after their husband or "doing kitchen." A woman's bedroom at her mother's house, or the way she keeps her apartment before she gets married, is an indication of what your place will look like if you marry her. Many women are slobs, but even the tidiest women are likely to throw in the towel after a few years of marriage, as girls are inundated with articles from feminists deriding "women's work."

Since married women can steal a man's house, half his wealth, and receive alimony and child support payments, there's just no reason any woman should tolerate cleaning up after some man. Your wife can take your money and just hire a maid. Which is precisely what you should do. There's a lot of girls that need a job too. All these gals with worthless degrees in the Art & Science of Lesbian Basket Weaving, Gender Studies, or other useless liberal nonsense, would appreciate a few bucks for cleaning your house. No one wants to take care of a tattooed 30-year-old who spent the best years of her beauty riding the cock-carousel, or that has three kids by three different men, so these girls need a job.

Why throw away your freedom, risk losing much of your savings account, your house, and your earnings, just to have a wife who will dust, vacuum and fold your laundry? Especially when there's no guarantee that she'll keep at for years to come. For much less than most men spend on a nice date with a woman, you can have a maid clean your place twice a month. For \$150 - \$200 you can have a topless maid clean your house. Do you really think you can get your wife to clean your house naked or in lingerie, even if you took her to the best restaurant in town and bought her a \$500 designer purse? You might be able to convince her once in a blue moon, but a professional housekeeper or sexy maid service will do the job every time.

Reason #31 – It's Your Turn to Wash the Dishes

Before I exorcised the beta male right out of me, I twice found myself being the one who always washed the dishes while I had a live-in girlfriend. Today I have such a severe allergy to washing dishes that I just have a maid do it. Some guys think it's good practice to do a little "women's work," because it supposedly earns points with their ladies. Basically, these guys have failed one of the most basic shit-tests of them all, and unbeknownst to them, their vaginal behavior is taking a toll on their sex life.

The American Sociological Review published a study in 2013 called "Egalitarianism, Housework and Sexual Frequency in Marriage," that showed that women are less attracted to men who do chores that are traditionally associated with the duty of wives. The more a man cooks, cleans, folds laundry, mops or vacuums, the less attractive he appears to his wife. Husbands who only did masculine chores, like mowing the lawn, taking out the trash or wrenching on the car, had sex 1.5 times more than beta male husbands who engaged in feminine chores. Not only that, but the more traditional the division of household chores was, the more sexual satisfaction women said they were receiving from their husbands.

This research flies in the face of feminist nonsense, and the opinions of liberal marriage counselors, that says that husbands should help their wife with her traditional female household duties. If a man doesn't want to have less sex and wants to keep his wife sexually satisfied, he shouldn't ever touch a mop, vacuum or a dish. Stay clear of the washer and dryer machines too, unless you need to fix them.

The problem is that women are fed feminist propaganda from every angle that equates a woman's housework with slavery, and articles in women's magazines that claim a happy marriage entails men helping out with cooking and cleaning. It's difficult for men to put their foot down and refuse to do women's labor when their wives are made to feel like they're being mistreated. It speaks to female intelligence, and their ability to be influenced that feminists have been able to convince women that housework is slavery. If a woman lives by herself as a single woman, she'll have to cook, clean and do the laundry. The presence of a man in her household only marginally increases the number of chores she already had to do.

Feminists never factor in the benefits of what a woman receives in marriage, and pretend instead that husbands are receiving the great benefit of a female slave. The truth is that wives receive the resources of their husbands, typically get a more spacious house to live in, and are afforded the option to work fewer hours or stay at home. Married women have someone to care for them when they're sick, and protect them against predatory animals and criminals. Wives also have a creature that is stronger than them, in the form of a husband, so they can move heavy objects by merely pointing at them, as opposed to getting off the couch and breaking a nail. Men who are remotely handy also serve as the go-to handyman for their wives.

The males of our species have endeavored to ease the labor of women in every possible way, from dishwashing and laundry machines, vacuums, microwaves and stoves. Our reward for making housework easy has been a rising divorce rate and a parade of feminists chanting, "We're not your slaves!"

Thoughtful men looked upon the difficulties of women's work and took the initiative to use their creative minds to ease their labor. What has been our reward?

Alva J. Fisher invented the washing machine. J. Ross Moore invented the automatic clothes dryer. William Cullen and Oliver Evans invented the refrigerator. Percy Spencer invented the microwave. Willis Carrier invented air conditioning. John Logie Baird is the father of television, and Guillermo González Camarena from Mexico improved the invention by bringing us color-TV in 1941. The powered vacuum cleaner was invented independently by British engineer Hubert Cecil Booth and American inventor David T. Kenney. Antonio Santi Giuseppe Meucci

invented the telephone just a few years before Alexander Graham Bell created his version of the device.

In the days of hunters and gatherers, a wife would be busy beating the dirty laundry with a bat down by the river, or collecting firewood to make dinner when her husband gets home from hunting. She could also busy herself collecting fruits and vegetables. She could either sit in the shack her husband built, or sit outside to do her work. The hut is a pinch cooler than sitting out in the scorching sun, but there's no lighting. Her primitive dishes and pots don't amount to much, and there's no refrigerator, so gathering food is a daily chore. She has hardly any clothes to speak of. She might miss her friends, but they're miles away. Her husband arrived from another tribe and took her away from the people she knew. It would be nice to talk to someone she is familiar with, to keep her mind off morbid thoughts that her husband might get killed on the hunt. If her husband dies, how will she survive? Some bloodthirsty warband might also one day come through their village and murder her husband—and what will they do to her? Batting away a small swarm of gnats, she walks into the one-room hut, picks a pot up off the compacted dirt floor, and decides to go fetch some water.

Today, a woman can sit around in her multi-roomed air-conditioned house her husband purchased for her. She can watch her favorite television show on the giant color TV her husband also bought her, while the laundry is getting done virtually hands-free. When she flips through the channels she'll ignore the news broadcast about some foreign politician threatening to declare war on her country. She doesn't know much about the military, but she does know there's millions of men in her nation's armed forces who will defend their people. She'll also ignore the report about a burglary, because last week her husband paid a man to install a home alarm system. Besides, she lives in a quiet neighborhood, and policemen have done well to keep the riff-raff at bay. When her husband gets home, she can reach into the refrigerator, and toss some leftovers into the microwave, or just have some chicken and mashed potatoes delivered. She can pull out the vacuum cleaner to suck up any dirt that comes in off her husband's boots, and then sit back down on the couch to contemplate exactly how much money she'll be able to squeeze out of her husband in divorce court. When her husband retires to his man cave in the garage, she can load the dishwasher, flop back on the couch again, pick up the telephone, and call her best friend. While she sips on a glass of chilled Pinot Grigio, she can yap about how much she feels like she's enslaved, while she messages her ex-boyfriend on her smartphone.

For the record, it is true that Josephine Cochrane is credited with inventing the dishwasher, yet she was assisted by George Butters, a mechanic. Also, keep in mind that it is chiefly male truck drivers—doing a job that is statistically more dangerous than that of a police officer—who haul dishwashers to warehouses. It is primarily men who improved upon the original invention, who put them together on the assembly line, who deliver them to homes, and who repair them when they break. Men have worked their asses off to build a world where being a housewife is one of the easiest jobs a woman can do.

Many men spend their whole lives looking forward to retirement and daydreaming with their buddies about what they'll do when they no longer have to work. Even though women live longer, in 2018 their retirement age is 63, while the pension age of men is 65. The average age of retirement for men was 66 in 2018. According to the Centers for Disease Control and Prevention's National Center for Health Statistics, the life expectancy of American men was 76.4 years in 2012 and 81.2 years for females. This means men typically “enjoy” 10 years of retirement before they die, and who knows how many will never realize their retirement dreams because years of job stress and a nagging bitch of a wife robbed them of their health.

It takes a pretty stupid creature to equate household chores with slavery while thinking that working a job is freedom, but feminists have somehow managed to convince women that is the case. With divorce settlements, alimony and child support in reach of any married woman—and feminists claiming that housewives are slaves—beta male husbands all over the world are now washing the dishes to keep themselves out of divorce court, while their wife's vagina dries up at the sight of a weak, pathetic, broken man.

Reason #32 – Her Most Esteemed Advisor is a Television

While most people are familiar with the word misogyny—which is contempt for, or prejudice against women—few know the opposite term is “misandry.” [Misandry](#) is, of course, a dislike of, or prejudice against men.

Movies, television commercials, women's magazines, and fiction books, are all peppered with misandry and feminism. Virtually all commercials that are intended to be humorous, and that feature a man and woman, will

portray men as gullible, inept, slovenly, weak, immature or stupid. Men are often portrayed as objects to be laughed at, rather than respected. Television shows like *The Simpsons* and *Family Guy* are typical examples of the idiotic father. Tim in *The Office* is an idiot. Joey on the TV show *Friends* and Charlie in *Two and a Half Men* are sex-crazed buffoons. The exaggerated masculinity of Tim Taylor, played by comedian Tim Allen, in the sitcom *Home Improvement*, is intended to make manliness the butt of all jokes.

Take careful note of the trend in Hollywood movies wherein the hero does not rescue the damsel in distress but is often incapable of defeating the bad guys without her. Increasingly, male characters are kicked around like ragdolls by female assassins, superheroes and soldiers. In the movie *Justice League*, starring Ben Affleck as Batman and Gal Gadot as Wonder Woman, there is a scene where Wonder Woman gets upset at Batman's comments. With her superhuman strength, Wonder Woman strikes Batman, because apparently, it's okay for a woman to hit a male if she's upset with him.

In the film industry, women aren't just capable of doing anything a man can do, they can do it better. Even little boys are portrayed as vastly inferior in their abilities and conduct to little girls. In the HBO series *Game of Thrones*, Meera Reed is a warrior badass, but her brother Jojen is a pathetic weakling. In the very first episode of *Game of Thrones*, Arya Stark effortlessly hits a bulls-eye on an archery target after her brother Bran completely misses it like a pitiful twerp. Entertainment geared toward male audiences is no different. In *The Punisher* mini-series produced by Marvel Television for Netflix, take note that the hero and his assistant both have a daughter and son. Frank Castle's son is the problem child, not his daughter, and the same is true for Micro's son.

From every angle, women are programmed to believe that men are inferior to women. It is utterly foolish to think that such programming has no effect on the way wives treat their husbands. How can one expect to be respected as a capable father when dads are portrayed as incapable idiots?

In the area of romance novels and female-centered movies and television programs, infidelity is glorified, and divorce is normal. How can anyone expect to have a faithful wife when entertainment makes cheating out to be normal and exciting?

I encourage men to watch romance movies to get a sense of how women define romance. At the end of an action movie the guy gets the girl because he proved himself, and to men this makes sense: if you are the alpha male, you deserve the girl. Whereas in romance movies like *Fifty Shades of Grey*, Anastasia doesn't have to do anything to catch the handsome billionaire Christian Grey. This is compounded by the fact that the actress Dakota Johnson is a 6.5 at best on a scale of 1 – 10. Thus the message to the female audience is that any mediocre woman has the chance to marry a hot young stud whose among the wealthiest men in the world. *The Shape of Water* is even worse, where Elisa Esposito shows us, that without her makeup, she's a 4 on the beauty scale, yet she somehow manages to seduce a demi-god.

Browsing through the romance category of books shows that women hunger for men with chiseled bodies who are billionaires, famous football players, rich mobsters or wealthy nobles. Sure, there are male characters who don't have a mountain of cash, but the message remains the same throughout all advertisements and entertainment targeted toward females: you deserve anything and everything you want because you have a vagina.

With books, movies, magazines, advertisements, and television shows elevating the value of a woman's vagina to the heights of the stars, it is impossible to ever satisfy their delusional sense of self-worth. Contrast this with repeated reminders that men are idiots and you have a recipe for relationship disaster.

If you're delusional enough to think you can prevent your woman from being brainwashed by nearly every form of entertainment she engages in, don't get married. Your traditional marriage pipe-dream is likely to change because of such influences. Misandry is par for the course.

Reason #33 - She Isn't Wife Material

There are tons of lists from average guys to relationship experts, advising on how to determine whether or not a woman is wife material. No one is perfect, but once you review even a few of the wife material requirements, most men will agree that the quality of women has sharply declined since feminism.

I mentioned to an old-timer that I find tattoos on a woman unattractive; his response was, “Back in my day, not even the whores had tattoos.” Another man made a case to me about how much women need men and said, “If these girls today had to go survive out in the woods they’d die. These girls can’t even sew two pieces of fabric together to make a tent.” His comment reminded me of *The Island with Bear Grylls*, a British reality television show wherein men and women who have no formal survival training are dropped onto a tropical island for a month to see how average people fair in a real survival scenario. The women notoriously do terribly without the aid of men. The message is quite clear: women need men for their survival, but men don’t need women.

In the household, it’s no different. Modern women often don’t bring any real traditional wife skills to the table. Married men have to work an average of 400 hours more each year than single men, but what are they getting out of it? If a man goes to work every day without fail to support his household, but his wife doesn’t have dinner ready every afternoon, doesn’t give him sex when he wants it, and he has to split the chores—on top of working more hours—then what’s the point of having a wife?

There’s more to it than the traditional wife skills of cooking and cleaning or providing a great sex life. To be a wife is to be a man’s assistant, companion, and friend. Husbands should receive praise and compliments from their wives and should celebrate his successes, for she will surely reap the benefits of his achievements.

As men should be the leaders of their house, a wife should have good followership. One characteristic of a good follower is that she will know her leader better than she knows herself, and be capable of anticipating his needs. A police officer friend of mine asked if it was really too much to ask his wife to give him a back rub, foot massage or a blowjob when he gets home each day from work. For many contemporary women, “yes” it is too much to ask. A wife should uplift her man, and ease the stress of his life. A good wife should be considerate, kind and thoughtful. She’s low maintenance but goes out of her way to make herself pretty for the pleasure of her husband.

One guy I knew told me that his wife went out to the library and got a stack of books on NASCAR so she could learn about her husband’s favorite sport. There were some severe issues in their relationship that excluded her from the “wife material” category, but taking the time to educate herself on her husband’s interests was a top-notch gesture most women today wouldn’t even think about.

I’m not a bible-thumper, but when a Christian friend of mine shared with me the Bible’s guide to finding a woman who is wife material, we both agreed that such women are all but extinct. The Bible speaks of a woman who is of noble character, wise, trustworthy and kind; she takes care of her house and is satisfied being at home, rather than always wanting to go out at night. The ideal wife is not wicked or scandalous, and would not harm anyone. Contrast this with data compiled by the Department of Health and Human Services in the UK showing that 70.6 percent of children who were abused by a parent between 2001 and 2006, were abused by their mother. The lack of the modern woman’s noble character is reflected throughout the multiple studies presented in this book. As for wisdom, women read books and magazines that are shallow and devoid of substance.

Wife material also extends into assessing how much of a slut a woman is, to estimate the likelihood that she’ll cheat. Since the Women’s Liberation Movement of the 1960s and 70s, women have gotten increasingly promiscuous. Today many women are tattooed, cigarette smoking, bubblegum-chewing harlots who drown themselves in alcohol, spend the best years of their youthful beauty riding the cock-carousel, and then complain that there’s a shortage of good men that are husband material. The truth is that good men are everywhere, but they’re just not interested in washed-up sluts who are over 30 and don’t have any wife skills to speak of.

According to the Pew Research Center, only half of Americans older than 18 were married in 2014. That means that since 1960—which was the dawn of Women’s Liberation—marriage has dropped 72 percent. Once again, we find that women have shot themselves in the foot.

Men are wising up to the gynocentric system that treats men less than second class citizens. It is not only that women don’t know how to be good wives, but the system has been reconstructed by feminism in such way that a man can’t put his foot down and maintain leadership of his household. On the off-chance that a man believes he’s found a real unicorn, there’s nothing to stop a wife from transforming into a sexually-frigid nagging banshee that refuses to do housework, belittles her husband in public, and consumes more calories than a full-grown elephant.

Chapter 6 - She's in Control

“Marrying means to halve one’s rights and double one’s duties.” – Arthur Schopenhauer, 19th-century philosopher

Reason #34 – A Husband is a Woman’s Servant

The famous painting *The Accolade* by Edmund Leighton depicts a man bowing before a queen as she rests a sword on his shoulder to dub him a knight of her realm. As the knight swears his oath of service and fealty, the sword symbolizes the understanding that the queen possesses the power to have his head cut from his neck should he disregard his vows. Similarly, when a man proposes to a woman, he kneels before her in a position of submission, as he is symbolically offering her his eternal service and loyalty. The ring he offers symbolizes the ouroboros, or the snake eating its tail; it is the alpha and omega, a representation of eternity. The overall value of the ring represents a mere preview of the amount of resources the man is willing to provide his wife-to-be. Taking all this symbolism into account, the unspoken words of a marriage proposal are: I will serve you if you will serve me.

Proposing to a woman immediately lowers a man’s perceived alpha status as he is placing himself in an inferior position of supplication, and servitude symbolism, on the part of the man, is echoed throughout marital courtship.

Some believe that carrying the bride over the threshold is thought to have originated from a superstition that demons would follow her into her home if she walked in the first time. Others have said it is because tradition holds that a woman should modestly appear unwilling to give herself up to husband on their wedding night. Although the origins of picking the bride up and carrying her over the threshold have been variously argued, I find some Freudian symbolism in the practice. In his infancy, the groom was carried by his mother, but now he has the strength to care for a female. He can now be in service to the female, rather than she being in service to him. Regardless of how I see it, there are no symbolic acts in contemporary weddings of Western culture that place the bride in a position of service, apart from reciting her vows. But as we have already covered, vows are meaningless.

A woman does not place the blade of a sword to the neck of a man who proposes to her, nor in the wedding ceremony, but she doesn’t need to. In place of an instrument of death, the woman has been provided the threat of alimony, child support and a divorce settlement that will see his house given over to his ex-wife, his wealth plundered and other possessions granted to her. Should an ex-husband refuse to comply, a woman’s real husband (i.e., the government) will send men with firearms and handcuffs to force him to.

To marry a woman is to appoint her as your queen while removing your crown from your head.

Reason #35 - Marriage is Not a Partnership

The marriage contract forms a legal corporation with the state and creates a needlessly complex merger in which there are joint tax filings and joint bank accounts. It is essential to understand that a marriage is by a law a maritime corporation, but it is unlike any kind of business partnership.

If a man partners with his friend in a business venture he can later sell his share of the company and possibly make much more money than he initially invested. A man who wishes to dissolve a marriage does not gain money but takes a loss in the form of the money he spent on courting the woman, the engagement ring, wedding ceremony, honeymoon, the larger house his wife wanted, and countless other expenses. This is to say nothing of child support and alimony, nor of intangible losses such as missed opportunities with his friends, or having to spend time doing things for his wife’s enjoyment rather than his own. Understand then that taking on a wife represents a series of irrecoverable losses even if a man is lucky enough to never have to pay alimony or child support, and ends up retaining his and all his possessions upon divorce.

While Christians quote Ephesians 5:22 - 23, which reads, “Wives, submit yourselves unto your own husbands, as unto the Lord. For the husband is the head of the wife, even as Christ is the head of the church: and he is the savior of the body,” it is vainly stated. Marriages no longer function as monarchies, in which the husband is effectively the king of his household. All Christians are monarchists in that they hope for the return of their messiah, who is foretold in Revelation to establish an absolute theocratic monarchy. The supreme authority of Jesus as the King of

Kings is echoed in Ephesians in the relationship between a husband and wife. It is therefore contradictory for any Christian to quote Ephesians 5:22 - 23 and then call a marriage an equal partnership, and say that it requires compromise. Marriage, according to Ephesians, should function as a monarchy. Not even the queen has the right to veto the rulings of an absolute monarch, and to submit to one's husband is to be in at least a secondary position, not one that is equal.

Outside of religion, the military provides the principle of Unity of Command, which states that no subordinate should report to more than one superior and that a single commander must have authority to direct all forces under his command. To abandon this hierarchical pillar is to open oneself up to internal conflict, chaos and the failure of the mission. So too then, are marriages almost certainly doomed to failure if neither the husband nor the wife has absolute authority on matters both trivial and important. While decision making can be divided up in a marriage, it can have unforeseen consequences that erupt into arguments and resentment.

Reason #36 – Your Opinions Mean Nothing

According to *TheRedPins.com* 2015 survey, 97% of respondents said that women get what they want in home purchases. After looking at a wide variety of other sources, the findings were similar in many different countries.

In terms of buying a home, where to go on a date, who does the housework, what color a room should be painted, how much time should be spent with friends, etc., a wife has become the decision maker in the marriage.

A study funded by the National Institute of Mental Health and Iowa State University, published in the April 2007 issue of *The Journal of Counseling Psychology*, concludes that wives are more demanding than ever, and more likely to get their way than their husbands. This was regardless of whether or not the so-called “man of the house” is the one who brought the issue up.

Despite how feminists continue to portray marriage as an institution of slavery, women exert incredible power in a marriage. With the instatement of no-fault divorce, beginning in California in 1970, marital rape laws in the mid-70s, alimony and child support, wives have absolutely no obligation to satisfy their husbands sexually or take his opinions seriously.

Reason #37 - You Will Be Tamed

A horse can carry more weight than a man, it can run up to 15 miles before requiring an extended period of rest, and can travel about 30 miles per day. A mounted soldier can push a sturdy warhorse to travel as much as 60 miles in a day.

A comparison between horses and husbands is apt, as men are on average stronger, faster, more resilient, more intelligent and more capable than women. Girls that are obsessed with horses are among the worst kinds of girls to date as they try to educate themselves in how to get a powerful beast to do their bidding. Horseback riding is almost exclusively a female sport, and girls make up the brunt of clients for horseback riding lessons. The way that girls interact with a horse—speaking to it softly, petting it and feeding it treats—is reflective of how a wife uses her feminine skills of manipulation to get her husband to do what he wants. A 2015 article written by Hannah Hickok at *RedBookMag.com* is unashamedly titled “6 Sneaky Ways to Train Your Husband,” and such guides are littered throughout other women's magazines. Although there are gals with serious brains and business savvy, most women only have their looks and their vagina to get what they want.

Except in the case of gracefulness, such as in ballet, and the ability to carry a child in her womb, the truth is that men can do anything a woman can, and do it better. Men only need women for sex and reproduction, nothing more. If sex and the use of her womb are not enough, the only other things she can really offer are the fringe benefits of pleasant companionship, someone to cook, clean and care for the children. Her end goal is to convince the much more capable male to use his strength, mind, stamina and accumulated resources to her benefit. Since a man can easily have sex without getting married, it is critical to understand that women need you, you don't need women—unless you want to have children. Women already stupidly devalued themselves with the sexual liberation movement brought on by feminism. As the saying goes, “Why buy the cow if the milk's still free?” Once human beings achieve artificial womb technology, the value of women will be reduced even further.

Men have somewhat reduced their value as well, with the entrance of women into the workforce, as any woman is

free to earn her own income and leave her parents' nest without need of a husband. However, women loathe hard work and are less capable of it, so it is much more appealing to have a tamed animal working for them. Divorce settlements, alimony and child support furthermore allow a woman to gain the resources of the much more capable animal without having to do any more work at all.

Being tamed by a woman does not just mean being used, but can also be defined as domesticating a man and making him easier to control. A wife might use nagging or other forms of persuasion to influence her husband to dress more professionally, stop hanging out with buddies who are always in and out of jail or convince him to quit the rock band and instead spend his time learning new skills so he can get a better job. One guy I met happily said he was glad his wife didn't tolerate his drinking because he felt he was a better person without alcohol. Perhaps some men might believe the influence of good woman can help them become the best version of themselves, but there is a severe problem with that line of thinking.

A wife doesn't make a man a better person, he makes himself a better person; no one changes anyone, people decide for themselves to change. Real manhood requires an examination of oneself, accepting responsibility for one's actions and condition, and taking the initiative to make appropriate changes. To rely on someone else to change you is not only to succumb to a fallacy of how inner-evolution is accomplished but to think that a woman is required for such change is to reduce one's alpha status by holding onto a crutch offered by mommy.

Reason #38 - Compromising Means You Always Lose

When single men argue about how much marriage requires appeasing a woman, marriage advocates attempt to defend it by saying that marriage requires compromise. "Happy wife, happy life" is a favorite anecdote of beta males who have traded their alpha status for a marriage contract, or were never alpha males to begin with.

When you compromise you always lose. A man who gets married is agreeing to never get 100% of what he wants. As an example, if a man compromises by saying that he'll do the dishes if he can watch an extra hour of sports, and in exchange, his wife will do the dishes next time and get to watch whatever she wants, he has accepted a loss. Had he never married the nagging cow, he could watch as much sports as he wants and do the dishes whenever he sees fit, or just hire a maid.

Compromising can be likened to checking account and ATM fees, with a savings account interest rate that hardly accounts for inflation. Like credit cards with terrible interest rates, the expense of using a greedy bank outweighs the convenience of its services, especially in light of other options.

If having a wife meant that a man would get sex on demand, a lifetime of eager blowjobs, dinner when he gets home from work, a clean house, and a woman who will try to maintain her appearance as close to the day her husband proposed to her, then compromising wouldn't be a lose/lose situation.

The fact is, that just by getting married a man has already made an enormous compromise. In light of a man's marriage vows, he has agreed to never have sex with any other woman, even when his wife's beauty fades away. While his wife ages, he has agreed to pass up sleeping with beautiful young women and completely shut down any possibility of a relationship with a woman that is more suitable to his physical tastes and interests. A husband has vowed to financially support his wife, protect her and care for her when she's sick. In consideration of the enormous burden and sexual restraints a married man has agreed to take on, he should not have to make any additional compromises, not even so much as washing a single dish in exchange for being allowed to go to poker night with his buddies.

Compromising is said to be a necessity in marriage because the vows and services provided to women by their husbands is grossly undervalued, while the chores of a housewife and access to her vagina are monstrously overvalued.

Reason #39 - It's Not You & Her Against the World

A painting of a happy couple embracing each other on a beach is only true-to-life if the woman in the illustration is just the man's girlfriend, and they're stranded on an island.

The reality is a wife's parents, and friends will advise her on how her husband should treat her, how he should

behave, and even suggest methods to manipulate him to get what she wants. The picture of a married couple happily in love is a farce, as it doesn't include the influence of society, television programming, marital counselors, fiction writers, the books of self-appointed relationship experts, your wife's new psychiatrist or even random strangers putting forth their opinion of what a marriage entails. Most importantly, it leaves out the view of the government and the courts on what it means to be a husband, father, mother or wife.

If you get married, it will not be "you and her against the world" but you against everyone else's opinion of who you should be as a husband, and what your wife should and should not be willing to do. While a wife's demands may be deemed unreasonable by her husband, it has very little meaning when her mother, psychiatrist, friends or favorite women's talk show disagrees.

Chapter 7 - Your Money is Her Money

“It is an amazing thing to see in our city the wife of a shoemaker, or a butcher, or a porter dressed in silk with chains of gold at the throat, with pearls and rings of good value...and then in contrast to see her husband cutting the meat, all smeared with cow’s blood, poorly dressed...but whosoever considers this carefully will find it reasonable because it is necessary that the lady, even if low born and humble, be draped with such clothes for her natural excellence and dignity, and the man less adorned as if a slave, or a little ass, born to her service.” – Lucrezia Marinella, 16th-century feminist

Reason #40 - She’ll Spend Your Money Like Water

It is not just that women are more materialistic than men, or that marriage will dramatically increase your monthly expenditures, but a wife will spend your money like it grows on trees. The reason for this is simple: she didn’t work hard to earn the money. Whereas you might have had to do backbreaking labor or spend extra hours at the office, and therefore you are careful not to spend money on frivolous nonsense, she didn’t have to do anything for it. In fact, a wife feels she has a right to your money. The life experience of a beautiful woman amounts to men trampling all over themselves to gain her attention, and lining up to spend money on her. From her vantage point, that is what life is.

Males are typically raised to understand that the world is harsh and they need to be tough to overcome life’s challenges. Keep in mind that women were raised to rely on others for their care. One study found that parents will respond much more quickly to a baby girl crying than a baby boy. Although several psychologists and neurologists have warned against toughening up boys so early in life, parents tend to treat male infants differently than females. Parents want their boys to be strong enough to face the world, and do it alone if they have to, so they are not as quick to rush to the crib of a crying baby boy as they are for a girl.

Almost from birth, females are taught that other people exist to bend over backward for them. A beautiful girl doesn’t have to do anything at all to earn the service, adoration, and protection of men. Girls also learn that exaggerating their emotions is an easy way to get what they want. If a little girl is denied a toy, she’ll experiment with crying, screaming, pouting or even sweeten her voice and act extra nice. By high school age, girls have developed a whole battery of methods to persuade people to get what they want, and with hormones raging in male students, and their bodies taking shape, it becomes even easier.

Imagine a father who, after a night of trick-or-treating, places the majority of the Halloween candy up in the highest cupboard above the refrigerator. If a boy wants access to the candy jar, he’ll have to devise a plan to sneak into the kitchen and construct himself some means of climbing up to get it. His other option is to ask his father for more treats, but that will likely result in flat-out denial, or being told to do chores. Thus the boy learns the lesson that you either can’t always get what you want or that great rewards are reaped for hard work. A man’s daughter is more likely to receive extra candy just by pouting, crying, or the skillful use of her voice. Again, girls learn the lesson that people exist for their pleasure.

With the debit card of the couple’s shared bank account in hand, a wife can ring up bags full of clothes, shoes, makeup, trinkets and assorted retail crap without a second a thought.

Reason #41 - Less Money for Your Hobbies

In all the expenditures that marriage requires, it inevitably means you’ll have less money to spend on things you enjoy. Since alimony, child support, sleeping on the couch, or the threat of your wife cheating on you looms over your head, it becomes easy for her to coerce you into spending your money on whatever she wants. Your fishing gear, golf clubs, firearm collection, high-end gaming computer or sports memorabilia are all going to take a back seat to your wife’s hair, makeup, shoes, clothes and never-ending home decorations. You’ll have to have to pass up a great deal on front-row tickets at the basketball game because she wants new curtains to match the new living room paint job or because she needs help paying off her credit cards.

[Terrence Popp](#) from [Redonkulas.com](#) points out in his video “[The Cost to Be the Boss](#),” precisely what it takes to

live well as a single man versus living well if you're married. After thoroughly researching average costs to have dental, medical, a decent car, place to live, food, money for vacation and holiday gifts, Terrence determined that a single man needs a minimum salary of \$23,204. To live well if you're married requires a minimum salary of \$74,942. Keep in mind that Terrence was throwing out averages and minimums. Living well in Los Angeles or New York is going to be much more expensive than San Antonio, Texas. The point is that sustaining a nice lifestyle as a married man is three times more costly than remaining single, which is why married men have to work longer and harder than single guys.

Getting married is a great way to reduce the amount of money you'll have to do things you enjoy.

Reason #42 – You Will Have to Work Harder

A wife's lifestyle demands and spending habits invariably mean that her husband must work harder than when he was single or dating. A report by the American Enterprise Institute (AEI) and Institute for Family Studies titled "For Richer, For Poorer: How Family Structures Economic Success in America" reveals that married men work an average of 400 hours more than single men with similar job experience. The reason for husbands having to work so hard is simple: having a wife is expensive.

In 2015 an article in *The Washington Post* tried to entice men into marriage with the headline "Don't be a bachelor: Why married men work harder, smarter and make more money." The author of the article, William Bradford Wilcox, mentions a Harvard study that found that married men are much less likely to quit their job before lining up a new one, than single men. He also noted that married men make more money than their single counterparts. What Wilcox conveniently fails to point out is that married men have to work harder because of the spending habits of their wives, increased holiday expenses, increased utility, and grocery bills. Not to mention credit card debt and a mortgage payment on a large house they wouldn't have needed if they had just remained single.

A single man can work as much or as little as he wants, and is free to change his place of employment or even take extended time away from work. A husband doesn't have such a luxury and must keep grinding away unless he can find another job with equal or better pay. Most married men will not be allowed to take a few months off of work to finish writing a novel, nor have the liberty to switch to part-time hours so they can try their hand at opening a business. A single man can quit his job whenever he wants to and use some of his savings to travel around the world, or he can cut back his hours and choose to live a frugal minimalist lifestyle. Married men have to work harder when they don't want to because a wife is a financial burden.

The practice of a wife bringing a dowry into the marriage is an indication that it has been known throughout the centuries that women are a liability, not an asset. In the days before women entered the workforce en masse, there were few options for a young lady to earn a living, and thus she would be a strain on her parent's budget. To help sweeten the deal, a bride would bring property or money to her husband on their wedding day that she usually had acquired from her father. Women also used to accumulate linen, clothing, and other items useful for a married life in a hope chest, but that practice has all but ceased in favor of family and friends giving gifts on the wedding day.

If you don't want to work harder, just to support someone else's existence, don't get married.

Reason #43 – Women Love to Shop...With Your Money

In 2009, *The Harvard Business Review* reported that women worldwide represented \$20 trillion in annual consumer spending, which is the entire gross domestic product of the United States in 2017. Women's spending worldwide is quadruple the 2018 GDP of Japan, and "represents a growth market bigger than China and India combined," according to the article titled "The Female Economy" published in *The Harvard Business Review*. A 2014 report from Simple Relevance, an email marketing firm, states that women either make or influence the purchasing decision in 85% of all retail transactions. Women buy a lot of retail crap.

On May 25, 2012, TakePart.com reported that the Puente Hills landfill in Los Angeles was taking in 12,000 tons of garbage daily and sat at an astounding 3.7 million tons of trash. The reality is that 70 – 80% of the retail garbage found in a landfill is the product of women's spending habits. It's funny how many women can be seen in photographs of environmentalist protests considering the appalling size of their collective waste footprint upon the Earth.

Daniel Kruger, an evolutionary psychologist at the University of Michigan, told *ABC News* in the 2009 article “Why Women Love to Shop,” that it could be due to hunter-gatherer evolution. Kruger theorizes that men evolved to have a “get in, get out” approach because they often hunted their food, but since women gathered their food and spent time examining it, they adapted to enjoying a leisurely time searching for the best deal. Kruger might be on to something, but in terms of a marriage, a wife enjoys shopping more than her husband because she didn’t have to bust her ass to earn the money.

It’s not easy for a man to part with his money, not just because he worked hard for it, but also because he’s too tired to waste time methodically scanning through each aisle of retail crap. Moreover, men make purchases according to what the product or service can do, and assess its utility and durability, while women are more likely to buy something because of how it will make them feel. Do you want your finances to be directed by logic or some woman’s emotions?

Chapter 8 - The Married Lifestyle

“By the age of twelve at the latest, most women have decided to become prostitutes. Or, to put it another way they have planned a future for themselves which consists of choosing a man and letting him do all the work.” – Esther Vilar, author of [The Manipulated Man](#)

Reason #44 - Dates You Don't Want To Go On

Whereas when we hang out with the boys, we are satisfied with each other's company no matter the surroundings, women demand to be entertained and treated to the best experience that your wallet can afford. When male friends meet at the bar or café, go fishing together, or take a road trip, they needn't even say much to each other to enjoy one another's company. Women need constant reassurance of the value of their vagina. To this end, a seedy dive-bar, or floating around in an old fishing canoe, won't do.

A woman's requirement for validation that she is still beautiful and desirable demands that she is seen—that she catches the attention of males other than her husband. The expenditure of the date provides creditability to whatever price she puts on her vagina. Whereas a man can validate his self-worth by the respect he receives from other men, a woman only validates her worth by the number of men who thirst after her, the amount of money spent on her, and the number of women who envy her. This translates to a husband having to spend his time and money taking his wife to places that he does not necessarily enjoy, and funding how she will appear in front of others. A wife's dress, jewelry, and makeup have absolutely nothing to do with her husband but are only a means of advertising to the world the minimum appraisal of her stinky-pinky.

After waiting an hour or two for a woman to get ready, a man will say, “You look beautiful.” Such compliments are not celebrated as an indication that her husband will be satisfied but are a reassurance that other men, and women, will validate that she is a prize. Naturally, a woman's inherent psychological need to be validated by others requires that she will want her husband to take her places where she will be seen. Romance for a man can be laying under the stars in the middle of the woods, but for a woman, it is typically going to some socialite event where the eyes of others will be on her. Whereas a man might envision walking with his bikini-clad lady down a beach while a gentle breeze blows through her sarong, her vision is likely to take place on the beaches of Hawaii, France or some other exotic place—so she can boast to her girlfriends about where her husband took her. A woman's romance is then in the validation of her beauty, by way of how much money was spent on her.

Reason #45 - Celebrate Holidays on Her Terms

I don't celebrate any holidays apart from buying a few loved ones gifts on Christmas or the occasional birthday present. Women live for holidays so they must be factored in as an extra expense of your money and time.

Married men have to deal with Valentine's Day, their wife's birthday and their wedding anniversary. They'll need to endure in-laws on Thanksgiving, Christmas or Hanukkah, and perhaps suffer through an Independence Day barbecue at her annoying brother's house. The gift-giving season will no longer mean a few affordable but thoughtful items for mom and a few loved ones, as wives expect a husband who earns an average wage to spend at least a few hundred dollars on their gift alone. This is to say nothing of food, beverages, decorations, travel and lodging expenses. You can always spot the homes of married couples during the holidays because they're adorned with the most decorations.

It is also worth mentioning that a married man will be dragged into a wide variety of family functions and minor celebrations. A wife comes with a whole set of nieces, nephews, brothers, sisters, and other in-laws, to say nothing of friends' families. A married man without kids will soon realize there's no shortage of baptisms, kids birthday parties, bar mitzvahs, soccer games, weddings, dinner parties and other functions he'll be expected to attend and throw money at if necessary. To not do so means he'll find himself sleeping on the couch, or getting an earful from his bloated nagging bitch of a wife for the next week—and he can bet money she'll bring up his rude absentee behavior every time he wants to do something of his choosing.

Reason #46 – A Husband’s Work is Never Done

Married men on average work more hours than single men, so a husband’s day off is something to be savored. The problem is that a wife can introduce a never-ending list of chores and errands for her pack-mule of a husband to do.

The presence of a man in the house means that a woman can accomplish a lot of things she would not otherwise be able to do, due to her lack of strength or knowledge. Moving all the furniture in and out of the living room so you can paint it the color of her choice might be on her “Honey Do List” for your next day off. After she buys a bed more suitable to her tastes, maybe you’ll need to haul your old mattress and bed frame down the stairs. When the headboard slips out of your hands and knocks a hole in the wall, you’ll be fixing that too, and while you’re at it, you might as well fix the creaky stairs and stain the banister to match the dining room table. If you could run down to the home improvement store and buy ten 50 pound bags of topsoil, and then haul them to the backyard so your wife can start an organic vegetable garden—even though she doesn’t hardly ever cook—that would be great too. Don’t expect a blowjob afterward, and you probably won’t get a back massage either.

Ex-wives and ex-girlfriends somehow seem to dictate the free-time of the men they abandoned. A truck driver told me that almost all his fellow over-the-road truck drivers were guys paying child support or alimony. They had often chosen the career because a semi-truck that’s built for traveling all over the United States comes with a sleeper berth in the cab of the tractor. It’s an affordable way to have a roof over their head instead of a house or apartment they can’t afford due to payments to an ex-wife or ex-girlfriend. Truckers work up to 70 hours per week keeping the economy moving, and while they are granted 48 hours of federally mandated downtime, their days off are often spent at a truckstop or a Wal-Mart parking lot.

If you get married, you can basically kiss your days-off goodbye.

Reason #47 – TV Shows & Movies You Have No Interest In

A wife’s tastes in entertainment can be drastically different than her husband’s. A girlfriend might put up with your taste in war movies, gangster flicks, but a wife has no reason to. Expect to be dragged to the cinema to watch whatever romantic trash Hollywood has pumped out this week. If you’re not willing to be emasculated as you step into the theater for *A Walk to Remember* or *Beauty and the Beast*, not to worry; your wife will have taken over the living room and your prized 80-inch television screen and \$2000 sound system you put together for sporting events. You’ll be regulated to watching your favorite shows on your 17-inch laptop on an old couch in the basement.

As a bachelor, I don’t have to spend a single minute watching anything I have no interest in. I don’t have to subject myself to hearing poorly written romantic dialog from the latest pseudo-alpha male character blaring from the next room while my wife and her fat ass friends pass around a tub of cookie-dough ice cream.

Reason #48 - Women Want to Control Your Time

A wife will want her husband spending his time with her or doing something that benefits her. The mommy dynamic resurfaces here because a wife will want to know what you’re doing at all times. How many times have you heard a married man say that he has to check in with his wife, or call her to let her know when he’s coming home? This is exactly what little boys have to do to keep their mother’s happy. The comparison of wives to mothers is apt, as a study by Tamas Bereczkei at the University of Pécs in Hungary discovered that men end up marrying women that have a bone structure that resembles their mother.

Men want sex from women, but women want the resources and services of men. Divorced women often claim that their ex-husbands didn’t serve their emotional needs. The translation is that out of the 24 hours each man is given in a day, not enough hours were spent trying to make the woman happy.

Reason #49 – Dealing With In-laws

Whereas a man has no obligation to spend time with a girlfriend’s in-laws, it is expected that he does so if he is foolish enough to marry her. It is not just a matter of dealing with in-laws that are an annoyance but also having to deal with their meddling into your marriage and the possibility of giving some of them financial assistance. You might need to shell out money to help your sister-in-law, or to bail your wife’s idiot brother out of jail. Even things as small as purchasing candy or cookies from a niece or nephew for a school fundraising project should be factored

in. You might also have to babysit for your in-laws or attend school plays or sporting events that you have no interest in. Keep in mind that these are not children that you raised, and with an increasingly liberal approach to parenting, you could find yourself stuck with a pack of brats running amuck in your house for the next five hours while your sister-in-law goes on a date with another jobless loser.

You may somehow weasel your way out of funding your sister-in-law's relationship, but your wife might throw a fit if you don't let her and her idiot husband stay in your basement for a few months until he finds new employment. A father-in-law might need you to help paint his house, while next week your brother-in-law pulls his rusty truck into your driveway because he knows you know a thing or two about fixing vehicles.

Getting married opens up a whole new group of people that you just might not want to deal with.

Reason #50 - Her Friends

The names of a woman's relatives should be written all over her wedding dress alongside her friends as a reminder that they're part of the whole package. A husband will be forced to deal with his wife's friends even if he moves far away from them.

Women love yapping on the telephone, and the internet opens up a whole new means of staying in communication and making a never-ending assortment of new friends through social networking websites. You can pick your friends, but you can't pick your wife's friends. The influence of a woman's friends will always hang over the head of your marriage, and if you live in proximity to them, your wife will want to spend time with them.

Influence does not have to mean something overtly negative, such as her best friend running you down behind your back, or enticing your wife with stories about how nice it is to be riding some other man's cock while her husband is away at work. A woman's friends can sway her buying decisions, and create feelings of resentment and envy as they share stories of how much money the men in their lives are willing to spend on them. Friends can have an impact on your wife's diet, appearance, vices, spending habits, politics, the location she wants to live, and they'll weigh in on how they think you should be behaving as a husband.

Your wife's guy friends are the worst, as any male friend of hers will sleep with her given a chance, and perhaps the right amount of alcohol. Again, with ready access to a whole host of social networking websites, there's plenty of guys she can "make friends with" and monkey branch around. A survey of 1,000 women by OnePoll.com in 2014 found that 50 percent of women have a "Plan B" backup plan in the form of man they know, should they found themselves unhappy with their current relationship. A wife is more likely to have a backup suitor than a girlfriend, and her chosen Plan B is usually someone she has known for around seven years. As noted in an article citing the poll at *DailyMail.co.uk* on September 25, 2014, "With sites like Facebook and Twitter, it's easier than ever to stay in touch with an old flame."

I can only imagine how many women are telling their husbands "I love you" or "I love you with all my heart," and yet are keeping another man's phone number handy just in case things don't work out.

Reason #51 - Her Pets & Your Pets

Another unforeseen potential restriction upon a married man's life may be the kind of pets he can have, or the pets he must tolerate. An unwanted pet can represent extra expenses you don't want. A single dog or cat can cost around \$1000 for the first year, and an additional \$500 for every year thereafter.

Maybe your wife wants an annoying parakeet, or a couple of ferrets running amuck in the house, or perhaps you do, but she doesn't. Comedian Dane Cook jokes that every guy wants a monkey. Marriage limits the freedom to have such exotic pets, as well as common domesticated animals, but all pets are an additional expense. They can also become a source of resentment. Are you annoyed by your wife's pets? Does she treat the dog or cat better than you? Does your wife think you pay more attention to the dog than you give to her?

In the book [*Leader of the Pack: How a Single Dad of Five Led His Kids, His Business and Himself from Disaster to Success*](#) by Matt Sweetwood, the author shares a story about his family dog Max. Matt got roped into marrying his girlfriend Charlotte after she announced she was pregnant—which was also after she claimed that the doctors said she couldn't get pregnant. Matt got a dog to complete the picture of marriage normalcy. As the months of his wife's

pregnancy ticked by, Matt noticed she got colder toward him and the dog. On the day he brought his newborn daughter home, he said Charlotte barged into the house, kicked the dog and retreated to the baby's room. A woman who loves your pets one day may not tomorrow.

Reason #52 – You Will Never Have Peace of Mind

If there's one thing that marriage is guaranteed to do, it will destroy your peace of mind. I sense this plays into why married guys get less sleep than bachelors. The questions that will float around in your mind are endless.

If your wife shows any indication that she's unhappy, but doesn't tell you—keeping in mind that women loathe speaking truthfully—you'll be wondering what you did to upset her. Did you say something wrong? Is she happy enough?

When she takes a phone call, you'll wonder who she's talking to. Is she talking to that idiot friend of hers, or is she talking to her mother, who blames her failed marriage on your father-in-law?

After reading about a celebrity divorce settlement in some Hollywood gossip magazine, has she done the math on how much she can extort from you in divorce court?

Exactly who is she texting on all the time?

When you went with her to buy her a new cellphone, didn't it seem like she lit up a little too much as the handsome salesman walked her through all the service plan options?

If you can't spend enough money on her birthday present as her friend's husband spent on his wife's present, is she really going to be happy?

She's been packing on a lot of pounds lately, so does this mean you're going to be stuck with a woman who's intent on becoming her own landmass?

If a mountain lion jumps out of a tree while you're hiking, will you be able to protect her?

If you don't close the deal on this big account, how dissatisfied will she be if you have to scale back your vacation plans?

Did she catch you glancing at the young barmaid's delicious titties, and are you going to have to hear about it tonight if she did? How much has she had to drink tonight anyway?

Does she regret marrying you after seeing how great her ex-boyfriend is doing at the high school reunion?

Is she really okay with you spending a weekend at your buddy's hunting cabin to console him while he's going through a divorce?

If you didn't marry her, what would your life be like? Who could you have become? How many of your dreams could you have materialized?

...and who is it that she keeps texting all the time?

Chapter 9 - Cutting Your Balls Off

“We’re a generation of men raised by women. I’m wondering if another woman is really the answer we need.” – Tyler Durden, a character from the book *Fight Club* by Chuck Palahniuk

Reason #53 – Say Goodbye to Your Dream Car

One easy way to tell if a guy is married, or if he has kids and is paying child support, is the kind of car he’s driving. Most married men can no longer afford the car they really want to drive, and instead, opt for a cheaper model, or just keep driving the same old rag-trapper until the engine falls out. Even if you can afford a fully-loaded luxury pickup truck or sedan, or badass sports car that’s guaranteed to turn heads, there are steep obstacles and severe penalties to pay if you make the purchase.

Since women are petty creatures more obsessed with appearances than men are, she’ll also be requesting a new car that’s comparable to yours. After all, she needs to flaunt to her friends and neighbors how much her husband spent on her so she can validate the price of her vagina. If you can’t afford your dream car—because of legitimate bills, or her irrational spending habits—she’ll be sure to remind you. Meanwhile, you’ll be wondering why you’re still making payments on the \$3000 treadmill her fat ass stopped using a week after she ordered it.

Your dream car is never going to divorce you. It is never going to cheat on you, prevent you from spending your free-time how you want to spend it, or hit you up for child support while telling your kids what a deadbeat you are.

Reason #54 - Firearms & Motorcycles

Some very few women enjoy going out to the shooting range, riding on the back of their man’s motorcycle or doing other activities that are traditionally masculine, or might otherwise be viewed as dangerous.

Getting married increases a woman’s desire to feel safe and secure, as her husband is perceived as her safety net. Having children, or merely getting pregnant, compounds a wife’s need to be reassured that she is in a stable and safe environment. A woman’s desire for security and stability translates to a disagreeable attitude when it comes to various manly activities. To take on a wife may mean that a man may have to forgo participating or investing in things which his wife deems dangerous or of no value to her needs.

A random news report on a terrible motorcycle accident can give way to a wife demanding her husband sell his prized bike, and the same can be said for a speedboat, dune-buggy or other unconventional vehicles. Once she views the receipts, a man’s firearm collection, or the joy of amassing more tools, will take a back seat to his wife’s need for designer clothes, home decorations, new furniture, an exotic vacation, or some useless trash that caught her eye on a home shopping television show.

Reason #55 – “Will you please stop leaving the toilet seat up!”

It may sound silly, but I quite enjoy that I can skip a shower, leave the place a complete mess, let the dishes pile up for days, or fart up the whole house if I want to. I can drink right out the of the milk jug, have the same meal delivered to my place five days in a row, or chain-smoke two packs of cigarettes in my bedroom while I get sauced on booze. I can play video games all day or watch the entire *Die Hard* film franchise in one sitting. I can make my bed or leave it a complete mess while I sit around in my underwear with my feet kicked up on the coffee table, trying to see if I can burp loud enough to wake the neighbors. I’m not saying I do any of this stuff, but the point that I’m making is that I have the freedom to do as I please in and out of my own home.

If you don’t get married, you’ll never have anyone nag you that you need to stop leaving the toilet seat up, or threatening to throw your clothes away if you don’t stop leaving them in a heap on the floor. Heck, my friend’s toilet bowl hasn’t been cleaned in so long it looks like you still need to flush it, even after you’ve already flushed it.

Reason #56 - Your Vices

She might tolerate your love of cigars or pipe tobacco now but that can all change.

When Melissa moved in with me and brought in some of her furniture and decorations, I reluctantly agreed that I would no longer smoke in my house. Plenty of guys choose not to smoke in their home, but as the king of their castle, it's their choice to have a smoke free environment. Cohabiting with a woman can change that, and control over the household is never equal. This is especially the case since women have spent their childhood playing house, and believe themselves to be rightfully in control of the home—despite however much they object to the traditional duties of a housewife. Ken Roberts, who made his fortune trading and teaching people how to trade commodities, said in one book that he had a separate house built on his property so he could enjoy smoking cigars without hearing his wife complain about the odor.

To be fair, the positive aspect of a woman putting her foot down against smoking, gambling, drinking, or other vices, is that it can be good for your health and your wallet. In my beta male days, I once told an alpha male friend that I liked the idea of a good woman who would help keep me in line and control my spending. He was shocked at my vaginal comment and retorted, “We are not those kind of men. If we have a weakness, we do not seek a crutch from a woman or anyone else. We look within ourselves, and we change it.” I scolded myself for being so weak, for I had read the works of Anthony Robbins, Napoleon Hill, Robert Greene, and many others, but failed to apply what they were teaching.

If you have an addiction that you recognize impedes you from being the best version of yourself that you can be, it's up to you to take steps to change it or seek professional help. It is not up to a mommy that comes in the form of a wife. If, on the other hand, you don't see your vices as harmful, or believe the tradeoff is worth it, marriage gambles your chances of being able to enjoy what you like, when, where and how much you like.

Reason #57 – Marriage Takes the Fun Out of Nightlife

Going to a dance club with your buddies, or taking a girlfriend or a wife, are three very different experiences.

As a single man, the dance club is a buffet of gorgeous girls shaking their ass, trying to attract the attention of alpha males. The presence of a girlfriend shuts down the opportunity to thoroughly enjoy the eye-candy, but it's a joy to see a girlfriend dress up for the night, and if the relationship is fresh you'll still find some electricity between you. Bringing a woman to a dance club, however, also comes with having to watch over her, and fending off any would-be suitors. You've basically just stepped into a mating competition where the men have dressed their best, inflate their chests or show off their muscles in the hopes of proving that it is they who deserve vagina access.

A friend of mine said that he hated going to the dance club with his girlfriend because it meant that he had to deflect an onslaught of flirtatious attempts by other men to sleep with his girlfriend. Add alcohol to a gathering that includes 200 – 800 males trying to assert their dominance and impress females, and now you have to play bodyguard in the event that some drunken hooligans start exchanging blows too close to your gal. If someone insults you in front of your lady, you're forced with the difficult decision of ignoring it like a weakling, or trying your best to pummel the guy, so you don't lose face.

If you don't like to dance, your choice is to let her pull you to the dance floor—where you'll shuffle around like a half-retarded ape—or you can sit on the sidelines keeping an eye out for the next guy who's going to cop a feel or rub his pecker against your girl's silky ass.

If your wife has one too many drinks, you'll have the added bonus of playing babysitter to a drunk, and while it might ignite the bed sheets, it could also mean she'll be going off on a drunken tirade that uncorks all her criticisms of you that she's collected over the past few years.

Finally, in light of the almost inevitable weight-gain that marriage brings, as proven by numerous studies, husbands have to keep their eyes off of all the pert breasts of scantily clad young ladies while their fat-ass aging wives shimmy up to the bar for another overpriced cosmopolitan.

Reason #58 - Having to Hide Guys' Night Out

Adam White of the University of Bedfordshire in Britain assisted in a study to find out how much men valued close heterosexual relationships with other men compared to having a girlfriend. Their survey discovered that men found their friendships much more fulfilling than tolerating a girlfriend. White told Joseph Brean from *The National Post*, “What happens in 50 years, say, if these bromantic relationships really take off and men decide, ‘Hang on, we really

enjoy these. These are much better. We can gain more emotionality from it. We're less regulated, we're less policed, and therefore women actually just become the sexual fulfillers of men and nothing else. That's the worrying aspect."

I think I just figured out the true identity of the comic book superhero Captain Save-a-Hoe.

White is worried that men will realize that if they don't succumb to the trap of long-term relationships with women—because men know they're just going to be "regulated" and "policed"—we'll only value women for what's between their legs. In other words, White is concerned that men will actually wake up!

Apparently, it's a bad thing if men realize they've been suckered into giving up their freedoms for vagina access when they can easily have sex with women without sacrificing any of their freedom.

The fact is, heterosexual men prefer the company of other men over women. In fact, men can enjoy the company of a best friend without hardly saying a word, whereas girls like to talk and talk, require fistfuls of our money, and make all sorts of incessant demands. A guy can sit quietly in a fishing boat with his buddy, or hardly exchange a word as they watch Tiger Woods dominate the golf course, and have the time of his life for the price of a few beers.

Upon getting married a man automatically decreases the chance to spend quality time with friends. A wife inevitably places restrictions on how often her husband can go to poker night, Monday night football, and what he'll be doing some fishing and hunting season. Strip clubs are almost always out the question, and you can forget about planning a men's only trip to Las Vegas, Thailand or the Philippines. The amount of time a guy can spend at the Freemasonic lodge, Elks' lodge, or other fraternity can also be restricted by a wife.

As a single man, I can hang out with the boys as often as I want.

Reason #59 – Say Goodbye to Eye-Candy...and Candy & Bambi's Sweet Young Ass

One of the great things about going out to the bar, coffee shop, beach, or any number of public places, is that you can enjoy the scenery of beautiful women. A married man can still scope out the ladies, but only when he's not with his wife—unless he wants to risk stealing a glance when she isn't looking.

I often take walks to a local restaurant, barbershop or grocery store because they're so close to where I live. I'll usually spot at least a couple of hot girls in the few short blocks that I walk. Even the girl that cuts my hair is a hot-pie, but if I had a wife who found out where I get my hair cut, I'd likely have to deal with her jealousy—and for what? Why would I want to voluntarily limit how much enjoyment I get from eye-candy? As a single man, I'm not just a window shopper either; I can try my hand at seducing any girl I see. The married man can look but isn't supposed to touch, so he's willing turned himself into a cock-tease.

Reason #60 – The Boys are NOT Back in Town

A study conducted by Bella dePaulo at the University of California at Santa Barbara found that single people have more fulfilling social lives than married couples. After dePaulo reviewed 814 studies, she determined that staying single meant a greater connection to family and friends. Marriage often results in an insular lifestyle.

Not much more needs to be said here. Women want to dominate your time, and a wife inevitably decreases the amount of quality time you can spend with friends and family. A wife will also attempt to remove any friends from your life that she feels might pull you away from the direction she wants you to go in life. Moreover, women are jealous creatures who feel alive by emotional interactions, so to step in the door laughing and smiling after hanging out with the guys, is just another reason for a woman to lash out in envy.

Reason #61 – She Wants Brand New Everything

There is truth in the old joke that men are content to wear underwear that has holes in it. Men are more likely to appreciate the function of things, whereas women value the appearance of things. Women also concern themselves with whether or not what they own elicits a response of praise or envy in others.

When a man foolishly spends money, it is often to prove his alpha status to draw the attention of females or to garner the respect of other men. We also blow money on our hobbies and addictions, if we have any. However, we are still more likely to reuse, repair or recycle. For instance, a man can be satisfied with a leather jacket that's a bit

worn or a pair of boots that have taken a beating because it makes him look rugged and tough, but a woman wants her clothes and shoes to be new and pristine. Most women don't even know how to sew anymore, so a dress that's coming apart at the seams or a missing button on a blouse will soon be chucked in the trash.

While a man is content to drive a used car, because he's confident he can fix any problems, has a buddy whose a grease-monkey, or knows an affordable shop, a woman wants a new car. She not only wants a new vehicle so she can actualize the value of her vagina and flaunt how much her husband spent on her, but also because women want safety and reliability. A man will purchase a fixer-upper house because it's dirt cheap, and he knows he can fix it, or have his friends help out for the low price of a case of beer. A woman wants a new and spacious house in the best neighborhood her husband can afford because it's a matter of status, a feeling of security, and, once again, demonstrating the value of her vagina.

I've known plenty of men who admit that their wrist watch is broken or they haven't bothered to replace the battery, including myself, because we understand it still retains its function. The purpose of a nice watch is merely to display status, and make the man look like a refined and successful gentleman of good taste; therefore, who cares if it stops working? Besides, if you really need to know the time you can look on your cellphone or simply ask somebody.

While the status artifacts of men are usually few in number, women want to adorn themselves in expensive jewelry. The book [The Millionaire Next Door](#) by Cotter Smith and Dr. Thomas J. Stanley speaks to the true purchase habits of the rich, and it is no mistake why men form the majority of the affluent. Most millionaires drive used cars, wear inexpensive suits, live in middle-class and upper-middle-class neighborhoods, and if they drink, they don't reach for expensive wine or high-priced scotch. After I read *The Millionaire Next Door* and had a few high-end suit salesmen affirm that most people can't tell whether or not a suit was an expensive designer brand or not, I never purchased a \$1,000 suit ever again. Again, it is a matter of function: if a well-tailored suit at a discount men's clothing store can do the job of a name brand suit, what's the point of blowing the money? Women do not see it this way, and instead reach for name brands and fantasize about wearing the most expensive clothing money can buy.

If you don't want to throw practical spending right out the window, don't get married.

Reason #62 – No One Respects a Pussy-Whipped Man

Guys who let their woman drive the car while they sit in the passenger seat should really know how pussified they look. Perhaps it's more honest for a married man to let his wife drive, because after all, in today's society the husband is not at the wheel of the marriage.

When a friend or acquaintance announces his engagement to a woman, the wiser among us immediately think, "This guy's a damn fool." Some men can remember the specific instance in their youth when they realized their mother treating them like a fragile little boy affected how other boys saw him. When little boys challenge each other to a dangerously steep downhill bicycle ride, or jumping the cemetery fence to take a shortcut at night, the boy who responds, "My mother would get mad if she found out," loses status in the male pecking order. It is no different when a grown man says he has to check in with his wife, or cut-short his time with the guys because some woman—whose lifestyle he supports with his hard work—will be upset if he doesn't get home. Nobody really says anything, but we men see it all the time: broken men whose wives sapped the life out of them.

Allowing a female to dominate or control your life is called "simping" or being a simp. Probably the greatest expert on simping behavior is Darius, a US Navy Veteran who created a YouTube channel called [MGTOW Knowledge](#) to educate men on how to stop being simps and manginas. Before taking the metaphorical "red pill" that woke him up to the power that women can exert on a man's life through her real husband, the government, Darius admits he was one of the biggest simps of all time. In one video, Darius shares a story of how he was dating a woman who always wanted to know where he was. It was so bad, he said, that he would take a picture of himself with the location he was at clearly in the background. So imagine Darius, a grown man whose pumping iron at the gym, but asking his buddy to stand in a picture with him so he can prove to some woman that he's not out cheating on her.

Getting married means losing your dignity—you become a simp.

Chapter 10 - It's Not Your Castle

“Instead of getting married again, I’m going to find a woman I don’t like and give her a house.” — Lewis Grizzard, 20-century American writer and humorist

Reason #63 – Buying a House You Don’t Need

According to the US Census Bureau’s “2015 Characteristics of New Housing” report, the average size of a house has increased by 1,000 square feet since 1973 to an average of 2,687 square feet. Interestingly, the number of household occupants declined from 3.01 persons in 1973 to 2.54 persons in 2015. The birthrate in the United States has plummeted from 3.65 in 1960 to a mere 1.84 in 2015 and is continuing to drop like a rock. A birthrate below 2 means replacement levels are not being reached, and the population is shrinking. The curious thing is that homes have gotten bigger and more expensive, yet the number of household occupants has decreased, and women are having fewer children.

An article published by *Bloomberg* on January 31, 2017, says it all in the title, “Why Single Women Are Buying Homes at Twice the Rate of Single Men.” The author notes that only 7 percent of homes are purchased by single men, while single women make up 17 percent of home buyers, and married couples make up most of the rest. A 2017 article by *Inc.* magazine entitled “Data Shows Millennial Women Are Dominating the Current Job Market” notes that women are getting higher paying jobs than men, so home purchases by single women make sense. All this data also reveals that single men either cannot afford to purchase a home or aren’t interested in being homeowners.

With the brunt of home purchases being made by single women and married couples, it goes without saying that marrying a woman will mean having to purchase a house. As any real estate agent will tell you, and redundant polls show, women are the chief decision makers when a couple goes to buy a home. Marriage means buying a house that you didn’t need if you remained single, that was picked out by your wife, and that will most likely be given to her—along with many of your other belongings that you paid for—whenever she decides to divorce your sorry ass.

According to RCLCO (formerly known as Robert Charles Lesser & Co.), the average size of apartments built between 2000 – 2009 was 988 square feet, and decreased in size to 917 square feet between 2010 – 2016. Contrast this with an average house size of 2,687 square feet, and you’ll realize that getting married virtually requires a space three times the size of what a single man needs. So while fewer people are getting married, and apartments are shrinking, women are demanding larger and more expensive homes.

Getting married is a great way to spend your money buying a house that you don’t need, can’t afford and that you didn’t even pick out.

Reason #64 – Moving to 2432 Mangina Lane

Since men are more independent, they are less likely to have qualms about moving away from friends and family to their dream location. Men who are intent on saving money for a business venture, or other purposes, can also be satisfied living in an affordable home in a rough neighborhood. Despite the stigma of living in a trailer park, if finances or savings goals require it, a man is more often willing to suck-it-up and live below his means than a woman.

Men are long-term thinkers whereas women look at what will satisfy them immediately. Women also have a greater need for safety, social interaction, and stability, and must validate the value of their vagina to others. Due to her comfort in consistency and social needs, a wife is less likely to condone moving away from her friends and family than a man. Whereas a man will just sleep with a pistol in his nightstand drawer and get a concealed carry weapons permit, a woman needs to feel safe so she’ll want to live in a neighborhood that has a low crime rate. Because she must advertise to the world that her yeast-factory is prize-worthy, a wife will also want to live in the most expensive neighborhood her husband can afford.

A single man can live on a boat, travel around in an RV, move off-grid to a cabin in the woods, or even take a year to hitchhike around the country sleeping wherever he decides to lay his head. There are indeed some women who

are okay with living in a 35-foot boat or an RV, and there's a small handful who'll run off with a mountain man to live in the woods, but marriage significantly decreases your options for where and how you'll live.

Reason #65 - Your House Becomes Her House

When men think about getting married, they inevitably envision the kind of home they'll share with their wife. Unless a man already lives in a sizeable house, he's likely to picture eventually moving into a larger home with his wife. He might daydream about kicking his feet up in a spacious living room, with his sexy wife serving dinner right at the coffee table so they can cuddle up, enjoy a meal together and watch the latest action flick with Gerald Butler, Denzel Washington or Mel Gibson.

Having provided his wife a dream home, and a kitchen that would make Chef Ramsey blush, it's only natural to think that somewhere in the midst of watching the movie, his deliciously hot wife will reach over to start massaging his groin. Before he closes eyes, as he tilts his head back—and she tries to swallow all of his manhood—he can envision how the expansive living room is decorated to his liking. His great grandfather's old rifle from the war hangs above the fireplace, the colors in the room are manly and subdued, and the art and furniture speak to his good taste.

After a good hour or two of sex, he imagines he'll fall asleep and wake up to his beautiful wife sound asleep in her silky negligée, or maybe she'll rouse him with a morning blowjob and breakfast in bed. Yes indeed, he thinks, "This is my castle, and I am the master of my domain."

The problem with this picture is that it amounts to pure fantasy. When a man purchases a home, he is genuinely buying it for his wife—not for him, or the both of them—it is bought for her. A married man is quickly resigned to spend his days in a space allotted by his wife. Usually, this is the basement, garage or a shed in the backyard. This is where the term "man-cave" comes in, for whatever place his wife decides he is free to decorate as he pleases, it is likely to be a single room much colder and darker than the rest of the house. While a stark difference in the actual lighting and temperature may exist between the rest of the home and the man-cave, it is cold and dark insofar as its separation from the warm light and love he thought he secured when he married his wife.

When I was a child, while the boys were throwing snowballs and making snowmen on the playground, the girls would make crude outlines of the floor plan of a house in the snow. Even if a married woman never had a dollhouse as a little girl, she certainly fantasized about how she would decorate her home. The colors, smells, decorations, and furniture were always picked out by her in her mind.

A married man does not rule over his castle but works to provide his wife whatever palace she desires, just as the sweat of his labor exists to expand her freedom to decorate the place as she sees fit. Any seasoned real estate agent will tell you that 70-80% of home purchase decisions are made by the wife; if the woman likes the home, the man will buy it. It is her home, not yours. This is further proven to be the case in the fact that divorce settlements often end in the ex-wife keeping the house which the man purchased with his hard-earned money.

If you do not want to be in the business of buying homes for women, do not get married.

Reason #66 – Your Clubhouse is a Shack

When I was a boy, my friends and brothers would build tree houses or even dig large holes and cover them with wood to create an underground hideout. In adulthood, having our own space to shoot the breeze with our buddies and just be men can take the form of a few comfy seats in the garage and a kegerator (i.e., a refrigerator that holds a keg of beer). We might envision a basement with a pool table, dart board and a foosball table, or a loft over a four-car garage that's made to look and function like a speakeasy of the 1920s. Tech-savvy gamers might dream of a game room outfitted with a half-dozen PCs, or two aircraft or race car simulators, along with a wall of classic arcade games and pinball machines. Canadian *Dungeons & Dragons* aficionado, Robert Wardhaugh, has been running a table-top role-playing game for over 30 years with his buddies. Even guys that aren't into pen-and-paper games are likely to get jealous over his sprawling setup.

The fact is that getting married reduces the amount of space, money and time one can allot to a private clubhouse. Women tie-the-knot to secure a man's time and resources. Long gone are the days when men were truly the kings of their own castle. A wife might argue that her husband is spending too much money on his man-cave, or deny him

the space altogether. Instead of creating the clubhouse of their dreams, many men are reduced to sipping beers with their buddies out by the toolshed just out of earshot of their wives. Sailors and fishermen have had to abandon the idea of hanging out with their best buds on their dream yacht for a tiny fishing boat with hardly any room to move.

If you don't want to see your dream of the ultimate hangout going up in flames, do not get married.

Chapter 11 - Cheating

“The fundamental defect of the female character is a lack of a sense of justice. This originates first and foremost in their want of rationality and capacity for reflection but it is strengthened by the fact that, as the weaker sex, they are driven to rely not on force but on cunning: hence their instinctive subtlety and their ineradicable tendency to tell lies: for as nature has equipped the lion with claws and teeth, the elephant with tusks, the wild boar with fangs, the bull with horns and the cuttlefish with ink, so it has equipped woman with the power of dissimulation as her means of attack and defense, and has transformed into this gift all the strength it has bestowed on man in the form of physical strength and the power of reasoning.” – from Arthur Schopenhauer’s essay “On Women” (c.1865)

Reason #67 – Hypergamy

Colloquially referred to as “marrying up,” hypergamy is the practice of marrying someone of a higher caste or social status. Women are hypergamous by nature, as it is their biological imperative to seek out the best male specimen they can find, and use his resources to create the lifestyle they desire for themselves and their offspring. Men are more likely to engage in hypogamy—which is the reverse of hypergamy—as our instinct is to plant our seed into as many women as possible, regardless of whether or not we consciously want children. For men, our unconscious biological imperative has us valuing a woman’s womb, and a healthy attractive body fit for giving birth to a healthy child.

In a paper on evolutionary anthropology entitled “Women’s Mating Strategies,” written by Elizabeth Cashdan at the Department of Anthropology at the University of Utah, she states, “Females in a wide variety of species (insects, birds, mammals) prefer males with resources, and the same is true for humans.” Cashdan reduces women’s selection of mates to three factors: attractiveness, resources, and status.

Women ultimately value a healthy and symmetrical appearance because an attractive man is likely to be a better provider and have genetic traits that can be passed on to her offspring. Attractiveness relates to one’s ability to provide resources to a woman insofar as it can be an indication of a man’s ability to stand up against harsh environmental conditions, disease, parasites, and the strength and stamina to work harder and longer. A man’s resources indicate the degree to which he can ensure a woman’s survival and that of her offspring. A man’s overall status is indicative of what his offspring might inherit, and the ease of life his children and their mother will enjoy. A woman who is with a man who others regard as powerful also has the added benefit of not having to deal with a constant barrage of lowly men, with fewer resources, flirting with her—because they dread disrespecting her husband.

Because women are hypergamous creatures, a reduction in a man’s social status or resources can quickly see his wife monkey-branching with the intent of marrying up and out of what has become to her an undesirable condition. A woman clings to a man like a monkey holds onto a branch, but like a tree that starts to sway too much in the wind, she will branch off to other men if they offer a sturdier environment or a bigger meal ticket. Having a wife means that a man must always be aware that the woman who supposedly loves him will swing to another tree if she believes it’s more promising, and she thinks she can get away with it.

Robert Stephen Briffault, a social anthropologist of the early 20th century, expanded on women’s hypergamy by codifying what is known as [Briffault's Law](#). The principle, published in the first volume of *The Mothers*, states:

“The female, not the male, determines all the conditions of the animal family. Where the female can derive no benefit from association with the male, no such association takes place.”

Dr. Briffault expanded on this law with three undergirding principles.

1. “Even though a woman has accrued past benefits from her relationship with a man, this is no guarantee of her continuing the relationship with him.”

This is quite simply to say, that no matter how well a man treats his wife, nor how much money he spends on her,

there is no assurance she won't at some point file for divorce. Guys delude themselves into believing that since they spent money on a sparkly rock, take their wife on exciting dates, bought her the car and the house she wanted, they have strengthened the relationship. According to Dr. Briffault, women do not look back upon all the previous things a man has done for them to determine the value of a relationship. No amount of money can ensure the loyalty of a wife.

2. "If a woman promises a man to continue her relationship with him in the future in exchange for a benefit received from him today, her promise becomes null and void as soon as the benefit is rendered."

To fully grasp this, imagine that a woman is threatening to leave her husband because she's tired of living in his small house in a neighborhood she doesn't like. The man promises he'll rectify the situation. She promises not to leave him if he can deliver on his promise to buy her the home she been dreaming of; the one that's just a stone's throw away from his annoying mother-in-law. Though her husband delivers on his promise, it would be foolish of him to ask why she's filing for divorce two months after he purchased the house. He will say, "Didn't I purchase the house you wanted," because he doesn't understand that his wife does not see the home as a long-term benefit, but one that has already come and gone. Technically, in her tiny little mind, she held up her end of the bargain. She called off the divorce because he purchased the home, but she's come up with a different reason to divorce him. Furthermore, she'll get to take over ownership of the house in the divorce settlement anyway.

3. "A man's promise of a future benefit has limited ability to secure a continuing relationship with a woman, and his promise carries weight with her only to the extent that the woman's wait for the benefit is short and to the extent that she trusts him to keep his promise."

If a husband draws up a detailed picture charting his expected financial growth over the next five years, promising that he'll be able to provide a better lifestyle for his wife, he doesn't realize that women are not creatures of long-term thinking but immediate gratification. After all, why would a woman wait and gamble on her husband becoming wealthier when she can seize his current earnings through alimony and monkey-branch to exploit a man who is much more successful than her soon-to-be ex-husband?

Marrying a woman does not magically call a ceasefire to all other male competition because women are hypergamous by nature. She is always going to be looking for an opportunity to monkey-branch and acquire more resources from a superior provider-male or spread her legs for genetic material in the ballsack of another alpha male.

Reason #68 - She'll Cheat on You

I've caught several girlfriends cheating on me or about to cheat. The girls always try to make it seem like they've been the victim of unethical surveillance. Meanwhile, white nights and other beta male cuckolds, who haven't the first clue about women and know nothing of the details of my relationships, will make spurious judgments that I must have deserved to be cheated on. Other equally delusion men might argue that I just chose the wrong gal—believing there is some magical checklist that significantly decreases the chance of dating or marrying a cheater. The real lunkheads might think that a woman cheated because her boyfriend or husband didn't have a big enough John Thomas, or didn't pound her Weiner Wagon hard enough with his Bone Ranger.

The theories of why women cheat are endless, but ultimately they do so because females are hypergamous, and they are also driven by emotions; a woman can be after the emotional exhilaration of the act itself or the emotional high from the drama of getting revenge.

In the time of my father and his father before him, there were much fewer opportunities for women to cheat, but with social media and dating apps accessible on every smartphone carried in a woman's purse, girls have an endless supply of men to sleep around with. For this reason alone, most women have ridden the cock-carousel before they tied-the-knot, and can quickly jump right back onto Rumplesforeskin's merry-go-round anytime the mood strikes them.

According to a research document by Dr. Lawrence B. Finer titled "Trends in Premarital Sex in the United States, 1954–2003," the number of women who are still virgins on their wedding day is roughly 3%. The pretty girl-next-door, that you've been sizing up to see if she's marriage material, has likely been riding so much Chad-cock that her vagina looks like a heap of roast beef.

Dr. Charles E. Corry from the National Coalition For Men researched the subject of how many men are taking care of children that they have been duped into believing are their biological offspring. He found some sickening facts. Dr. Corry noted in 2004 that approximately 300,000 paternity tests are done in the United States for the purposes of including or excluding a male as the biological father of a child. Out of these tests, about one in three prove that the man is not the father of the child. Dr. Corry estimates that each year roughly 90,000 men have been wrongly accused of fathering a child. It also means that with about 4 million children born in the United States each year, there are 1.2 million men that are victims of paternity fraud. By such estimates, there are 21 million men at this very moment who are financially enslaved in a marriage, or through child support, to take care of a child that is not biologically their own. For the record, 32.9 billion dollars was owed in child support for the year 2014, yet how many billions of dollars have cheating women profited—and child support agencies themselves—for suckering men into paying for children that are not their biological offspring?

The *General Social Survey* of 2010 to 2016 conducted by The Institute for Family Studies claims that 20% of men cheat on their spouse but only 11% of women. In light of Dr. Corry's research concerning paternity fraud, there seems to be some shenanigans going on with the findings of the *General Social Survey*. The study did note, however, that the number of unfaithful women is increasing.

In her book *State of Affairs: Rethinking Infidelity*, Esther Perel concludes from her research that the number of women who cheat on their husbands has risen by 40% since 1990. According to Buss and Shackelford's 1997 paper "Susceptibility to Infidelity in the First Year of Marriage," they showed that numerous studies place the likelihood that a woman will cheat on her spouse between 20 – 50%.

In the article "Why Women May Be Bigger Cheaters Than Men?" published at *The Huffington Post* on December 6, 2016, Ashley Papa from Fox News was asked why more women are unfaithful today. Ashley responded, "Part of the reason is access. Women are in the workplace more than ever before. So they have access to men who might be interesting and available to them. And the Internet and social media has made cheating so much easier to do. Cheating is basically just a click away now."

When women defend cheating or relationship experts try to answer what motivates wives to cheat, a whole laundry list of goofy reasons are presented. When I caught Crystal cheating on me, I was purchasing a house, making more money than most men in my age bracket, and I would take her on dates, treat her like gold and even bought her a new wardrobe. After discovering that she was nothing but an unscrupulous whore, I finally cracked open her diary only to read that she had been obsessed with a guy who she admitted was a complete asshole who treated her as little more than a receptacle for his semen. All the while she was telling me she loved me, she was making entries in her diary about some verbally abusive prick she was obsessed with.

After I found out Melody had cheated on me—and called her out on it, by showing her a photograph of her guy friend with his hands all over her—she cried and talked about how much of a mistake it was. She said that she regretted having sex with him, and described how fat and repulsive he had become, and how he huffed, wheezed and sweated like a wild boar when he was on top of her. I decided to forgive Melody, because in those days I was a typical beta male simp; however, I did install software on her computer that recorded all of her keystrokes. Sure enough, she had kept in contact with Brett. When I called her on it a second time, she had the gall to tell me how Brett said that snooping on her was immoral. The same garbage came out of Crystal's mouth when I caught her. It never fails to amaze me how a woman who is caught red-handed, believes she can retain her innocence by shaming someone else, or having some emotional outburst, just like a child.

At the time I caught Bethany cheating I was working at a marketing firm and had received two promotions in the record span of four months. Even though Bethany was a little chunky, I treated her like a beautiful princess, only to have her go out with her feminist friends to bang other men. After leaving her while she was out with her mother, my best mate called me when he was at work, and said Bethany had barged into his house and was begging his girlfriend to tell her my whereabouts because she desperately wanted me back. She ended up blowing up the phone at my work so badly that the girl at the front desk had to sternly tell her to stop calling.

Don't be the fool who believes his wife won't cheat on him. The best way to avoid ever having to deal with the heartbreak of a cheating whore of a wife is not to get married—and that's real peace of mind.

Reason #69 - Women Do Not Love You

Men are the true romantics as we have been created by God, or evolved by nature, to fall in love with women.

In the absence of artificial womb technology, women have been necessary for the species to carry on. When a man steps up to defend a woman against a predatory animal or another man, or when he allows her to get off a sinking ship first, his actions are intended to protect the existence of the species. Men do these things regardless of whether they understand the real purpose of their chivalrous impulses or not. If men did not so easily fall in love with women, or at least have the instinct to protect females—that they aren't even interested in—human beings would have died off long ago. Women being weaker, slower, possessing less endurance and intelligence demands men who are programmed to love them and keep them out of harm's way for the sake of their precious wombs.

On the other hand, a woman's biological imperative is to find and breed with the best male she is capable of sleeping with to strengthen the species. In the animal kingdom, we observe that females will breed with whichever male is victorious in a battle of alpha status. Nature cannot have females refusing to reproduce with the best genetic stock they can find, and thus they cannot have any attachment to any particular male. A woman's version of love cannot be so rigid as to prevent her from passing up the sperm of a man who she intuitively has far more alpha characteristics than whatever man she's been saying "I love you" to for the past few years.

Her other mission in life is to secure a mate who will protect and provide for her. Since women are unable or unwilling to amass the kind of resources a man can, it is essential for her to capture the attention of a male who can provide her with the resources she needs for her survival and happiness, and that of her offspring. Women do not get married because they're in love, but because marriage is an insurance policy. Men are little more than lifeboats on the ship of life.

Men are romantic about relationships, but women are pragmatic. A woman loves what a man can provide for her, but a man loves the woman. Men generally do not care how poor a woman is, but only that she is attractive and treats us with respect. The movie *Pretty Woman*, wherein a rich man falls in love with a prostitute and spends gobs of cash on her, is the classic example of how men fall in love with the person, but women fall in love with a man's bank account.

To love someone with all your heart is to be willing to sacrifice for them, and men will sacrifice their time, their money, and their lives, in the service of the most impoverished woman. Women will sacrifice their marriage on the altar of divorce if their husband's earnings no longer satisfy them, if a wealthier man takes an interest in them, or if they realize alimony and a divorce settlement are a better way to extract his resources.

Despite how many women devour shelves of romance novels, or the number of romance movies geared toward a female audience, men are the true romantics. After looking at a stack of studies on which gender is more romantic, Dr. Gwendolyn Seidman in her article "Who's Really More Romantic, Men or Women?," published at *Psychology Today*, said matter-of-factly "...no study to date has shown women to be more romantic [than men]."

Reason #70 – Dealing With Her Jealousy

Hasse Walum of the Karolinska Institute in Sweden led a study of over 3,000 people to determine whether men or women are more jealous. Consistent with previous research, Walum found that women are more jealous than men. My view is that women are more likely to show signs of jealousy, or erupt in a fit of jealous anger because they are dependent upon the resources of the male. A woman's failure to control a man by keeping him emotionally and sexually tied to her spells danger, as he might end up running off to provide his resources to another female.

A woman who is married long enough to receive a sizable divorce settlement, ownership of the house her husband paid for, and monthly alimony payments, need not worry if her husband becomes infatuated with another woman. A woman who gets pregnant possesses a degree of financial security even quicker, as it only takes nine months till the birth of the child to receive child support payments, but can take five years or more to acquire long-term alimony. Despite a woman having numerous safety nets provided by her real husband, the government, her survival instinct is to be more jealous than a male and to act on those emotions to ensure the stability of her existence.

A woman's jealousy often appears irrational to men, and especially to those of us who pride ourselves on loyalty. The oddity is that a man can throw himself into his wife's service, shower her with compliments, waste his money on her, and tell her repeatedly that he loves her, but it will not quell her jealousy. When you discover that a girlfriend

or wife has been sifting through your text messages, or interrogating you to find out every little detail about how you spent your day, she is operating on instinct to make sure the fruits of your labor will still be hers for the foreseeable future. Another factor is that women know how easy it is for them to get away with cheating on their husbands, and as such, their own guilt can project onto their spouse. In my experience, girlfriends who cheated on me often became more jealous and interested in knowing exactly how I spent my time, and with whom.

When Crystal playfully asked, “Do you want to know what my email password is,” I knew something was amiss. I responded that I didn’t care, but she insisted that I guess, acting like it was a childish game. Finally, she told me her password, and knowing that this was her idiotic way of trying to get me to divulge my own email password—without her appearing that she wanted to police me—I freely told it to her. Within a day she had scoured my emails in a desperate attempt to find any signs that I was cheating on her. She found nothing, yet brought up some woman’s name who was merely a client of mine and tried to spin it that I might be involved with her beyond a professional relationship. Naturally, I became suspicious of Crystal, picked the lock on the tiny safe she hid under our bed, read her diary and tapped my own phone line with a recording device that would activate whenever the phone was picked up. It goes without saying that I discovered the jealous whore was cheating on me, all the while I was serving as her beta male simp who blew money on her and confessed his undying love to her.

In the friendship between two heterosexual men, envy and jealousy serve to encourage one another to excel and become better men. When a buddy pulls up in his dream car, though we might be jealous of his achievement, we do not get angry or resentful, nor feel the need to nit-pick into his bank statements to make sure everything was on the up and up. A best friend who starts to spend more time with another guy does not evoke the kind of irrational jealousy so common in women. If anything, we might find ourselves having an inner-reflection on how we can be a more enjoyable friend to hang around. Maybe we should take a little more interest in our best mate’s hobby if hanging out with him really means that much to us? If our best friend’s new pal is a bad influence, we might show real concern and express our concerns to him, but he’s a man after all, and he’ll have to make his own decisions.

On the other hand, if a married man spends too much time with a guy like me—who knows that marriage is a shell game—it becomes an immediate threat to the woman’s ability to control her husband and ensure access to his resources. A woman isn’t jealous because your buddy Rick drives his \$80,000 sports car too fast while you’re riding shotgun, it’s because your wife doesn’t want you to see how awesome being single can really be. A married man’s financial priority is his wife, not his own dreams, and interests. When your wife complains that every time you and the other couples get together for a barbecue, your buddy Jefferson always brings some ditzy girl who doesn’t even have enough brain cells to talk about the weather, it’s not because she can’t stand their banal conversation. It’s because he’s demonstrating that a man can enjoy a wide variety of beautiful young women well into his 50s and beyond, without having to put up with an aging old nag whose ass now requires a “Wide Load” sign.

Reason #71 – Who Does She Keep Texting?

A wise man once said that if you marry a pretty girl, you’ll never sleep at night. By that, he didn’t mean that you’ll be so turned on by her all the time that your sleep hours will be consumed with sex—because married women don’t put out as much as girlfriends and random sluts do anyway. What is meant by that, is that you’ll lay around at night wondering if she’s been fucking someone else.

Since I’m not goofy enough to get married—and I change my girlfriends out as often as I change the oil in my truck—my thoughts are never preoccupied with whether or not some gal is cheating on me. These women are disposable to me, just as divorce rates, and 80% of divorces being initiated by women, prove that men are disposable to women.

But who am I kidding? As of late, I’ve opted for prostitutes because it virtually nullifies the chance of false domestic violence or false rape allegations, or some woman claiming I got her pregnant. Unlike girlfriends, with call girls I don’t have to deal with drama, nagging, clinginess, or any of the assorted nonsense, nor do I risk becoming so attached that I start wondering who the girl might be texting.

A married man has to concern himself with cheating for two reasons: first, because he’s in love with the woman, and he’s deluded himself into believing she loves him; second, if his wife cheats on him, there’s absolutely nothing he can do about it. A married man who discovers that his wife has been deep-throating his best friend’s pecker every Monday morning for the past three months, has absolutely no legal recourse. You can barge in on your wife getting pounded by a guy who’s hung like a bull, and she can flat-out say that she plans to take you for everything you’re

worth, scream at you to get out of the house—that you paid for—and she'll still succeed in getting everything she wants in divorce court. By the time alimony and child support payments are determined, and the judge has ruled that your house is now her house, she'll have convinced everyone that you were a terrible husband.

On the other hand, if you cheat on her, it will only provide her more justification to take you for everything you've got. With tears in her eyes, she'll convince her friends what a monster you are, and might even cry in your buddy's lap, rubbing her cheek against his beef thermometer, with the intention of screwing him for revenge. If she has any brains at all she might even fabricate a story that you were physically abusive or even a sexual predator, so she can get full custody of the kids, along with your house, your boat, and motorcycle—in addition to alimony and child support.

If you don't get married, you'll never have to battle your own jealousy, and that's real peace of mind.

Reason #72 – Ovulation

Ovulation not only heavily determines when a woman is most desirous of sex, but also the kind of male characteristics she's attracted to.

Rollo Tomassi, the author of *[The Rational Male: Positive Masculinity](#)*, points out that when a woman is ovulating, she will be most attracted to men that express strong testosterone-based features. A square jaw, deep voice, pronounced V-shaped body, broad shoulders, and musculature, are just some visual and auditory cues that a man has a desirable level of testosterone. In terms of ideal personality traits and interaction with her, she is looking for a dominant male that displays confidence and assertiveness.

During this period of high fertility, she is looking for a short-term breeding opportunity. In other words, she isn't looking for a guy who is interested in becoming her boyfriend or husband; she's not interested in identifying a provider-male who will give her some of his resources, but an alpha male who will provide her with his valuable genetic material in the form of his semen.

When I asked a truck driver how he fared with the ladies, he divulged a strategy that echoes Rollo Tomassi's findings. He said that when he was 1 – 3 days away from delivering a load to a city, and knew he would have plenty of downtime, he would message 10 or 12 of the hottest girls he could find on a popular dating website. He advised that one should never give any indication that you are boyfriend or husband material. He wouldn't talk about his earnings, owning his own home, or anything that would indicate that he was a stable protector and provider, who was willing to bend the knee in service to a woman. Instead, he would repeatedly use the word "chill," saying things like, "We should get together and chill," or, "I'm thinking we could just go find a cool spot and chill." He used the word "chill" in place of the words "have sex." Since women ovulate for 12 – 48 hours, and he would message as many as a dozen women, by the time he arrived at a semi-truck dock to deliver his load, the odds are that one of the girls would want him to deliver the genetic alpha load that he was carrying around in his ballsack.

A study by the University of California Los Angeles, led by Dr. Martie Haselton, sought to determine whether or not ovulation affected a woman's fashion sense. The study found that a panel of judges could pick out the exact day a woman was ovulating 83% of the time by guessing on which day, in a timeline of photographs, she was trying to appear the most attractive.

Males are not only subconsciously aware of when women are most fertile, as studies have shown that men will tip ovulating strippers more generously than others, but women strive to make men aware of their window of fertility by the way they speak, walk and dance. Geoffrey Miller, an associate professor of psychology at the University of New Mexico found that strippers who were menstruating earned almost twice as much money from men than dancers who weren't. In 2007, Bernhard Fink of the University of Göttingen in Germany found that when his test group of 48 women danced for a panel of 200 men, the girls that were ovulating were picked as dancing the most provocatively. Scientists had formerly believed that women evolved to conceal their window of fertility to promote monogamy, but researchers have redundantly proven that girls go into heat just like house cats who cry out for the attention of males. In 2004, researchers at the University of Vienna took saliva samples from 351 women and digitally analyzed photographs of them at a nightclub. The girls who showed the most skin had higher levels of estradiol, a female hormone that is elevated when a woman is ovulating.

The fact is that men find women more attractive in their window of fertility, they will give them more attention, and women are more likely to cheat during this phase. David Buss, Elizabeth Pillsworth and Martie Haselton, followed the monthly pattern of women's sexual desire for someone other than their mate. As stated in the article "That Ex-Lover Who Keeps Popping Up in Your Dreams" published in *Psychology Today* on Jan 26, 2011, "These researchers found that the women who were in longer relationships had an increase in desire for someone other than their mate as they approached ovulation."

When a woman is ovulating, she's looking for alpha male semen, but her interests do a 180° turn once her fertility window closes. Apart from the short period of ovulation, the majority of the time a woman is attracted to the idea of catching the attention of a male who will give her his resources. If she's secured a long-term provider, such as a husband, she subconsciously intuits that she is in a stable enough environment to give birth to the offspring of the best alpha male she can find—and that may not be her husband. This is consistent with the findings from the University of Vienna's study of women at nightclubs. The women who showed the most skin and danced the most provocatively—digitally measured by software that analyzes movement—weren't just the ones who were ovulating. The girls who were trying to get the most male attention were not only ovulating but also stated that they were in a committed long-term relationship.

Every month a married man has to face the reality that his wife's biological imperative, driven by the hormones of ovulation, will ignite her desire to seek out the best alpha male she can find. It may be a hard pill to swallow, but there will always be a man who has superior alpha characteristics than you do, at least in one particular area. I have redundantly stated throughout, marrying a woman can reduce a man's perceived alpha status in the eyes of his wife in any number of ways.

It doesn't make sense to swear an oath of sexual monogamy to a creature that is triggered by biological programming, every few weeks, to search for sexual opportunities with other men.

Reason #73 – You Can't Stop Girls' Night Out

When women go out at night together, there is only one reason: to be gawked at and perhaps fondled by men. This is again about her need to validate her self-worth, which comes down to whatever price she places on her sperm-Jacuzzi. Girls' Night Out is also an opportunity to encounter a male who has more alpha characteristics than the man she is with. The alpha status of a man automatically decreases from the moment he proposes to a woman and then plummets to "beta male provider" upon getting married.

The biological imperative of a woman is to reproduce with the greatest alpha male she is capable of sleeping with, but also to create a safe and secure nest that will ensure her survival and that of the alpha male's offspring. A married woman already possesses the latter part of this equation, as her beta male husband has provided her with a nest to raise children, and will ensure she is well fed and protected during her pregnancy.

A marriage contract utterly nullifies a man's power, so his wife is free to go out with her friends to hunt for the semen of an alpha male, or at least receive the emotional and sexual excitement of being ogled and fondled by other men.

If you get married and deny your wife Girls' Night Out, expect her to scream that you're not the boss of her, say that you're too controlling, and then walk out the door dressed like a whore so she can go get pounded by some other man's Mr. Potato Head.

Reason #74 - Every Alpha Male Becomes a Threat

Men are naturally competitive, and more so in the presence of women. When an attractive woman is around a group of men, each will try to send her signals that he is an alpha male. Some men might choose not to enter into the unspoken competition because they are loyal to another woman, they are a beta male, or they are conscious of the stupidity of the ritual and don't want to be bothered.

Since a man turns himself into a beta male by the very act of signing a marriage contract, nearly all other men who possess alpha characteristics become a threat. Even a married man's friends become strong candidates for men that his wife might sleep with if she decides that she can get away with cheating on him.

In my old circle of friends, I never saw myself as the leader of the pack. Despite thinking that women found many of my friends more attractive than me, I've had the opportunity to sleep with almost all of my friends' wives or girlfriends.

Soon after Stewart married his trophy wife Margaret, she was flirting with me at the dance club. Stewart was a hard-charging salesman extraordinaire who was climbing the corporate ladder like a boss and always exuded confidence. Despite this, his wife made it clear she was in heat and her eyes were on me for the night. Margaret later got a job at a restaurant and confided in my girlfriend that she didn't know how she was going to contain herself because one of her coworkers was an old flame. Everyone thought Stewart and Marg's marriage was picturesque, but my cheating-whore-of-a-girlfriend laughed and scolded me for buying into that foolishness.

When my buddy David was out of town, and his girlfriend called me to come take a look at her car, I obliged. I don't like entering a place when the man of the house isn't home, but this was before the age of smartphones, and I needed to look something up on the internet. I poked around on her computer for the make and model, and the parts I needed while she took a morning shower. She came out of the shower in a bra and see-through panties, jumped in lap, wiggled her ass around trying to get my purple-headed warrior to stand-at-attention, and asked me if I thought David would like her new underwear. I kept my hands to myself and completely ignored her.

Given women's hypergamous nature and biological drive to reproduce with the best alpha males they can find, your wife might just pivot over to your best friend.

Reason #75 - Your Options are Nullified

There's one way to ensure that you'll have to cheat or pass up the opportunity to spend time with a woman who is much more compatible and attractive to you than any woman you've ever met, and that's to get married.

Since the frequency of sex and blowjobs decreases over time in a marriage, married men are virtually guaranteed to either cheat or resign themselves to a life of sexual misery, tied to a nagging aging fat-ass heifer who no longer takes an interest in her husband's pursuits. Just as men who are serious about sobriety aren't going to be found in bars, men who pride themselves on their honesty and proudly say that their word is their bond should reconsider any thoughts of marriage. Due to the vow to sleep with only one woman for the rest of your life, getting married is a great way to turn an honest man into a liar, or increase a life of sexual frustration.

To defend human beings maintaining monogamous relationships, some people argue that 3% of mammals are classified as monogamous, and 90% of birds. The problem is that there is a difference between sexual monogamy and social monogamy. Additionally, monogamous relations are separated into serial monogamy and long-term monogamy. There are virtually no animals that practice long-term monogamy, and those who are serial monogamists—maintaining a relationship until their offspring are old enough to fend for themselves—are not sexually monogamous.

With the advent of DNA tests, hidden cameras and tracking devices, scientists have discovered that supposedly sexually monogamous female animals often sneak off to copulate with many different males. The Dunnock, a small bird, found in Europe and Asia, was once thought to practice sexual exclusivity, but upon closer observation ornithologists realized that the female Dunnock would sneak off to have sex with dozens of mates unbeknownst to her partner. If her partner suspected her of infidelity, he would peck near her vagina to encourage her to expel the semen of other males. Paternity tests have since proven that bird fathers who help feed their partner's hatchlings are often taking care of another male bird's offspring. In fact, a nest of six eggs can have six different fathers, all the while the unsuspecting male—who might not be the father of any of them—is sitting on the eggs to assist in keeping them warm.

One can't help be reminded of Dr. Corry's research that estimates that 1/3rd of men have been conned into taking care of children that aren't their biological offspring.

With a nest to build, eggs that need to be incubated, hatchlings that need to be fed and taught how to fly, and predators to fend off, raising a little bird family is quite the challenge. It is for this reason that most birds are socially monogamous, yet there is no reason why females should be sexually exclusive. The biological imperative of the

female is to reproduce with the most magnificent alpha males she can find, and securing a mate who will help raise the children does not somehow prevent her from continuing that mission.

Monogamy can be advantageous to human beings, especially in light of how difficult it is to raise a human child. It takes 10 – 15 years before a human being can become self-sufficient enough to survive in the wild without his parents. As countless studies have shown, the chances of a child doing better in life, than his parents, heavily depends on having had his biological father—or assumed biological father—in the household. Female humans stayed socially monogamous with our grandfathers and their fathers before them, because it ensured their survival and that of their children. Although access to other men was much more limited in centuries past, paternity tests now prove that human females have not all practiced sexual monogamy. Short of a DNA test, you never really know who your real great-great-grandfather was; especially if he was a soldier, a sailor, or took up residence in an emerging metropolis.

Men are not sexually monogamous by nature either. As pointed out in *Why Men Don't Listen and Women Can't Read Maps: How We're Different and What to Do About It* by Allan and Barbara Pease, out of the characteristics of polygamous animals, the human male shares many of them. For instance, males from polygamous species are considerably larger than their female counterparts, and this is the case with humans. Men are usually 15 – 20% larger than women. The males of polygamous species also have large genitals compared to their overall body mass, and this is also the case with the human male sex organ.

Female animals will usually only engage in sex if they believe a male is an alpha, perhaps by witnessing him defeat all other male contenders in battle. Male animals, on the other hand, are often always ready to go whenever they encounter a female. Note that a dog will get an erection as soon as a new female comes into close proximity to him. Human males are also easily aroused by merely seeing the female body and are wired to become less excitable overtime with the same woman. As Allan Pease points out, you cannot get a bull to have intercourse with the same cow repeatedly, but if you introduce a new cow, he's ready to go again.

In an effort to subdue their polygamous urges, men all over the world buy their women lingerie or role-playing outfits, such as a maid, nurse, or another sexy uniform. Many men even encourage their women to change the color or style of their hair. Unlike a dog or a bull, who cannot be tricked into having intercourse with the same female repeatedly in one afternoon, no matter how much you change her appearance, men can fool themselves into thinking they're with a completely different woman. If a woman really wants to keep her husband sexually monogamous, she should periodically change her appearance and the manner in which she speaks and performs in the bedroom. The problem is that women have no incentive to do this, as thoroughly covered throughout this book. Moreover, women age poorly and hit the wall of their beauty usually in their 30s, so their ability to contend with younger females quickly fades away.

A married man who says he doesn't fantasize about other women, or claims he doesn't get aroused when seeing a beautiful naked woman, is a liar. To vow to sleep with only one woman for your rest of your life, is to agree to force yourself to deny your nature. It has only been about 60 years since Western civilization began to control men by shaming them into practicing sexual exclusivity with their wives. Before feminists deemed masculinity to be toxic and dangerous, it was common practice for married men to keep a mistress or occasionally visit a brothel.

The sexual satisfaction our grandfathers enjoyed through extra-marital affairs was beneficial to their wives, because it eased a life of social monogamy. The *Old Testament* is filled with stories of men who had multiple wives, and are regarded as the noblest, pious and wise of biblical figures. King Solomon is said to have 700 wives and 300 concubines in his harem. Some Christians have written at great length defending the practice, and argue that Jesus did not abolish polygamy. I invite believers to search out these arguments rather than dissolving this book into a religious debate.

It was not until the 1860s that polygamy became illegal in the United States. Over 50 sovereign nations, out of 195 countries, permit polygamy, and for good reason: sexual monogamy defies the nature of men and turns them into liars.

With the illegality of polygamy, men in long-term relationships often turn to pornography and are shamed by their girlfriends, wives, manginas and feminist society. Men's sexuality is increasingly being vilified, and the recent anti-masturbation movement called "No Fap" is an indication that it's still on the rise. Backed by little more than pseudo-

scientific nonsense, claiming that masturbation decreases a man's ability to focus and succeed, No Fap advocates encourage men to retain their semen. Are we supposed to believe that a billionaire alpha male, or a muscular mixed-martial arts fighter, who bangs several women every week, is somehow sabotaging their potential greatness by ejaculating so much?

One Christian man who married a Christian girl, who was a virgin on their wedding night, confided in me how shameful he felt that he would look at pornography. A high school friend told me of the great lengths he went through to hide his viewing time from his girlfriend, and how she couldn't understand its importance. These men loved the women they were with but were driven by their natural biological imperative to spread their seed into the wombs of as many women as possible. Had it not been taboo and illegal for such men to have multiple wives, perhaps they never would have indulged so much in pornography. Arguments have also been made that the forced celibacy of certain religious orders, only increases the chances of the psyche succumbing to sexual perversions due to suppressing man's natural sexual appetites.

The vow to only sleep with one woman remains a great way to almost certainly condemn oneself to a life of sexual frustration. This is especially true for alpha males, as being among the most confident and masculine of leaders usually entails having a high sex drive, as well as an unending surplus of beautiful women who will try to take a ride on his pocket rocket.

If you do not want to willfully remove your options, and stifle the very nature of who you are as a man, do not get married.

Chapter 12 - Children

“In fact, our director would say regularly, “We aren’t the friend of the family, we’re the friend of the court.”” – Carol Rhodes, former Child Support Enforcement Agency employee, and author of *Friend of the Court, Enemy of the Family: Surviving the Child Support System and Divorce Racket*

Reason #76 - Your Sons Will Be Victims, Your Daughters Victimizers

As Western societies become increasingly more gynocentric, it inevitably means that current and future generations of boys are doomed to become victims of feminist-influenced women empowered by the government. Having sons today means a father needs to warn his boys about the dangers of any kind of relationship with a female, beyond merely having a conversation about safe sex.

In an age far out of sight of where we are today, a father would only have to concern himself with his sons’ education and made sure to raise them with good values so they wouldn’t wind up in jail. In the 21st century fathers’ are now seeing their sons financially ruined by alimony and divorce settlements, and many young men have taken their life because the burden of child support payments and custody battles was just too much to bear. Fathers’ see their boys carted off to jail on false charges of rape or domestic violence. When a teenage boy’s hormones are raging, it’s almost impossible to communicate how dangerous it can be to sleep with a woman. In addition to warning a son about sexually transmitted diseases, and encouraging contraception, dads now have to tell stories of young men who have been thrown in prison because a vindictive girl cried crocodile tears to a feminist judge.

Because liberal degenerates believe gender is only a state of mind, children’s movies and television shows featuring androcentric content increasingly replace a male protagonist with a little girl. In children’s entertainment girls are shown outshining little boys in every way imaginable. Meanwhile, elementary school curriculums and teaching styles are reimaged with female students in mind. College courses are increasingly taught with a feminist slant, women are more likely to earn degrees than men, and women are outpacing men in securing high-paying employment. It doesn’t take a genius to understand why so many little boys are having problems paying attention in school, alongside other behavioral issues, when their education takes a backseat to educating a female mind.

Raising a little girl in this society is even worse, as feminism is prepared to wage an unrelenting war on any father’s attempt to instill traditional feminine values. The odds that your little girl is going to grow up to be a loving and caring wife, who dresses modestly, and takes care of her house and children, are slim to none. Riding the cock-carousel from high school to her college graduation has become a rite of passage for modern girls. The only good news is that rates of teenage pregnancy are on the decline in the United States, but so are marriages.

Teenage pregnancies haven’t decreased because girls are becoming less promiscuous. Multiple studies show that national birthrates drop like a rock any time women are provided voting rights and increased opportunities for higher education. Moreover, young girls have ready access to birth control and abortion clinics.

With the introduction of gynocentric laws, young men are wising up that modern women make terrible wives, and there are absolutely zero benefits, and a mountain of risks, to getting married. That said, the likelihood that your little girl will find some handsome, hardworking man to wed is shrinking by the day. If your daughter does get married, there’s a strong possibility she’ll be ruining the life of some other guy’s son, by way of the divorce court and child support.

Some men hold onto the fantasy that they’ll be able to raise their children however they see fit, but the data doesn’t show that. Given rates of divorce, and the relatively insignificant amount of time fathers are given to visit with their sons and daughters, men who ignore the facts and proceed into marriage with the intent of fatherhood, are playing with the lives of children. It’s a terrible time to bring a child into this world.

[Tom Leykis](#), an infamous shock-jock radio host who broadcasted in southern California and railed against marriage, said that he didn’t want to have children because he loves children. In an emotional broadcast, Tom opened up and

shared with his audience how hard his father had to work. He talked about how he desperately wanted to spend time with his dad, but the mounting bills of married life meant his father was often too tired to spend time with him. Tom said that the weight of work darkened his father's mood, making him so unpleasant that it scarred his memories of him. With this in mind, to be married with children can end up meaning that you'll give your sons and daughters an abysmal childhood experience because you're working too hard to keep food in their bellies, clothes on their backs and a roof over their head.

Now is not the time to have children, and there is no rush to have children because we men can reproduce even in our old age.

Reason #77 - You're Legacy is Bullshit

The word "legacy" can be defined as something that you have left behind in the past, yet remains today. You don't need a child to carry on your legacy, and you certainly don't need a wife to have a kid.

A Norwegian beta male, and white supremacist, somehow managed to convince his small audience that men who refuse to breed with women in feminist-dominated societies are only making way for the genetics of "superior" men to succeed them. He also argued that there is some magical way to determine if a woman will be a good wife and mother, and therefore eliminate the chances of getting screwed by the gynocentric divorce and family court system. Don't fall for this nonsense.

Although the human species, much like the animal kingdom, has been strengthened by women selectively breeding with the best alpha males they can find, we are not mere animals. The most unique thing that separates us from all other life on our planet is our brain. We are creatures of the mind, rather than fang and claw, or even muscle. The only kind of legacy a non-human animal can leave behind is offspring, but we have many other options. Furthermore, how many men have been as foolish as the Dunnock, who can be easily deceived into sitting on eggs fertilized by another bird's semen, all the while his goofy ass thinks his legacy is intact.

Whether some ended up having children or not, single men such as Antonio Vivaldi, Descartes, Franz Kafka, Hans Christian Anderson, Henry David Thoreau, Sir Isaac Newton, Leonardo da Vinci, Ludwig van Beethoven, Nikola Tesla, Orville and Wilbur Wright, Voltaire and others, didn't need to have children to have an impact on the world.

Only non-human animals must have a legacy of genetics, but we humans can leave a legacy of our ideas, art, inventions, music, humanitarian contributions or other great deeds.

Having a child almost assuredly requires giving up your dreams, and diverts the time and energy you can put toward their manifestation to the care of another human being. Some guys don't want to find out what they're capable of because it may mean that they were not as great as they imagined themselves. Paying on a mortgage in a quiet family-friendly neighborhood, with a wife and kids, as opposed to striking out on your own, and seeing what you can do, is a great way to excuse yourself from the frightening table of possibilities of what you might have become.

A man who is determined to be a father should carefully consider his options. There are around 100,000 children in the United States alone that are dreaming of being adopted by loving parents, and it is possible for a single man to adopt a child. Despite how much I feel for orphaned children, I do not, however, recommend adoption as taking care of another man's child can come with many heartaches. A child who learns that he was adopted can run off to give more affection and time to the biological parents that abandoned him, rather than rewarding his adoptive parents with the joy of seeing the man he becomes into his adult years. An adopted child that continuously misbehaves or has a personality far removed from his adoptive parents can cause resentment in them, for it becomes a constant reminder that the child is really only theirs legally, not biologically. The difficulties of raising a child can also cause regret because the burden of raising the child was not supposed to be yours, but that of their real mother and father.

Perhaps the best way to become a father without the threat of alimony, or losing the house you paid for to divorce court, is to hire a surrogate mother. This does not, however, protect you from being forced to pay child support if the mother decides to keep the child. In a 2011 article titled "Couple Told To Pay Child Support After Surrogate Decides To Keep Baby" by Margaret Hartmann at *Jezebel.com*, she reports that a couple was ordered to pay \$900 a month in child support to a surrogate mother.

Men who donate sperm because they just want to have their genetics carry on—even if they won't have direct

contact with their offspring—are also not safe from the insanity of feminism. On January 24, 2014, *CNN* reported that a Kansas man, William Marotta, who donated his sperm, was ordered to pay child support to a lesbian couple despite having signed documents waiving all parental rights to the child. Thankfully, by 2016 the court reversed the child support order, but the course of American society seems to predict that such nonsense is likely to emerge again in the future. The cancer of gynocentrism is also spreading around the world. In 2012, Miles Brignall from *The Guardian* reported that a gay Englishman, Mark Langridge, was ordered to pay child support to a lesbian couple he had donated his sperm to.

The reality is that in a gynocentric society, where men are less than second-class citizens, it is foolish to have a child with any woman. Maybe the safest bet is to find a country where women have virtually no rights, change your citizenship, get a local girl pregnant, and hope and pray that your new country of residence doesn't try to mirror the United States, UK, and other feminist cesspools.

Vietnam has one of the lowest divorce rates of any country, at 4% but don't get too excited. In 2017 a journalist for *Ozy.com* reported that multiple female hip-hop artists were beginning to beat the drums of feminism in the article, "How Hip-Hop is Fueling Feminism in an Unlikely Place." Chile has the lowest divorce rate in the world at 3%, but a simple search for "Chilean feminists" shows that the virus of feminism is beginning to germinate.

If you really like kids and want to help instill values in them, you can get involved in the lives of nieces, nephews and second cousins. This can be dangerous financial ground too under the legal theory that a man could be seen as a child's parent, even if he is not the biological father. Several cases have emerged in which a man stepped into the life of a child and was considered by the government to have become a "psychological parent." In the case of *Williams vs. McCloud*, it was argued that a man was financially responsible for his nephew because he had acted in the capacity of a father. It is more often the case that an ex-girlfriend can pursue child support from a boyfriend who has no biological relationship to her child, but who argues that her son or daughter regarded the man as a father figure. Let this be a warning against dating single mothers, or involving yourself in the lives of the neighbor lady's kids because you think it would be nice if they had a male role model around.

Being an elementary school teacher, child psychologist, little league coach or children's martial arts instructor are probably among the absolute safest ways to give back to the next generation. Just keep in mind that Western civilization regards masculinity as toxic, and increasingly views all men as equally capable of being sexual predators. To have a child with a woman, or to get involved in the lives of children, is only to increase the likelihood that some woman is going to ruin your life or take a bite out of your bank account.

Whatever you choose, keep in mind that there is no rush to have children. Unlike women, whose window of fertility opens and closes quite quickly, men can have kids late in life, and many men do. In places like Thailand and Vietnam, there are a plethora of Western men in their 60s and 70s who traveled abroad to have children. I cannot speak to how secure their assets are if they remain in a foreign country, but the point is that men have years to decide and research the best options for fatherhood. Getting married to a woman in the West, or bringing a foreign bride to the gynocentric West, are the absolute worst options.

Most importantly, having children is not the only way a man can leave behind his legacy. But getting married and having children is a great way to gamble with your assets and the lives and future of your children.

Reason #78 – Single Mothers are Crime Production Factories

With the understanding that most marriages end in divorce, it is essential to review what single-motherhood really means for your children.

With a father's visitation rights accounting for an average of 20% of a child's parental time, by all intents and purposes, the child is effectively being raised by his mother and her real husband—the state. The child gets up in the morning, goes to school to get taught a government-sanctioned curriculum and then returns home to spend the rest of the afternoon with his mother. Every two weeks he'll spend a weekend at his father's house, and receive a few phone calls during the week. That is, of course, if she doesn't just move across the country to make it exceedingly difficult for the father to visit his children. It's illegal for the mother to move away without the consent of the father, but since he has to work extra hours to keep up with child support and alimony payments, it's doubtful he can afford the time in court or the attorney fees to pursue her.

A friend of mine from Oregon married a virgin Christian gal, but he waited ten years to get her pregnant. After a decade, he was confident she was the right one to have a child with. Three years later, after spending lots of time with her feminist-influenced friends, his wife realized she could get a massive chunk of her husband's six-figure income through alimony and child support. She filed for divorce, moved 300 miles away to make it difficult for her ex-husband to see his son, and had the courts hit him with an order to pay her thousands of dollars a month. He fled the United States before the child support enforcement agency put a block on his passport. When I last spoke to him, he was contemplating whether he should commit suicide or join the French Foreign Legion.

Since divorce is virtually inevitable, men who are considering getting married and having children with their wife should resign themselves to understanding that she'll be raising the children. Dating websites are filled with single mothers who present all manner of excuses for why they didn't stay with the biological father of their child. The evidence is all around you: your children will likely be raised by a single-mom.

Feminists are champions for single motherhood and claim that women don't need a man to raise a child. The facts tell quite a different story, and one so terrible that single mothers should deserve nothing less than our contempt. A woman can be a great mother in all respects, but the mere act of removing her children from their father is so psychologically devastating to children, that the kindest single mothers might as well be abusing their sons and daughters. Single mothers amount to little more than crime production factories, as the absence of a father in the home almost guarantees their children will become criminals.

At minimum, there is an assortment of behavioral and psychological issues that can afflict children raised in a mother-only home. In his video "[What Happens When Boys Get Raised By Single Mothers - Five Stories](#)" hosted at YouTube.com, Jerry Liu, an advocate for the bachelor lifestyle, outlines the tell-tale signs that are indicative that a male was raised by a female. Jerry points out that guys raised by their mother are much more emotional than other males, and are prone to behavior that is associated with girls. Such boys can cry a lot and burst into tantrums. They often lack masculine assertiveness and confidence, and are quick to throw up their hands and give up when faced with a challenge, rather than stay the course.

One of the reasons why people turn to crime is because it's seen as an easier avenue to making money than the hard road of learning a trade, opening a business or climbing the corporate ladder. There are, of course, a whole host of other reasons a young child or a teenager might lash out and engage in criminal activity. The discipline of fathers quickly instills respect for authority, and an understanding that—just as there is an order to the household—there is an order to society. Furthermore, it is utterly innate that boys will seek initiation into manhood. In the absence of a father, boys end up joining gangs or hanging out with older boys who appear to be tough because they recklessly break the rules. Every boy instinctively knows that only another male can teach him how to be a man.

In their paper "Putting Children First," the Progressive Policy Institute argued that their research shows that the presence or absence of a father is a stronger predictor of whether or not a child will become a criminal than ethnicity or household income. In other words, if a white guy, a black guy, a Chinese guy and a Mexican all walk into a bar, the one who is most likely to rob the place is whoever was raised by a single mother. Dozens of other studies support this assertion. According to the Texas Department of Corrections, 85% of youth prisoners grew up in a home without a father. The article "Dousing the Kindlers" in *Psychology Today* states that 90% of adolescent repeat arsonists are raised by single-mothers. According to the "Behavioral Sciences and the Law, Life Without Father, Policy Review", 60% of rapists and 72% of adolescent murderers grew up without a father in the home. According to the US Bureau of Justice Statistics, 43% of prison inmates grew up in a single-parent household, but of that, 39% were raised by their mother while only 4% were raised by their father. Single-motherhood equates to a disproportionately high number of criminals, whereas being raised by a single-dad is not a strong predictor of criminal behavior, but quite the opposite.

Under the topic "Child Abuse and Violence in Single-Parent Families" appearing in *The American Journal of Orthopsychiatry*, researchers found that violence against children was related to poverty in mother-only households, but a father's income was unrelated to child abuse in father-only homes. This means that if a single mother is poor, it increases the likelihood that she will abuse her children, but if a single-dad is poor, it will not increase the chance that he will harm his kids. "Economic Deprivation and Early Childhood Development" published in *Child Development* demonstrates that behavioral problems in children are more closely linked to being raised by a single-mother even after adjusting for family income. In other words, not only are poor mothers more likely to abuse their

children than poor fathers, their kids are also more likely to have behavioral problems.

Cheryl Meyer, a psychologist at Wright State University in Ohio, estimates that a mother kills a child once every three days in the United States. Evolutionary psychologists have presented some theories as to why a mother might kill her children. Female primates will kill their offspring if there is no male to assist them in the care and protection of the child. A mother faced with inadequate resources might also decide to terminate her children, so as not to decrease her chances of survival, and also to not needlessly waste her time trying to prevent the inevitable death of her offspring. By separating themselves from their children's father, human females stupidly increase the chances of depression, and resentment and anger directed at their children. Just as studies attempting to chart happiness show that female happiness has declined since feminism's supposed victories in the 60s and 70s, here again, is an example of women being utterly clueless as to what is good for them, and best for their children.

Sarah Blaffer Hrdy, an emeritus professor of anthropology at the University of California at Davis, and author of *Mother Nature*, spoke to *The Washington Post* on this subject. In the September 2013 article "What makes mothers kill their own children?", the journalist stated, "Hrdy's work also suggests, paradoxically, that those pressures may be greatest in patriarchal cultures where a woman's role as mother is idealized and she is under intense pressure to give birth to children and nurture them with self-denying devotion."

As is typical of feminist double-think, we're supposed to believe that men are to blame when mothers kill their children. Hrdy claims that the rates of child murders decrease when a society becomes less patriarchal, but she doesn't factor in the 53,000,000 legal abortions that occurred in the United States from 1973 through 2011, according to the Guttmacher Institute. Hrdy also ignores the rising number of children who take their own lives.

One of the saddest repercussions of feminism promoting single-motherhood is child suicide. About 63% of children who commit suicide are from a fatherless home according to the US Department of Health Census. Growing up without a father in the home wounds the soul and psyche of children. Out of the number of pre-school children who are admitted as psychiatric patients, 80% of them come from a fatherless home according to "Psychiatric Hospitalization of Pre-School Children" published in *The Journal of the American Academy of Child and Adolescent Psychiatry*. According to the Center for Disease Control, 85% of children who show a behavioral disorder come from a mother-only home. *Rainbows for all God's Children* states that 75% of children admitted to a drug addiction treatment facility are being raised by a single-mother.

Single motherhood also contributes to the amount of poverty that will occur in the next generation. The chances that a child will excel beyond the socio-economic status of his parents drops like a rock once the father is removed from the household. *The National Principals Association Report* states that 71% of high school dropouts come from a fatherless home. According to research conducted by AVoiceForMen.com, 90% of homeless children come from a fatherless home.

With overwhelming data showing that single motherhood increases the risk of child suicide and psychological problems, why aren't single mothers considered as shameful as pregnant women who drink alcohol or smoke crack? I'll admit that's a rhetorical question. The reason why we don't see people waving picket signs that shame single mothers, or hear talk show hosts scolding women for leaving the father of their children, is because we live in a gynocentric society.

To get married and have children is to risk the future of your children. It's a foolish man who is willing to gamble with his wealth at the wedding altar, crossing his fingers that he won't one day be a victim of financial divorce rape, but to gamble with the lives of children—now knowing full well the facts I have presented herein—is nothing but despicable. Instead of men betting that they'll be able to raise their children in a wholesome traditional family unit, they should do the honorable thing and step away from the table. The game is rigged, feminists control the casino, and there is much more at risk than a man's bank account.

Reason #79 – She is Going to Raise the Children, Not You

Even if a marriage stays together, married men on average work 400 hours more annually than single men. A wife is usually going to work less hours or will opt for staying at home with the children. This means that the parental experience of most children will primarily be with their mother, rather than their father.

If you want your little girl to dress more modestly, and don't think she's old enough to have a cellphone, a wife can easily veto your restrictions. One man shared with me how his wife would butt-in and snap at him anytime he tried to toughen up his boys by the way he spoke to them. His wife allowed her sons to become quitters and complainers, contrary to her husband's good intentions. Another guy I met was upset how overweight his sons and daughter had gotten, and said his wife would let his kids dump heaps of cheese and ranch salad dressing on almost anything. These men were powerless to intervene because to put their foot down too hard meant they could wind up in divorce court facing a financial catastrophe.

Men teach boys how to achieve goals and act responsibly. A father teaches his sons not to be a quitter, a crybaby or a complainer. Fathers are integral to teaching boys how to stand up against a harsh and unforgiving world. Women cannot teach responsibility because their entire existence is built around relying on others.

A boy who grows up without a mother might be a little less sensitive than other males. A boy who grew up without a father is more likely to fail in life, become a criminal, commit suicide, drop of high school, have psychological issues, set a building on fire, or wind up in prison. A girl who grows up without a mother might be a little more Tom Boyish than other females. A girl who grows up without a father is more likely to wind up on a strip club pole, chase bad-boy losers, wind up in a psych ward, have a teen pregnancy, or be known as the town whore.

Since women exert so much power in marriage via the threat of alimony, divorce settlements and child support, a man's ability to dictate how his children will be raised is nullified.

Reason #80 - Another Man Will Raise Your Children

In light of the divorce rate and appalling visitation rights that amount to seeing your child only 20% of parenting time, your sons and daughters will be raised by their mother, their school teachers and a variety of men your ex-wife dates or marries.

Expect that your kids will be calling some other man dad, while their mother periodically reminds them how much of a loser you are. You'll either be hearing about all the fun things your kids got to do with your ex-wife's new boyfriend or husband—or tightening your fists as they tell you how much of an asshole their stepdad is. How do you expect to contend with their stepfather when you only get to see your kids a fraction of the time he does?

Don't even think about trying to toughen up your little boys, and forget about scolding your daughters when you get your meager visitation time with them. The last thing you'll want is to provide their mother with another reason to give you an earful or supply her with more ammunition to keep you from seeing them. Besides, you're in direct competition with their stepdad, and you won't want them to think that you're an asshole compared to him.

Even if your ex-wife fails to get another man to move in with her, her dad and brothers will get to spend more time with your kids than you can ever hope to. Expect your daughter to tell you how grandpa took her horseback riding, and your son to talk about his hunting trip with his Uncle Joe. Meanwhile, your goofy ass is going to pound cans of piss-warm beer so you can sedate yourself to the reality that you have to go work another fourteen-hour shift to keep up with the child support payments.

Reason #81 - Child Support

I am 100% against the practice of child support for a wide variety of reasons. Namely, child support financially rewards women for leaving the father of their children.

With women representing over 80% of all retail purchases, most admitting that they love to shop, and clearly being the sex that is more materialistic, it does not make sense to reward women with money if they leave their child's father. I care about children—and knowing how vital a father is in the life of a child—I will never advocate an institution that uses money to entice women to leave the father of their children.

Since there is absolutely no law which states that a woman must spend child support money on the man's child, it is a misnomer to call it "child support." A more accurate term is "grown woman support." A woman can spend an entire support payment on a new wardrobe, or a wild night out with her boyfriend, Chad. In fact, any mother who wants to immediately raise her standard of living needs only to leave the father of her child so she can collect support payments. The bitch can then go get herself a new man who will also spend money on her. Instead of one

man's income, she is now getting two. Instead of having to deal with her former husband telling her the kids don't need a bunch of new designer clothes, a single-mother can spend his money however she wishes.

You might be able to handle a payment of \$500 or \$1000 a month, but that does not include medical coverage, which can nearly consume the average man's paycheck when combined with grown woman support.

For every \$1.00 in child support that is collected, the state government is rewarded \$0.66 by the federal government in accordance with the 1969 Social Security Act. Thus the state turns a profit for every broken home. Every dollar in child support is a tax burden that forces a father's fellow Americans to pay for his children.

Incarcerating men for child support has led to debtors prisons in the United States, even though US law supposedly forbids the practice of imprisoning someone because they are too poor to pay a debt. Through child support and alimony, men have effectively become the indentured servants of women.

Reason #82 - Custody Battles

A 2011 study led by Sanford Braver at Arizona State University discovered that the general public favors equal custody rather than granting a disproportionate amount of parental time to the mother. Despite this, Robert Hughes, Jr. wrote in his article "Are Custody Decisions Biased in Favor of Mothers?" appearing in *The Huffington Post* on November 29, 2011, "mothers receive primary custody 68-88% of the time, fathers receive primary custody 8-14%, and equal residential custody is awarded in only 2-6% of the cases."

Regardless of how many facts can be brought forth to prove the importance of a father in a child's life, or to demonstrate that single-fathers can raise children better than a single mother, the judicial system is starkly gynocentric. The belief that women make better parents is an old myth that needs to die.

To secure custody rights, women use a wide array of devious tactics. Even when a child is deemed of age to decide which parent they would like to live with, single mothers can sabotage the child's opinion of their father. Parental Alienation Syndrome (PAS) is a purposeful attempt, usually by the mother, to ruin a child's feelings for the other parent. The methods women use to undermine a child's respect for his father are as varied as false stories, rumors and deceptively negative explanations of events. Children who are afflicted by Parental Alienation Syndrome can end up developing hatred toward their father or men in general. Additionally, children who are abused by their mother, but who have been taught to hate their father, can end up developing Stockholm Syndrome, in which they associate positive feelings with their abusive mother, and even defend and glorify her.

Under "Frequency of visitation by Divorced Fathers" and "Differences in Reports by Fathers and Mothers" in *The American Journal of Orthopsychiatry*, 40% of mothers admitted to interfering in the father's visitation to punish their ex-spouse. Children living with their mother were more likely to think negatively about their dad but have positive thoughts about their mom according to "Advantages of Father Custody and Contact for the Psychological Well-Being of School-Age Children" published in *The Journal of Applied Developmental Psychology*.

One of the most sinister methods women deploy to secure full custody of a man's children is a false charge of child molestation, or fabricating that her ex-husband watches child pornography, or allegedly admitted to pedophilic fantasies. Fathers For Equal Rights and the National Fathers' Resource Center located at Fathers4Kids.com discovered that 70-80% of divorce-linked child sexual abuse cases are hoaxes, and out of approximately 7,600 reports of child abuse that occur each day, 7,200 are eventually classified as false allegations.

Being exonerated from a false accusation of sexual child abuse does very little to repair a man's tarnished reputation, as excellently portrayed in the Danish movie *The Hunt* (2012), in which a kindergarten teacher becomes the victim of false allegations. If a lying ex-wife somehow manages to get charges to stick, or if a man enters a plea of "no contest" to accusations of pedophilia, he will be forever recorded in government databases as a sex offender.

One guy told me that when he reached a low-point in his career, he agreed to move in with his sister who was a single mother. His nephews would have the benefit of having their uncle as a male role model, but when Child Protective Services visited to assess the living conditions, for the purposes of securing her custody rights, she told him he had to vacate the house for the day. His sister said that Child Protective Services would classify him as little more than some strange man living in the house, who could possibly be a sexual predator. As feminism marches on, men are increasingly viewed as potential rapists and perverts, and automatically guilty unless proven innocent.

The fact is, it is delusional to think that if a marriage ends, the father will be able to get custody of the children. Reproducing with a woman in a feminist society virtually guarantees that the children will be raised by their mother—or their mother and some other man.

Reason #83 - Taking Care of Someone Else's Children

Dr. Charles E. Corry from the National Coalition For Men estimated that each year 90,000 men in the United States are the victims of paternity fraud and end up being ordered to pay child support on children they don't realize aren't even their biological offspring.

In 2015, *WXYZ-TV Detroit Channel 7* reported on the case of Carnell Alexander, who was threatened with jail time if he refused to pay child support on a child that DNA tests already had proven was not his. The woman simply wrote his name down as the father because a request for welfare assistance required that she put a man's name on the document.

In March 2016, *WCCO CBS Minnesota* reported that Iowa resident, Joe Vandusen was ordered to pay child support to his estranged wife who he hadn't seen for at least 16 years.

In January of 2017, *NewsOn6.com* reported that a man in Tulsa, Oklahoma was ordered to pay approximately \$500 a month in child support and about \$15,000 in arrears for a child that paternity tests proved was not his.

WREG News Channel 3 reported on the case of Edward Bowdery who was ordered by Shelby County judges in Memphis, Tennessee to pay child support for a child he never claimed as his own, and which he later proved was not his with two paternity tests. Even after a court-ordered DNA test confirmed he was not the biological father, the judge had the audacity to scold him for making such a stink about being ordered to pay child support for a kid that wasn't even his. Though the whole debacle had resulted in the unjustified loss of his license and arrest, in the eyes of the feminist judge, it was somehow dishonorable for Edward to refuse to pay for another man's child.

Being the victim of paternity fraud is one thing, yet some men are foolish enough to willingly agree to take care of another man's children by marrying a single mother.

Single motherhood is an indication that the woman has made bad decisions in life and will likely make more of them. Almost every single mom on the planet has a story about how much an asshole, loser or cheater the father of her children is. The question that men fail to ask is: why was she attracted to such a terrible person in the first place? Moreover, if she couldn't tell the difference between a good man and a bad one in the past, then what makes you think she can now?

There's one way to tell if a woman has poor judgment, and that's if she's a single mother. When she says the father of her children turned out to be an asshole, she's admitting she's a poor judge of character. Someone with sound judgment would make sure they didn't reproduce until they were confident they found a quality mate.

We all have made bad decisions, but single mothers are incapable of taking any responsibility for their mistakes.

In light of how detrimental single motherhood is to a child's mental health, and his socio-economic future, it does not make sense to trust the moral fiber of a single mom. With the understanding that the availability and affordability of birth control means that girls have full control over whether or not they get pregnant, a single mother represents a selfish and thoughtless woman who didn't care enough about her child's future to breed with a quality mate so that her kids would have a father.

Understand too, that her children take precedence over your wants and needs. In short, a single mom needs your money. Whether a man is dumb enough to give her money, she receives child support or collects welfare, a single mother is a financial burden on her fellow Americans. For every dollar a single-mom receives in child support the federal government awards the state \$0.66, so whether she gets welfare or not, she is a burden on her countrymen.

Growing attached to children is another critical point to consider. Good men delude themselves into thinking that if they're not an asshole—like their wife's ex-husband supposedly was—then there's no risk of her running off with the kids. One beta male I knew got involved with a single mother, only to be tossed to the curb after several years. This clown was already paying child support on another kid, and his ex-girlfriend had moved to another state to

deny him access to his son. He found himself getting attached to a child that wasn't his, almost making up for the limited time he was able to spend with his son, only to find he had no rights to the child that wasn't his.

In the worst case scenario, getting involved with a single mother can end up meaning you'll end up paying child support for a child that isn't yours.

Reason #84 - Children Increase a Woman's Power Over You

One man advised that if a guy wants kids, it's better to have children with an unmarried woman, so he'll only have to pay child support and can avoid alimony and a divorce settlement that turns ownership of his house over to some woman. I think this is terrible advice for various reasons. Namely because having children with a woman increases her power over you. Furthermore, avoiding the marriage contract doesn't safeguard a man from alimony if he cohabitates with the mother of his children for several years. Some unmarried women have been awarded alimony because they lived with a man long enough to be considered married under common law.

Women know that they've locked a man in once they're pregnant. Plenty of women will hold out until they get pregnant, and then their behavior and attitude toward the father of their children will change drastically. Men who believe in abortion have absolutely no say in whether or not a woman will keep their child and will be forced to pay child support even if they don't want to be a father. Furthermore, a man can waive all his parental rights in court, but it will not dissolve an order to pay child support. On the other hand, guys who are pro-life cannot do anything legally to stop a woman from aborting their son or daughter. The fact is, from the moment of conception to the birth and adolescent years of your offspring, you have little to no power.

The mother of your children has the power to raise your children as she sees fit. With the threat of child support and divorce hanging over a man's head, she has more leverage to make demands of the father. She will make demands on what school district the family should live, what clothes the children will wear, the friends their allowed to have, and so on. If she takes care of the children at all, it offers her another excuse for being too tired to have sex.

A man who ends up having to pay child support will soon realize that increasing his income only means that he must hand over more of his earnings to the mother of his children. The stories of men who commit suicide because support payments were too much to handle are scattered all over the internet. Hefty support requirements mean that a woman has power over a man's lifelong past the end of their relationship. Because of his financial burden, a man may find himself having to take on a roommate or a second job, or even move back in with his mother or father.

Marrying a woman who says she doesn't want children is no guarantee of anything, as women change their minds and do so often. Having secured the resources of a male through marriage, she may decide that she now wants to have kids, especially once her girlfriends or sisters start having children.

While I advise the use of condoms, they cannot be considered sufficient male birth-control. Condoms break, and if your heat-seeking moisture missile gets a girl's goop-chute wet enough, they can slip right off. A woman who is intent on getting pregnant can simply "sperm jack" the semen from a used condom while her man is sleeping, or when he gets up to go to the restroom after sex. A married couple is unlikely to be using condoms, and will instead opt for one of the many female options for birth control. The problem here is that the woman can just lie about being on birth control if she really wants a child.

Women have all the rights when it comes to reproduction, and getting pregnant increases a woman's power over the father of her children.

Chapter 13 - Crushing Your Dreams

“A man may be a fool and not know it — but not if he is married” - H.L. Mencken, 20th-century journalist, satirist and cultural critic

Reason #85 - Say Goodbye to Malee and Pimchan's Sweet Young Ass

I know a very successful man, just shy of his 80th birthday, who spent much of his married life traveling around the world on business. For all descriptions, when Peter talks about his late wife she really sounds like he found himself a unicorn. She would stay with the kids while he traveled, and when they were out of school in the summer, they would travel together as a family.

Note that the women of Peter's age—gals born in the World War II era—were not so entrenched in feminism as they are now. Moreover, Peter married a girl from a small country that prided itself on family values. Finally, Pete has been hugely successful throughout his life. I don't discount the possibility that such ladies exist as Pete's dear sweetheart, but it was a different time, a different place, and Peter is as rare a man as was his lady.

The increased financial responsibilities of marriage will often mean having to work more hours, which decreases opportunities for travel. If anything, it will also limit the length and luxury of travel. Whereas a single man could perhaps afford to stay in a nice hotel suite for a month, maybe the same man could only afford a one week visit if he were married. On the other hand, a demanding wife could mean luxury and safety are required, whereas a single man could save his money staying in a cheap motel. Marriage can also mean wild adventures climbing mountains or trekking through a jungle are out of the question or will be cut short because your wife's feet hurt.

Going on a solo trip or vacation with the boys widens the opportunity for infidelity. This is especially the case with modern technology giving women ready access to hunky alpha males through social networking and dating websites. The enjoyment of vacation away from the wife can be stained by recurring thoughts that she might be banging her Plan B backup plan she dated five years ago. Cheating goes the other way as well. Instead of inhaling the fresh air of being completely free from the worries and drama back home, expect that you'll have to check in multiple times a day, and perhaps deal with your wife's jealousy.

If she joins you on the trip, you've bought yourself an additional person to worry about. You can also forget about any possibility of sleeping with beautiful foreign women. You might just discover a country where the women still respect men and treat them like lords compared to how your feminist-influenced, strong-and-independent wife treats you. In fact, if you marry a woman from a fat country like the United States or Mexico—and also in light of studies proving that married women pack on pounds—your lap lizard will be begging you to set him free in places like Thailand, Colombia, Vietnam, Italy, Finland, Japan, Iceland and many others.

Your gravitationally challenged wife is sure to take notice if you hold your gaze too long on some deliciously fit foreign hottie. The absolute worst is if your wife doesn't give you as much sex and blowjobs you want while you're staying in a foreign hotel. While you're lying there with a hard-on next to your bought-and-paid-for cock-tease of a wife—staring at her breasts while your knob-goblin is going crazy nestled up against her soft panties—a single man has his face buried in foreign trim while another girl is trying to deep-throat his Eiffel Tower.

Just like all the useless crap your wife purchased back home, expect to spend money on a few worthless trinkets between stops at tourist attractions you have no interest in. If you have children, the expense of traveling will also skyrocket while vacation time and the number of things you can do decreases. Your bank account will be hit for extra luggage, plane tickets, one or two additional hotel rooms, food for the family, whatever keepsakes the kids want, and entrance fees at special events. You'll probably want to get each child a cellphone just in case they get lost, and also for taking pictures.

If you want to travel like a boss, be the boss of your own life and don't get married.

Reason #86 - Devout Religious Practice is Over

There are hundreds of thousands of monks from a variety of religions, but that lifestyle is out of the question for

married men. Many men do not spend their entire lives as a monk but can enjoy a few years at a temple or monastery, but a short stint as a monk is also out of the picture if you tie-the-knot.

One doesn't have to become a monk to devote themselves to their religion. A man might decide to go abroad as a minister or just to immerse himself in Bible study, religious service or meditation. Marriage limits the possibility for a life of religious devotion, even when a wife shares the same beliefs. A wife may change her beliefs, she might not be as dedicated, or the financial and time requirements of married life may decrease the amount of time her husband can devote to his spirituality.

Reason #87 – A Woman is at the Wheel of Your Career

When I was in my twenties, I learned how to DJ, promote events and pack dance clubs. It was inevitable that I would wind up in a relationship because the girls threw themselves at me, yet it was one of the very girls that I met while DJing that ended my gigs.

Long before I became the man I am today I was a simpering beta male. I allowed my girlfriend to convince me to sell off my DJ equipment. She knew that women love a handsome DJ. After all, the girls associate the pleasure of dancing to their favorite songs directly with the man whose spinning the music in the booth, and he is the apparent alpha male in charge of the room. I was making good money as a DJ, so who knows to what heights I could have taken it to.

Therein is the problem with being married: a wife has considerable say in your career choice and its direction. This is especially the case for men interested in action careers or dangerous occupations. A wife can quickly put the kibosh on a career as a bodyguard, fireman, police officer, bounty hunter, soldier, fighter pilot or mercenary.

Wives also find occupations that require their husbands being gone from the home for days or weeks at a time disagreeable. For instance, there's a lot of money to be made as a long-haul truck driver owner-operator, or as a pilot for a major airline, but marriage means they're almost out of the question as a career choice.

Even careers that don't seem particularly disagreeable with a marriage commitment end up having unforeseen high divorce rates. In a study published by *Zippia* in 2017, among the worst jobs for marriage are: automotive technicians, carpenters, library assistants, logisticians, chemical technicians, engineering technicians, medical assistants, tax examiners, and probation officers.

Entrepreneurs are also worth mentioning because women favor stability. A husband's business idea is more likely to be perceived as a pipe-dream of reckless gambling, than a wise investment of his time and money. The same is true for inventors or other creative men like artists, authors and musicians. Moreover, the time and money that is demanded by a wife significantly decreases what a man can invest in his dreams, to say nothing of what will be required of him if children enter the picture.

Success in a venture of any kind is also profoundly affected by one's ability to be resolute in the face of challenges. An unsupportive wife doesn't just take the wind of a man's sails but can tear them to pieces. Even when a wife has been convinced to accept her husband's entrepreneurial dream, all it takes is a bitchy attitude and a face of disappointment to ruin a man's will to continue the fight. A wife's attitude, and fear of losing her and be wrecked in divorce court can also dissuade her husband from taking job opportunities that require relocating or push him to turn down a promotion because it will increase his time away from home.

If you do not want to limit your career choices and how you will invest your time and money, do not get married.

Reason #88 – Freedom!

Marriage limits your options in every way imaginable. Marriage decreases the time you have to yourself, and that you can spend with family and friends. Marriage decreases your options for where you will live and how you live. A wife automatically lowers the number of women you can sleep with and even restricts how many women whose company you can enjoy platonically. In all things, a wife decreases a man's freedom.

Some men don't want freedom, as it is easier to let someone else decide the purpose of their existence and what they should do with their time than to accept responsibility for the course of their life.

In the military, you always know your purpose because you are told what to do. Some men enjoy military service for that very reason. Unlike the military, which offers a whole host of benefits beyond giving a man a mission and a purpose, marriage provides none while restricting a man's freedom. To be a soldier, marine, airman, guardsman or sailor, is to sacrifice one's comfort for the defense of their nation and brothers-in-arms. To become a woman's husband is to sacrifice one's time and earnings to deliver whatever lifestyle is desired by a woman.

There is nothing honorable in throwing away your freedom to provide for the life of some woman. In the absence of any benefit to becoming the servant of a woman's lifestyle, it is silly.

Chapter 14 - Growing Old Together

“I had always thought of woman as possessing those delicate qualities of mind and soul that made her in these respects far superior to man. I had put her on a lofty pedestal, figuratively speaking, and ranked her in certain important attributes considerably higher than man. I worshiped at the feet of the creature I had raised to this height, and, like every true worshiper, I felt myself unworthy of the object of my worship. But all this was in the past. Now the soft-voiced gentle woman of my reverent worship has all but vanished. In her place has come the woman who thinks that her chief success in life lies in making herself as much as possible like man—in dress, voice and actions, in sports and achievements of every kind.” – Nikola Tesla, world renowned 19th-century inventor

Reason #89 - She's Going to Turn Out Just Like Her Mother

In *The Importance of Being Earnest*, Oscar Wilde wrote, "All women become their mothers; that is their tragedy."

In 2009, plastic surgeons used facial imaging and 3D computer modeling software to determine how close a woman's face would age like her mother's. The American Society of Plastic Surgeons published the findings of the research team at Loma Linda University Medical Center in California, concluding that girls will age and wrinkle like their mothers.

Genetics account for around 80 percent of our physical characteristics, rather than diet, environment or exercise. Thus, the man who believes his new bride won't end up looking like his wrinkled old cow mother-in-law is deluding himself. If you want to know how your girlfriend is going to look and act when she's older, just spend a little time with her mother.

According to a survey of one-thousand women conducted by Dotty Bingo, over half of women believe they've become just like their mothers and completed their transformation soon after turning 30. The rest of the women who were surveyed may also have become like their mother but may not have been willing to admit it.

A woman's mother has usually been her longest and closest advisor, and even where she disagrees with her mother's way of doing things, she has doubtlessly been a subconscious role model. For instance, if her mother succeeded in reaping the financial benefits of divorce, she'll always have an example, floating around in her head, of how easy it can be done. The same is true for a mother-in-law who cheats on her husband, belittles him, dresses like a slob, doesn't cook or clean, or nags your father-in-law right into his grave.

Men who get married are essentially marrying their wife's mother because that's almost certainly what she's going to become in appearance and behavior.

Reason #90 - Your Dreams Are Over

The thought of an elderly couple sitting on the porch while they reminisce about the wonderful life they've shared together is quaint, but far from reality.

Not only is it increasingly unlikely that a man's marriage will last 30 or 40 years, but many older men realize that once they look back from their 60s, 70s or 80s, they see decades of missed opportunities. Marriage can mean having to forego your dreams and lying on your deathbed looking back with regret.

How many business ventures or inventions did you pass up? How many opportunities to travel did you decline? How much of your time and wealth did you sacrifice to manifest the lifestyle some woman was dreaming of, rather than the one you dreamed of? How many gorgeous skinny young women did you pass by only to crawl in bed with a fattening, aging, wrinkled old woman who barely gave you head, and only slept with you once or twice every few months of your miserably banal married existence?

To dream big is to gamble big, but gambling is contrary to the stability women desire. A man might be confident to take a risk on himself, but bringing a wife into the picture virtually guarantees how many chips he's able to bet, or even if he's allowed a seat at the table.

Sharing memories together is appealing, but if you're lonely get a dog. One divorced man made the following anonymous comment on the internet, "I'm in heaven now. After suffering 37 years of two ex-wives and their problems and bad habits; my dog of three years is the perfect partner for me. He costs nothing to clothe, is always obedient, is never in a bad mood, doesn't tell lies, always guards me, is always happy to see me and doesn't chatter about nothing. Loyalty is personified in one's dog. Unfortunately, the same cannot be said of my former failed partners so ill-equipped of loyalty."

For the record, Egyptian men envisioned traveling into the afterlife with Anubis. Some goofy Egyptologists used to say that depictions of Anubis show that he has the head of a jackal. In 2015 geneticists realized that the Egyptian jackal wasn't related to jackals at all, but was, in fact, a wolf. It is so evident that Anubis would be a wolf-headed god because wolves are among the dog family, and dogs are man's best friend. Who else would you want to take your final journey with, but your loyal canine companion?

Reason #91 - You Really Don't Know Her, You Just Think You Do

Your wife could end up being a psychotic bitch from hell. The risk of a wife turning out to be a completely different woman from the one you thought you married dramatically increases the less time you knew her before signing the marriage contract.

Knowing someone for years still is no assurance that she'll remain the same. Marriage will inevitably change her, as will pregnancy and motherhood if she decides she wants to have children. The shift of power that occurs upon signing the marriage contract forces the change.

Moreover, a boyfriend is not perceived as a safety net, but a husband is. A husband has agreed to be someone his wife can rely on, and who promises a happy lifestyle for his wife; her happiness and financial stability are now the sole responsibility of the man she married. It is inevitable that her attitude toward her husband will fluctuate in accordance with whether or not he is sufficiently meeting those goals.

There are a whole host of other factors that can change a wife into Dr. Jekyll and Mr. Hyde. An abortion, miscarriage, pregnancy or childbirth can all significantly alter a woman's behavior. Moving away from her friends and family, her husband losing his job, changing careers, or her getting into an affair with some guy at work, can also alter a wife's attitude toward her husband.

To get married is to risk that a woman is going to be the same person you fell in love with.

Reason #92 – She's Going to Get Fat

Virtually all men like skinny women, but marrying a woman is almost a guarantee that she'll get fat.

According to a study published in *Obesity*, if a man just dated a woman, she is likely to gain 15 pounds over five years. If a man cohabitates with a woman but doesn't marry her, she'll pack on about 18 pounds. Married women are the fattest women at 24 pounds in five years of marriage. In fact, [supposedly] the happier the marriage, the fatter she'll get. Andrea Meltzer of Southern Methodist University discovered that the happier a couple reported the state of their marriage, the greater the weight gain.

Another factor in weight gain is menopause, which usually begins when a woman is 45 – 55 but can occur as early as her 30s. Once a woman hits menopause, she's likely to gain another 10 – 30 pounds or more.

Perhaps in a desperate attempt to sucker men into marrying fat-ass women, several news outlets began spreading a fabricated study that claimed that men who marry obese women are ten times happier and live longer. The study was supposedly conducted by Dr. Filemón Alvarado and Dr. Edgardo Morales at UNAM's department of psychology. Snopes.com, a fact-checking website stated, "...the psychology department at the National Autonomous University of Mexico (option one for [the abbreviation] UNAM) does not list someone by either name as a faculty member, and the web site for the National University of Misiones in Argentina (option two for UNAM) provides no evidence that the school has a psychology department at all."

"Fat acceptance" is just another feminist ploy to shame men into putting up with women no matter how bad they behave or unattractive they become. No amount of "plus-size" models or internet memes that attack men for not finding double-chins and blubber attractive is going to change men's nature. Feminists want to have their cake and

eat it too, just as most married women want the freedom to blow up like a blimp but also want the benefit of their husband's earnings, and yet don't want him to cheat. In the article "Plus-Sized Women Admit They Aren't Attracted To Overweight Men" published to the website *Whisper.sh*, fat women admitted the double-standard that they want men to accept their fat asses, but are only interested in skinny guys. Expect this nonsense to echo into your marriage, wherein your fat wife packs on the pounds, refuses to exercise, yet backhands you in the shoulder if you stare too long at some hot piece of trim—all the while she's fantasizing about some athlete pounding her chunky meat curtains with his yogurt-slinging clam hammer.

Reason #93 – She Might Become an Addict

If your wife decides to take up a vice, you will have absolutely no power to correct her behavior.

Even when children are involved, unless a woman can be proven to be so addicted and grossly irresponsible that she cannot possibly care for your kids, she is almost certain to be awarded majority custody. What is more likely to happen is that she is ordered to attend a treatment program and retain custody of your children. I have, however, known two men whose wives became substance abusers and left them with the kids, but such cases are unusual.

A woman needn't even become a drug addict on the level of a toothless crack-whore to create an undesirable situation. A man who doesn't smoke, or just doesn't want his wife to smoke, has absolutely no authority to get his wife to quit smoking if she decides to take up a tobacco addiction. Pharmaceuticals like anti-depressants and prescription opiates are also a form of altering the mind that is favored by women, and all it takes is one of her friends or relatives recommending a psychiatrist to deal with marital or job stress. Outside of tobacco, drugs, and alcohol, a wife can become a food addict, or become addicted to television or the internet.

There is just no guarantee that she is going to remain the same person you married, and there's absolutely nothing you can do to stop her from doing whatever she pleases.

Reason #94 – She's Going to Stop Dressing Up For You

When a guy pictures what life will be like with his future wife, he imagines she'll make herself as pretty as she always has when she was just his girlfriend.

After having captured a male servant via the marriage contract, a woman no longer has any reason to dress sexy—she's already got you. This goes back to a woman's biological imperative to breed with the best male she can get her hands on, and also to find a provider and protector. Once a woman believes she has hooked in an alpha male or a beta male provider, she has no motivation to dress sexy—except when ovulation kicks in and it's time for "Girls' Night Out." In other words, when you see your wife getting all dolled up, it might just be because it's time for her to go see if she can get another alpha male to explore the depths of her bikini-cavern with his vagina-miner.

Even a girlfriend will eventually stop dressing seductively for her boyfriend if he continues to fail her shit-tests. In other words, if he repeatedly demonstrates that he'll put up with her shit, she knows that she no longer has to try hard to get him hard.

In my beta male days, I had purchased a dozen or so sexy outfits for three different girlfriends. In the city I was in, the girls weren't known for their excellent fashion sense, so I got my girlfriend's measurements and took matters into my own hands. The first two times I did this, I didn't realize I had already failed their shit-tests and been relegated to the lowly status of beta male provider.

The girls rarely if ever wore the outfits for me. The first girl, a bartender, would wear the sexy clothes I bought her to look more alluring at work. The second girl dressed up for me once, and the only other time I ever saw her get all tarted up was when she said she was going out for "girls' night out." Once again, I must insist upon the understanding that "Girls' Night Out" is just an excuse for women to continue their hunt for alpha male semen while their beta male provider sits at home like a good little boy. As for the third girlfriend I had bought a wardrobe for, I ended up dropping her like a hot rock because I started taking issue with her being a single mother.

In all, there simply is no reason for a wife to doll herself up on a daily basis for her husband. A man's wife has no problem putting on makeup and dressing modestly sexy for her day job, but at work, she's getting paid to look presentable, whereas she has nothing to lose if her husband tells her she needs to put more effort into her

appearance. Feminists love to argue that being a housewife is a job, and thus men should give them some kind of occupational severance pay in the form of alimony, yet during the marriage, how often did these women put as much effort into their appearance as they would do if they had a real job?

Reason #95 – Say Hello to a Wrinkled Old Nag...and Goodbye to Candy and Bambi's Sweet-Sweet Young Ass

We all grow old but while men age like wine, women age like milk.

Nature is harsh on a woman's beauty because she only has so many years to give birth to a healthy child. The lines of a woman's face, sagging butt, and breasts, increase in facial hair and wrinkled skin, are all warning signs to men that she is not a good candidate for reproduction.

Among feminism's various shaming tactics deployed against men, we are supposed to accept women that are fat and old. The fact is that men are not biologically attracted to older females, and older women are not usually interested in a relationship with younger men.

Dr. Michael Dunn, a psychologist at the UWIC's Cardiff School of Health Sciences, found that a study of online dating websites revealed that older women are not seeking younger mates, but prefer men older than themselves. Women are after the resources that usually come with a man being older, and men are attracted to a woman's reproductive quality, regardless of whether or not they want children. This inevitably means that a man's wife will become increasingly less attractive to him as the years tick by.

Along with aging, pregnancy, and childbirth ruin the female body. Along with stretch marks, a wrecked vagina, marshmallow stomach, saggy skin, possible hair loss, veiny breasts with giant areolas, pregnancy, and childbirth can add serious pounds to a woman that many aren't likely to burn away with exercise.

Chapter 15 - The Aftermath

“Ah yes, “divorce”. From the latin word meaning to rip out a man’s genitals through his wallet.” – Robin Williams, famous 20th-century comedian who was driven to suicide by two ex-wives

Reason #96 - Your Secrets Aren’t Safe With Her

The saying that “hell has no fury like a woman’s scorn” is all too true. Women are spiteful and vindictive creatures, who do not place value on loyalty, honor or honesty, but justify their actions according to how the outcome makes them feel.

Men are not known for spray-painting a woman’s car because she cheated on them, nor are we known for throwing a girlfriend’s belongings out onto the lawn or trying to ruin her reputation by badmouthing her to everyone we meet. While some men have engaged in such dishonorable nonsense, women are the ones that are known for it.

It is sheer foolishness to believe that a woman is going to keep your innermost secrets long after your relationship is over, or even while it lasted. Confiding certain secrets in a woman, that might perhaps reveal some inner-weakness or poor judgment, also has the effect of lowering your perceived alpha male status. Women will also stow away secrets in the reservoir of their vindictive, childish mind so that they can be later used against you. Telling certain secrets to a woman only affords them more ammunition to use against a man in divorce court and custody battles.

I’ve spoken with several ex-cons who assured me that many of the men they were imprisoned with were there because their wife or girlfriend ratted them out. One does not need to be critical of the law to understand that such a testimony speaks to women’s inability to keep secrets. In the case of turning on a boyfriend or husband who has committed a crime, there are two factors: women are vindictive; and, women value safety and stability more than men.

A wife should be viewed as a trusted friend and confidant.

Reason #97 – Bouncing Back Won’t Be Easy

Since statistically, your marriage is likely to end in divorce, it’s important to look at the aftermath.

A married man will have grown further apart from his friends and perhaps his own family. Given the degree to which a wife can control a man’s life, he will have a laundry list of missed opportunities. A husband has passed up events, opportunities to travel, and given up on an untold number of dreams his wife wouldn’t support. For the years a man is married, his life will have bent to satisfy her and prevent the financial catastrophe of divorce.

In the shadow of divorce are men burdened by alimony and child support, and likely psychologically wounded by the whole ordeal. With money going out the window to his ex-wife, and children he barely gets to see, a divorced man’s ability to attract a hot woman or have the lifestyle he wants will decrease. This is especially the case when child support is involved because an increase in income means an increase in child support payments.

In summation, the longer a man is married, the less likely he will have lived a life that he really wanted—a life worth writing about. Upon getting divorced, the length of his marriage will dictate the degree to which he can get back on track to become the man he wanted to be and live the life he dreamed of.

Reason #98 - You Just Might Become an Alcoholic

With the stresses of marriage, and a wife who’s fat overhanging stomach makes her look like she has a front-butt, many men turn to alcohol.

One man confided in me that he couldn’t have sex with his wife unless he was drunk because she looked like a cross between a land-whale and the Stay Puft Marshmallow Man.

One study reported that divorced men are three times more likely to be alcoholics than married men, but I sense it’s

a fallacy to assume that alcoholism was the cause of the divorce in all those cases. How many divorced men became alcoholics as a means to cope with the emotional aftermath of divorce and the financial devastation wrought by the divorce court? How many men didn't have a drinking problem on their wedding day but picked up the bottle after realizing that marriage is merely a contract to support the lifestyle of a woman who is free to deny her husband sex, spend his money and act however she pleases?

An excellent way to find out what married life will be like is to visit a bar where old-timers and working-class men hangout. If you see a wedding ring, glance at their face; is that the face of a happy man?

Reason #99 - Prenups are Bullshit

A prenuptial agreement, or prenup, is a contract signed before a couple gets married that is intended to protect the assets of both parties in the event of a divorce. The problem with prenuptial agreements is that [they often don't work](#), and none can be considered foolproof. There is almost an endless supply of reasons a judge will throw a prenup out of divorce court.

Any prenuptial agreement that shows that a man did not fully and accurately disclose all of his assets and earnings can be considered fraudulent with an intent to conceal the real value of his estate. A prenup that is signed too close to the wedding date can be thrown out on an argument that the woman was not provided enough time to fully consider the ramifications of the contract, and is thus deemed coercive. So too, if a man's fiancé did not have legal counsel before signing the agreement, it can be tossed out of court. If the woman was under the influence of alcohol or any other mind-altering substance anywhere near the hour the contract was signed, it could be considered invalid. If the man included a line that he will not pay alimony or child support his prenup is useless. If a woman's husband stated that she mustn't gain a certain amount of weight, or otherwise specifies appearance requirements, such as the length of her hair, the prenup could be considered overbearing. If the agreement states that she will provide her husband with a certain amount of sex and blowjobs, the prenup can also be considered too demanding and is therefore invalid.

A prenuptial agreement can appear to have worked if the woman has poor legal counsel or her husband isn't extremely wealthy. When a man is sitting on serious assets, it will only increase the likelihood that his wife will fight the prenup and her legal team will attempt to find a flaw in the agreement or the conditions under which it was signed. Expect lies and a circus of legal shenanigans to ensue.

A politically liberal man I met argued that Mel Gibson's payout of \$425 million dollars to his ex-wife Robyn was fair because she gave birth to seven of his children, and took care of the children and the household for 26 years of marriage. He argued that Mel couldn't have become the huge success he was without her maintaining the home front, and raising the children.

First off, there are a lot of assumptions being made about precisely how much Robyn contributed as a housewife and a mother. Are we supposed to believe that a man who purchased his own island, and was worth almost \$1 billion, didn't have a maid, nanny, chauffeurs, and cooks to ease the day-to-day life of his wife? Even without such luxuries, exactly how hard is it to load a dishwasher, cook for the kids, or keep the house clean?

We can easily estimate the real value of a housewife, and even quantify the value of giving birth to a man's child.

Seven children from surrogate mothers would cost around \$700,000. Although a full-time nanny usually earns approximately \$30,000, we'll bump it up to \$200,000 in light of the number of children Mel has. This means that he would have spent \$5,200,000 over 26 years for one of the best nannies in the world. A nanny can cook and help out without housekeeping, but we'll throw in a full-time live-in housekeeper for \$60,000 a year and a chef for \$100,000, which totals \$4,160,000. The value of a rich man's wife, who gives birth to seven children—and for some strange reason, also cooks, cleans and stays home to raise the kids without any professional assistance—is \$10,060,000 over 26 years.

Contrast \$10 million (roughly 1% of Mel's wealth) to a divorce settlement of \$425 million dollars (50% of his assets).

For almost a half-billion dollars, I bet Mel Gibson could have made some real strides in artificial womb technology and helped save himself, and men all over the world, the heartache of child support and financial divorce rape.

Mel didn't have a prenuptial agreement, but I doubt that would have saved him from losing half his wealth. Furthermore, if a judge deems that a woman cannot afford legal counsel, her husband can end up paying for the very attorney's his wife will use to shred the prenuptial agreement and destroy him. A prenup that is found to have a flaw can result in a man having to sue his own legal team. Additionally, some believe that the inclusion of a prenuptial agreement can increase the likelihood of divorce.

No matter which way you look at it, prenuptial agreements do not somehow fix the critical problems of marriage, nor make marriage beneficial for men, even if the prenup succeeds in protecting a man's assets. There simply are no benefits to marriage.

The only unbeatable prenuptial agreement is to agree to never get married.

Reason #100 – Marriage Increases Your Chances of Depression and Suicide

Since 50% of marriages end in divorce, getting married is like loading a six-shooter with three bullets, pointing the barrel of the gun at your bank account and then pulling the trigger. Sadly, many men end up putting the gun in their mouth.

Some divorced men end their life believing it will send a message to their ex-wife about how deeply she hurt them. It is foolish to think that some heartless bitch that divorce raped a man will care if he commits suicide.

Other divorcees kill themselves because they can't keep up with the alimony payments, as was the case with the famous comedian Robin Williams, who was ordered to pay \$30 million to his ex-wives. Robin brought joy and light to millions of people, but it only took a few greedy cunts to extinguish that light.

People have argued that married men are less likely to commit suicide, but the facts are quite different. No matter what psychological benefit can be concocted by marriage advocates, at least half of all marriages in the United States end in divorce and divorced men are twice as likely to commit suicide than single men. Getting married is then a gateway into increasing one's chances of ending up so unhappy, after divorce, that you take your own life. Having a child with a woman is also a way a man can increase his chances of one-day committing suicide.

Randy Brouse, David Guinn, Randy Johnson, Reinaldo Rivera, Robert Steadman, Carl Tarzwell, Jr., and Kenneth Taylor, are just a few names of men who hung themselves after being incarcerated for failure to pay child support.

On January 7, 2002, Derrick K. Miller walked up the steps of the San Diego courthouse with his divorce papers in one hand and a pistol in the other. After shouting, "You did this to me," he promptly blew his brains out.

After the Canadian courts banned Mark Drexel, age 42, from seeing his son, he went to a motel on January 23, 2003 and hung himself. Another Canadian man, Darren White, killed himself in March 2002 after the court ruled he was capable of paying out \$2,071 to one woman and \$439 to another woman, even though his disability check was only \$950 a month.

James Poore of Bristol, Tennessee was arrested for failing to appear at a child custody hearing. James somehow got his hands on a shotgun while on a work-release program and blew a hole in his chest.

Suicide statistics from the Center for Disease Control show that 34,727 men committed suicide in 2016 in the United States. Since divorced men are 2 – 3 times more likely to commit suicide than other males, perhaps as many as 20,000 men committed suicide in 2016 after their marriage fell apart.

On September 27, 2017, an article titled "Are You Among the Growing Number of Unhappy Married People?" was posted to *PsychologyToday.com*. The author cites three sources that show that the majority of married couples are unhappy, and marital happiness is rapidly declining. The fact is, single people are happier.

In India, married people accounted for 66% of all suicides reported in 2014 according to the article "Married men twice as likely to commit suicide than married women" published by *The Times of India*.

In the United States, few have dared to challenge the theory that married people have a lower suicide rate. Dr. Bella DePaulo stepped up to the plate in her April 2013 article "Are Married People Less Likely to Kill Themselves?"

posted at *PsychologyToday.com*. Augustine Kposowa's findings in "Marital status and suicide in the National Longitudinal Mortality Study" also show something quite interesting. American men who got divorced were twice as likely to commit suicide, but that isn't the case for women.

As I've argued throughout, women do not fall deeply in love with men, they fall in love with the resources a man provides them. The biological imperative of women is to pick themselves up, dry their tears and move on to acquire the resources of the next male whose goofy enough to become their servant.

Craig Morris from Binghamton University surveyed over 5,000 men and women from 96 different countries to find out which gender is most heartbroken after a breakup. Morris found that men take longer to recover from a breakup, and may never fully recover. Putting out his best pseudo-scientific bullshit to bury the fact that men are the true romantics—as numerous other studies prove—Morris hypothesizes that our emotional heartbreak is just linked to being disgruntled that we have to go back out and compete again for a new mate.

Morris, trying to cover for the heartlessness of women, also claimed that females feel more emotional pain when a relationship comes to an end but since women supposedly have more to lose from choosing the wrong partner, they've evolved to recover quicker than men. So women are supposedly wounded more deeply but recover faster?

Also, how is it that women have more to lose in a relationship? Precisely what do women put on the line in a relationship? In the ancient days of hunter-gatherers, it was assuredly the case that a woman who was cast aside by a male had to recover quickly from the breakup. With a sweet smile and a girlish giggle, her survival depended upon making another male feel he was all she ever dreamed of, so she could become the beneficiary of his strength, protection, and resources.

Today women invest nothing and have nothing to lose. Instead of the mouthy bitch being left to the wolves—after she's been kicked from the cave for refusing play with her man's one-eyed trouser snake—a modern woman has no shortage of men ready to don the badge of Captain-Save-a-Hoe. Instead of being forced to subsist on earthworms and berries out in a freezing rainstorm—like that sexually frigid bitch that would have been your ancestral grandma, if your caveman ancestor hadn't kicked the bitch out—today, *bitches have options*.

A beautiful girl can divorce a man in the morning, take ownership of his "cave," along with half his bank account, and have some beta male buying her dinner before nightfall. White knight beta males are so plentiful that even a girl that looks like a walrus can easily find some poor fool to fall in love with her and give her money if she plugs into enough dating and social networking websites.

Don't become another statistic: the man who wakes up to realize that his wife never really loved him. But whatever you do, do not ever forget the name Thomas Ball. In mid-June of 2011, Thomas Ball walked up to the courthouse in Keene, New Hampshire and set himself on fire in protest over the injustices of the family court system. Thomas Ball was the divorced father of three.

Do not let the deaths of such men be in vain. Do not blindly march into the depressing mire of marriage, but rejoice in the freedom of being your own man, and knowing you alone are in command of your destiny.

Reason #101 – Marriage Can Take Years Off Your Life

The joke is that married men live longer but so do house cats. It's also worth mentioning that the lifespan of elephants, orcas, and other wild beasts decreases in the safe calmness of captivity. The fact is, we're not cats, elephants or whales, and few people have challenged the assertion that tying the knot extends your life.

We know that getting a good night's rest, communicating with friends, and overall happiness, play a role in longevity. We also know that overworking yourself with long hours isn't good for your health. We've seen that single people get more sleep, have much more contact with friends and relatives, are happier than married couples and don't work as hard.

I don't see how working an average of 400 hours more per day than a single man could possibly add years to anyone's life.

Despite what marriage advocates would have us believe, a cursory comparison of the single and married lifestyles should have us logically conclude that marriage shortens our lifespan. In the article “Being single could help you live longer” published in *The New York Post* on September 22, 2017, Andrea Downey points out that staying single can mean less debt, which means less stress. Stress has a direct correlation to mental health, physical health, and longevity.

You have the rest of your life ahead of you—don’t screw it up with marriage.

Chapter 16 – The MGTOW Solution

“Bachelors know more about women than married men. If they didn't, they'd be married, too.” – H. L. Mencken

Stop Dreaming & Start Living

I feel for the guys that dreamed of falling in love with a beautiful girl, marrying her, and living happily ever after. The truth is that it is nothing more than a dream reinforced by societal programming. We are everywhere indoctrinated into the belief that we will be most happy by submitting ourselves in service to a woman. We let storytellers convince us that there is some gorgeous girl out there who will love us with all her heart and soul. When we think we've found our soul mate, television commercials for engagement rings provide us with instructions for exactly what we need to do to put a beaming smile on her face: we need to spend our resources on that woman to make her happy.

Some of my favorite movies as a child depict the soul mate fantasy in all its glory, and there is often an underlying message in films and songs that a man should serve a woman—and if necessary, throw down his life for her.

There is a classic example of this in the movie *The Princess Bride*. The farm boy Westley falls in love with the beautiful Buttercup, and to express his appreciation to her, anytime she asks something of him, he responds, “As you wish.” Here are the first words spoken by the narrator of the story:

“Buttercup was raised on a small farm in the country of Florin. Her favorite pastimes were riding her horse and tormenting the farm boy that worked there. His name was Westley, but she never called him that. Nothing gave Buttercup as much pleasure as ordering Westley around.”

Buttercup is played by the actress Robin Wright, while Westley is played by the actor Cary Elwes—both of whom are of European descent. Imagine the reaction the first few lines of narration would have if Westley had been played by a black actor. To visualize this, here is how the opening of the story could read:

“A beautiful white girl named Buttercup lived on a small farm in the country of Florin. Her favorite pastimes were riding her horse and tormenting the negro farm boy that worked there. His name was Caleb, but to make him feel like less of a human being, Buttercup never called the colored boy by his name. Nothing gave Buttercup as much pleasure as ordering the poor negro around.”

My example is not about getting into a conversation about race. It's about realizing the type of characters we're dealing with. Buttercup is a sadist. When Westley responds, “As you wish,” every time Buttercup orders him to do something—in an attempt to convey the words “I love you”—he reveals that he is a masochist. Westley has succumbed to Stockholm Syndrome, as he has fallen in love with his tormenter.

As the story goes, the sadistic Buttercup eventually realizes that she loves the poor farm boy. Westley then becomes a sailor, with the intent of making enough money so that he can marry Buttercup. His plans are cut short when his merchant ship is attacked by the Dread Pirate Roberts. Westley is held captive in the brig, but the infamous pirate ends up becoming fond of him and decides to release him. The Dread Pirate Roberts invites Westley to take on his identity, saying that he wishes to retire. What does Westley do? Westley takes on the identity of the Dread Pirate Roberts, but cuts his exciting career short to pursue the woman that tormented him. He goes on a harrowing journey to rescue Buttercup from an evil prince who wishes to marry the fair maiden.

I still enjoy *The Princess Bride*, but though it is regarded as a masterpiece of entertainment, it is really the story of a simp afflicted with oneitis.

A man who becomes fixated on a woman, believing that nobody else can measure up to her, suffers from oneitis. A man who bends over backward to appease a woman is a simp. Westley expressed the words “I love you” to Buttercup by saying, “As you wish,” which testified to his willingness to be her servant. He was willing to bend the knee in servitude simply because Buttercup was beautiful. He went to seek his fortune, just so he could possess Buttercup through marriage. Once again, women require the resources of men.

Westley gave up the adventurous life of a pirate—where undoubtedly he would have access to women at various port cities around the world—to risk his life for a single woman that loved to boss him around. We have to see Westley for what he was: a masochistic simp.

No heterosexual man is foolish enough to submit himself in service to another man, just because that man is nice, and women happen to find him attractive. To make this point, I asked a friend, “If you only knew me for a few months, would you be willing to give me \$6,000 (the average price of an engagement ring)?” “Of course not,” he said. I replied, “Why not? I’m nice to you, and there are many females who find me attractive.” He intuited the point I was making, as he had spent six-figures on an engagement ring to vainly win the heart of a woman who is now long gone—and that he later realized was a nut job.

No, he didn’t get the ring back.

How many men have purchased an expensive sparkly rock for a woman they haven’t known for more than a few months? Why did they do it?

The only thing that is missing from my earlier hypothetical question is that my friend and I, are both heterosexual men; I don’t have tits or a pair of lasagna-lips hiding in my underwear. Is it not now clear the value men foolishly place on women they hardly know, all because they desire access to their panty-hamster, and have been told that offering a female resources is the way you get it?

No man would tolerate me saying, “Henceforth you’ll have to open doors for me, pull the chair out when I go to sit down, and if we’re in a building that catches on fire, you’ll need to make sure I get to leave first—all because my ethnic group is better than yours.” Any sane man would retort, “What kind of supremacist nonsense is this!” If I responded, “Serving my race is one of the greatest ways you can prove that you are a real man,” how likely would I be to succeed in convincing someone who isn’t a spineless twit? Yet film after film, and the rhetoric of tradition, would have us believe real men bend the knee, open doors, pull out chairs, and sacrifice themselves to women—not because females belong to a particular race—but because they have a vagina.

Movies are not the only means to indoctrinate men into the idea that simping behavior is where we will find romantic happiness or prove our manhood. One of my favorite rock songs is “Love You to Death” by *Type O Negative*. I enjoy the instrumentation and Peter Steele’s exceptional vocals, but it is another example of how simping behavior and oneitis can be glorified, and subconsciously beaten into our minds. Peter sings, “I beg to serve, your wish is my law,” and later asks, “Am I good enough?”

When two bucks or bears battle it out in front of a female, each is attempting to prove that he is good enough to reproduce with the female. For a beautiful girl to return our attention, perhaps in a gaze across the room, is to have the feeling of being victorious over all other challengers; she has made us feel that we are good enough.

In the 1985 video game *Super Mario Bros.*, what did Mario set out to do? His mission was to save Princess Peach from the evil Bowser, at the risk of his own life. No matter how much a man might pretend that he isn’t into “mushy romance,” we are driven by our biological imperative to hope for a kiss if we succeed in rescuing the princess. Surely, we think, if we risk our lives for her, and prove we are an alpha male by defeating our opponents, she will see the value in us—and she will love us.

The anecdote is to realize that you do not need a woman to validate your self-worth.

The Red Pill

I completely acknowledge that it’s not easy to wake up from the dream that one day you’ll find the perfect girl, get married and live happily ever after. After a man verifies the truth, it can really start to hurt to accept it. I recognize that pain in others, as I too have felt it.

In the movie *The Matrix*, the character Neo is offered a choice to see the world as it really is, or to abandon his search for the truth, and go back to his normal workaday life. The character Morpheus, named after the god of dreams, offers him the truth in the form of a red pill or continuing to live a lie, in the form of a blue pill. Neo believed he was prepared to accept the entirety of the truth, and so he took the red pill. Though Neo was a man who thought outside of the box, the truth was so heavy that he angrily rejected it, before finally accepting the reality that

was revealed to him.

Arthur Schopenhauer famously said, “All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.”

The red pill that I am offering is the truth that men in the United States and other Western nations, are less than second-class citizens under the rule of a gynocentric government. The truth is that there are absolutely zero benefits for a man to get married, regardless if a fortuneteller with perfect foresight predicts that he will never get divorced. The truth is that redundant studies prove that men are the true romantics, and we are programmed to fall in love with women—to protect them, provide our resources to them, and if necessary sacrifice our lives for them—for the survival of the species. The truth is that the biological imperatives of women, are to acquire the semen of alpha males, and to seduce males into using the strength of their bodies and minds to provide them with resources and protection. The truth is that the survival of our species depends upon women being incapable of reciprocating the kind of unconditional love that men give to women.

To take the red pill is to have clarity in understanding what lies behind the interactions between the male and female genders. It is to be aware of the dangers of getting involved with a woman in any way, and to know what women are capable of on their own, and through the force of government. Taking the red pill does not mean a transformation of one’s sexuality; it doesn’t mean that a man no longer enjoys the company of women, or having sex with them. A man who takes the red pill means that he is ready to go his own way.

MGTOW stands for “[Men Going Their Own Way](#).” Going your own way is a statement of self-ownership and self-determination. Instead of letting society, or a woman, determine what a man’s role in life should be, a guy who is MGTOW declares the supreme right to choose the course of his life. Weaker males, in preference to self-determination, prescribe to utility-based roles for males that entail servitude to women and society.

MGTOW does not mean trying to change the system or violently oppose it. It means you understand the game is rigged, and the only way to win the game is not to play it.

MGTOW is not a cult or organization, but merely an abbreviated way of saying, “I’m a single guy who intends to stay single. I have no interest in placing myself in any kind of situation that would allow a woman to divest me of my resources, or falsely accuse me of something I did not do. To that end, I have no interest in marriage, cohabiting with a woman, or engaging in any kind of simping behavior. I refuse to allow others to define manhood and reject the charge by feminists that masculinity is toxic. Most importantly, I do not hate women—I understand them.”

Most men will go through a phase of “[red pill rage](#),” just as Schopenhauer predicted in the stages of truth. The first stage is ridicule, the second is violence or anger, and the third is acceptance. Women, beta males, simps, white knights and manginas, scorn the truth and try to shame men into sticking to the cookie-cutter of what a man should do with his life. Sadly, most men who have finally chosen to go their own way were once among those who thought MGTOW meant that a man was homosexual, or didn’t have what it takes to get laid. Others scoff about what MGTOW guys have to say about the true nature of women, and the gynocentric court system until they end up becoming victims themselves.

I wrote this book to help men avoid the pitfalls that so many other men have fallen into, yet there is a danger in waking up to this information. “Red Pill Rage” inevitably follows the realization that your situation, or that of other men who have been wounded by women, is not unique. There is plenty to be angry about. One can be angry at God, women, the government, or oneself. Men who take the red pill can also succumb to depression, in the same way that an emptiness can form when we’ve lost a dear friend or family member, or a relationship with a girl comes to an end.

Calmness comes from an understanding that there is no more reason to be angry at women than there is to be enraged by a cat acting like a cat. Acceptance comes from the realization that there is a path even more joyous and wonderful than the road we had chosen before, or that others had insisted we travel.

MGTOW Lifestyle

Open your eyes to the celebration of becoming a man who chooses to go his own way.

MGTOW means your time is yours to do with as you please, rather than pressing yourself into the service of others. Your money is yours to spend, save or invest as you see fit. Your goals are yours to achieve, and there will be no woman to derail you from your dreams.

The man who goes his own way dodges bullets. Alimony, child support, divorce rape, losing your house to an ex-wife, the pain of a cheating wife, and the heartache of realizing that a woman never really loved you, are all bullets that have no effect on a guy who is a MGTOW.

I've compared the lifestyle of single men to married men throughout this book, but they deserve repeating.

Women & Sex – The thing that guys really want from women is sex. Celebrate a life where you'll be able to have sex with as many women as you want. If you need a little training in how to pick up women, plug into T21C.com or just search the internet for the words "PUA seduction." The 21 Century courses at T21C.com cover everything a man needs to know to get women.

If your wardrobe needs a little work, jump over to AlphaM.com where Aaron Marino will show you how to look like a boss. Why waste money funding some woman's wardrobe, when investing in your appearance pays dividends in the form of more poon.

Having a small mutton-dagger is no longer an excuse to settle down with a woman who looks like she should have a few moons orbiting her fat ass. PEgym.com has a plethora of legitimate, tried, tested, and proven ways to increase the size of the male sex organ.

As a MGTOW you'll have your choice of one-night-stand bar sluts, friends with benefits, call girls, foreign prostitutes, and every size, shape, and shade of girl you can imagine. Want to sleep with two or three girls at once? Learn the right pick-up artist skills, or travel to the right country, and you can do that as many times a week as you can afford.

The primary rules here are to avoid getting a woman pregnant at all costs, don't catch any STDs, and, whatever you do, do not ever cohabit with a woman. To that, I recommend getting a vasectomy, using condoms, and if you sleep with prostitutes, avoid freelancers. Only sleep with working girls that are licensed sex workers, and therefore are required to get checked for STDs periodically. You can also get a sex doll to minimize, or completely nullify, any chances of ever having to pay child support, catching an STD, or being the victim of a false rape accusation. Some heterosexual MGTOW decide to go completely "monk" and avoid women altogether. It's your choice.

Home – Your home is your castle, and that's nowhere truer than when you're a man going his own way. You have the freedom to blow your money on the ultimate bachelor pad, or to save your money living in a modest apartment. Want to travel around in an RV, live on a sailboat, or build a tiny home out in the woods? Want to see what it's like to survive in the Alaskan wilderness for three months living in a tent? You can do whatever you want because you won't have a wife telling you otherwise.

Housekeeping – As Burt Reynolds pointed out, a wife is a terribly expensive way to get laundry done. Look into having a maid come over every few weeks to tidy the place up. If you're willing to spend a little extra cash, you can even get a topless maid. Pat yourself on the back for being wise with your money, and celebrate that you'll never have to deal with a woman who complains when you ask her to clean up the house.

Travel – With more money in your pocket, you can travel the world, and there are some great places where foreign girls will literally throw themselves at you. How about a trip to Thailand or the Philippines, where you can bang a different girl every night even if you don't make much more money than a guy flipping burgers?

Money – As [Terrence Popp](#) from Redonkulas.com pointed out, staying single means you can live well for much less than the cost of having a wife. With the freedom to increase or lower your living expenses as you see fit, you now have the opportunity to start creating real wealth. Pick up a copy of [MGTOW Building Wealth and Power: For Single Men Only](#) by Tim Patten over at Amazon.com.

Without the financial burden of a wife, alimony or child support, a man has a real shot at becoming wealthy or at least living a lifestyle well above the average married couple. Keep in mind that there's no such thing as a wealthy man who is too ugly, too fat or too old. A single man with money can have virtually any woman he wants, and

spend his time traveling around the world enjoying the variety of women that life has to offer.

Companionship – A man going his own way doesn't have to lose his friends. As a single man, you can spend as much time with friends as you'd like, and make new friends all over the world. Moreover, dogs are called "man's best friend" for a reason. A pet dog is always happy to see you when you get home, and so long as you're kind to him and feed him, he's never going to walk out on you. Your dog, motorcycle or sailboat is never going to wake up and tell you it doesn't love you anymore. Your badass dream car—that you can afford because you never got married—isn't ever going to cheat on you. Your real friends don't care how much money you make, how many women you've slept with, where you live, or how you decorate your home. Rejoice in knowing that you will have companions that really care about you, and truly love you as a brother, just for being you.

About the Author

Duke Armstrong is a sales and marketing professional, who now focuses on writing and having sex with women all over the world. When he's not traveling, Duke lives a happy single life in Montana, where he owns his own cabin, drives the truck of his dreams, and spends time shooting the breeze with his buddies or shooting targets in his expansive backyard.

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JAMES PERLOFF

COVID-19

and the Agendas to Come

Red-Pilled



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*The Case against Darwin:
Why the Evidence Should Be Examined* (2002)

Freedom Shall Return (2003) (music CD)

*Truth Is a Lonely Warrior:
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*Thirteen Pieces of the Jigsaw:
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CONTENTS

PREFACE

PART ONE: THE LOCKDOWN

1. The Economic and Health Impact of the Lockdown
2. Destruction of Civil Liberties
3. Was the Lockdown Necessary? Experts Speak Out
4. The Social Distancing and Mask Controversies

PART TWO: THE METHODOLOGY OF PANIC

5. Putting COVID-19 in Perspective
6. Fake News Stories Intensify the Panic
7. An Important Disclaimer
8. Inflating COVID-19 Deaths: (1) Early in the Pandemic—Misleading Sampling Weights and Inaccurate Models
9. Inflating COVID-19 Deaths: (2) Conflating It with other Diseases
10. Inflating COVID-19 Deaths: (3) Death Certificates
11. Inflating COVID-19 Deaths: (4) The Nursing Home Controversy
12. Accuracy of Testing

PART THREE: THEORIES ABOUT THE NATURE OF COVID-19

13. Mainstream Story of the Origin
14. The Bioweapon Theory
15. Accidental Leak or Deliberate Dispersion?
16. The 5G Theory
17. Other Theories about COVID-19

PART FOUR: THE DEEP STATE'S END-GAME

18. Population Reduction

19. Bill Gates

20. Deep State Goal #1: Global Vaccines

21. Eight Reasons Why We Don't Need a COVID Vaccine

22. The Storm over Hydroxychloroquine

23. Deep State Goal #2: Global Digital ID

24. Deep State Goal #3: Cashless Society

25. Contact Tracing/Surveillance State

PART FIVE: WHAT MAY LIE AHEAD

26. Possible Scenarios

27. Hope and Encouragement

INDEX

PREFACE

For those who might not know, “red-pilled” is a metaphor taken from the 1999 film *The Matrix*. Taking the “red pill” means to awaken to reality; taking the “blue pill” means to continue living in illusion.

In 2020, I had been writing a book on 9/11, but switched focus due to a matter of greater urgency—the global response to COVID-19. (The acronym’s meaning, officially, is—“CO” stands for Corona, “VI” for virus, “D” for disease, and “19” for 2019.) I wrote an extensive blog post, “COVID-19 Red-Pilled.” As the situation progressed, I kept updating the post, but it eventually became too long for online reading, and the need for a book was apparent.

Let me say at the outset that no one has all the answers on COVID-19, but we should have the will to look for them. One reason I decided to write this book is that when it comes to this disease, unprecedented censorship is making information that contradicts the “official story” increasingly hard to find on major search engines. Searches typically turn up only mainstream outlets, and “fact-checking” from sources such as scandal-ridden¹ Snopes, or PolitiFact, whose largest funder has been the Bill and Melinda Gates Foundation.² For analysis of such sites, their methodologies and backers, I recommend the *Corbett Report*’s video “Who Will Fact Check the Fact Checkers?” https://www.youtube.com/watch?v=rtirKL_XmGg.

I have been a journalist for 35 years (starting in 1985 as a writer for *The New American*) and a registered nurse for 45 years (retired in 2019). Neither of these backgrounds qualifies me as an “expert” on COVID-19; however, it does give me some perspective, both on the geopolitical forces controlling world events, as well as common-sense training and experience in infection control. By the way, Bill Gates is not a medical professional, yet that hasn’t stopped him from advising the world on how to respond to COVID-19 in mainstream media.

On a personal level, I immediately knew that quarantining perfectly healthy people did not accord with decades of infection control practices. In infectious diseases, you isolate the sick, not the healthy. To quarantine the

healthy as “presumed sick” is the medical equivalent of violating the law of jurisprudence that a person is presumed innocent until proven guilty.

However, since COVID-19 is said to be different, and as those who challenge the government/mainstream media response to COVID-19 have been targeted for censorship, this book will quote scholars and experts whose credentials are beyond dispute.

I have broken the COVID-19 crisis into five major sections:

- (1) The Lockdown’s Human Impact (I wanted to address this first because it is the least hypothetical of the issues.)
- (2) The Methodology of Panic
- (3) Theories about the Nature of COVID-19
- (4) The Deep State’s End-Game
- (5) What May Lie Ahead

I am aware that the circumstances, statistics and global responses to COVID-19 will continue to change after this book’s publication, making some of what I report seem defunct later. Nevertheless, I believe a grounding in how this crisis came about will help us better understand and cope with it in the future.

Regarding end-notes: All hyperlinks are accurate as of publication. Unfortunately, due to the Internet’s transient nature, and especially due to censorship, some articles and videos, for which I have provided hyperlinks, will disappear in the future. (In such cases, it may be fruitful to use search engines in an attempt to locate alternate copies of the material. Many videos deleted by YouTube can now be found on <https://www.bitchute.com/> and <https://altcensored.com/>.)

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PART ONE



THE LOCKDOWN

CHAPTER 1

THE ECONOMIC AND HEALTH IMPACT OF THE LOCKDOWN

When this book was published, states had been incrementally coming out of lockdown, but with the caveat that the lockdowns could be prolonged or resumed depending on the course of the pandemic. I do not know, of course, what will occur following publication. But Bill Gates may have given us a clue when he told Stephen Colbert: “Most of the work we’re going to do to be ready for Pandemic Two—I call this Pandemic One—most of the work we’ll do for that are also the things we need to do to minimize the threat of bio-terrorism.”¹ Bill Gates has also stated: “It is fair to say things won’t go back to truly normal until we have a vaccine that we’ve gotten out to basically the entire world.”²

Since President Trump announced the lockdown on Friday the 13th of March 2020, many famous companies have filed for bankruptcy, including J.C. Penney, Neiman Marcus, Gold’s Gym, Pier 1 Imports, and J. Crew. Even the Hertz rental car agency, which had been in business for 100 years, went bankrupt. And many corporations, while still surviving, announced thousands or tens of thousands of layoffs—permanent and/or temporary—including Boeing, GE, United Airlines, Chevron, IBM, Macy’s, Uber, and many others.³ But the worst devastation has been to America’s small businesses, more than 100,000 of which had already closed permanently according to *The Washington Post* of May 12, 2020.⁴

Even before the lockdown began, a survey showed 49 percent of Americans were living paycheck to paycheck.⁵ By the end of May, more than 40 million Americans had filed unemployment claims since mid-March.⁶

(Again, these statistics, like many I cite, will continue to change after this book’s publication.)

Let's consider the implications. People without a job eventually lose their health insurance. Without an income, many will find it impossible to pay mortgages, real estate taxes or (alternatively) pay rent. The \$1200 government stimulus checks couldn't have helped much in this regard. In March 2020 the average monthly rent for a one-bedroom apartment in Boston was over \$2,500,⁷ meaning the bailout would cover rent for about 2 weeks. Of course, it's not just mortgages and rent, it's utilities, groceries, and other necessities.

According to a 2019 study by *The Ascent*, 52 percent of Americans had, at some point, maxed out on their credit cards,⁸ meaning that during the lockdown many people couldn't even resort to credit to buy essentials. Breadlines began forming in America,⁹ which increasingly resembles the old Soviet Union. Meanwhile farmers who supply restaurants, schools and theme parks were forced to throw away thousands of acres of rotting crops.¹⁰

According to the American Psychological Association—before the lockdown—the number one cause of stress in America was money problems.¹¹ Imagine how much the lockdown has amplified that. And as the quarantine forces distressed people to stay together constantly, domestic abuse cases have spiked. The *New York Times* already reported on April 6:

In Spain, the emergency number for domestic violence received 18 percent more calls in the first two weeks of lockdown than in the same period a month earlier.... On Thursday, the French police reported a nationwide spike of about 30 percent in domestic violence.¹²

Calls to suicide hotlines were up 600 percent, and liquor sales 300 to 600 percent, according to a May letter sent to President Trump by more than 500 doctors, urging him to end the lockdown, which they called a “mass casualty incident.”¹³

Health care providers in Michigan filed a lawsuit against Governor Gretchen Whitmer as her unprecedented lockdown was threatening the lives of many non-COVID patients across the state by denying them needed surgeries and preventative care. Jordan Warnsholz, an owner of two of the

plaintiffs, Wellston Medical Center and Primary Health Services, said: “Not only has this shutdown harmed my employees and my practice, but it has put my patients directly at risk. These oppressive executive orders are meant to save lives, but instead, they are endangering many of them.”¹⁴

Dr. Mohammad Iqbal Adil, Consultant General, laparoscopic and colorectal surgeon for the United Kingdom’s National Health Service, noted:

What impact has the NHS had as a result of this coronavirus? Most of the hospitals have gone empty, all the elective work has been cancelled. There is no endoscopy, no cystoscopy, no flexible sigmoidoscopy, and no gastroscopy happening. All the elective operations including bowel and lung cancers . . . have been cancelled. These patients are accumulating day by day, and the number is ramping up.¹⁵

The BBC reported in June:

Health bosses fear the COVID-19 crisis could see the number of people waiting for NHS treatment double to 10 million by the end of the year.... Cancer Research estimates about 2.4 million people in the UK are waiting for screening, treatment or tests with a potential 23,000 cancers having gone undiagnosed during lockdown.¹⁶

With jobs demolished and the poverty that ensues, crime can also be expected to soar. In fact, there can be little doubt that the massive looting of stores following the George Floyd incident was, to a certain extent, attributable to the massive impoverishment as well as bottled-up emotions of people who had been locked inside too long—what we call “stir crazy.”

The lockdown’s justification was to “protect our health.” But if masses of people lose their health insurance and homes—becoming homeless—will the impact of that be less than COVID-19, a disease which lasts on average two weeks and that, for most people, resembles a mild to moderate case of the flu? (We will greatly amplify on this later.) The threat of mass homelessness had become real by July 2020, when *Reuters* reported:

As the coronavirus began to shut down large swaths of the U.S. economy in March, spiraling millions of Americans into unemployment, a patchwork of state and federal eviction bans were enacted to keep people in their homes. Now those protections are vanishing. Moratoriums have already expired in 29 states and are about to lapse in others.... As many as 28 million people could be evicted in coming months, according to Emily Benfer, a visiting law professor at Wake Forest University who is the co-creator of Princeton University's Eviction Lab, a national research center on evictions.¹⁷

Sure, Uncle Sam can financially “come to the rescue.” But the U.S. government is—officially—over \$25 trillion in debt. There is no treasure in the Treasury, no “reserves” to hand out. Anything the government gives the people it must *take* from the people— either by (1) raising taxes (obviously now impossible) or (2) its favored method: borrowing money from the Federal Reserve, which increases the nation's debt burden and, by expanding the money supply, devalues the dollar, making prices rise.

As the Mises Institute's editors wrote:

The shutdown of the American economy by government decree should end. The lasting and far-reaching harms caused by this authoritarian precedent far outweigh those caused by the COVID-19 virus. The American people—individuals, families, businesses—must decide for themselves how and when to reopen society and return to their daily lives.

Neither the Trump administration nor Congress has the legal authority to shut down American life absent at least baseline due process. As Judge Andrew Napolitano recently wrote, business closures, restrictions on assembly and movement, and quarantines are not constitutionally permissible under some magic “emergency” doctrine. At a minimum, the federal government must show potential imminent harm by specific infected individuals at some form of hearing or trial.

These due process requirements are not suspended.¹⁸

That brings us to the next human implication of the lockdown.

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CHAPTER 2

DESTRUCTION OF CIVIL LIBERTIES

Benjamin Franklin said, “Those who would give up essential liberty, to purchase a little temporary safety, deserve neither liberty nor safety.”

Thanks to the “Controlavirus,” martial law has overtaken the planet, curtailing freedom, virtually empowering governments to the point of totalitarianism. Here in America, planks in the Bill of Rights have been shredded. Officially, these prohibitions on rights have not been revoked permanently, but they nevertheless represent an unprecedented flirtation with dictatorship. I will use past tense to describe these restrictions; some may be either relaxed or tightened following this book’s publication. But I am not confident they will improve much.

- Freedom of worship: At the lockdown’s height in the spring, religious services were forbidden. Gatherings for worship, corporate prayer and religious studies were curtailed, except for online substitutes such as livestreams and Zoom meetings. This appears to be the first time that Easter services had been globally cancelled since Constantine legalized Christianity in the fourth century AD. Even though services have been phased back in, severe restrictions remain on churches, such as the attendance far below capacity and members, including choirs, compelled to wear masks.

On April 10, Kentucky Governor Andy Beshear announced plans to record the license plate numbers of Easter churchgoers and force them into self-quarantine for 14 Days.¹ Fortunately, a judge overturned the edict.

Less fortunate was Greenville, Mississippi, where police cars descended on King James Bible Baptist Church for scheduling a “drive-up” Easter service.” Even though churchgoers were observing social distancing, they were fined \$500 each.² A video of the fiasco was taken by Pastor Charles E.

Hamilton, Jr., who noted that in Greenville, that many police cars didn't show up for murders or drug busts.³

- The right to peaceably assemble: A number of states restricted gatherings to ten persons, with “stay at home” requirements or advisories in effect for “non-essential travel.” In a worst-case scenario, Michigan governor Gretchen Whitmer issued orders forbidding anyone from even visiting a friend or family member unless they were a caregiver.⁴

- “The right to a speedy and public trial,” and trial by jury is encoded in the Bill of Rights. Jury trials across the nation have been cancelled or postponed—again, the suspensions are supposedly temporary, but how close are we to acclimating people to eliminating them altogether?

Here are examples of egregious rights violations across the nation:

- A Colorado man was arrested and handcuffed in front of his six-year-old daughter for playing softball with her, which allegedly violated “social distancing” requirements. Noteworthy, the police themselves were not wearing masks and violated social distancing in making the arrest.⁵

- Residents of Cameron County, Texas, faced a \$1,000 fine for not wearing “some form of covering over their nose and mouth.”⁶

- In Sedgwick County, Kansas—emulating the old Soviet Union—citizens were encouraged to use online forms to “snitch” on neighbors who might be violating “stay-at-home” mandates or operating “non-essential businesses.”⁷

- Indiana’s Howard County ordered businesses to stop selling “non-essential” goods, including *books*. So book-burning became part of the “medical martial law” paradigm.⁸

- On May 5, Shelley Luther was ordered to be jailed for seven days and fined \$7,000 for reopening her Dallas hair salon in defiance of lockdown restrictions.⁹ She was released from jail after the case received nationwide attention.

- On May 13, in a scene becoming all too typical, police threw a New York mom onto a subway station floor, and handcuffed her in front of her small child, not because she wasn't wearing a mask, but because she wasn't wearing it *properly*.¹⁰

- Google is reporting people’s movements to the government to track whether “social distancing” and limits on social gatherings are obeyed.¹¹ Meanwhile, the White House held a teleconference with execs from Amazon, Apple, Facebook, Google, Microsoft and Twitter to “help battle coronavirus,” including “discussion about how to stop the spread of coronavirus conspiracy theories.”¹²

Overseas, the situation is often worse.

- In Singapore, sitting or standing too near another person was made punishable by prison terms of up to 6 months and fines of up to \$7,000.¹³

- In Tunisia, remotely controlled “robocops” enforced lockdown rules and demanded to see people’s travel permits.¹⁴

- In Greece, Orthodox Bishop Seraphim Stergiulis was arrested for keeping his church open for worship.¹⁵

- In Britain, police set up online forms so people could “snitch” on neighbors who violated lockdown orders.¹⁶

- Paris banned outdoor exercise during daytime hours.¹⁷

- The Danish Parliament passed a draconian law authorizing the government to test, quarantine and vaccinate citizens without their consent.¹⁸

- On May 9, an Australian mother, who was very peacefully protesting the lockdown’s violation of civil liberties, was arrested and her young son torn away from her.¹⁹

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CHAPTER 3

WAS THE LOCKDOWN NECESSARY? EXPERTS SPEAK OUT

Let's now give voice to some of the eminent medical scholars who have opposed the lockdown.

Infectious disease specialist Sucharit Bhakdi is an emeritus professor at the Johannes Gutenberg University in Mainz, Germany, and for more than 20 years was head of the Institute for Medical Microbiology and Hygiene there, In March 2020, he was interviewed on COVID:

Bhakdi: When patients concurrently have other illnesses, an infectious agent must not be held solely responsible for a lethal outcome. This happens for COVID-19, but such a conclusion is false and gives rise to the danger that other important factors are overlooked. . . .

Interviewer: The highest alert level has been proclaimed and extreme preventative measures have been installed in the desperate attempt to retard spread of the virus.

Bhakdi: Yes, and this is the incredible tragedy. Because these adopted measures are actually senseless.... We have 10,000 infections reported. 99.5 percent have no or only mild symptoms. . . . "Infection" is not identical with "disease." . . .

Interviewer: So what do you think about these measures?

Bhakdi: They are grotesque, absurd and very dangerous.... The life expectancy of millions is being shortened. The horrifying impact on the world economy threatens the

existence of countless people. The consequences on medical care are profound. Already services to patients in need are reduced, operations cancelled, practices empty, hospital personnel dwindling. I can only say: All this will impact profoundly our whole society. All these measures are leading to self-destruction and collective suicide, based on nothing but a spook.¹

Professor Klaus Püschel, head of forensic medicine in Hamburg, explained about COVID-19:

This virus influences our lives in a completely excessive way. This is disproportionate to the danger posed by the virus. And the astronomical economic damage now being caused is not commensurate with the danger posed by the virus. I am convinced that the Corona mortality rate will not even show up as a peak in annual mortality. In Hamburg, for example, not a single person who was not previously ill had died of the virus: All those we have examined so far had cancer, a chronic lung disease, were heavy smokers or severely obese, suffered from diabetes or had a cardiovascular disease. The virus was the last straw that broke the camel's back, so to speak. COVID-19 is a fatal disease only in exceptional cases, but in most cases it is a predominantly harmless viral infection.²

Early during the pandemic (March) some common sense came from Dr. Vernon Coleman, MD, of the UK.

The panic and the hysteria are wildly overblown. There really isn't any need to stop all non-urgent operations and there's no need to close shops and cafes and put people out of work, which is what's going to happen; the economies all around the world are going to be in a terrible state. Loads of people are going to lose their jobs, and when people lose their jobs, then the death rate goes up; there's a well-known correlation between unemployment and death rates.³

In May he stated:

The evidence makes it clear to me that we're being manipulated. Here's a summary of some of the reasons why I'm convinced. First, in the UK, the government's advisors ruled back in March that the corona virus was not a high consequence infectious disease. That's the official wording. . . .

Other media were quite happy to ignore it. They didn't seem to think it was significant. I didn't see any note of it on the BBC's website, for example. . . .

Second, within days of this reassuring news when the country, and indeed the world, should have been celebrating our good fortune, that the corona virus was not going to kill us all, the UK government published its 358-page emergency bill and put the country into lockdown, as though it were the plague we were dealing with.

Third, the total number of alleged coronavirus deaths at the moment... around the world is approximately 300,000, though there are many people like me who rather suspect that this figure may be a little lower in reality—I'm trying to be very tactful to keep this video on air for a bit longer....

Every death is a tragedy, but we have to look at things in perspective and we have to remember that in an average sort of flu season, a bad flu can kill 650,000 people. That's twice as many, of course; even the mathematical modelers could probably work that out, and in an average bad sort of year tuberculosis can kill one and a half million people.

I don't remember any country being put into lockdown or introducing social distancing in a bad flu year or because of tuberculosis, or indeed, malaria, which also kills quite a lot of people.

Fourth, all opposition to the establishment's viewpoint is being silenced, the videos are being removed and very little coverage is given to the sort of news that I try to provide you

with and certain other people. The main news outlets don't seem interested in providing a balanced viewpoint.⁴

Dr. Joel Kettner, former Manitoba Chief Provincial Public Health Officer:

I want to say that in 30 years of public health medicine, I have never seen anything like this, anything anywhere near like this. I'm not talking about the pandemic, because I've seen 30 of them, one every year. It is called influenza. And other respiratory illness viruses, we don't always know what they are. But I've never seen this *reaction*, and I'm trying to understand why.⁵

Pulmonary physician Dr. Wolfgang Wodarg, after pointing out that coronaviruses have typically been part of the makeup of respiratory illness, said:

The Chinese government made something really big out of it, suddenly this was very important politically—completely exceeding the virological frame. All of a sudden, face recognition was installed everywhere at the airports, fever was being measured. The clinical thermometer controlled the traffic on Chinese streets. And all this was so significant that it led to international consequences....

The governments asked their own virologists and they confirmed that this virus is a thing to worry about and proposed to develop tests to help measure the virus, like in China....

A network of information and opinions has been developed in certain expert groups. And the politicians turned to these expert groups, who initially started all this. And they really absorbed this network, moved within it. This led to politicians who now are just resting on these arguments, while using these arguments to evaluate who has to be helped, to determine safety measures or what has to be permitted.

All these decisions have just been derived from these arguments. This means that now it's going to be very hard for critics to say "Stop. There is nothing going on." And this reminds me of this fairytale about the king without clothes on. And just a small child was able to say "Hey, he is naked!"

All the others on the courtyard—surrounding the government and asking the government for advice because they can't know themselves—they all played along and joined the hype. And like this, politicians are being courted by many scientists. Scientists who want to be important in politics because they need money for their institutions. Scientists who just swim along in this mainstream and also want their part... "We can help too!" "We made an app!" "We have a program for this!"

So many people saying "Hey, we want to help too!" because they want to earn money with it and become important. And what is missing at the moment is a rational way of looking at things. We should ask questions like "How have you found out that the virus is dangerous?" "Didn't we have the same thing last year?" "Is it even something new?" That's missing. And the king is naked.⁶

Dr. David Katz, physician and founding director of the Yale University Prevention Research Center:

I am deeply concerned that the social, economic and public health consequences of this near-total meltdown of normal life—schools and businesses closed, gatherings banned—will be long-lasting and calamitous, possibly graver than the direct toll of the virus itself. The stock market will bounce back in time, but many businesses never will. The unemployment, impoverishment and despair likely to result will be public health scourges of the first order.⁷

For 20 years, Dr. Knut Wittkowski was Head of Biostatistics, Epidemiology, and Research Design at Rockefeller University's Center for

Clinical and Translational Science. Interviewed by *The Press and The Public Project* in April 2020, he stated:

With all respiratory diseases, the only thing that stops the disease is herd immunity. About 80% of the people need to have had contact with the virus, and the majority of them won't even have recognized that they were infected, or they had very, very mild symptoms, especially if they are children. So, it's very important to keep the schools open and kids mingling to spread the virus to get herd immunity as fast as possible, and then the elderly people, who should be separated, and the nursing homes should be closed during that time, can come back and meet their children and grandchildren after about four weeks when the virus has been exterminated....

We are experiencing all sorts of counterproductive consequences of not well-thought-through policy.... We will see maybe a total of fewer cases—that is possible. However, we will see more cases among the elderly, because we have prevented the school children from creating herd immunity. And so, in the end, we will see more death because the school children don't die, it's the elderly people who die, we will see more death because of this social distancing....

If we had herd immunity now, there couldn't be a second wave in autumn... However, if we are preventing herd immunity from developing, it is almost guaranteed that we have a second wave as soon as either we stop the social distancing or the climate changes with winter coming or something like that.... [Extreme reactions] cost the US taxpayer \$2 trillion, in addition to everything else that it costs, but it also has severe consequences for our social life, and depression is definitely something that we will be researching. I can say for myself, walking through New York City right now is depressing....⁸

Dr. Wittkowski's interview was swiftly censored by YouTube. Michael T. Osterholm, regents professor and director of the Center for Infectious Disease Research and Policy at the University of Minnesota:

Consider the effect of shutting down offices, schools, transportation systems, restaurants, hotels, stores, theaters, concert halls, sporting events and other venues indefinitely and leaving all of their workers unemployed and on the public dole. The likely result would be not just a depression but a complete economic breakdown, with countless permanently lost jobs, long before a vaccine is ready or natural immunity takes hold.
...

[T]he best alternative will probably entail letting those at low risk for serious disease continue to work, keep business and manufacturing operating, and "run" society, while at the same time advising higher-risk individuals to protect themselves through physical distancing and ramping up our health-care capacity as aggressively as possible. With this battle plan, we could gradually build up immunity without destroying the financial structure on which our lives are based.⁹

The internationally renowned virologist Dr. Karin Mölling was director of the Institute for Medical Virology at the University of Zurich until 2008. She said:

The 2018 influenza epidemic, with 25,000 deaths, never disconcerted the press. The clinics had to deal with an additional 60,000 patients, which was no problem in the clinics either! . . .

It's [the curfew] the only thing I'm afraid of. It is wrong! That's why I'm speaking out.... We are presented with numbers that are frightening. They do not put them in relation to other numbers. Then my taxi driver tells me that he will perish if he has to close his business, and might as well hang himself. You have to put that into consideration as well. I am

not an economist. I only hear the voice of the people. They all say: Do something! I just want to prevent the curfew....

I was asked on TV what I thought about old people going for a walk. I can only say: Yes, they should do it. Fresh air is good, that dilutes; anyone can imagine that. The second thing that's good about it is the sun. Ultraviolet light kills viruses. This is good in children's playgrounds; it is good for children when they do sports outside. It's good outside! . . .

It is important to isolate and protect the old. Then fresh air and UV as much as possible. Furthermore, open kindergartens and schools instead of plunging the young families into chaos. Schools are the best place to put them all together and where you know how the infection chain works. You can control that and you can react....

And under no circumstances a curfew! People should go to restaurants, at their own risk. When the weather is nice, you can't shut people in. I hear that in the family: Where should the children go in nice weather? You can only do that for a week, or at most two. Immunity also has to be built up, only contact allows that.¹⁰

Leading virologist Hendrik Streeck has stated that there is no proof coronavirus can be spread while shopping.¹¹

Concerning the closing of schools, Scott Atlas, MD, observed: "There's no science whatsoever to keep K-through-12 schools closed, nor to have masks or social distancing on children, nor to keep summer programs closed," "What we know now is that the risk of death and the risk of even a serious illness is nearly zero in people under 18."¹²

In May the *Moscow Times* reported:

Russia's head of coronavirus information has suggested that global anxiety over the pandemic is misplaced . . . Doctor and television presenter Alexander Myasnikov was appointed in April to his new role of informing Russians about coronavirus

treatment and prevention methods and to battle “fake news” about COVID-19....

In an interview that aired Wednesday, Myasnikov gestured for the cameras to stop running and said candidly: “It’s all bullsh*t. It’s all exaggerated. It’s an acute respiratory disease with minimal mortality,” he told television personality Ksenia Sobchak in the interview for her YouTube project.

“Why has the whole world been destroyed? That I don’t know,” Myasnikov said, adding that he’s more concerned about a second wave that he claimed “we’re unprepared for.”¹³

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CHAPTER 4

THE SOCIAL DISTANCING AND MASK CONTROVERSIES

As social distancing and masks became twin icons of the lockdown, it's important to hear the medical professionals speaking against them.

On her YouTube channel, Sam Bailey, MD, discussed social distancing:

[I]n my home country, New Zealand, we have to remain at home in our social bubbles. We can leave our house if we need to go to the supermarket, pharmacy, if you are an essential worker or to exercise. You cannot go swimming, hunting, tramping or do anything that may put extra strain on emergency services. You cannot talk to anyone outside of your social bubble at a distance of less than two meters which includes family, friends and co-workers. And lately when I've gone for a walk or run, I noticed people don't even want to make eye contact, and they often cross the street or act panicked and move away from you like you have leprosy.

The first time I went to the supermarket after we went into lockdown three weeks ago, I saw someone wearing a gas mask. Now why would someone want to wear a gas mask at a supermarket? I'd presume that it's either a practical joke or it's because they are scared and think that they might die from an infection that is hanging around in the air. I don't blame that person for feeling scared, as most people don't understand what the medical risks are to them. We're bombarded every day by the media about how dangerous it is when people don't practice social distancing. So I decided to look into this myself, as I wanted to understand what scientific literature is behind social distancing....

So what's the science behind social distancing? There's one systematic review article that looked at how effective social distancing is in reducing the spread of influenza. It looked at 12 modeling and three epidemiological studies. Unfortunately, all three epidemiological studies were highly biased, and therefore the results are not usable, and if you have any familiarity with computer modeling, you'll understand how highly unreliable these results can be. If you have to plug in hundreds if not thousands of variables, the end result can be manipulated by changing the variables that are included in the study. Examples of recent computer modeling gone wrong is from the Imperial College of London, who estimated the risk of infection and death from coronavirus to be 131 times greater than it actually has turned out to be . . . The modeling studies support social distancing in non-healthcare workplaces, but I am highly dubious that these models play out in reality. There have been no observational studies on real human beings to determine if social distancing works. Please let me emphasize that I am *not* talking about the evidence for quarantine or self-quarantine [of sick people], which is different to social distancing and physical distancing....

What I personally believe is far more troubling is social isolation and the generalized suspicion we have for our neighbors, our friends, co-workers and strangers on the street. Many studies have been done on social isolation, and long-term it increases the risk of premature death, while short periods of isolation can cause increased anxiety or depression that start within days. We are social creatures that have evolved over millennia to be in family structures and groups. and we rely on that interaction with other human beings. I believe more is needed than just social media, which can never replace a cup of coffee in person with a friend.¹

As far as the need for outdoor social distancing goes, a Chinese study of COVID-19 examined 318 outbreaks; of these, it found that only one began

in an outdoor environment, and that outbreak only infected two people.² This is not surprising, since sunlight is a potent destroyer of viruses, including—scientists say—COVID-19.³

By June 15, Britain's *The Telegraph* could report:

The two-metre rule has no basis in science, leading scientists have said as the Government comes under increasing pressure to drop the measure. Writing for *The Telegraph*, Professors Carl Heneghan and Tom Jefferson, from the University of Oxford, said there is little evidence to support the restriction and called for an end to the “formalised rules.” The University of Dundee also said there was no indication that distancing at two metres is safer than one metre.... Examining the current evidence for the two-metre rule, Prof. Heneghan and Prof. Jefferson looked at 172 studies cited in a recent review in *The Lancet* and found just five had dealt explicitly with coronavirus infection in relation to distance. Only one mentioned coming within six feet of a patient, and that paper showed proximity had no impact.⁴

Epidemiologist Dr. Gerald Evans, medical director of infection control at Kingston (Ontario) Health Sciences Centre:

To get infected with this virus, you have to be in close contact with another person (and) that contact has to be for a significant amount of time. It's not 10 or 15 minutes, it's hours. It needs to be in a closed environment, a house, and in the environment, there has to be a significant amount of contamination.⁵

In May 2020, *The New England Journal of Medicine* had this to say about social distancing and masks:

We know that wearing a mask outside health care facilities offers little, if any, protection from infection. Public health authorities define a significant exposure to Covid-19 as face-to-face contact within 6 feet with a patient with symptomatic

Covid-19 that is sustained for at least a few minutes (and some say more than 10 minutes or even 30 minutes). The chance of catching Covid-19 from a passing interaction in a public space is therefore minimal. In many cases, the desire for widespread masking is a reflexive reaction to anxiety over the pandemic.⁶

Regarding masks, Russell Blaylock, MD, noted:

As for the scientific support for the use of face masks, a recent careful examination of the literature, in which 17 of the best studies were analyzed, concluded that, “None of the studies established a conclusive relationship between mask/respirator use and protection against influenza infection.” Keep in mind, no studies have been done to demonstrate that either a cloth mask or the N95 mask has any effect on transmission of the COVID-19 virus. Any recommendations, therefore, have to be based on studies of influenza virus transmission. And, as you have seen, there is no conclusive evidence of their efficiency in controlling flu virus transmission.

It is also instructive to know that until recently, the CDC did not recommend wearing a face mask or covering of any kind, unless a person was known to be infected, that is, until recently. Non-infected people need not wear a mask. When a person has TB we have them wear a mask, not the entire community of non-infected. The recommendations by the CDC and the WHO are not based on any studies of this virus and have never been used to contain any other virus pandemic or epidemic in history.

Now that we have established that there is no scientific evidence necessitating the wearing of a face mask for prevention, are there dangers to wearing a face mask, especially for long periods? Several studies have indeed found significant problems with wearing such a mask. This can vary from headaches, to increased airway resistance, carbon dioxide

accumulation, to hypoxia, all the way to serious life-threatening complications.⁷

(In the article, Blaylock cites the specific studies.)

In a post called “We Must Wear Face Masks? Show Me the Science Behind That!” Dr. David Brownstein, M.D., wrote (providing citations):

Folks, I have been writing to you about COVID for over a month. It is been a painful time period for all of us. What is really sad is that *too many political dictates are being fostered on us without any good scientific evidence to back them up*. One of those requirements that has me irritated is the use of face coverings that I see so prevalent out there. When I go to Costco, 95% of the people in the store are wearing face masks. Why is that? . . .

It should be well known that cloth masks, bandanas, or handkerchiefs will do very little to stop the spread of coronavirus. In fact, they may actually increase your risk of becoming ill from corona and other influenza-like illnesses. A 2015 study found cloth masks, when compared to surgical masks, increase the rate of influenza-like illnesses 13x! Cloth masks are probably best avoided and should not be reused without properly sanitizing them.

Regular surgical masks are not much better in this situation. The COVID-19 virus is 0.125 μm in size. Surgical masks have been shown to not adequately filter against aerosols measuring from 0.9-3.1 μm . Other researchers have shown that particles from 0.04-0.2 μm can penetrate surgical masks.

A 2020 study in Seoul, South Korea looked at the effectiveness of surgical and cotton masks in blocking COVID-19 in a controlled comparison of four patients. The COVID-infected patients were put in negative pressure isolated rooms. The scientists compared disposable surgical masks (3 layers) with reusable cotton masks. Patients were instructed to cough 5 times while wearing no mask, surgical mask, or cotton mask.

Interestingly, all swabs from the outer masks—including surgical masks—were positive for COVID-19. Inner masks were also found to be contaminated. That means the mask did not effectively filter out the COVID virus since it is too small. The authors state, “Neither surgical nor cotton masks effectively filtered [COVID-19] during coughs by infected patients.”⁸

In his article “Masks Don’t Work: A Review of Science Relevant to COVID-19 Social Policy,” Denis G. Rancourt, PhD, writes:

Masks and respirators do not work. There have been extensive randomized controlled trial (RCT) studies, and meta-analysis reviews of RCT studies, which all show that masks and respirators do not work to prevent respiratory influenza-like illnesses, or respiratory illnesses believed to be transmitted by droplets and aerosol particles.

After citing seven RCT studies from the scientific literature, Rancourt concludes:

No RCT study with verified outcome shows a benefit for HCW [health care workers] or community members in households to wearing a mask or respirator. There is no such study. There are no exceptions.⁹

Dolores Cahill, PhD, the eminent immunologist from University College, Dublin, has stated: “There is absolutely no basis for social distancing.”¹⁰ In an interview with Del Bigtree, she displayed the following table:

SHOULD YOU REALLY WEAR A MASK?	Corona	Ebola
Death	SARS-COV1 2003: 800 globally SARS-COV2 2020: 1 in 1,000	1976: 8,800 in 10,000 2014: 3,300 in 10,000
Transmission	Not through the air.	Through the air.
Is there a licenced vaccine	No - since 2003	No - since 1976
Age range most affected	Over 80	All ages
Age range not affected	Children	-
Are masks effective to stop spread of infection?	No	Yes
Is there a pathway to reduce symptoms?	Nutrition, Zinc, Vit. C, Vit. D	No
Is there a treatment?	Hydroxychloroquine AZT, Zinc	No
How long has it been prevalent?	2003 SARS-COV-1	1976 Ebola River, Democratic Republic of Congo
Is there a vaccine?	No	No

She stated:

There's a table that just compares coronaviruses with Ebola viruses, so if it was an Ebola virus outbreak, then a mask would be effective because Ebola virus is transmitted through the air. But in the case of coronavirus, it's not transmitted through the air, it's transmitted through droplets that would then drop on a surface like a door handle. So in coronavirus there is absolutely no need to wear a mask.... I entirely agree with Professor Blaylock, who has an outstanding track record and is very experienced in this area. Because the mask is covering you, you have less oxygen and that puts your immune system under stress... and not only will you have more coronavirus, but if you had other latent viruses it would allow them to reemerge.¹¹

Early during the pandemic, even the World Health Organization admitted that masks weren't needed for the healthy. As Fox News reported:

“If you do not have any repository symptoms such as fever, cough or runny nose, you do not need to wear a mask,” Dr. April Baller, a public health specialist for the WHO, says in a video on the world health body's website posted in March. “Masks should only be used by health care workers, caretakers or by people who are sick with symptoms of fever and cough.”¹²

Switzerland's Beda M. Stadler, former director of the Institute for Immunology at the University of Bern, a biologist and professor emeritus, writes:

The next joke that some virologists shared was the claim that those who were sick without symptoms could still spread the virus to other people. The “healthy” sick would have so much of the virus in their throats that a normal conversation between two people would be enough for the “healthy one” to infect the other healthy one.... But for doctors and virologists to twist this into a story of “healthy” sick people, which stokes panic and was often given as a reason for stricter lockdown measures, just shows how bad the joke really is. At least the WHO didn't accept the claim of asymptomatic infections and even challenges this claim on its website.... Those young and healthy people who currently walk around with a mask on their faces would be better off wearing a helmet instead, because the risk of something falling on their head is greater than that of getting a serious case of Covid-19.¹³

Daniel W. Erickson, MD, and Artin Massihi, MD, of Accelerated Urgent Care in Bakersfield, California, stated in a press briefing on COVID-19:

I'd like to go over some basic things about how the immune system functions so people have a good understanding. The immune system is built by exposure to antigens: viruses, bacteria. When you're a little child crawling on the ground, putting stuff in your mouth, viruses and bacteria come in. You form an antigen antibody complex. You form IgG IgM. This is how your immune system is built. You don't take a small child, put them in bubble wrap in a room and say, “go have a healthy immune system.”

This is immunology, microbiology 101. This is the basis of what we've known for years. When you take human beings and you say, “Go into your house, clean all your counters—Lysol

them down, you're gonna kill 99% of viruses and bacteria; wear a mask; don't go outside. What does it do to our immune system?"....

Sheltering in place decreases your immune system. And then as we all come out of shelter in place with a lower immune system and start trading viruses, bacteria—what do you think is going to happen? Disease is going to spike. And then you've got diseases spike—amongst a hospital system with furloughed doctors and nurses. This is not the combination we want to set up for a healthy society. It doesn't make any sense....

Do you think you're protected from COVID when you wear gloves that transfer disease everywhere? Those gloves have bacteria all over them. We wear masks in an acute setting to protect us. We're [Doctors Erickson and Massihi] not wearing masks. Why is that? Because we understand microbiology; we understand immunology; and we want strong immune systems. I don't want to hide in my home, develop a weak immune system, and then come out and get disease.¹⁴

OSHA (the Occupational Safety & Health Administration) states: "While normal atmosphere contains between 20.8 and 21 percent oxygen, OSHA defines as oxygen deficient any atmosphere that contains less than 19.5 percent oxygen."¹⁵ In June 2020, Ohio State Senator Nino Vitale, using an RKI GX 2009 oxygen sensor, made by RKI Instruments, conducted an outdoor test with several students wearing different types of masks. The sensor showed atmospheric oxygen at 20.9, but when it was placed under the masks, it registered between 17.1 and 18.1 percent oxygen, well below OSHA's safety standard. The video can be viewed on the YouTube channel *Citizens Journalist for Truth* at <https://www.youtube.com/watch?v=mMrYvyS8k94>.

Seen on Facebook:



Doc Graham

Yesterday at 7:36 PM · 🌐

MASKS! Folks, let a surgeon of 30 years (a.k.a. me) teach you about MASKS. COVID 19 virus particle size averages 125 nanometers (0.125microns); the range is 0.06 microns to .14 microns; one needs an electron microscope to see a COVID 19 virus particle. The hoarded N 95 mask filters down to 0.3 microns. So, N95 masks block few, if any, virions (virus particles). This is a simple fact, so you just cannot argue against it. Other surgical masks, home-made masks and kerchiefs do the following: 1) the allow free passage both ways (in and out) of COVID 19 virions. 2) they become a warm, damp or moist reservoir of COVID 19 particles in asymptomatic "carriers" (estimated to be 85% of all people tested). For surgeons, years of training, intimidation, and humiliation teach us to touch NOTHING but our surgical field. Lay people constantly touch, re-arrange, and manipulate their "masks", wonderfully inoculating thousands of virus particles onto their bare or (even worse, gloved) hands. So, these absurd masks ENCOURAGE the fomite transmission ("infected" articles-to-hand-to face transmission of the virus). So, go ahead and allow idiots to delude and mislead you to the false sense of security--and danger--of masks!

On April 24, 2020, the *New York Post* reported:

A New Jersey driver crashed head-on into a pole—after passing out from wearing an N95 mask for hours, police said Friday. Lincoln Park police believe that the driver, who was not named, lost consciousness while behind the wheel Thursday from lack of oxygen and breathing in excessive carbon dioxide thanks to the mask, the department wrote on Facebook.¹⁶

Mandatory masks also impede the recovery of abducted and trafficked “milk carton” children, since they make identification of the missing far more difficult.

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PART TWO

THE METHODOLOGY OF PANIC

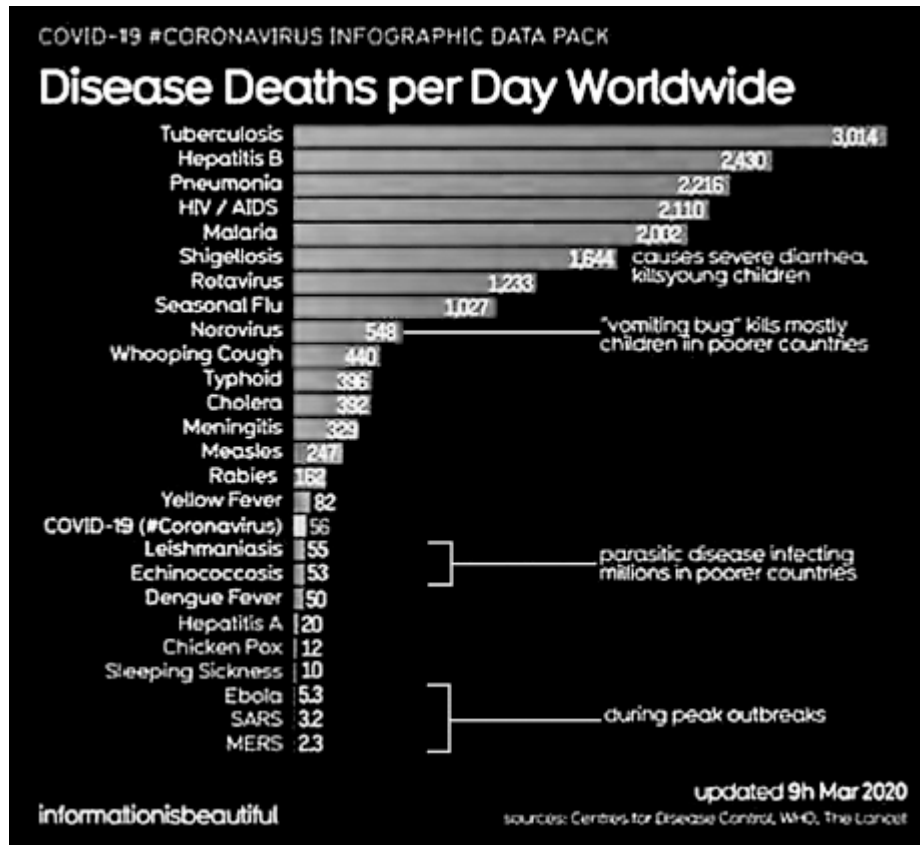
CHAPTER 5

PUTTING COVID-19 IN PERSPECTIVE

The graph below was taken from statistics on the *Worldometer* website. It shows death by cause through March 25 of 2020, or almost two weeks after the U.S. lockdown began. Clearly, coronavirus's impact, while significant, was still small relative to other causes, including other infectious diseases.



And here's a graph of deaths by pathogen, from the *Information is Beautiful* website. It's a little older (March 9) than the previous graph, but it shows COVID-19 only ranked 17th in the world for infectious disease deaths when the world was locking down.



Obviously, using these graphs can be criticized, since COVID deaths have risen since they were compiled. Nevertheless, they give us perspective. Furthermore, as we will soon see, various factors have caused the number of COVID-19 deaths to be artificially inflated.

Now let's put COVID in a broader historical context. The CDC's website maintains annual statistics for each flu season in the U.S.; typically tens of thousands die each year. According to the CDC, the 2017-18 flu season saw an estimated 45 million flu cases, resulting in 21 million doctor visits, 810,000 hospitalizations and 61,000 deaths.¹

Where was the media panic? Where were the headlines saying "4,000 new flu cases reported in Kansas"? Why no lockdown?

Looking back further, the CDC says the Asian Flu of 1957-58 killed 1.1 million worldwide and 116,000 in the United States,² and the 1968 Hong Kong Flu killed one million worldwide and about 100,000 in the U.S.³

Even if we accept the official COVID-19 death totals at face value, those older numbers were still greater. Furthermore, since world population

was 2.8 billion in 1957 and 3.5 billion in 1968 (compared to 7.8 billion today) the earlier death rates represented a much higher percentage of population. Yet no one back then dreamed of locking down economies or quarantining the healthy.

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Chapter 6

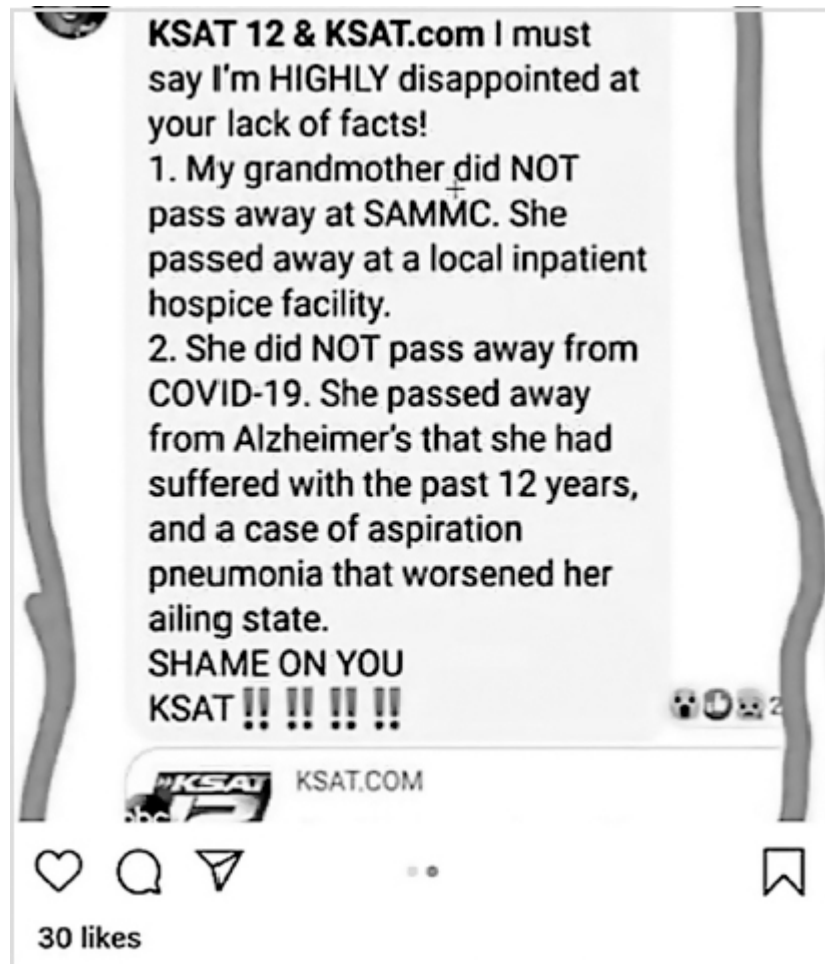
FAKE NEWS STORIES INTENSIFY THE PANIC

Although an orchestrated campaign quickly got underway to censor COVID-19 “fake news” in social media, it would be hard to outdo mainstream media in the “fake news” sweepstakes.

CBS was caught red-handed using Sky News footage of an overcrowded Italian hospital, claiming it was New York.¹ If the pandemic was as bad as mainstream media said, why resort to fakery to convince us?



In San Antonio, station KSAT reported an elderly woman as the first COVID-19 death in that city.² An outraged family member responded on social media (I have cropped out the name to respect their privacy):



Los Angeles health officials had to back off claims that a 17-year-old had died from coronavirus, allegedly the first U.S. juvenile to do so. As *Gateway Pundit* reported:

Remember the 17-year-old Lancaster boy who died from the Coronavirus? The fraudstream media ran searing headlines about the boy's death which was described as the first known "juvenile" to die from the Coronavirus in the US. Well, it turns out this story was a lie. California health officials are now saying they are reevaluating the teen's death, claiming the case is "complex" and needs to be further investigated.... The teenage boy has been dropped from the list of deaths from the Coronavirus in Los Angeles and the CDC will complete the investigation into the boy's death. How many more cases like this are out there?³

In July, *The Washington Free Beacon* reported:

An NBC medical expert who was brought on air nearly a dozen times to detail his struggle with COVID-19 never had the virus, he revealed this week. After believing he had the coronavirus in spite of getting negative tests, virologist and NBC News science contributor Dr. Joseph Fair tweeted Tuesday that he had tested negative for the antibodies and that the illness that hospitalized him in May “remains an undiagnosed mystery.”⁴

Like the media, government spokespersons have been hyping “coronavirus deaths.” Commentator Candace Owens, who has over two million Twitter followers, responded to COVID fakery in her state:

As many of you know, I went absolutely crazy the other day when Governor Ned Lamont of Connecticut tweeted a series of tweets where he essentially said that an infant, the first infant mortality linked to COVID-19, happened in the state of Connecticut.... It was the language that he used that let me know that he was lying. He said “linked to COVID-19,” which was very strange language. You would never use that language in any other regard. You would say that somebody died from a heart attack, you would say that somebody died from cancer or lost their battle with cancer, which is a little more politically correct, but you don’t say “linked to.” It’s very strange language that let me know that this was a form of political doublespeak. I’ve been in politics long enough now to know that when politicians lie, they lie by omitting facts....

I have two sisters that just gave birth for the first time in the last three weeks, so I became a first-time aunt, and they obviously were heavily pregnant when this entire coronavirus thing broke out, and they both gave birth in Connecticut, so this was really a lie that was a bad-luck lie for Governor Lamont, because he couldn’t have hit a bigger nerve or a more personal nerve. I know that both of my sisters have been extremely terrified of this COVID-19 thing, and when both of them

discovered this news about the infant death they understandably freaked out....

Politicians are now lying because they are realizing that the more cases that they have in their state, the more money that they can extract from the federal government.... It is not a coincidence that Illinois and New York and Connecticut and California are the states that are claiming they need the most federal funding. Particularly when you look at New York, you need to do your digging in your research on the healthcare collapse that they were facing before this coronavirus outbreak. Governor Cuomo was having serious budget issues—April 1st was going to be his deadline to figure out where he was going to get the money to sponsor these Medicaid programs that were on the brink of collapse; sixteen hospitals had shuttered since 2003....

I want to limit the details that I give you here, but I can tell you definitively that the infant that died in Hartford, Connecticut, died of a terrible at-home tragedy.... the infant was brought to the hospital, had already succumbed to its injuries, and so this was not a case where they ever even needed to test for COVID-19. It was an open-and-shut case; they knew exactly what happened, but because of a new process, where no matter how someone dies they are tested for COVID-19. We do this for nothing else. If I died today, dropped dead of a heart attack or an asthma attack . . . they are going to test me for COVID-19 and they are going to say that was a COVID-19 death. This is what happened with this infant.
...

It is pointedly ridiculous that Ned Lamont, having known exactly how this infant died ... said that the incident was linked to COVID-19, which naturally made every single mother in this country freak out.... this is something that in my opinion, Governor Ned Lamont should be asked to step down—I think you should go to prison personally, I don't think it's enough to step down—I don't think you get to cause mass hysteria like

that. If someone can go to prison for yelling “fire” in a movie theater, Ned Lamont should have to go to prison for spreading mass hysteria and panic amongst parents by omitting the facts around this case.⁵

As COVID-19 has not, so far, been observed to be deadly to children, another pretext was needed to keep schools closed, and headlines began appearing linking COVID-19 to Kawasaki disease, a systemic inflammatory illness that occurs in children. The UK Kawasaki Disease Foundation responded:

We’ve been contacted by a huge number of families regarding the severe worry caused by social media and other media coverage on COVID-19 and Kawasaki Disease. A lot of these media articles were confused and contained little factual information.... Based on all available information made available so far we note: The cases being referred to have been reported in approximately 20 children in the UK (out of 11.5 million U.K. children)—of whom half have tested *negative* for COVID-19 according to their doctors....Fewer cases of Kawasaki Disease than would be normally expected at this time of year are currently being seen—not more.... We are aware of recent delayed presentations of Kawasaki Disease because of initial incorrect diagnoses of COVID-19, resulting in adverse coronary outcomes due to delayed institution of treatment.⁶

As Ann Coulter asks, “How do we flatten the curve on panic?”⁷

Overseas, the situation can even be worse. As *Fort Russ News* reported in June, in a story documented with video footage:

Members of the Brazilian parliament decided to confirm suspicions and break into a hospital that claimed to have 5,000 infected and 200 deaths from COVID-19, and found that the hospital had grossly over-represented the cases and its claims. There was in fact not a single person, they report, and the

hospital was entirely empty and was obviously still under construction.

Acting on a tip that something was going wrong at this hospital, five members of the Brazil parliament went to hospitals under encouragement by President Bolsonaro to break in and check to see the number of patients there....

The governor is apparently defrauding the state and the nation along with the citizen taxpayers, and lying about the stats. This is possibly an embezzlement scheme to help bring down the country, and to push vaccines based upon inflated numbers of COVID-related deaths.

What was more shocking still was the decision to open the coffins supposedly awaiting transport to be buried, of coronavirus victims. Opening the coffins, the MPs were shocked, but not surprised, when they were found to be empty.⁸

But how is it possible to coordinate inflation of the panic by governments *and* media? Through the power of finance, most governments today are not run by “the people,” but are under behind-the-scenes oligarchical control, or to use the term popular today, *the Deep State*. This is a topic I won’t belabor here, but which I have addressed in my books *Truth Is a Lonely Warrior* and *Thirteen Pieces of the Jigsaw*, and which hundreds if not thousands of other authors have written about. It is not something new. In his 1937 book *America’s 60 Families*. Ferdinand Lundberg, one of the most eminent finance journalists of his day, wrote:

The United States is owned and dominated today by a hierarchy of its sixty richest families.... These families are the living center of the modern industrial oligarchy which dominates the United States, functioning discreetly under a democratic form of government behind which a *de facto* government, absolutist and plutocratic in its lineaments, has gradually taken form since the Civil War. This *de facto* government is actually the government of the United States—

invisible, shadowy. It is the government of money in a dollar democracy.⁹

Lundberg was not a “conspiracy theorist”; he proved what he said through the financial records. The oligarchy Lundberg referred to has increased its power exponentially since 1937. It is international in scope, and controls the central banks and most of the major multinational corporations. As a quick visual example of how politicians are centrally managed, I recommend watching the short YouTube video “Two Prime Ministers, One Speech,” on the *UndefeatedArmy09* channel, URL <https://www.youtube.com/watch?v=nYfDTsjwE58>. In it, the prime ministers of Australia and Canada are seen giving *identical* speeches in 2003 advocating the war in Iraq.

The main reason the oligarchy is generally unknown: it owns, in the United States, more than 90 percent of all major media through five corporations (thanks to mergers, this is down from about 50 corporations in 1983). These five corporations are: Time-Warner; Disney; NewsCorp; CBS/Viacom; and GE. This is not a theory; it can easily be proven. No matter what you are reading or watching, it is likely owned by one of these five. If you watch ABC News, ESPN or Lifetime, you’re watching Disney. If you watch Fox or read the *Wall Street Journal* or a book published by HarperCollins, that’s NewsCorp. If you watch CNN or read *People* or *Sports Illustrated*, that’s Time Warner. These lists could be extended to scores or hundreds for each corporation. Independent mainstream journalism is all but dead in America, and as one evidence for that, people can watch a viral clip of numerous local news anchors—from different networks—reading identical remarks about “fake news” from their teleprompters. This is easy to find on the Internet, but here is one link: “Sinclair’s Script for Stations—This Is Extremely Dangerous to Our Democracy” at the *Project 2501* channel at https://www.youtube.com/watch?v=D9rbHpA_6W4.

This is why more and more people, when seeking information, look to independent journalists (such as Candace Owens, James Corbett, and innumerable others)—journalists motivated by the sincere search for truth instead of corporate salaries paid in exchange for promoting agendas.

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CHAPTER 7

AN IMPORTANT DISCLAIMER

Before proceeding further, I wish to stress: I'm not suggesting COVID-19 is not a serious disease. Though retired from nursing, I have front-line contacts who keep me abreast of the realities. One of these is "Doctor B," an MD who has appeared twice on *SGT Report*. Doctor B (whose name is kept private to protect her practice) is a brilliant physician who is completely "red-pilled" politically. Though at one time a hardcore atheist/feminist, she is today a remarkably dynamic Christian. I've had the privilege of meeting her face-to-face.

During the spring of 2020, I asked Doctor B what was happening at the large urban hospital where she works. She confirmed they had many COVID-19 patients. I asked if more people were dying from it than seasonal flu. She said they were. She said that while most infected people get mild to moderate symptoms, a very small percentage experience an extreme reaction where the virus invades the alveoli (the air sacs where oxygen exchange occurs); a hyper auto-immune reaction afflicts the lungs that can quickly turn deadly. Descriptions of this phenomenon, known as a "cytokine storm," can be found abundantly on the Internet; it is the main characteristic that distinguishes COVID from ordinary flu.

Dr. B. also clarified an important point. I mentioned that a number of people had posted social media videos after walking by hospitals and their ERs, observing how quiet they seemed. As a result, some had concluded that no COVID-19 crisis existed—that it was a hoax.

She noted that these videos were well-intentioned, but misleading. Like the rest of the country's businesses, hospitals were in "lockdown"—cancelling non-essential services, elective surgeries, and preventative care. Clinicians who were able to, worked from home. (I know one cancer patient whose doctor gave her examinations on Zoom.) Meanwhile, many people were terrified to visit an ER, fearing COVID-19. This produced an

externally quiet *appearance*, but she told me that her hospital's ICU was "quite busy, but not overwhelmed" with COVID-19 patients.

Nevertheless, Doctor B harbored no doubt that the COVID-19 outbreak is part of the Deep State's "New World Order" agenda.

In ensuing chapters, we will examine how COVID-19 death rates were artificially inflated. **This does not preclude, however, a future turn of events that could sharply increase actual death rates.** In Chapter 26, we will look at ways by which that could happen.

CHAPTER 8

INFLATING COVID-19 DEATHS: (1) EARLY IN THE PANDEMIC – MISLEADING SAMPLING WEIGHTS AND INACCURATE MODELS

During the early days of the COVID crisis, Vernon Coleman, MD (who I have already quoted) pointed out an obvious flaw in reporting the COVID death rates; disproportionate testing being given to the dying as opposed to those with little or no symptoms:

The death rate for the coronavirus seems to be very high, or at least we're told it's very high, but let's look at how these figures work. If a hundred people have the coronavirus and four of them die, then the death rate is obviously four percent. If a thousand people have the virus and four of them die, the death rate is 0.4 percent, and so on. But they're only testing for the coronavirus in hospitals, and they're only testing seriously ill patients. So it's a pretty obvious fact that there are an enormous number of people in the community who have the coronavirus, but who haven't been tested and haven't been shown to have the coronavirus. Now that means that the death rate is nowhere near as bad as they're saying it is.¹

Remarkably, the controversial Dr. Anthony Fauci, Director of the National Institute of Allergy and Infectious Diseases, agreed. In a March 2020 article for the *New England Journal of Medicine*, which he co-wrote with H. Clifford Lane and Robert R. Redfield, Fauci stated:

Patients had a wide spectrum of disease severity. If one assumes that the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%. This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.²

If, as Dr. Fauci and his colleagues put it, “the overall clinical consequences of COVID-19 may ultimately be more akin to those of a severe seasonal influenza,” why then the lockdown? Should America lock down for every future severe flu, contrary to our practices throughout history?

Neil Ferguson was the lead researcher for the Imperial College doomsday computer model that led the UK to be shut down. Anthony Fauci and Deborah Birx also used Ferguson’s model in persuading President Donald Trump to put the United States in lockdown.³ It may be noteworthy that in 2020 alone, the Gates Foundation has so far given at least \$79 million to Imperial College.⁴

On May 5, Ferguson resigned from his government advisory position after it was revealed that he was ignoring his own lockdown/social distancing rules by carrying on an affair with a married woman.⁵

Furthermore, Ferguson’s computer model—which predicted 2.2 million U.S. deaths from coronavirus—has come under intense fire. As Britain’s *Telegraph* reported in May:

The COVID-19 modelling that sent Britain into lockdown, shutting the economy and leaving millions unemployed, has been slammed by a series of experts.

Professor Neil Ferguson’s computer coding was derided as “totally unreliable” by leading figures, who warned it was

“something you wouldn’t stake your life on.”

The model, credited with forcing the Government to make a U-turn and introduce a nationwide lockdown, is a “buggy mess that looks more like a bowl of angel hair pasta than a finely tuned piece of programming,” says David Richards, co-founder of British data technology company WANdisco.

“In our commercial reality, we would fire anyone for developing code like this and any business that relied on it to produce software for sale would likely go bust.”⁶

As the *National Review* noted:

Indeed, Ferguson has been wrong so often that some of his fellow modelers call him “The Master of Disaster.” . . .

In 2002, Ferguson predicted that, by 2080, up to 150,000 people could die from exposure to BSE (mad cow disease) in beef. In the U.K., there were only 177 deaths from BSE.

In 2005, Ferguson predicted that up to 150 million people could be killed from bird flu. In the end, only 282 people died worldwide from the disease between 2003 and 2009.

In 2009, a government estimate, based on Ferguson’s advice, said a “reasonable worst-case scenario” was that the swine flu would lead to 65,000 British deaths. In the end, swine flu killed 457 people in the U.K.

Last March, Ferguson admitted that his Imperial College model of the COVID-19 disease was based on undocumented, 13-year-old computer code that was intended to be used for a feared influenza pandemic, rather than a coronavirus. Ferguson declined to release his original code so other scientists could check his results. He only released a heavily revised set of code last week, after a six-week delay.

So the *real* scandal is: Why did *anyone ever* listen to this guy?⁷

In April 2020, a Stanford University study put the COVID-19 death rate at just 0.12% to 0.2%.⁸

Following the release of the data, Scott Atlas, MD, published an opinion piece for *The Hill* entitled “The Data Is In—Stop the Panic and End the Total Isolation.” He wrote:

The recent Stanford University antibody study now estimates that the fatality rate if infected is likely 0.1 to 0.2 percent, a risk far lower than previous World Health Organization estimates that were 20 to 30 times higher and that motivated isolation policies.... Let’s stop underemphasizing empirical evidence while instead doubling down on hypothetical models. Facts matter.⁹

A study at Oxford University, updated on May 26, reached a similar conclusion:

Taking account of historical experience, trends in the data, increased number of infections in the population at largest, and potential impact of misclassification of deaths gives a presumed estimate for the COVID-19 IFR somewhere between 0.1% and 0.41%.¹⁰

Nobel Prize-winning scientist Michael Levitt added his voice in an interview video uploaded in May:

I think that everybody panicked. They were fed incorrect numbers by epidemiologists and you know this, I think, led to a situation—there’s no doubt in my mind—when we come to look back on this, the damage done by lockdown will exceed any saving of lives by a huge factor.¹¹

In April 2020, Daniel W. Erickson, MD, and Artin Massihi, MD (whom I have previously quoted), gave a briefing after testing thousands of patients for COVID-19. They reported:

Typically you quarantine the sick. When someone has measles you quarantine them. We've never seen where we quarantine the healthy....

[T]he initial models were woefully inaccurate. They predicted millions of cases of death, not of prevalence or incidence—but *death*. That is not materializing. What is materializing is, in the state of California is 12% positives. You have a 0.03 chance of dying from COVID in the state of California. Does that necessitate sheltering in place? Does that necessitate shutting down medical systems? Does that necessitate people being out of work?... The more you test, the more positives you get. The prevalence number goes up, and the death rate stays the same....

The initial models were so inaccurate they're not even correct. And some of them were based on social distancing and still predicted hundreds of thousands of deaths, which has been inaccurate....

Do we need to still shelter in place? Our answer is emphatically no. Do we need businesses to be shut down? Emphatically no....

We also need to put measures in place so economic shutdown like this does not happen again. We want to make sure we understand that quarantining the sick is what we do, not quarantine the healthy. We need to make sure if you're going to dance on someone's constitutional rights, you better have a good reason. You better have a really good scientific reason, and not just theory.¹²

As an aside, The Erickson-Massih briefings received over five million views before being censored by YouTube. Remarkably, even ABC23 in Bakersfield, California—a mainstream news channel—had its short news segment about the briefings deleted by YouTube.¹³

YouTube CEO Susan Wojcicki stated in an interview with CNN: “Anything that goes against World Health Organization recommendations would be a violation of our policy, and so remove is another really

important part of our policy.”¹⁴ This is of course, absurd, given that the WHO, whose top financial supporter is the Gates Foundation (after the U.S. defunding announced by Trump), has often waffled and changed its own position on COVID issues like face masks and the disease’s contagiousness. How can doctors be censored for contradicting the WHO, when even the WHO contradicts the WHO?

In its article “WHO Exposed: How Health Body Changed Pandemic Criteria to Push Agenda,” Britain’s *Express* reported:

In the years following the [H1N1] pandemic, the World Health Organisation (WHO) faced fierce criticism over its handling of the situation. Some medical experts doubted whether the H1N1 outbreak was really a pandemic at all.

Dr. Wolfgang Wodarg, a German doctor and former member of parliament, had been watching the spread of swine flu in Mexico City—where the virus was first recorded—and was puzzled at the reaction of the WHO. In 2010, he said: “What we experienced in Mexico City was a very mild flu which did not kill more than usual—which killed even fewer people than usual”.... Dr. Wodarg eventually launched an inquiry into the Swine Flu pandemic and the WHO’s dealings with the pharmaceutical industry in the lead up to the H1N1 pandemic. At a council meeting, Dr. Wodarg declared that “all the business deals that had been prepared between individual countries and the pharmaceutical companies were about to be triggered by the WHO.” He added: “The relevant contracts were mostly confidential and the companies insist they should never be published.”

In the months leading up to the WHO’s declaration of the pandemic as a “level 6” contagion—the highest possible level — many countries including Italy, Germany, France and the UK made secret agreements with pharmaceutical companies. These contracts obliged the countries to buy Swine Flu vaccinations only if the WHO raised the pandemic to a level 6.¹⁵

Clearly, the World Health Organization does not deserve to be the exclusive arbiter of medical truths on platforms such as YouTube.

Tucker Carlson of Fox News, reacting to YouTube's censorship of the Erickson-Massih video, remarked: "This is not about science; censorship never is about science, it's about power. Big technology companies are using this tragedy to increase their power over the American population.... That is not what science and open inquiry really is about—that you test theories and then you find out what actually is true."¹⁶

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CHAPTER 9

INFLATING COVID-19 DEATHS: (2) CONFLATING IT WITH OTHER DISEASES

In Chapter 3, I quoted Professor Klaus Püschel:

In Hamburg, for example, not a single person who was not previously ill had died of the virus: All those we have examined so far had cancer, a chronic lung disease, were heavy smokers or severely obese, suffered from diabetes or had a cardiovascular disease. The virus was the last straw that broke the camel's back, so to speak.¹

An April German study puts that country's COVID death rate at 0.37 percent.²

Italy, by contrast, had at one time reported headline-grabbing mortality rates near 10 percent. However, as a *Bloomberg* report clarified:

More than 99% of Italy's coronavirus fatalities were people who suffered from previous medical conditions, according to a study by the country's national health authority. The new study could provide insight into why Italy's death rate, at about 8% of total infected people, is higher than in other countries. The Romebased institute has examined medical records of about 18% of the country's coronavirus fatalities, finding that just three victims, or 0.8% of the total, had no previous pathology. Almost half of the victims suffered from at least three prior illnesses and about a fourth had either one or two previous conditions. More than 75% had high blood pressure, about 35% had diabetes and a third suffered from heart disease. The

average age of those who've died from the virus in Italy is 79.5.³

On April 24, Vittorio Sgarbi, a veteran member of the Italian Parliament, denounced the falsification of COVID-19 statistics in a blazing speech. Excerpts:

We are on the eve of April 25th and we must be united against dictatorships and united in truth. Let us not make this the House of Lies . . . Do not say 25 thousand dead here too, it is not true! Don't use the dead for rhetoric and terrorism. The data from the Higher Institute of Health say that 96.3% died of other diseases.... The 25,000 dead, as Professor Bassetti said, died of heart attacks, cancer and other diseases.... 25 thousand Coronavirus people didn't die in Italy. That's not true! It's a way to terrorize the Italians and impose a dictatorship of consent: it's ridiculous!⁴

In June, a report from Britain's National Health Service revealed that more than 95 percent of all UK "COVID deaths" had pre-existing comorbidities.⁵

This is the norm in America also. People who die from other diseases—cancer, chronic respiratory disease, cardiovascular disease, hypertension, diabetes—are labeled "coronavirus" even though it wasn't the prevailing cause of mortality. As Fox News reported:

The federal government is classifying the deaths of patients infected with the coronavirus as COVID-19 deaths, regardless of any underlying health issues that could have contributed to the loss of someone's life. Dr. Deborah Birx, the response coordinator for the White House coronavirus task force, said the federal government is continuing to count the suspected COVID-19 deaths. . . "The intent ... is if someone dies with COVID-19 we are counting that," she added.⁶

This is happening locally as well as nationally. Dr. Ngozi Ezike, Director of the Illinois Department of Public Health, stated at a press conference:

If you were in hospice and had already been given a few weeks to live, and then you also were found to have COVID, that would be counted as a COVID death. It means technically even if you died of a clear alternate cause, but you had COVID at the same time, it's still listed as a COVID death. So, everyone who's listed as a COVID death doesn't mean that that was the cause of the death, but they had COVID at the time of the death.⁷

Because people who die of other causes, but happen to test positive for COVID-19, are counted as “COVID-19 deaths,” this means the headlines used to panic the public—“latest COVID death totals”—are based on markedly distorted statistics. Lack of an accurate accounting method makes it very difficult to ascertain the true number of U.S. deaths attributable to COVID and not to other more primary conditions. However, if we use the Italian analysis—which determined that well over 95 percent dying with “COVID” had preexisting diseases—then news reports proclaiming 100,000 American COVID deaths might translate, more realistically, to less than 5,000 dying from COVID *alone*. Admittedly this is speculation, since we have been denied honest data, but certainly it's less speculative than the numbers in the “panic headlines.”

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CHAPTER 10

INFLATING COVID-19 DEATHS: (3) DEATH CERTIFICATES

In April, Chris Berg, television host of *Point of View* (KX4 North Dakota), interviewed Scott Jensen, who is a medical doctor, clinical associate professor at the University of Minnesota Medical School, and a state legislator:

Jensen: In Minnesota, as a physician, I received an email last week from the Department of Health, coaching me on how to fill out death certificates, and I've never really received coaching from the Vital Statistics Agency in terms of how to do a death certificate, but basically I felt like they were saying you don't have to have a confirmed laboratory test for COVID-19 in order to make the death certificate be COVID-19 . . .

Berg: Sir, I don't mean to interrupt you with that, but what you just said I think is critically important. Can you repeat what you just said, please?

Jensen: Well, last Friday I received a seven-page document that sort of told me that if I had an 86-year-old patient that had pneumonia, but was never tested for COVID-19, but, sometime after she came down with pneumonia, we learned that she had been exposed to her son who had no symptoms, but later on was identified with COVID-19, that it would be appropriate to diagnose on the death certificate COVID-19. Now we've not done that. If someone has pneumonia and it's in the middle of a flu epidemic, and I don't have a test on influenza, I don't diagnose influenza on the death certificate; I will say this elderly patient died of pneumonia.

Berg: I don't mean to interrupt you, but my heart is sinking right now as you're telling me this. You're a doctor. Why in the world would they be sending you out information to fill out death certificates whether the person's been diagnosed with COVID-19 or not, but then to say in the death certificate, this person's death was caused by COVID-19? That does not sound right to me.

Jensen: I went to the person in our office who does most of the death certificates over the last, you know, 10, 20 years, and I said does this sound right? I had her look at the documents that I printed off, and she said, well, we've always been told that you always put down just facts, you don't put down any probabilities, you don't put any presumptions down, it's just what you know, and so this is concerning.¹

Indeed, looking online, the CDC's National Vital Statistics System has mandated that "COVID-19 should be reported on the death certificate for all decedents where the disease caused or is assumed to have caused or contributed to death."²

On her Fox News show *The Ingraham Angle*, Laura Ingraham also interviewed Dr. Jensen. She quoted the CDC's own instructions:

In cases where a definite diagnosis of COVID cannot be made but is suspected or likely (e.g. the circumstances are compelling with a reasonable degree of certainty) it is acceptable to report COVID-19 on a death certificate as "probable" or "presumed."³

On the program, Ingraham asked Dr. Jensen about this; he expressed outrage, observing that the CDC's own death certificate manual tells physicians to focus on "precision and specificity." In the same interview, Dr. Jensen also revealed: "Medicare has determined that if you have a COVID-19 admission to the hospital, you'll get paid \$13,000; if that COVID-19 patient goes on a ventilator, you get \$39,000."⁴

For those who believe the CDC would never falsify statistics, former CBS investigative reporter Sharyl Attkisson has revealed that the CDC did exactly that during the 2009 Swine Flu pandemic. CBS knew, but killed the story. Here is an excerpt of her interview with John Rappoport:

Rappoport: In 2009, you spearheaded coverage of the so-called Swine Flu pandemic. You discovered that, in the summer of 2009, the Centers for Disease Control, ignoring their federal mandate, [secretly] stopped counting Swine Flu cases in America. Yet they continued to stir up fear about the “pandemic,” without having any real measure of its impact. Wasn’t that another investigation of yours that was shut down? Wasn’t there more to find out?

Attkisson: The implications of the story were even worse than that. We discovered, through our FOI efforts, that before the CDC mysteriously stopped counting Swine Flu cases, they had learned that almost none of the cases they had counted as Swine Flu was, in fact, Swine Flu or any sort of flu at all! The interest in the story from one [CBS] executive was very enthusiastic. He said it was “the most original story” he’d seen on the whole Swine Flu epidemic. But others pushed to stop it [after it was published on the CBS News website] and, in the end, no [CBS television news] broadcast wanted to touch it. We aired numerous stories pumping up the idea of an epidemic, but not the one that would shed original, new light on all the hype. It was fair, accurate, legally approved and a heck of a story. With the CDC keeping the true Swine Flu stats secret, it meant that many in the public took and gave their children an experimental vaccine that may not have been necessary.⁵

Even the *New York Times* acknowledged in April 2020:

New York City, already a world epicenter of the coronavirus outbreak, sharply increased its death toll by more than 3,700 victims on Tuesday, after officials said they were now

including people who had never tested positive for the virus but were presumed to have died of it.⁶

Established in 2011, Project Veritas (www.projectveritas.com) “investigates and exposes corruption, dishonesty, self-dealing, waste, fraud, and other misconduct in both public and private institutions to achieve a more ethical and transparent society.” The organization, a go-to site for whistle-blowers, has won plaudits for its unique journalism, often conducted through undercover investigations. In a video uploaded on April 30, 2020, Project Veritas included interviews with several New York funeral home directors. Short excerpt:

Joseph Antioco, Funeral Director, Schaefer Funeral Home:

To me all you’re doing is padding the statistics. You know, you’re putting people on that have COVID-19. If they didn’t have it, you’re making the death rate for New York City a lot higher than it should be.

Michael Lanza, Funeral Director, Colonial Funeral Home:

I’ll be honest with you, all the death certificates, they’re writing COVID on all the death certificates, whether they had a positive test or they didn’t. So I think, you know—again, this is my personal opinion—I think the mayor in our city is looking for federal funding, and the more they put COVID on a death certificate, the more they can ask for federal funds, so I think it’s political.⁷

Pressure to classify deaths as COVID-19 is not limited to America. Dr. John Lee, a retired professor of pathology in the UK, wrote in *The Spectator*:

If someone dies of a respiratory infection in the UK, the specific cause of the infection is not usually recorded, unless the illness is a rare “notifiable disease.” So the vast majority of respiratory deaths in the UK are recorded as bronchopneumonia, pneumonia, old age or a similar

designation. We don't really test for flu, or other seasonal infections....

Now look at what has happened since the emergence of COVID-19. The list of notifiable diseases has been updated. This list—as well as containing smallpox (which has been extinct for many years) and conditions such as anthrax, brucellosis, plague and rabies (which most UK doctors will never see in their entire careers) has now been amended to include COVID-19. But not flu. That means every positive test for COVID-19 must be notified, in a way that it just would not be for flu or most other infections.⁸

Britain's *The Sun* chimed in:

Coronavirus fatalities could be “less than half the official toll,” a former World Health Organisation chief has said. Prof. Karol Sikora claims that doctors may have marked the virus as the cause of death on certificates if there was “any hint” Covid played a part. The NHS has reported that over 41,000 people have died in hospitals due to the pandemic. But Prof. Sikora said this figure could in fact be much less—as many medics are marking it down without proof it was the main cause. Speaking on the *Planet Normal* podcast, he said the UK's system of recording deaths caused by Covid-19 was different to other countries. In Germany, coronavirus can only be recorded as the cause of death when the end-of-life care team certifies that this was the case.⁹

From the UK, here is a letter to the editor (name blanked out to respect privacy):



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CHAPTER 11

INFLATING COVID-19 DEATHS: (4) THE NURSING HOME CONTROVERSY

Yet another factor that raised the COVID-19 death rate were state decisions to send COVID patients to nursing homes. The *New York Post* reported on April 26: “Gov. Cuomo doubled down Sunday on the state’s controversial directive ordering nursing homes to admit COVID-19 patients.”¹ As *Business Insider* noted a month later:

At least 5,800 people have died in New York nursing homes and adult care facilities.... Gov. Andrew Cuomo’s March 25 order that required nursing homes to admit patients who were suspected to have or had tested positive for COVID-19 has been deleted from the state of New York’s website, Fox News reported Tuesday.

On Wednesday, the state of New York’s website displayed an error message, stating the “page that you are looking for is not found,” in place of a link to the original document. The March 25 order is only accessible through an archived version of the webpage, posted by the Internet Archive’s Wayback Machine.²

Dr. Simone Gold, a board-certified ER physician, and Dr. Dan Wohlgeleter, a 30-year cardiologist trained at Yale University School of Medicine, gave a joint whistle-blowing interview, touching on many aspects of the COVID-19 response, including the nursing home tragedy:

Gold: I think there’s going to have to be some reckoning when this is all over, how we really harmed and killed nursing home

patients.

Wohlgelernter: The data certainly were known; we knew this as early as February from China, from Italy, that it was the elderly and frail who were most at risk. So why did Governor Cuomo and his health commissioner force the nursing homes to take patients? Well, it was part of the overall panic that occurred not just in most of society, but in the healthcare industry. The hospitals in New York and throughout the country were afraid that they would be overwhelmed with patients and they wouldn't have sufficient capacity. and they wanted to offload patients who were no longer requiring inpatient, high-intensity care and they said we need to let those people go out of the hospital and— where can you send them? Well, there were places in New York where they could have sent them: the Javits Center, which had been equipped; the Navy ship *Comfort* had been sent to New York Harbor. Instead they were sent to nursing homes, where it created massive death. This was a tragic mistake—you know, just absolute negligence in terms of decision-making.

Gold: The *Comfort* and the Javits Center were shockingly empty, they were almost completely empty, which was amazing. The question of why Governor Cuomo did this is very unpleasant to speculate, but one thing that's for sure is it was absolutely known when he made the decision to let the patients go back to the nursing homes, it was 100% known . . . that it was risky to send the nursing home patients back. You know, the health commissioner of Pennsylvania really had an egregious situation where she took her own mother out of an assisted living facility, but she told the rest of the state that it was perfectly safe to leave your grandparent in an assisted living facility. That's just egregious. There's no question that it was known at the time. I don't know why this was the plan. You know, people always wonder why the deaths were so high

in New York. There's no question that the nursing home deaths put them over the top.³

As *Newsweek* reported on May 13:

Pennsylvania's Health Secretary Dr. Rachel Levine confirmed on Tuesday that she recently moved her 95-year-old mother out of a personal care home [to a hotel]. Outbreaks in Pennsylvania long-term care facilities make up nearly 70 percent of the state's coronavirus-related deaths and 21 percent of the state's positive cases of the virus.⁴

Although, as we have seen, the true COVID-19 death toll is very sketchy, *Forbes* reported that 42 percent of the deaths nationally were at nursing homes or assisted living facilities.⁵

Rosemary Frei describes a comparable situation occurring in Canada:

On April 17 the Canadian federal government released information to guide clinicians in rationing healthcare resources during the SARS-CoV-2 epidemic. Unlike at least some other COVID-19-related guidelines issued in the same period, it was not accompanied by a press release; therefore it has flown under the public radar. The document includes an emphasis on age-based rationing. It also explicitly discourages transfer of carehome residents to hospitals:

Long term care (LTC)[care-home] facilities and home care services will be encouraged to care for COVID-19 patients in place and may be asked to take on additional non-COVID-19 patients/ clients to help relieve pressure on hospitals.

This is underlined in another place in the document:

If COVID-19 does develop in LTC facility residents, they should be cared for within the facility if at all possible, to

preserve hospital capacity.

Prohibiting transfer to hospital drastically narrows the treatment options available to care-home residents. There have been transfers of care-home residents to hospitals in Canada during the COVID-19 crisis, but until very recently they have been by far the exception. (Instead, starting in mid-March as part of the clearing out of hospitals to make room for a putative surge in COVID-19 patients, thousands of elderly people were transferred from hospitals to care homes. This likely also contributed to the care-home death toll. More than one journalist has compared care homes to the *Diamond Princess* cruise ship: virus incubators with people trapped inside.)⁶

As a registered nurse who has worked in multiple acute care hospitals as well as in nursing homes during my career, I can state categorically that most nursing homes lack the staffing, equipment, and training needed to deal with acute infectious illnesses. Nursing homes are designed to help the disabled—in particular, of course, the elderly—to maintain basic standards of daily living: nutrition, mobility, bathing, etc. If a nursing home resident ran a fever, our protocol was to send them to the hospital, where diagnostic tests would ascertain the cause of the fever, and where they would receive preliminary treatment—typically antibiotics and intravenous fluids—until they were well enough to return to the nursing home. The political decision to send acutely ill COVID patients into nursing homes was the exact opposite of normal protocols. These homes thus became hotspots for rapid spread of the virus among the most vulnerable—the elderly. Compounding the cruelty of the situation, family members were routinely forbidden to visit, meaning these people had to die alone.

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CHAPTER 12

ACCURACY OF TESTING

There is also controversy regarding the accuracy of COVID-19 tests. Various tests exist for it globally; some check for antibodies formed by the immune system against the virus; the most widely used is PCR (polymerase chain reaction), which seeks to detect genetic material from the virus.

David Crowe has written a 9,000-word review of COVID-19 testing, documenting many issues with the methods, such as people fluctuating back and forth from “positive” to “negative,” and the PCR’s failure to isolate the virus itself (as opposed to detecting strands of DNA).¹

The CDC’s own literature warns: “Detection of viral RNA may not indicate the presence of infectious virus or that 2019-nCoV is the causative agent for clinical symptoms.”²

Although the mainstream media loves to panic the public with headlines showing the numbers of new coronavirus cases, when those numbers are critically analyzed, they often prove meaningless. For example, at Boston’s Pine Street Inn shelter, 146 homeless people tested positive for COVID-19, yet none (zero) exhibited any symptoms of the disease.³ One would, of course, expect the homeless to be more susceptible to being sick, as they usually do not lead healthy lifestyles. What did these results mean? Are the homeless less vulnerable to the virus because they spend more time outdoors, absorbing the sunlight’s vitamin D? One takeaway is that COVID-positive tests are much less significant than the headlines have been implying.

As noted at *Global Research*:

[T]he PCR works by amplifying minute amounts of DNA. It therefore is useless at telling you how much virus you may have.

And that's the only question that really matters when it comes to diagnosing illness. Everyone will have a few viruses kicking round in their system at any time, and most will not cause illness because their quantities are too small. For a virus to sicken you, you need a lot of it, a massive amount of it. But PCR does not test viral load and therefore can't determine if it is present in sufficient quantities to sicken you.⁴

Beda M. Stadler, former director of the Institute for Immunology at the University of Bern, writes:

So if we do a PCR corona test on an immune person, it is not a virus that is detected, but a small shattered part of the viral genome. The test comes back positive for as long as there are tiny shattered parts of the virus left. Correct: Even if the infectious viri are long dead, a corona test can come back positive, because the PCR method multiplies even a tiny fraction of the viral genetic material enough [to be detected].... It is likely that a large number of the daily reported infection numbers are purely due to viral debris. The PCR test with its extreme sensitivity was initially perfect to find out where the virus could be. But this test can not identify whether the virus is still alive, i.e. still infectious. Unfortunately, this also led some virologists to equate the strength of a test result with viral load, i.e. the amount of virus someone can breathe out.⁵

Furthermore, a positive test may result from factors besides COVID-19 infection. In April 2020, Rashid Buttar, MD, stated that patients who had received the trivalent vaccine (a potent flu vaccine for multiple strains) were reading false-positive on COVID tests.⁶ This was met with a flurry of "fact-checkers" saying it was fake news. Reuters, for example, said "The claim is not true. Flu shots do not contain the coronavirus that causes COVID-19."⁷

However, this was contradicted by Dr. Judy Mikovits, the PhD biochemist whose book *Plague of Corruption* was the number one best-selling book on Amazon for weeks during 2020. Although not addressing testing specifically, she stated in the film *Plandemic*:

“Coronaviruses are in every animal, so if you’ve ever had a flu vaccine, you were injected with coronaviruses.”⁸

The eminent immunologist Dolores Cahill, PhD, supported Mikovits on this point when she was interviewed by Del Bigtree, host of *The HighWire*:

Bigtree: There’s been a big discussion this week. Judy Mikovits said there’s actually coronavirus in the flu shot. Do you agree with that perspective? . . .

Cahill: I agree entirely with Judy . . . what happens is that these vaccines are made sometimes on monkey kidneys, or on different cell lines, and as we know, coronaviruses are actually associated with different animals, so if they use a tissue to make the influenza vaccine, and that tissue comes from a dog or from a monkey, and they intrinsically have coronaviruses, when you’re making a virus you actually often homogenize the tissue—you know, the underlying fetal cell line or the underlying dog tissue or the underlying kidney from a monkey—and so all of the latent viruses that those animals have are then included in the flu that has then been injected into people.⁹

But even if coronaviruses were included in past flu shots, could a test mistake them specifically for the *COVID-19* coronavirus? The World Health Organization says: “Several assays that detect the 2019-nCoV have been and are currently under development, both in-house and commercially. Some assays may detect only the novel virus [COVID] and some may also detect other strains (e.g. SARS-CoV) that are genetically similar.”¹⁰

Indeed, according to *The Lancet*, the COVID-19 and SARS viruses are 79 percent similar genetically.¹¹ In another interview, Dolores Cahill pointed out that after the SARS virus circulated the globe beginning in 2003, an estimated 7 to 15 percent of the world population developed antibodies to it. These people, she notes, will test false-positive for COVID-19 in antibody tests.¹²

President John Magufuli of Tanzania, suspicious of the COVID-19 test kits his country was supplied with, reported in May that he had his security

forces covertly submit specimens from a goat, sheep, and pawpaw fruit—and the results came back positive for COVID-19.¹³

On the other hand, I discussed the matter of testing with Doctor B, the highly red-pilled MD I mentioned in Chapter 7, and she told me that while the initial test kits provided by the CDC indeed gave many false positives, her hospital had been able to verify the accuracy of COVID diagnoses through sophisticated methodologies.

Nevertheless, enough questions have been raised, from multiple sources and perspectives, to say that the efficacy of COVID-19 testing is in doubt. Given the widespread efforts to panic the public—as by dishonest efforts to inflate COVID death numbers—it would come as no surprise if COVID testing itself was being abused to further exaggerate the level of infection.

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PART THREE



THEORIES ABOUT THE NATURE OF COVID- 19

CHAPTER 13

MAINSTREAM STORY OF THE ORIGIN

Scientists first noted human coronaviruses in the 1960s; they are among the viruses causing the common cold. Like all viruses, they mutate over time. The virus which COVID-19 is attributed to (called SARS-CoV-2) is a variant of the coronavirus, and very similar to coronaviruses found in bats. Early on, the claim was made that the virus originated from people eating bat soup from the Huanan seafood market in Wuhan. Quoting Britain's *The Sun* from February:

Coronavirus could have spread from bat soup to humans, experts have claimed. Scientists in China, where the deadly coronavirus has killed 26 people, believe the bug shares a common ancestor with a virus found only in fruit bats.... footage and images have since been circulated purporting to show people eating the Chinese delicacy. The outbreak of coronavirus began in the city of Wuhan—which has since been put in lockdown after more than 800 people were infected globally. Bat soup is reported to be an unusual but popular dish particularly in Wuhan, where the virus is understood to have originated at an open air fish market. And scientists claim that the delicacy may have sparked the outbreak.¹

An early analysis of 41 COVID-infected patients in Wuhan showed that 27 had exposure to the seafood market.² However, Chinese authorities were never able to identify “patient zero”—the first person to be infected. Furthermore, there is disagreement as to whether the seafood market in Wuhan actually sold bats. *Live Science* stated: “However, no bats were sold at the Huanan seafood market.”³ More recently, it has been hypothesized

that the virus was transmitted from bats to humans through an intermediary animal, such as pangolins.

However, one thing about which there is no controversy in mainstream media is that COVID-19 had a natural origin—in other words, that it occurred purely by chance. As we will see, there is considerable evidence and informed opinion to the contrary.

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CHAPTER 14

THE BIOWEAPON THEORY

Dr. Shiva Ayyadurai holds four degrees from MIT, including a PhD in biological engineering. In an interview with Gary Franchi of *Next News Network*, he discussed the probability of COVID-19 being engineered, tracing back to Fort Detrick—historically the center of the U.S. biological weapons program, which is now called the U.S. biological *defense* program:

Some people have asserted that the base sequences there [in the COVID virus] are very difficult to occur in nature, that they were recombined from other components.... The scientific question is the probability of those base sequences being different.... Separate from that, there have been reports that the Wuhan virus was a different strain than the one that was in Iran, versus the one that was in Italy, and there's reports that I've read—I haven't started to verify a lot of this—that all of those different viruses go back to one common branch, which actually goes back to Fort Detrick in the United States, and North Carolina.

And there's other suppositions that the US military or Deep State sent people over to Wuhan, and that's how it got given in China—this is one theory; and the reason this comes up is because if you look at the first 41 cases, they haven't been able to find “case zero,” but of the 41 cases, approximately thirteen of these people, they're totally disconnected to these people, so the thesis is that this came from somewhere else into Wuhan. Whether it came in or not, my view is that if you believe in the concept of a set of people who don't care about the U.S. national interest or the Chinese national interest or the Indian national interests or Italian, they care more for their own global interests. And you know nowadays, given the level of collusion

that we've seen that takes place on so many levels, you could view a scenario where it got created by the Deep State and got put out there really to suppress dissent....

What was going on at this time? Hong Kong was blowing up, remember that? And what people do not know is six months before the coronavirus there were massive anti-pollution protests by Chinese citizens in Wuhan, in the same city where this came from. And remember, you don't protest in China without risking your life. It's not like they have the First Amendment there. So large numbers of people were taking to the street and protesting, tens of thousands, because the Chinese government was going to build one of the largest incinerator plants, which is going to spew out pollution....

And then also remember in the United States, the anti-vaccine movement was growing, so there's a scenario that becomes to me very interesting. You have Trump, in the United States, could not be taken down from Russian collusion, Trump could not be taken down from impeachment, and how extraordinary is it that this thing comes out, the timeliness of it, you see Hong Kong completely disappear, [which] serves the globalists because, remember, any protests create uncertainty for globalism. You see Wuhan go away, and then you see now an argument saying "Of course we should vaccinate everyone, right?" against the anti-vaccine movement....

When you're a student of politics and a student of medicine, you start seeing these connections, and you also recognize that the academic elite in this country, it basically practices the oldest profession—no one in the academic elite is saying anything. Fortunately, I don't owe anything to academia, I made my own money by myself. I have the training to call out a guy like a Fauci, to call this out, because I understand the science.¹

According to his biography at the Illinois College of Law, Professor Francis Boyle "drafted the U.S. domestic implementing legislation for the

Biological Weapons Convention, known as the Biological Weapons Anti-Terrorism Act of 1989, that was approved unanimously by both Houses of the U.S. Congress and signed into law by President George H.W. Bush.”² In an interview with Jason Liosatis, Dr. Boyle stated:

I think I found the smoking gun here; there was a recent scientific study³ published in *Antiviral Research*, 10 February 2020, by three scientists from France and one from Montreal, who did a genetic analysis of the Wuhan coronavirus, and they said it “may provide a gain of function of the 2019 n-coronavirus for efficient spreading in the human population compared to other lineage b beta-coronaviruses.” . . . That’s the smoking gun for an offensive biological warfare agent; gain-of-function properties is a tip-off. It’s only useful for offensive biological warfare activity, and it is typically conducted in either—it’s so dangerous—either a bsl-⁴ [biosafety level 4] or a bsl-3 facility. And there in Wuhan, you have the only bsl-4 facility in China, so I think it’s clear it came out of this lab. Gain-of-function, it means it’s DNA-genetically engineered to be more lethal and more infectious. Clearly what we’re seeing now with this coronavirus, it is basically SARS, which is already a weaponized version of the coronavirus that has leaked out of that laboratory at least twice before, and then it is given gain-of-function properties . . .

Second, we have an article here from *Nat Med* 2015 December, “SARS-like Cluster of Circulating Bat Coronavirus Pose Threat for Human Emergence.”⁴ This was at the University of North Carolina; in Chapel Hill they have a biosafety lab level 3 there, and I have previously condemned them up for using gain-of-function work on MERS, which is the Middle East respiratory syndrome. It is like SARS, only more dangerous; it has a 33% lethality rate, and they were doing gain-of-function work there to make it even more lethal. . . . if you read the article, they admit that they were doing this with SARS, that they were giving it gain-of-function activity

and it turns out part of their team was a researcher from China, Zhengli Shi, “Key Laboratory of Special Pathogens of Biosafety, Wuhan Institute of Biology”... they [China] gave a grant to the University of North Carolina to get their scientist in on this extremely dangerous Nazi-type biological warfare work. So it appears that what happened was, instead of stealing this technology, China bought it from the lab there at the University of North Carolina.... and it also appears that the North Carolina lab got cells from Fort Detrick, which is the U.S. major facility for the research, development, testing, stockpiling of biological weapons.⁵

An analysis of COVID-19 was published by nine scientists from the Indian Institute of Technology and Delhi University. They wrote: “We found 4 insertions in the spike glycoprotein (S) which are unique to the 2019-nCoV and are not present in other coronaviruses.” They called the characteristics “uncanny” and “unlikely to be fortuitous”—i.e., improbable to have been produced by chance mutation.⁶ Interestingly, the paper is now marked “withdrawn.”

Luc Montagnier, awarded a Nobel Prize as co-discoverer of the HIV virus, also says COVID-19 is man-made, and sheds light on why the Indian paper was withdrawn. As *Gilmore Health News* reports:

According to Professor Luc Montagnier, winner of the Nobel Prize for Medicine in 2008 for “discovering” HIV as the cause of the AIDS epidemic together with Françoise Barré-Sinoussi, the SARS-CoV-2 is a virus that was manipulated and accidentally released from a laboratory in Wuhan, China, in the last quarter of 2019....

“With my colleague, bio-mathematician Jean-Claude Perez, we carefully analyzed the description of the genome of this RNA virus,” explains Luc Montagnier, interviewed by Dr Jean-François Lemoine for the daily podcast at *Pourquoi Docteur*, adding that others have already explored this avenue: Indian researchers have already tried to publish the results of the

analyses that showed that this coronavirus genome contained sequences of another virus . . . the HIV virus (AIDS virus), but they were forced to withdraw their findings as the pressure from the mainstream was too great.

In a challenging question, Dr Jean-François Lemoine inferred that the coronavirus under investigation may have come from a patient who is otherwise infected with HIV. “No,” says Luc Montagnier, “in order to insert an HIV sequence into this genome, molecular tools are needed, and that can only be done in a laboratory.”⁷

I’m aware that the British medical journal *The Lancet* issued a brief statement condemning “conspiracy theories suggesting that COVID-19 does not have a natural origin.”⁸ This statement has been sharply rebutted by bioweapons expert Meryl Nass, M.D.:

Top scientists circled their wagons to protest against “*conspiracy theories suggesting that COVID-19 does not have a natural origin,*” in a statement published in the *Lancet*.... Many who signed the statement have worked in biodefense.... Five additional scientists soon provided the “scientific evidence” to back up the natural origin claim. These five scientists have been affiliated with signers of the statement above, they too have worked in biodefense, and their article was published in *Nature Medicine* (in the print version) on March 17, 2020....

These scientists set up a straw man to knock down: they claimed that had the novel coronavirus (SARS-CoV-2 is the official name of the virus) been created in a lab: “*if genetic manipulation had been performed,*” then a known coronavirus backbone would have been used. But because no known backbone forms part of SARS-CoV-2, “*the evidence shows that SARS-CoV-2 is not a purposefully manipulated virus*” I know that the groups of scientists who wrote these pieces in the *Lancet* and *Nature* . . . know that you don’t need genetic

engineering methods to create a bioweapon. Like me, they are old, they recall a world before genetic engineering, they know the history of biowarfare, and they know the score. Why then are they participating in this charade?... Were I creating a deliberate bioweapon, I would not construct it from published sequences that would suggest a lab origin. I would construct it or choose it to not leave that evidence of its origin.⁹

Sean of *SGT Report* (who interviewed me in April 2020 on COVID-19 —the interview was deleted by YouTube and has been moved to Bitchute) called my attention to Rashid Buttar, MD, who I consider among the most compelling COVID-19 analysts. YouTube has censored a number of Dr. Buttar’s videos, although you can still find them on his websites. He calls attention to the 2015 article “Engineered Bat Virus Stirs Debate over Risky Research” published in the journal *Nature*. It concerned the controversial virus experiment (mentioned above by Dr. Francis Boyle) undertaken by a team of American and Chinese scientists, including Dr. Zhengli Shi from the Wuhan Level 4 lab, located near the Wuhan seafood market blamed for the outbreak. *Nature* has now added a disclaimer which reads: “We are aware that this story is being used as the basis for unverified theories that the novel coronavirus causing COVID-19 was engineered. There is no evidence that this is true; scientists believe that an animal is the most likely source of the coronavirus.” Dr. Buttar observes that the disclaimer does not discredit the article, which he suggests reading straightforwardly. It said, in part:

An experiment that created a hybrid version of a bat coronavirus—one related to the virus that causes SARS (severe acute respiratory syndrome)—has triggered renewed debate over whether engineering lab variants of viruses with possible pandemic potential is worth the risks.

In an article published in *Nature Medicine* on 9 November, scientists investigated a virus called SHC014, which is found in horseshoe bats in China. The researchers created a chimaeric [hybrid] virus, made up of a surface protein of SHC014 and the backbone of a SARS virus that had been adapted to grow in

mice and to mimic human disease. The chimaera infected human airway cells—proving that the surface protein of SHC014 has the necessary structure to bind to a key receptor on the cells and to infect them....

But other virologists question whether the information gleaned from the experiment justifies the potential risk. Although the extent of any risk is difficult to assess, Simon Wain-Hobson, a virologist at the Pasteur Institute in Paris, points out that the researchers have created a novel virus that “grows remarkably well” in human cells. “If the virus escaped, nobody could predict the trajectory,” he says....

In October 2014, the US government imposed a moratorium on federal funding of such research on the viruses that cause SARS, influenza and MERS (Middle East respiratory syndrome, a deadly disease caused by a virus that sporadically jumps from camels to people).

The latest study was already under way before the US moratorium began, and the US National Institutes of Health (NIH) allowed it to proceed while it was under review by the agency, says Ralph Baric, an infectious-disease researcher at the University of North Carolina at Chapel Hill, a co-author of the study. The NIH eventually concluded that the work was not so risky as to fall under the moratorium, he says.¹⁰

As Dr. Buttar notes, the man in charge of NIH’s infectious disease branch when it approved the study was none other than Anthony Fauci—prompting Robert F. Kennedy, Jr., nephew of President John F. Kennedy, to post the following on social media:



Shedding further light on this, in April 2020 *Newsweek* published an article entitled “Dr. Fauci Backed Controversial Wuhan Lab with Millions of U.S. Dollars for Risky Coronavirus Research”:

But just last year, the National Institute for Allergy and Infectious Diseases, the organization led by Dr. Fauci, funded scientists at the Wuhan Institute of Virology and other institutions for work on gain-of-function research on bat coronaviruses.

In 2019, with the backing of NIAID, the National Institutes of Health committed \$3.7 million over six years for research that included some gain-of-function work. The program followed another \$3.7 million, 5-year project for collecting and studying bat coronaviruses, which ended in 2019, bringing the total to \$7.4 million.

Many scientists have criticized gain of function research, which involves manipulating viruses in the lab to explore their potential for infecting humans, because it creates a risk of starting a pandemic from accidental release....

Dr. Fauci did not respond to *Newsweek's* requests for comment.¹¹

Fauci has a long association with Bill Gates, who has emerged as the high priest of the drive for a COVID vaccine. As James Corbett notes:

Beyond just their frequent collaborations and cooperation in the past, Fauci has direct ties to Gates' projects and funding. In 2010, he was appointed to the Leadership Council of the Gates-founded "Decade of Vaccines" project to implement a Global Vaccine Action Plan—a project to which Gates committed \$10 billion of funding. And in October of last year, just as the current pandemic was beginning, the Gates Foundation announced a \$100 million contribution to the National Institute of Health to help, among other programs, Fauci's National Institute of Allergy and Infectious Diseases' research into HIV.¹²

For those who'd like an inside look at Dr. Fauci's record of corruption and cronyism, I recommend the 25-minute video *Plandemic* featuring comments from Dr. Judy Mikovits, who was persecuted by Fauci after she and her co-researcher Frank Ruscetti discovered that the virus causing Chronic Fatigue Syndrome came from contaminated blood and vaccines. Censored by YouTube, it can be found on Bitchute at <https://www.bitchute.com/video/PuY6jzvuRb3i/> (or just search for "Plandemic"). I also recommend Mikovits's best-selling book *Plague of Corruption*.

If, in fact, COVID-19 is a bioweapon, the University of North Carolina experiment may seem a reasonable "likely suspect" for its beginnings, and perhaps the Wuhan Level 4 bioweapons lab for its finalization. However, I'm certainly *not* asserting that it happened that way. Many countries have bioweapon capabilities, including, as Gilad Atzmon has noted, Israel, which is not a signatory to the Biological Weapons Convention.¹³ (No one who has read Ronen Bergman's 800-page *Rise and Kill First: The Secret History of Israel's Targeted Assassinations* would doubt the sophistication of Israeli killing methods.)

Also noteworthy: on October 18, 2019, opening ceremonies for the Military World Games, with nearly 10,000 military personnel from 110 nations, took place in Wuhan, China—six weeks before the coronavirus outbreak officially began there. Bioweapons are a military asset; did the Wuhan games act as cover for dispersal of COVID-19?

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CHAPTER 15

ACCIDENTAL LEAK OR DELIBERATE DISPERSION?

If, in fact, COVID-19 is a bioweapon, the question naturally follows: Was it accidentally leaked (as some have suggested, pointing out the proximity of the Wuhan bioweapons lab to the much-maligned seafood market)? Or was it released intentionally?

Several predictive events point to the latter.

- Event 201. As Spiro Skouras reported:

In this report we take an inside look at Event 201, which took place in NYC on October 18 2019. Event 201 is a high-level pandemic exercise hosted by the Johns Hopkins Center for Health Security in partnership with the World Economic Forum and the Bill and Melinda Gates Foundation. This is extremely fascinating because this pandemic simulation exercise of coronavirus took place about 6 weeks before the first illness from the coronavirus was actually reported in Wuhan China!¹

Event 201's own website states: "Event 201 simulates an outbreak of a novel zoonotic coronavirus transmitted from bats to pigs to people that eventually becomes efficiently transmissible from person to person, leading to a severe pandemic. The pathogen and the disease it causes are modeled largely on SARS, but it is more transmissible in the community setting by people with mild symptoms."²

In a disturbing parallel to COVID-19, Event 201 footage shows participants of the exercise openly discussing censorship of alternative media opposition to government measures as "fake news." Here are some excerpts:

Countries are reacting different ways as to how best to manage the overwhelming amounts of dis- and misinformation circulating over the Internet. In some cases, limited Internet shutdowns are being implemented to quell panic....³

I think this is more than just keeping the bad information out. It's also about making sure real public health information reaches the public news, is found from outlets other than social media. News organizations, public health groups and companies need to help people take the right actions to protect themselves by promoting accurate, real information about the outbreak. Okay, for more on this, we're going to get a briefing from our communications expert, Dr. Sell. Global Health experts have highlighted that dis- and misinformation are wreaking havoc on the CAPS [Coronavirus Associated Pulmonary Syndrome] response. Health workers are under attack in a number of locations due to rumors that they're purposely spreading the disease, and response efforts in many places have had to be suspended because of concerns around violence. Pharmaceutical companies are being accused of introducing the CAPS virus so they can make money on drugs and vaccines. And I've seen public faith in their products plummet....⁴

We know that social media is now the primary way that many people get their news. So interruptions to these platforms could curb the spread of misinformation, but could also limit access to information from legitimate sources.... Some governments have taken control of national access to the Internet. Others are censoring websites and social media content, and a small number have shut down Internet access completely to prevent the spread of misinformation. Penalties have been put in place for spreading harmful falsehoods, including arrests. Other countries have taken a more moderate approach and have focused on promoting fact-checking efforts and working with traditional media outlets.⁵

But I also think we're at a moment where the social media platforms have to step forward and recognize the moment to assert that they're a technology platform, and not a broadcaster, is over.

They in fact have to be a participant in broadcasting accurate information and partnering with the scientific and health communities to counterweight, if not flood, the zone of accurate information....⁶

And I know that the Gates Foundation and others are funding organizations to work on things like this, in order that people can actually have more confidence in the sources that they will use in any event.⁷

But one thing we haven't spoken about, and I'm wondering whether it's time to talk about this, is a step up from the part of the government's own enforcement actions against fake news. ... where we are able to, to bring forward some bad actors and leave it before the courts to decide whether they have actually spread some fake news.⁸

- Also in 2019, the U.S. government conducted a simulation called “Crimson Contagion,” which *Wikipedia* describes as follows:

Crimson Contagion was a simulation administered by the U.S. Department of Health and Human Services from January to August 2019 that tested the capacity of the U.S. federal government and twelve U.S. states to respond to a severe influenza pandemic originating in China. The exercise, which was conducted months prior to the start of the COVID-19 pandemic, involves a scenario in which tourists returning from China spread a respiratory virus in the United States, beginning in Chicago. In less than two months the virus had infected 110 million Americans, killing more than half a million. The report issued at the conclusion of the exercise outlines the

government's limited capacity to respond to a pandemic, with federal agencies lacking the funds, coordination, and resources to facilitate an effective response to the virus.⁹

- As *True Pundit* reports:

The Bill and Melinda Gates Foundation helped negotiate who would score a \$100 billion government-backed contact tracing contract in August 2019—six months before the “pandemic” arrived in the United States and four months before it swept through China. The shocking revelations were unveiled on the *Thomas Paine Podcast* and the *Moore Paine Show* on Patreon by the two investigators who blew the whistle on the massive Clinton Foundation tax fraud during a Congressional hearing in 2018. John Moynihan and Larry Doyle testified in Congress, detailing the fraud and schemes utilized by the Clintons to avoid paying up to \$2.5 BILLION in federal taxes.

The investigative duo, in their first interview since that bombshell Congressional testimony, revealed to Paine that representatives from the Gates Foundation met with U.S. Congressman Bobby L. Rush at a sit-down in Rwanda, East Africa in mid-August 2019 to hash out who would score the windfall from a government contact tracing program. And just last month—nine months after the meetings with the Gates Foundation in Rwanda—Rush, a Democrat from Illinois, introduced the \$100 BILLION H.R. 6666, the COVID-19 Testing, Reaching and Contacting Everyone (TRACE) Act.

Rush's bill would establish a program run by the Centers for Disease Control and Prevention (CDC) for national coronavirus testing and contact tracing. Paine has since learned Congressman Rush traveled to Rwanda with his spouse from August 12th to 19th, 2019 to take part in talks and a week-long event underwritten by the Bill and Melinda Gates Foundation and the Rockefeller Brothers Fund. But how can you negotiate

the byproducts of monitoring a pandemic six to seven months before the outbreak of the virus even happens?¹⁰

- In January 2020, Netflix released a three-episode documentary called *Pandemic*. Here is a transcript from the trailer (the voices are of various actors):

A hundred years ago, a deadly influenza virus infected hundreds of millions of people. Somewhere in the order of 50 to 100 million deaths. When we talk about another flu pandemic happening, it's not a matter of if, but when.... This is definitely one of the most lethal influenza viruses that we have seen so far. It just takes one person to start an outbreak. It will leave its mark. The result would be hundreds of millions of people that would likely die. That's why I do what I do. We're making a vaccine that could treat all future versions of flu. This vaccine could eradicate influenza as we know it. The problem's so widespread, the World Health Organization is calling the refusal to vaccinate one of the biggest threats of 2019.... The virus can spread throughout the country; a month after that widespread throughout the world. The next pandemic is going to start; we just don't know where or how, but we know it will. That poses an existential threat to us as a species.¹¹

- Before the outbreak, the Israeli firm MIGAL began working on a coronavirus vaccine. The *Jerusalem Post* reported in April 2020:

Israeli scientists are on the cusp of developing the first vaccine against the novel coronavirus, according to Science and Technology Minister Ofir Akunis. If all goes as planned, the vaccine could be ready within a few weeks and available in 90 days, according to a release. (*Akunis made his statement at the end of February.*)

“Our basic concept was to develop the technology and not specifically a vaccine for this kind or that kind of virus,” said Dr. Chen Katz, MIGAL’s biotechnology group leader.... “Let’s

call it pure luck,” he said. “We decided to choose coronavirus as a model for our system just as a proof of concept for our technology.”¹²

- Street demonstrations that had erupted around the world— in Hong Kong, France (the Yellow Vests), Chile, India, protests against 5G, etc., were conveniently halted by the COVID-19 lockdown. (Interestingly enough, it did *not* pose any barrier to the massive looting, arson and violence following the George Floyd incident—which furthered the economic distress caused by the lockdown.)

- For those who understand that the globalist New World Order is Luciferian, COVID-19 was timed so that it cancelled Easter services. Again, I believe this was the first time this had happened *globally* since Christianity was legalized in the 4th century

A.D. In October 2019, the British hard rock band “The Darkness” released an album entitled *Easter Is Cancelled*, certainly an interesting bit of predictive programming.

- The stock market bubble, generated by years of pumping fiat cash into the markets, finally and inevitably collapsed, with the Dow dropping from above 29,000 in February 2020 to below 19,000 in March. Unlike 2008, when bankers were blamed for the crash, COVID-19 conveniently became the scapegoat.

Collectively, there were too many “coincidences” and advance signals of the coming pandemic to dismiss as pure chance. If, then, COVID-19 is a bioweapon, it appears that it was strategically timed. And that means it, or a variation, could be strategically timed again, whenever desired.

The Rockefeller Foundation

Before leaving the subject of advance knowledge of the COVID crisis, note should be made of the Rockefeller Foundation, long notorious for using its tax-free assets to advance geopolitical agendas. In 2010, the Rockefeller Foundation published *Scenarios for the Future of Technology and International Development*. In several ways, the first scenario reads eerily similar to the COVID-19 outbreak:

In 2012, the pandemic that the world had been anticipating for years finally hit. Unlike 2009's H1N1, this new influenza strain—originating from wild geese—was extremely virulent and deadly. Even the most pandemic-prepared nations were quickly overwhelmed when the virus streaked around the world, infecting nearly 20 percent of the global population and killing 8 million in just seven months, the majority of them healthy young adults. The pandemic also had a deadly effect on economies: international mobility of both people and goods screeched to a halt, debilitating industries like tourism and breaking global supply chains. Even locally, normally bustling shops and office buildings sat empty for months, devoid of both employees and customers. The pandemic blanketed the planet—though disproportionate numbers died in Africa, Southeast Asia, and Central America, where the virus spread like wildfire in the absence of official containment protocols. But even in developed countries, containment was a challenge. The United States's initial policy of “strongly discouraging” citizens from flying proved deadly in its leniency, accelerating the spread of the virus not just within the U.S. but across borders. However, a few countries did fare better—China in particular. The Chinese government's quick imposition and enforcement of mandatory quarantine for all citizens, as well as its instant and near-hermetic sealing off of all borders, saved millions of lives, stopping the spread of the virus far earlier than in other countries and enabling a swifter post pandemic recovery.

China's government was not the only one that took extreme measures to protect its citizens from risk and exposure. During the pandemic, national leaders around the world flexed their authority and imposed airtight rules and restrictions, from the mandatory wearing of face masks to body-temperature checks at the entries to communal spaces like train stations and supermarkets. Even after the pandemic faded, this more authoritarian control and oversight of citizens and their activities stuck and even intensified. In order to protect

themselves from the spread of increasingly global problems— from pandemics and transnational terrorism to environmental crises and rising poverty— leaders around the world took a firmer grip on power.

At first, the notion of a more controlled world gained wide acceptance and approval. Citizens willingly gave up some of their sovereignty—and their privacy—to more paternalistic states in exchange for greater safety and stability. Citizens were more tolerant, and even eager, for top-down direction and oversight, and national leaders had more latitude to impose order in the ways they saw fit.¹³

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CHAPTER 16

THE 5G THEORY

Wuhan was China's rollout city for 5G, the 5th generation mobile network that, unlike previous wireless networks, will operate through millions of "small cells" that transmit over short distances. Another major hypothesis circulating in alternative media has been that 5G was the primary cause of the COVID-19 pandemic. YouTube has systematically deleted videos making this assertion. From one perspective, this may validate the videos, given YouTube's record of draconian censorship. On the other hand, there are responsible people in alternative media who argue against, or at least question, a 5G role. For example, activist and blogger Derrick Broze, an opponent of 5G, was interviewed on the *Corbett Report*. Broze did not see 5G as causing the COVID-19 crisis; he pointed out, for example, that he had lived in Houston, an America rollout city for 5G, and no one started having COVID-19 when 5G began there.¹ (However, as 5G operates at widely varying frequencies, and since the initial U.S. rollout was "soft," one could question if this was done so there would be no public alarm and the "frog could be boiled.")

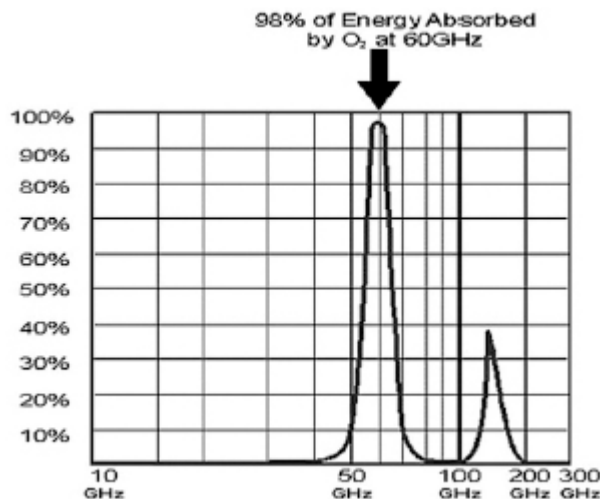
Also, I received an email in April 2020 from 5G Crisis, a leading anti-5G activism website which I subscribe to. While affirming that harm from EMF (electromagnetic field) waves is undeniably well-documented, they asked subscribers to refrain from saying 5G was causing the pandemic—that there was no hard, evidence-based science for this, and that the assertion was causing ridicule of 5G opponents, making their work harder.

Nevertheless, there are responsible scholars who see a possible correlation between COVID and 5G. In February 2020, Dr. Ronald Kostoff of the Georgia Institute of Technology published a 1086-page paper on EMF dangers, *The Largest Unethical Medical Experiment in Human History*.² Appendix 5—starting on page 648—is "Potential Impact of Wireless Radiation Exposure on the Opioid Crisis and the Coronavirus

Pandemic.” He questions if EMFs contributed to the pandemic by weakening the immune system.

Magda Havas, PhD, did a study showing that, in U.S. states with 5G, both the infection and death rates for COVID-19 were about double that of states without 5G.³ Others who see a 5G link with COVID-19 include Thomas Cowan, MD, and Robert O. Young, PhD, both of whom YouTube has heavily censored. Cowan calls attention to the work of Arthur Firstenberg, whose book *The Invisible Rainbow* points out that past pandemics—in 1889 (Russian Flu), 1918 (Spanish Flu), 1957 (Asian Flu), and 1968 (Hong Kong Flu)—each corresponded with new electric/electromagnetic rollouts: electric power lines, radio, radar and satellites. He believes that the impact of these on the ionosphere—the Earth’s electrical envelope—had negative ramifications for human health. Our nervous systems are, after all, largely electrical; and our bodies themselves, at the most basic level, consist of electrons, protons and neutrons. Firstenberg’s book is well-researched and deserves a hearing. If he’s right, then 5G’s introduction, like previous rollouts, might indeed play a role in the current pandemic.

Shigeaki Hokusui, president of the Harmonix Corporation, wrote an article in 2001 on wireless radiation which states: “At the millimeter wave frequency of 60 GHz, the absorption is very high, with 98 percent of the transmitted energy absorbed by atmospheric oxygen.”⁴ Here is a graphic from that article:



5G operates at frequencies as low as 450 megahertz, but can go to well above 60 gigahertz.⁵ (1 gigahertz is a thousand times stronger than 1 megahertz.) One of the strangest things about the Wuhan outbreak: residents, who appeared healthy and were engaged in routine activities, were photographed suddenly dropping dead. This has led some to ask if they were unable to process oxygen due to directed electromagnetic blasts from Wuhan's network of approximately 10,000 5G antennas. As *Scientists for Wired Technology* has noted:

The Department of Defense has developed a RF-EMR crowd-control weapon called the Active Denial System (ADS). The ADS works by firing a high-powered beam of 95 GHz waves at people—that is, a millimeter wavelength weapon—similar to millimeter waves being used for new 5G installations.⁶

During a Congressional hearing, representatives from the telecommunications industry admitted to Connecticut Senator Richard Blumenthal that no safety testing has ever been done on 5G. The exchange went viral and can be watched at (for example) “US Senator Blumenthal Raises Concerns on 5G Wireless Technology Health Risks at Senate Hearing,” *Environmental Health Trust* channel, <https://www.youtube.com/watch?v=ekNC0J3xx1w>.

This complete lack of safety testing for 5G is rather shocking, given the abundant evidence of physical harm from the *less* intense 4G and Wi-Fi, a matter I addressed in an interview with wireless educator Cece Doucette.⁷ Peer-reviewed scientific studies have linked wireless radiation to cancer, DNA damage, heart irregularities, lowered sperm counts, and many other health issues. For anyone looking for an introduction to wireless dangers, I recommend downloading the film *Generation Zapped*, winner of the Best Documentary at the 2018 D.C. Independent Film Festival; it includes compelling testimony from leading world scientists, doctors, and public health experts, as well as victims.

NOTES

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CHAPTER 17

OTHER THEORIES ABOUT COVID-19

Additional explanations for COVID-19 have been advanced that I won't elaborate on at length:

- It is generally acknowledged in the scientific community that viruses are not technically living things, and there has long been some debate as to what they actually constitute. In a 38-minute video posted in March 2020, Andrew Kaufman, MD, articulates the view that what is being identified under electron microscopes as the COVID-19 virus is actually identical to *exosomes*—structures which eliminate toxins from cells. Such toxins, he says, could result from various sources, not excluding EMFs. The video may be seen at “A Breakdown on Current Testing Procedures,” *Secrets of Saturn*, March 30, 2020, <https://www.youtube.com/watch?v=X-r8Dy5mnYx8>. Dr. Thomas Cowan, Dr. Robert O. Young, and Arthur Firstenberg, referenced in the preceding chapter on 5G, express an outlook on viruses very similar to Kaufman's.

- Dr. Stephanie Seneff, PhD, a Senior Research Scientist at MIT's Computer Science and Artificial Intelligence Laboratory, makes a case that the reason some people have such a lethal reaction to COVID-19 is exposure to the toxic Monsanto-produced pesticide glyphosate, both in their diet and by inhaling atmospheric glyphosate into their lungs (glyphosate is present in the biofuels increasingly used by vehicles to replace fossil fuels). Dr. Seneff's paper is called “Connecting the Dots: Glyphosate and COVID-19,” and may be read at <https://jennifermargulis.net/glyphosate-and-covid-19-connection/>.

- Zack Bush, MD, holding an outlook comparable to Seneff's, points out that the worst-hit regions for COVID death were also areas with the worst air pollution—Wuhan, Northern Italy, New York City. He views lethal cases of COVID as not simply viral, but being caused by hypoxic injury, comparable to cyanide poisoning, and principally aggravated by

exposure to air pollutants—including the airborne glyphosate Seneff alludes to. Bush has elaborated his view in a number of interviews—see, e.g., “Doctor Who Predicted COVID-19 Answers All,” *The HighWire with Del Bigtree*, May 8, 2020, <https://www.facebook.com/HighWireTalk/videos/783415185521346/>.

- Finally, why are antibiotics helping COVID-19 victims, but not anti-viral medications? Lawrence Broxmeyer, MD, has written an article for the magazine *Nexus*, proposing that the coronavirus acts as a “passenger virus” for a deadlier lung disease—tuberculosis. Broxmeyer’s article, “Questions Raised by the ‘New’ Coronavirus,” may be read at https://www.academia.edu/42205426/Questions_raised_by_the_new_coronavirus.

PART FOUR



THE DEEP STATE'S END-GAME

CHAPTER 18

POPULATION REDUCTION

The globalist oligarchs have an agenda of population reduction. CNN founder Ted Turner has said: “A total world population of 250-300 million people, a 95 percent decline from present levels, would be ideal.”¹ Robert McNamara, former President of the World Bank, calling population growth “the gravest issue the world faces,” stated, “Either the current birthrate must come down more quickly, or the current death rates must go up.”² Zbigniew Brzezinski, long-time architect of U.S. foreign policy, said: “In earlier times it was easier to control a million people, literally, than physically to kill a million people. Today it is infinitely easier to kill a million people than to control a million people.”³ Perhaps most telling for COVID-19 is Prince Philip’s remark made in 1988: “In the event that I am reincarnated, I would like to return as a deadly virus in order to contribute something to solve overpopulation.”⁴ These quotes are just a tiny sampling of what can be found out there by looking on search engines for “population control quotes.”

In April 2020, former Russian intelligence officer Vladimir Kvachkov gave a televised interview commenting on the population control agenda associated with COVID-19. He also addressed other aspects of the crisis which I find relevant enough to include here. Translated from the Russian:

Kvachkov: The coronavirus phenomenon, that they falsely deem a pandemic, needs to be examined from the perspective of global powers—religious, political, financial, economic and national. The coronavirus phenomenon, the so-called pandemic—and let me tell you, there’s no pandemic, it’s all a lie—needs to be considered as a global, strategic special operation. This is exactly how you need to think of this thing. These are command and staff exercises of the world’s behind-the-scenes

powers on controlling humanity. That is what the goal of this coronavirus is.

I'll repeat it once again, we have little faith in God and even less in the existence of Satan, the enemy of the human race. So, the aim of the behind-the-scenes Zionist and financial powers is reducing the world's population. It's their *idée fixe*. They think there's too many of us ordinary people in the world. There should be around 100 million of their own kind and a maximum of 1 billion people on Earth to serve them. Then they'll be living in abundance here on Earth. Because, us the people, the earthlings—there's too many of us for the behind-the-scenes world powers.

This is why the coronavirus and the financial crisis that has emerged almost immediately—they're inextricably tied to one another. The aim is to stop people's movement around the world, to curtail political freedoms.... The first attempt to take away those rights from people happened on September 11, 2001. Not many seem to remember that, after the so-called attack on the WTC towers, Pentagon and the White House [Kvachkov apparently refers here to the presumed target of Flight 93 which crashed in Pennsylvania] in the USA, the global war on terrorism was declared.... The behind-the-scenes powers created the events of September 11, 2001.

Now they need another excuse for greater control and takeover of humanity. That's how they came up with the coronavirus. Basically, to put it this way, it's not a pandemic, not an epidemic. Even now, I literally looked at the data this morning. 300 people in the world die from it daily. You can imagine what kind of scale this is. Of course, I'm sorry about each person who dies, but 300 people across 7.5 billion people—that's basically nothing....

Once again, these are command and staff exercises of the behind-the-scenes Zionist and financial liberal world powers with the aim of limiting the political rights that people are basically accustomed to having. Especially in Western Europe.

That's their second goal. The first goal is to reduce the population numbers on Earth. That's their satanic goal. The second, political goal of the behind-the-scenes world powers is to seize power, and the third goal is related to finances and power over the economy.

Now is a very important moment. Note, it allegedly started in China. Even though the Chinese are now adamant and report that the coronavirus was created artificially. It has an artificial origin—it's been proven scientifically already. Of course, in every virus, seeing that it's the simplest kind of microorganism—as far as I remember—mutations can happen, but they're of an accidental nature. And when you take the RNA molecule, not DNA—they have RNA—and there's a part of the genome that's clearly been carved out and another one inserted in its place—and this happens three or four times. It is perfectly obvious that the Chinese scientists have figured this out—it was artificially created and purposely spread—initially in Wuhan....

Accordingly, we as military intelligence, look at “who?”—it is obvious; and “where?”—it is also obvious. Europe and China are two geo-economic adversaries of the USA....

Interviewer: Of course, we would like to hear your opinion regarding a practical plan of action, how to act, how to protect oneself, some recommendations. Maybe it's not your field of expertise, but maybe you could tell us something.

Kvachkov: I'm, of course, no epidemiologist. Although, you could say I'm a parasitologist, because you have to be one in order to understand the power structures in Russia. So, I'm speaking as a *military* doctor—epidemiologist and parasitologist. Until we're able to get rid of our internal parasites who rule over us, we won't be able to tackle other parasites.⁵

The response to COVID encouraged population reduction in ways that may not be obvious at first glance. The wearing of masks, enforced social distancing, the closing of restaurants and movie theaters—these prevent young men and women from meeting, dating, and beginning the normal types of relationship that leads to marriage and family.

But a very fundamental method of population control is mandatory vaccination. Quoting James Corbett:

In its 1968 annual report, the Rockefeller Foundation addressed the “Problems of Population,” lamenting that “[v]ery little work is in progress on immunological methods, such as vaccines, to reduce fertility, and much more research is required if a solution is to be found here.” . . . The Rockefeller’s Population Council and other research organizations joined with the World Health Organization (WHO) in 1972 to create a Task Force on Vaccines for Fertility Regulation. By 1995, they were able to report progress in “developing a prototype of an anti-hCG-vaccine.”⁶

(hCG stands for human chorionic gonadotropin, a hormone that supports development of an egg in a woman’s ovary, and its release during ovulation.)

But as we will see in the next chapter, there is one individual in particular who has come to symbolize the fusion of COVID-19 with vaccines and population control.

NOTES

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CHAPTER 19

BILL GATES

As Bill Gates seems to have emerged as the unofficial “director” of the planet’s response to COVID-19, we should know something about his background, besides being Microsoft’s co-founder.

- His father, William H. Gates, Jr. was a director of Planned Parenthood,¹ the largest provider of abortions in the U.S.

- Gates was friends with the notorious pedophile Jeffery Epstein, and according to the *New York Times*, met with him many times, even after Epstein was convicted of sex crimes.²

- The Bill and Melinda Gates Foundation—America’s largest foundation with assets of \$46.8 billion—bought half a million shares of Monsanto,³ infamous for spreading carcinogenic glyphosate across the planet, as well as replacing natural foods with GMOs. The Foundation is also heavily invested in 5G, having purchased 5.3 million shares of Crown Castle International, a major provider of 5G infrastructure.⁴

- In 2018, Britain’s *The Telegraph* reported:

A satellite company planning to launch a \$1bn (£700m) network of satellites to provide “live and unfiltered” coverage of the Earth has been backed by former Microsoft chief executive Bill Gates and Japanese tech giant Softbank. The tech leaders are backing EarthNow, which plans to launch 500 satellites to cover Earth’s atmosphere in video surveillance and provide live video feedback with only one second of delay.⁵

- In 2019 the *Daily Mail* related:

Could dimming the sun save the Earth? Bill Gates wants to spray millions of tonnes of dust into the stratosphere to stop

global warming . . . but critics fear it could trigger calamity.... This is not the crackpot plan of a garden-shed inventor. The project is being funded by billionaire and Microsoft founder Bill Gates and pioneered by scientists at Harvard University.⁶

- Gates is also investing in lab-grown meat to replace the meat we consume. Quoting CNBC:

Bill Gates has invested in lab-grown meat companies, as has Richard Branson. “Raising meat takes a great deal of land and water and has a substantial environmental impact,” Gates wrote on his personal blog, Gatesnotes.com, a few years ago. “Put simply, there’s no way to produce enough meat for 9 billion people. Yet we can’t ask everyone to become vegetarians. That’s why we need more options for producing meat without depleting our resources.”⁷

- Gates is even investing in artificial breast milk. *The Science Times* reported in 2020:

A new and better breast milk alternative has arrived, and it claims to be helpful for the environment as well. The U.S. firm, BIOMILQ, is artificially producing human breast milk from cultured human mammary epithelial cells to be commercially available to consumers. The start-up company has received \$3.5 million from an investment fund that is co-founded by Bill Gates, Jeff Bezos, Richard Branson, and Mark Zuckerberg. The fund was established to help prevent the ill effects of climate change brought about by carbon emissions.⁸

From sunlight to food to the human body, Bill Gates wants to replace the natural with the artificial. What’s not to love?

- Gates has attended the Bilderberg Group,⁹ the shadowy power brokers who meet annually to privately set global public policy. They are described in detail in Daniel Estulin’s book *The True Story of the Bilderberg Group*.

- In 2020, Microsoft featured a commercial by the occult “spirit-cooking” artist Marina Abramović, notorious for her cannibalistic art, but was forced to pull it after it received over 25,000 “thumbs down.”¹⁰

- With millions of people impoverished by the lockdown, some wondered why Gates—whose net worth is over \$100 billion—was inappropriately beaming and giggling when CNN’s Fareed Zakaria told him “The economy’s not going to be anything like it was, it’s going to take a long time to recover.”¹¹

- But most relevant to our COVID-19 discussion is Bill Gates’s role as a eugenicist. As James Corbett notes:

And perhaps it was coincidence that the Bill and Melinda Gates Foundation organized their London Summit on Family Planning, at which the Gates recommitted themselves to funding population control in the third world, in July 2012, on the anniversary of the First International Eugenics Congress, held in London exactly 100 years prior.”¹²

In a 2010 Ted Talk, Gates stated:

The world today has 6.8 billion people. That’s headed up to about nine billion. Now, if we do a really great job on new vaccines, health care, reproductive health services, we could lower that by, perhaps, 10 or 15 percent.¹³

In his Instagram post of April 9, 2020, Robert F. Kennedy, Jr., nephew of President John F. Kennedy, enumerated many examples of the catastrophes caused by Gates-funded vaccines. Quoting him just partially:

Gates’ obsession with vaccines seems fueled by a messianic conviction that he is ordained to save the world with technology and a god-like willingness to experiment with the lives of lesser humans.

Promising to eradicate polio with \$1.2 billion, Gates took control of India’s National Advisory Board and mandated 50 polio vaccines (up from 5) to every child before age 5. Indian

doctors blame the Gates campaign for a devastating vaccine-strain polio epidemic that paralyzed 496,000 children. In 2017, the Indian Government dialed back Gates' vaccine regimen and evicted Gates and his cronies from the NAB. Polio paralysis rates dropped precipitously....

In 2010, the Gates Foundation funded a trial of a GSK's experimental malaria vaccine, killing 151 African infants and causing serious adverse effects including paralysis, seizure, and febrile convulsions to 1,048 of the 5,049 children....

In 2010, Gates committed \$10 billion to the WHO promising to reduce population, in part, through new vaccines. In 2014, Kenya's Catholic Doctors Association accused the WHO of chemically sterilizing millions of unwilling Kenyan women with a phony "tetanus" vaccine campaign.

Independent labs found the sterility formula in every vaccine tested.

After denying the charges, WHO finally admitted it had been developing the sterility vaccines for over a decade....

A 2017 study (Morgensen et al., 2017) showed that WHO's popular DTP is killing more Africans than the disease it pretends to prevent. Vaccinated girls suffered 10x the death rate of unvaccinated children. Gates and the WHO refused to recall the lethal vaccine, which WHO forces upon millions of African children annually....

Gates appears gleeful that the COVID-19 crisis will give him the opportunity to force his third-world vaccine programs on American children.¹⁴

To amplify, the sterility formula discovered in the African vaccines prevented women from secreting the hormone hCG—the very approach to vaccine-induced sterility that the Rockefeller-supported Task Force on Vaccines for Fertility Regulation was developing in the 1990s (mentioned at the end of the preceding chapter).

- For those who'd like more on Gates's background, including some of the mythology surrounding Microsoft's beginnings, in 2020 James Corbett produced a highly informative, scrupulously documented four-part series, *Who Is Bill Gates?*, <https://www.corbettreport.com/gates/>.

Gates is now at the helm of the “vaccine response” to COVID-19. As we've noted, he helped fund the Event 201 simulation that took place six weeks before the Wuhan outbreak.

How do we know he's not sincere? Personally, I've never seen Gates make any recommendations like building up one's immune system, eating right, taking vitamins C and D, getting fresh air and exercise, etc.—for him, the only answer to COVID-19 seems to be injection by syringe. Since Gates is supposed to be an entrepreneur, it's also noteworthy that his solution to “overpopulation” is *less people*—rather than coming up with innovations, such as making more use of arable land, raising (healthy) crops, housing development, etc.

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CHAPTER 20

DEEP STATE GOAL #1: GLOBAL VACCINES

Now let's examine the objectives behind the COVID-19 pandemic.

Bill Gates told Chris Wallace of Fox News: "It is fair to say things won't go back to truly normal until we have a vaccine that we've gotten out to basically the entire world."¹ He told CNBC's Becky Quick: "We're gonna have this intermediate period of opening up, and it won't be normal until we get a vaccine to the entire world."² He also told *The Daily Show* that he is funding seven "factories" to develop a vaccine for the coronavirus.³

Given the global track record of death, paralysis and sterility that Gates's vaccines have caused (enumerated by Robert F. Kennedy, Jr.) and his openly expressed desire *to reduce world population*, would anyone trust a Bill Gates vaccine?

On May 14, 2020, President Trump, stating he was confident a COVID-19 vaccine would be ready by the end of 2020, said "Our military is now being mobilized so at the end of the year, we're going to be able to give it to a lot of people very, very rapidly."⁴

CNBC reported on May 22:

Secretary of Defense Mark Esper doubled down on Friday by saying the Pentagon will meet an aggressive timeline to have a coronavirus vaccine by the end of the year, a deadline doubted by leading health officials.

"You know, our medical experts, our researchers have been working on this vaccine now, and therapeutics and diagnostics for a few months," Esper explained on NBC's "TODAY." "We've been ahead of the curve and in the fight from day one, and this is the next phase of this battle, and we will deliver on

time the vaccines,” he added, saying he was “completely confident” that the Pentagon will deliver.

Esper downplayed characterizations made by health officials that a vaccine within the year would be “aspirational.”⁵

One cannot but wonder at this bizarre transformation of the Defense Department (DOD) from a military institution to a vaccine delivery system. On May 12, the DOD announced it had awarded a \$138 million contract to ApiJect Systems America “to create a U.S.-based, high-speed supply chain for prefilled syringes beginning later this year . . . suitable for combatting COVID-19.”⁶

A commercial for RAPID USA, an ApiJect subsidiary, includes some surprising details. Jay Walker, RAPID’s chairman, narrates it:

Today the world is battling a global pandemic and there’s plenty of work to do. Some needs are obvious, like developing medicines and vaccines. Some needs are less obvious, like finding a faster way to put those medicines and vaccines into small glass vials, so every person in America can quickly get vaccinated....

America has 330 million people, all of whom will likely need two to four injections. That means packaging between 660 million and 1.3 billion doses of a vaccine, which requires an enormous number of glass vials and syringes. We have some of those glass vials and syringes in stockpiles, but not nearly enough....

These obstacles explain why America’s Assistant Secretary for Preparedness and Response and the Strategic National Stockpile, both part of the U.S. Department of Health and Human Services, have teamed up with a U.S. company called ApiJect Systems America, to help package hundreds of millions of doses of vaccines and therapeutics fast. The partnership is called the RAPID Consortium. RAPID will build U.S.-based facilities to make a new kind of plastic prefilled

syringe at extraordinary speed. These facilities will make enough prefilled syringes to inject every man, woman and child in America with just the right dose 30 days after a vaccine becomes available. Plus every prefilled syringe can have an RFID chip. This will allow healthcare workers to use their mobile phones to automatically capture where and when every injection takes place....⁷

Since RAPID is not a health care or pharmaceutical company, but a syringe manufacturer, one wonders how Walker is so certain that “every man, woman and child in America” will be injected, probably with “two to four doses” of a vaccine that has not even been developed yet. The inclusion of RFID chips (which are displayed in the commercial), add to the Orwellian dimensions.

Canada has also hopped on the syringe bandwagon. The *Toronto Star* reported on June 2:

Canada is gearing up for an eventual COVID-19 vaccine, having inked a contract to buy 37 million syringes—roughly enough to deliver shots to the country’s entire population.⁸

As to the vaccine itself, the *New York Times* reported on June 3: “The Trump administration has selected five companies as the most likely candidates to produce a vaccine for the coronavirus, senior officials said, a critical step in the White House’s effort to deliver on its promise of being able to start widespread inoculation of Americans by the end of the year.”⁹ The five finalists: AstraZeneca, Merck, Pfizer, Johnson & Johnson and Moderna.

The Trump administration is not merely naming favored COVID vaccine developers, but pouring U.S. tax dollars into them. *Reuters* reported in May that “the U.S. Department of Health and Human Services (HHS) agreed to provide up to \$1.2 billion to accelerate British drugmaker AstraZeneca’s vaccine development and secure 300 million doses for the United States.”¹⁰

On June 8, *Market Watch* reported:

British drugmaker AstraZeneca has started manufacturing the University of Oxford's potential coronavirus vaccine ahead of trial results and has doubled its capacity to two billion doses. Chief Executive Pascal Soriot said the company wasn't going to wait for clinical results, which it expected to have in August, and had begun manufacturing the experimental vaccine. The pharmaceutical giant, AZN, which has already agreed to provide the U.K. and the U.S. with doses, said it has secured agreements to supply the vaccine to low and middle-income countries through health organizations, including two backed by Microsoft co-founder Bill Gates.¹¹

Who ever heard of a company mass-producing a product without even knowing if it works or not? Of course, when gifted with more than a billion taxpayer dollars, risks are easier to take.

Of the five corporate contenders, only one is small and young: Massachusetts-based Moderna Therapeutics. *Bloomberg* reported on April 16: "Moderna Inc. shares rose as much as 21% after the company said the U.S. government has agreed to pay as much as \$483 million for the company to develop and test its COVID-19 vaccine now in an initial clinical trial."¹² The Gates Foundation had already pledged up to \$100 million to Moderna.¹³ As *New Eastern Outlook* reported: "Moderna's other partner is the US National Institute of Allergy and Infectious Diseases (NIAID), a part of the National Institutes of Health (NIH). Head of NIAID is Dr. Anthony Fauci, the person at the center of the Trump Administration virus emergency response."¹⁴

On May 15, Moncef Slaoui resigned from Moderna's board to become White House director of Operation Warp Speed—the plan to fast-track a COVID vaccine. As Slaoui owned 156,000 stock options in Moderna, this reeked of conflict of interest. Just three days later (May 18) Moderna made headlines with its announcement¹⁵ of preliminary positive test results for its COVID vaccine, and its stock jumped another 15 percent, increasing the value of Slaouis' holdings by \$3 million. However, the conflict was too glaring even for mainstream media to ignore, and Slaoui promised to divest himself of his financial interest in Moderna.¹⁶

Furthermore, Moderna's press release was less impressive once analyzed. As *STAT* noted:

While Moderna blitzed the media, it revealed very little information—and most of what it did disclose were words, not data.... Even the figures the company did release don't mean much on their own, because critical information—effectively the key to interpreting them—was withheld.... The company's statement led with the fact that all 45 subjects ... developed binding antibodies. Later, the statement indicated that eight volunteers ... developed neutralizing antibodies. Of the two types, these are the ones you'd really want to see. We don't know results from the other 37 trial participants.... Moderna disclosed the findings from eight subjects because that's all it had at that point.¹⁷

And as *Need to Know* reports:

Ian Haydon was one of 15 volunteer test subjects for Moderna's experimental COVID vaccine, and he said that less than 12 hours after vaccination, he suffered muscle aches, vomiting, spiked a 103.2 degree fever, and lost consciousness. Moderna's press release revealed that within 45 days, three volunteers, a shocking 20%, experienced "serious" adverse events and required hospitalization or medical intervention. Moderna let Haydon believe the illness was just a sad coincidence unrelated to the jab. Moderna never told Haydon he was suffering an Adverse Event. On May 7th, he told Sanjay Gupta about his reactions in a pre-interview. The two men agreed to keep this bad news secret when he went on air, which means they lied to the public. Dr. Fauci and Bill Gates are proceeding with their plan to funnel half a billion taxpayer dollars into their project with business partner Moderna to create 30 million doses by November and two billion within a year.¹⁸

A concern for many is whether or not the COVID vaccine will be mandatory. Associated Press provided a hint in a June 26 news story: “University of Tennessee students will have to get their flu shot this fall and also be immunized for COVID-19 if a vaccine becomes available under an emergency rule unanimously approved Friday by the university’s Board of Trustees.”¹⁹

In a May 16 interview with Jason Goodman of *Crowdsourcethe Truth*, famed attorney Alan Dershowitz—whose clients have included Jeffrey Epstein and Harvey Weinstein—expressed his view:

Dershowitz: Let me put it very clearly: You have no constitutional right to endanger the public and spread the disease, even if you disagree. You have no right not to be vaccinated. You have no right not to wear a mask, you have no right to open up your business.

Goodman: Wait, can I stop you?—no right not to be vaccinated, meaning if they decide you have to be vaccinated, we have to be vaccinated?

Dershowitz: Absolutely, and if you refuse to be vaccinated, the state has the power to literally take you to a doctor’s office and plunge a needle into your arm, if the . . .

Goodman: Where is that in the constitution?

Dershowitz: . . . if the vaccination is designed to prevent the spreading disease. If the vaccination is only to prevent a disease that *you* will get—for example, if there’s a disease that will kill you—you have the right to refuse that, but you have no right to refuse to be vaccinated against a contagious disease. Public Health, the police power of the Constitution, gives the state the power to compel that, and there are cases in the United States Supreme Court.²⁰

Dershowitz's comments won him no fans among civil libertarians, but may have previewed for us the legal pretexts that might be used for a mandatory COVID vaccine. The formula for coercion may quickly move from "You're selfish if don't wear a mask" to "You're selfish if you refuse a vaccine." The Nuremberg Code states: "The voluntary consent of the human subject is absolutely essential." That code applied specifically to medical experiments, but a vaccine developed at "warp speed" will certainly become an experiment on the nation and world. It sounds like we're going to need "red-pilled" attorneys to band together and mount legal challenges to compulsory COVID-19 vaccinations.

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CHAPTER 21

EIGHT REASONS WHY WE DON'T NEED A COVID VACCINE

Let's examine *why* we don't need the coronavirus vaccine Bill Gates clamors for.

(1) According to the Stanford University study we cited previously, the actual death rate for COVID-19 is 0.12 to 0.2 percent.¹ That would make the survival rate at least 99.8 percent. On May 22, even the CDC—which as we have seen, has relied on inflated mortality statistics—reduced its estimated death rate from COVID to 0.26 percent, meaning a survival rate of 99.74 percent.²

Why should everyone be forced to take a COVID vaccine, when 99.74 percent (or more) have strong enough immune systems to defeat the disease on their own? For those who *can't* beat it on their own, doctors are already having excellent success with the anti-malarial drug hydroxychloroquine (a derivative of chloroquine) in combination with zinc. So many efforts have been made to suppress this medication that we will devote the next chapter to it.

(2) Another reason why no COVID vaccine is needed is described by Dr. Stefano Montanari, the Italian nano-pathologist, who says:

The major issue at stake is, or are, the vaccines. The regime that now encompasses the world will force the world to vaccinate—that is to vaccinate with and against a virus that does not give immunity, as this (the coronavirus) is the case.

If 50 years ago, at my exam of pharmacology, I had told my examining professor—who was one of the most knowledgeable pharmacologists of the time—something like that, I would have

been thrown out of the door. For only an incompetent can imagine a vaccine against a virus that does not give immunity and has no chance of being effective. We are talking about a virus that mutates at very fast speed, and we cannot possibly run after it (its mutations).

It's a virus somehow similar to the cold virus, whose family it belongs to. You can't vaccinate against the common cold because the common cold does not give immunity. In the course of a life, a person can have a cold 200 times, and at no time will that cold give immunity (against the next). It is a colossal fraud. We are close to 8 billion people forced to be vaccinated and it will be an unimaginably enormous business.³

To paraphrase: if—as the mainstream media claims— COVID-19 is just a naturally occurring mutation of the coronavirus, a vaccine won't work. Why? Because the coronaviruses—a cause of the common cold—keep mutating into something new; this is why we never get immune to them, and why no one ever developed a vaccine for the common cold. If a COVID-19 vaccine is manufactured, the virus would presumably mutate into something else—meaning the vaccine would become worthless against new variants later on, but you'd still have the vaccine's toxins in your body.

(3) Related to the foregoing point, cold and flu viruses typically run their course and disappear from the scene (to be replaced in the future by mutant varieties). Some authorities believe COVID is doing exactly that—running its course. Sunetra Gupta, Professor of Theoretical Epidemiology at Oxford University, said in a May 21, 2020 interview with *Unherd*: “I think that the epidemic has largely come and is on its way out in this country.”⁴

On May 31, *Reuters* reported of Italy:

“In reality, the virus clinically no longer exists in Italy,” said Alberto Zangrillo, the head of the San Raffaele Hospital in Milan in the northern region of Lombardy, which has borne the brunt of Italy's coronavirus contagion. “The swabs that were performed over the last 10 days showed a viral load in quantitative terms that was absolutely infinitesimal compared

to the ones carried out a month or two months ago,” he told RAI television.⁵

Beda M, Stadler, former director of the Institute for Immunology at the University of Bern, wrote in June:

Sars-Cov-2 isn't all that new, but merely a seasonal cold virus that mutated and disappears in summer, as all cold viri do—which is what we're observing globally right now.... The virus is gone for now. It will probably come back in winter, but it won't be a second wave, but just a cold.⁶

Former Congressman and Presidential candidate Ron Paul, himself a physician, explains that when American death rates dropped, the media switched to “cases”:

For months, the *Washington Post* and the rest of the mainstream media kept a morbid COVID-19 “death count” on their front pages and at the top of their news broadcasts. The coronavirus outbreak was all about the number of dead. The narrative was intended to boost governors like Cuomo in New York and Whitmer in Michigan, who turned their states authoritarian under the false notion that destroying people's jobs, freedom, and lives would somehow keep a virus from doing what viruses always do: spread through a population until eventually losing strength and dying out. The “death count” was always the headline.

But then all of a sudden early in June the mainstream media did a George Orwell and lectured us that it is all about “cases” and has always been all about “cases.” Death, and especially infection fatality rate, were irrelevant. Why? Because from the peak in April, deaths had decreased by 90 percent and were continuing to crash. That was not terrifying enough, so the media pretended this good news did not exist.

With massive increases in testing, the “case” numbers climbed. This is not rocket science: the more people you test

the more “cases” you discover. Unfortunately our mainstream media is only interested in pushing the “party line.” So the good news that millions more have been exposed while the fatality rate continues to decline—meaning the virus is getting weaker—is buried under hysterical false reporting of “new cases.”

Unfortunately many governors, including our own here in Texas, are incapable of resisting the endless lies of the mainstream media. They are putting Americans again through the nightmare of forced business closures, mandated face masks, and restrictions of Constitutional liberties based on false propaganda.

In Texas the “second wave” propaganda has gotten so bad that the leaders of the four major hospitals in Houston took the extraordinary step late last week of holding a joint press conference to clarify that the scare stories of Houston hospitals being overwhelmed with COVID cases are simply untrue. Dr. Marc Boom of Houston Methodist said the reporting on hospital capacity is misleading. He said, “quite frankly, we’re concerned that there is a level of alarm in the community that is unwarranted right now.”

In fact, there has been much reporting that the “spike” in Texas cases is not due to a resurgence of the virus but to hospital practices of COVID-testing every patient coming in for any procedure at all. If it’s a positive, well that counts as a “COVID hospitalization.” Why would hospitals be so dishonest in their diagnoses? Billions of appropriated Federal dollars are being funneled to facilities based on the number of “COVID cases” they can produce. As I’ve always said, if you subsidize something, you get more of it. And that’s why we are getting more COVID cases.⁷

If these doctors are right, and COVID-19 is disappearing, then the media will have a hard time keeping panic going, there should be no need

for a vaccine months down the road, nor is there any point in developing one.

(4) Countries like China and South Korea have already “flattened the curve” on COVID-19 *without a vaccine*. Nations like Taiwan and Sweden have done it without even locking down their economies. (As of July 12, Taiwan, with a dense population of 24 million, had only suffered seven COVID deaths.⁸) This, too, proves no vaccine is necessary.

Of course, if—as we have previously seen scientists conclude—COVID-19 is a bioweapon, then possibly whoever engineered it will also continue dispersing it, or variants of it, around the world, creating the illusion that the pandemic is never-ending.

(5) Dr. Richard Bartlett of Odessa, Texas, has been an emergency physician for 28 years and served on Governor Rick Perry’s Health Disparities Task Force. In a July interview on *America Can We Talk?*, Bartlett explained that a major reason nations like Japan, Taiwan and Singapore were having such low COVID death rates was their practice of administering inhaled steroids. Bartlett reported having outstanding success with the same approach, using the inexpensive medication Budesonide, given twice daily by nebulizer. “It’s an asthma medicine,” he said, “it’s a respiratory anti-inflammatory for COVID—which is a respiratory inflammatory disease. And it works, A hundred percent of my patients are alive. I’ve been treating this since March.” Bartlett said that Dr. Fauci’s NIH had begun trials on Budesonide, but that it was “set up for failure” by only administering it to patients in the late stages of the disease—in ICUs and on ventilators.⁹

(6) Researchers at Northwestern University have found vitamin D may protect against death from the disease. The *Daily Northwestern* reported:

A group of Northwestern researchers have recently found a strong correlation between severe vitamin D deficiency and COVID-19 mortality rates. According to a University release, the researchers studied publicly-available global data from the COVID-19 pandemic and observed that patients from countries with high COVID-19 mortality rates had lower levels of vitamin D compared to those from countries that were not

affected as severely.... They also discovered a strong correlation between vitamin D levels and cytokine storm, a hyperinflammatory condition caused by an overactive immune system.¹⁰

(7) Many of the COVID vaccines being developed are taking us into uncharted territory: genetic vaccines. Companies like Inovio are working on DNA vaccines, while Moderna and Pfizer are developing messenger RNA (mRNA) vaccines. These would work by delivering genetic instructions for making a protein, which would then stimulate the immune system to make antibodies that would fight COVID-19. In other words, they would, however slightly, modify your genetic makeup. As Jon Rappoport of *No More Fake News*—one of the best bloggers on the COVID-19 crisis—says: “RNA vaccines and the technology they use are entirely experimental.... What in the world could possibly go wrong?”¹¹ No RNA or DNA vaccine has ever been approved for humans before. Why would we want one developed at “warp speed” and then delivered to everyone on the planet without adequate long-term safety testing? We must bear in mind that thanks to the Vaccine Injury Act of 1986, the public cannot sue vaccine manufacturers for injury or death caused by their products. The afflicted parties must go to “Vaccine Court,” and if able to prove their claim, are compensated by the Americans taxpayers. Thus vaccine manufacturers have little incentive to make their vaccines safe, since they produce them without risk of liability.

Tal Zaks, chief medical officer of the Gates-backed Moderna, is a former medic in the Israeli Defense Force (IDF). In a TED Talk, he described his company’s products as “actually hacking the software of life.”¹² As of publication of this book, Moderna had never produced a successful vaccine or brought a single product to market. Yet Zaks has said he is confident that Moderna will be able to produce a billion doses of a COVID vaccine in 2021.¹³

Here is a warning from Carrie Madej, MD:

[W]hat if our DNA, our genome, is modified and thus can be patented and owned? This is not a sci-fi movie or a future

event, this is right now today. This is called recombinant DNA and recombinant RNA technology, and this is what is proposed for COVID-19 vaccines. The coronavirus COVID-19 vaccines are designed to make us into genetically modified organisms; that is the same lingo and terminology used for Monsanto seeds. The frontrunners for this recombinant DNA technology are Inovio, which is backed by the Gates Foundation, GlaxoSmithKline and Sanofi. Also Moderna is in there too now, but that's also Gates-backed. I will add that this type of DNA vaccine has never been used on humans before.... They are now proposing to take something we've never used and to inject it into everyone.

Vaccine trials are being fast-tracked at a level and a rate that I have never seen in my life, nor did I ever expect to see this. They are skipping over the animal trials, going directly to human trials. They are not using good scientific methodology at all; they have no randomized placebo-controlled trials for any vaccine, which is the gold standard for any therapy to be approved by the FDA. They're not following any sound scientific protocol to make sure this is safe for us, to make sure it would work for us, to know anything about it, and they want to inject it into everybody....

The recombinant RNA, recombinant DNA technology would cause permanent and unknown genetic changes in a person's body—permanent. Once their DNA has changed, he or she will live with that change for the rest of their lives. And also the ripple effects from that genetic change—who knows what they could be for the rest of his or her life? There's no going back.¹⁴

(8) Cytokine storm—the deadly auto-immune response that afflicts a small number of COVID victims—has actually resulted from experimental vaccines in the past. In a guest appearance on *Joni Table Talk*, Robert F. Kennedy, Jr. stated:

Governments have been trying for almost 30 years to develop a coronavirus vaccine and it's been unsuccessful. And beginning in 2002, there were three outbreaks of coronavirus—we called them SARS at that point and MERS. The first SARS was a natural illness that jumped from a bat to human beings. The second two were lab-created that had escaped and infected human beings. And so the government of China and a consortium of Western governments all got together and put millions and millions of dollars into an effort to develop a coronavirus vaccine. And between 2002 and 2014, they worked very hard to do that. And what happened is, they developed about 35 vaccines. and four of them were really promising. They chose the four most promising and they gave them to ferrets, which is the animal that is most analogous to human beings when it comes to upper lung respiratory infections. The ferrets had a brilliant, robust and durable antibody response. But then something horrible happened. When those ferrets were challenged—when they were exposed to the *wild* virus—they got horribly sick, they got inflammation throughout their bodies and they died.

And the scientists remembered that something very similar had happened in 1960s, where they had developed a vaccine for RSV, which is very similar to coronavirus; it's an upper respiratory infection ailment. They had skipped the animals and given them directly to 35 children, and the children again had developed a very robust antibody response. But when those children were exposed to the wild virus, they got very, very sick—much sicker than unvaccinated children. Two of those kids had died; it was a scandal. And they realized when the same thing happened with the ferrets, that there was something that they called enhanced immune response; it's also called pathogenic priming. And what it means is when you get the vaccine, it appears that you have an antibody response, but when you actually encounter the wild virus, you become much

sicker and it actually creates a pathway that hurts you a lot more than with unvaccinated people.

So this was 2012. In 2014, NIH under Fauci developed a dengue vaccine which had some signals in it that there was pathogenic priming. In other words, in the clinical trials they saw some signs that you could get an antibody response, but get much sicker when you were exposed. But they ignored them. They gave it to the Philippines, and they gave hundreds of thousands of children this vaccine, and when the dengue came around, those children became horribly ill and 600 of them died. And in the Philippines today, people are being criminally prosecuted for that.

So the danger with the coronavirus vaccine is that you really need to test it on animals first to make sure whatever the vaccine is, that we don't get that really great immune response, followed by lethal infections. And it's very very strange to me, and seems almost criminally reckless, that Anthony Fauci is allowing these companies to skip animal trials and to go directly to human trials.¹⁵

Here is the abstract of the official report from the National Institutes of Health:

Severe acute respiratory syndrome (SARS) emerged in China in 2002 and spread to other countries before brought under control. Because of a concern for reemergence or a deliberate release of the SARS coronavirus, vaccine development was initiated. Evaluations of an inactivated whole virus vaccine in ferrets and nonhuman primates and a virus-like-particle vaccine in mice induced protection against infection but challenged animals exhibited an immunopathologic-type lung disease.¹⁶

The question must therefore be raised if a vaccine for COVID-19 might result in a similar deadly outcome: robust antibody reaction, followed by extreme illness when the actual virus is encountered. Is this perhaps even a factor in the deadly “cytokine storm” (autoimmune reaction) that *already*

occurs in a few COVID patients? It would be interesting to see a study undertaken on COVID victims who succumbed to autoimmune reaction, and determine just how many previously received annual free flu shots.

Lest we forget history's lessons, in 1976 President Gerald Ford was persuaded to go on television and tell Americans it was urgent they be inoculated against swine flu. Congress appropriated \$136 million for the vaccine's manufacturers. The vaccine paralyzed hundreds of people, at least 25 died, and over a billion dollars in lawsuits resulted. The vaccinations were halted—and the swine flu itself turned out to be no threat at all. I strongly recommend watching the old *Sixty Minutes* segment on the 1976 fiasco, from an era when journalism was more forthright. (At time of publication, it could be found on YouTube as “The Swine Flu Fraud of 1976, on 60 Minutes,” the *LibertyArchives3* channel, <https://www.youtube.com/watch?v=8elE7Ct1jWw>.) *Sixty Minutes* vetted, in depth, how CDC executives colluded with drug manufacturers, suppressed research that had foretold the vaccine could cause neurological damage, and engaged in a disingenuous television marketing campaign, even falsely claiming endorsements from celebrities like Mary Tyler Moore.

The *Sixty Minutes* report underscored the cozy relationships CDC executives have often enjoyed with the pharmaceutical industry. Julie Gerberding, director of the CDC from 2002 to 2009, now heads Merck's vaccine division; in January 2020, she sold over 100,000 shares of Merck stock valued at \$9.1 million.¹⁷

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CHAPTER 22

THE STORM OVER HYDROXYCHLOROQUINE

Now for a ninth reason we don't need a COVID vaccine. As we saw in the preceding chapter, even according to the CDC in May, the COVID survival rate was 99.74 percent. And here's a way to make the survival rate even higher: Doctors have had excellent success with the anti-malarial drug hydroxychloroquine in combination with zinc or Azithromycin. A study of 1,061 COVID-19 patients, published by the eminent French microbiologist and physician Didier Raoult, found that over 90 percent were cured within 10 days using a combination of hydroxychloroquine and Azithromycin.¹

Los Angeles emergency medical physician Dr. Anthony Cardillo spoke about hydroxychloroquine with Jory Rand of ABC7 Los Angeles:

Cardillo: What we are finding clinically, with our patients, is that it really only works in conjunction with zinc. Hydroxychloroquine opens the zinc channel, the zinc goes into the cell, it then blocks the replication of the cellular machinery. So it has to be used in conjunction with zinc. We are seeing some clinical responses in that regard. There are people that take it regularly for other disease processes. We have to be cautious and mindful that we don't prescribe it for patients who have COVID that are well. It really should be reserved for people that are really sick in the hospital, or at home, very sick, that need that medication. Otherwise we're going to blow through our supply for the patients who take it regularly for other disease processes.

Rand: But what you're saying is you are prescribing it and it is working for COVID-19 patients?

Cardillo: Every patient I have prescribed it to has been very, very ill. And within eight to 12 hours, they were basically symptom-free. And so clinically, I am seeing a resolution that's near to what we saw in the French study and other studies worldwide. But what I am seeing is that people that are taking it alone, by itself, it's is not having efficacy.

Rand: That is very interesting news, and hopefully we can get that worldwide spread.²

Laura Ingraham of Fox News interviewed Dr. Ivette Lozano:

Ingraham: My next guest, Dr. Ivette Lozano, says the state pharmacy board is requiring her to reveal patients' medical diagnoses in order to obtain the drug. Dr. Lozano, you're in Texas; isn't that a violation of privacy that you're being questioned as a physician in that manner?

Lozano: Absolutely, and this is what was very alarming to me — when I wrote a prescription and had the pharmacist call me and let me know that he could not fill that without me disclosing the diagnosis of the patient. And so we had a little scuffle on the phone, and I told him that I couldn't do that because of HIPAA laws. And he was insistent that the laws had been changed, and the pharmacy board had passed a mandate that that drug could not be dispensed unless it was accompanied by a diagnosis.

Ingraham: CVS Pharmacy released a statement to the *Ingraham Angle* tonight. Here's what it says: "We balance the off-label use of certain prescription medications to treat COVID-19 pneumonia with ongoing needs of patients who are prescribed these drugs. Our pharmacies make dispensing decisions to help ensure there's adequate supply of medication to meet patient needs while complying with all applicable regulations." Well, a dear friend of mine just told me, Dr.

Lozano, that she was called by the pharmacist and was interrogating her—and this was a CVS pharmacist—interrogating her over a prescription she wrote for hydroxychloroquine for one of her patients. And she said “What are you what are you talking about?” And they were insistent, and she ultimately finally got it, but not without the—you know, the hassle; it’s curious given your own experience with this drug.

Lozano: So it’s been an extremely difficult situation for me in the last couple of days. Yesterday I wrote five prescriptions for hydroxychloroquine, and I sent them to a pharmacy that I have used for the last 20 years, and I actually got a phone call from the pharmacist, letting me know that she was not going to refill another prescription for me for hydroxychloroquine. And so I told her that she couldn’t do that, that these patients were sick, and that if I wrote the prescription, she needed to fill these. And she told me that she was not going to fill another prescription for me, and so I said, “Well, I need your name and I’m going to call the pharmacy board.” And she said “I have the right to deny to fill this prescription for you.” And so I asked her, “Are you out? Do you not have any?” And she told me that she had 100 pills in the pharmacy, and I told her “Let’s just order some more; you can overnight this medication.”

Ingraham: It like costs nothing.

Lozano: So the prescription costs \$13, and I have so many very, very sick patients in the office, and today was horrible, because I treated 15 people that needed 15 prescriptions, could not go there, had to swarm all over Dallas to try and get these prescriptions.

Ingraham: Dr. Lozano, really quickly, do you find good results giving hydroxychloroquine to mild to moderate patients? Do you find good results?

Lozano: I have severe patients in the office. I have patients that have been diagnosed with pneumonia and been turned away from clinics. I've got patients that have been turned away from hospitals. I've got patients coming in with temperatures of 102.9, white blood cell counts of 17,000, all positive COVID tests. Their physicians are refusing to give them medication for fear that they are going to be in trouble with the licensing board, and the issue we have now is we've got pharmacists that are refusing to fill this medication, and so this is critical now. I have a huge problem on my hands. I have patients that are coming in from Austin, Houston, San Antonio—these are not my patients . . .

Ingraham: This is ridiculous. But just back to the question really quickly—it's working in patients that you've treated, that you've been able to prescribe it to, correct?

Lozano: Every patient that I treated—serious, moderate—has had resolution of symptoms within 24 hours, they are improved within five hours, the fevers are gone within two days. The lung restriction, which is the most important, resolves within about four to five hours. You see dramatic improvement. It's incredible; I'm surprised myself.

Ingraham: Doctor Lozano, I hope the FDA is watching this. People's lives are on the line because of these restrictions, or these warnings I should say, because it's trickling down to the pharmacies and the pharmacies board. You educated a lot of people with this segment tonight; thank you for explaining it to us.³

Simone Gold, MD, encountered similar frustrations as Dr. Lozano:

I was actually presented with a definite COVID positive patient, and I prescribed hydroxychloroquine and zinc. Because I was very up on the literature on this, and I got severely

reprimanded for it, and I also had received a letter from the State Board threatening all doctors—I was just one—with potential investigation into me for unprofessional conduct if I was to prescribe hydroxychloroquine. This was so shocking to me; it had never happened where the government told a physician if they had a right, or not a right to prescribe an FDA-approved medication, I mean that was just a *sui generis* event that that took me by surprise and I thought to myself: if doctors don't speak up, we're really all lost.⁴

It's no surprise that pressure has been exerted from high places to suppress hydroxychloroquine. Not only does this inexpensive medication threaten Big Pharma's profits, it discredits any need for a universal COVID vaccine and all that goes with it.

The Surgisphere scandal appears to have been a product of these circumstances. In June 2020, Britain's *The Guardian* reported:

The World Health Organization and a number of national governments have changed their COVID-19 policies and treatments on the basis of flawed data from a little-known US healthcare analytics company, also calling into question the integrity of key studies published in some of the world's most prestigious medical journals....

Two of the world's leading medical journals—the *Lancet* and the *New England Journal of Medicine*—published studies based on Surgisphere data. The studies were co-authored by the firm's chief executive, Sapan Desai. Late on Tuesday, after being approached by the *Guardian*, the *Lancet* released an “expression of concern” about its published study. The *New England Journal of Medicine* has also issued a similar notice.

...

The *Guardian*'s investigation has found:

- A search of publicly available material suggests several of Surgisphere's employees have little or no data or scientific background. An employee listed as a science editor appears to

be a science fiction author and fantasy artist whose professional profile suggests writing is her fulltime job. Another employee listed as a marketing executive is an adult model and events hostess, who also acts in videos for organisations.

- The company's LinkedIn page has fewer than 100 followers and last week listed just six employees. This was changed to three employees as of Wednesday.

- While Surgisphere claims to run one of the largest and fastest hospital databases in the world, it has almost no online presence. Its Twitter handle has fewer than 170 followers, with no posts between October 2017 and March 2020....

- Desai's *Wikipedia* page has been deleted following questions about Surgisphere and his history, first raised in 2010.

On 22 May the *Lancet* published a blockbuster peer-reviewed study which found the antimalarial drug hydroxychloroquine, which has been promoted by Donald Trump, was associated with a higher mortality rate in COVID-19 patients and increased heart problems....

The *Lancet* study, which listed Desai as one of the co-authors, claimed to have analysed Surgisphere data collected from nearly 96,000 patients with COVID-19, admitted to 671 hospitals from their database of 1,200 hospitals around the world, who received hydroxychloroquine alone or in combination with antibiotics. The negative findings made global news and prompted the WHO to halt the hydroxychloroquine arm of its global trials. But only days later *Guardian Australia* revealed glaring errors in the Australian data included in the study....

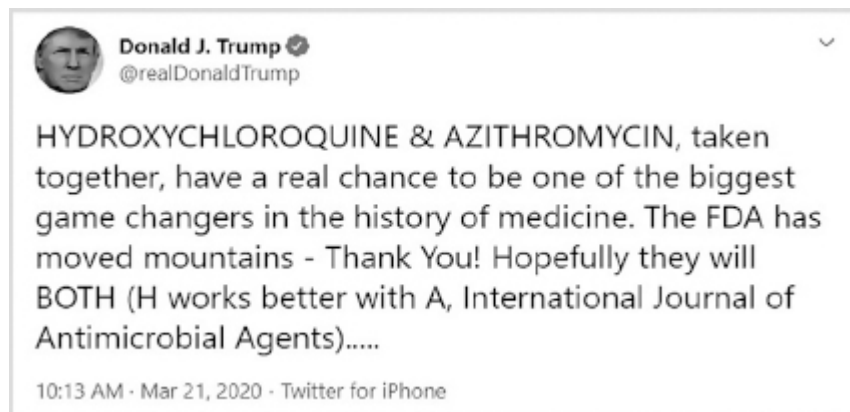
One of the questions that has most baffled the scientific community is how Surgisphere, established by Desai in 2008 as a medical education company that published textbooks, became the owner of a powerful international database. That database, despite only being announced by Surgisphere recently, boasts

access to data from 96,000 patients in 1,200 hospitals around the world....

Dr. James Todaro, who runs *MedicineUncensored*, a website that publishes the results of hydroxychloroquine studies, said: “Surgisphere came out of nowhere to conduct perhaps the most influential global study in this pandemic in the matter of a few weeks.” “It doesn’t make sense,” he said. “It would require many more researchers than it claims to have for this expedient and [size] of multinational study to be possible.”⁵

Dr. Fauci had known that inexpensive chloroquine is effective since 2005, when *Virology Journal*—official publication of Fauci’s own National Institutes of Health—published an article, “Chloroquine is a Potent Inhibitor of SARS Coronavirus Infection and Spread.”⁶ (Genetically, the COVID-19 and SARS viruses are 79 percent similar.⁷) Rather than recommend a treatment already known to work—a medication safely prescribed since the 1940s—Fauci continued to push for a vaccine whose outcome and side effects are unknown, as well as draconian lockdown measures.

The President himself Tweeted:



Later the President said he was personally taking hydroxychloroquine with zinc. His comments triggered a frenzy of media attacks on the drug, based on politics rather than science. Medical doctors Simone Gold and Dan Wohlgernter said in a joint interview:

Gold: I always want to remind people, this is an FDA-approved drug for 65 years; it's generic, it's cheap, it's widely available, we give it to pregnant women, we give it to breastfeeding women, we give it to elderly patients, we give it to patients who are immune-compromised. Most of those patients are on it for decades; there was never controversy about hydroxychloroquine right up until March 20th, 2020. So I would look at the studies before then; you know, the early studies before Trump said he kind of liked the drug.... I do find the data after Trump thought it was possibly helpful is suspect absolutely . . .

The *Lancet* study and the *New England Journal of Medicine* study both were retracted. I really want to emphasize that's a very rare thing for a world-famous journal to do.... the reason their study was retracted is the data that went into those studies could not be independently verified. You can draw what conclusions from that as you will: Was the data even gathered? Was the data faulty? Was it fabricated? We don't know, because we asked the company that provided the data, a company called Surgisphere, which has been quite secretive to reveal their data and they have absolutely refused. Because they wouldn't reveal their data, those studies had to be retracted by the journals.

Wohlgelernter: Why did this become politicized? The fact is, President Trump first mentioned hydroxychloroquine and advocated for its use as a non-physician in mid-March. But we had data from China and from France well before that in February, showing a significant beneficial impact of hydroxychloroquine. Yet you saw physicians, politicians, journalists saying that hydroxychloroquine is all hype and it's all due to the President pushing it. And that's revisionist history. The fact is there was a great deal of excitement in the medical community internationally a month before President Trump ever mentioned it, because of the data reported from China and from Dr. Raoult in France.

And it's sad that people used whatever political animosity they had toward the President to attack the medication that in fact had helped many people with coronavirus, and could have helped many more had it and its reputation not been so sullied by political accusations and by poorly designed studies.⁸

In June, despite the Surgisphere scandal and mounting evidence of hydroxychloroquine's effectiveness, the FDA announced:

Based on ongoing analysis and emerging scientific data, FDA has revoked the emergency use authorization (EUA) to use hydroxychloroquine and chloroquine to treat COVID-19.... We made this determination based on recent results from a large, randomized clinical trial in hospitalized patients that found these medicines showed no benefit for decreasing the likelihood of death or speeding recovery.... The FDA is aware of reports of serious heart rhythm problems in patients with COVID-19 treated with hydroxychloroquine....⁹

The World Health Organization quickly followed suit. On June 18, the Associated Press reported:

The World Health Organization's top scientist [Soumya Swaminathan] says it's now been definitively proven that the cheap malaria drug hydroxychloroquine—the drug favored by President Donald Trump—doesn't work in stopping deaths among people hospitalized with the new coronavirus....

The UN health agency announced this week that it is suspending the hydroxychloroquine arm of its own trial testing various experimental therapies for COVID-19, referring to previous results from a large UK trial and a separate analysis of evidence on the drug.¹⁰

The trials Swaminathan referred to were the “Solidarity” and “Recovery” trials. Marlin Nass, MD, debunked these in her article “WHO

and UK Trials Use Potentially Lethal Hydroxychloroquine Dose—
According to WHO Consultant.” Excerpts:

Last week, I was alerted to the fact that India’s ICMR, its official medical research agency, had written to the WHO, telling WHO that the hydroxychloroquine doses being used in the Solidarity trial were 4 times higher than the doses being used in India. Then I learned that Singapore had been hesitant to participate in the WHO trial due to the hydroxychloroquine dose.

The UK “Recovery” trial was very similar to, but not part of, the international Solidarity conglomeration of clinical trials. The Recovery trial ended its HCQ arm on June 4, reporting no benefit. In-hospital mortality of the 1,542 patients receiving hydroxychloroquine was 25.7%, or 396 deaths, about 10% higher than those receiving standard care, a non-significant difference.

The UK Recovery trial Study Protocol notes it is funded in part by the Wellcome Trust and the Bill and Melinda Gates Foundation, and by UK government agencies.... Twitter users began to notice a dosing problem, with hashtag #RecoveryGate....

The doses used in these trials are not recommended for therapy of any medical condition, which I confirmed with Goodman and Gilman’s Pharmacology textbook, the drug’s US label, and the online subscription medical encyclopedia *UptoDate*.

To sum up:

1. In the UK Recovery trial, and in WHO Solidarity trials, HCQ is used in a non-therapeutic, toxic and potentially lethal dose.
2. HCQ is furthermore being given, in clinical trials, too late in the disease course to determine its value against SARSCoV-2....

The conclusions to be drawn are frightening:

a) WHO and other national health agencies, universities and charities have conducted large clinical trials that were designed so hydroxychloroquine would fail to show benefit in the treatment of Covid-19, perhaps to advantage much more expensive competitors and vaccines in development, which have been heavily supported by Solidarity and Recovery trial sponsors and WHO sponsors.

b) In so doing, these agencies and charities have *de facto* conspired to increase the number of deaths in these trials.

c) In so doing, they have conspired to deprive billions of people from potentially benefiting from a safe and inexpensive drug, when used properly, during a major pandemic. This might contribute to prolongation of the pandemic, massive economic losses and many increased cases and deaths.¹¹

In contrast to the WHO, India's *Hindustan Times* reported:

No major side-effects of antimalarial drug Hydroxychloroquine (HCQ) have been found in studies in India and its use can be continued in preventive treatment for COVID-19 under strict medical supervision, the Indian Council of Medical Research (ICMR) said on Tuesday. The ICMR's statement came against the backdrop of the World Health Organization (WHO) temporarily suspending the testing of the drug as a potential treatment for COVID-19 over safety concerns....

The ICMR in its revised advisory on May 22 recommended use of the HCQ as a preventive medication for COVID-19 for asymptomatic healthcare workers in non-COVID hospitals and frontline staff on surveillance duty in containment zones and paramilitary/police personnel involved in coronavirus related activities.

Besides, the drug was also recommended for all asymptomatic healthcare workers involved in containment and treatment of COVID-19 and household contacts of laboratory-

confirmed cases.... Another investigation from three central government hospitals here indicates that amongst healthcare workers involved in COVID-19 care, those on HCQ prophylaxis were less likely to develop SARS-CoV-2 infection, compared to those who were not on it.¹²

In June, *Gateway Pundit* reported:

The Association of American Physicians and Surgeons (<https://aapsonline.org>) filed a lawsuit [on June 2] against the Department of Health and Human Services and the FDA for “irrational interference” by the FDA with timely access to hydroxychloroquine. Never in history have we seen such a determined effort by the scientific community and pharmaceutical industry to downplay and lie about the use of a successful drug to treat a deadly disease.

Hydroxychloroquine is the first choice in a study of 6,000 doctors treating the coronavirus. In the field and in independent testing hydroxychloroquine displayed amazing results in treating the COVID-19 virus. But there was great pushback against hydroxychloroquine for two reasons. The first reason was because it was safe and very inexpensive. The second reason is because Donald Trump promoted its use.¹³

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF MICHIGAN

ASSOCIATION OF AMERICAN
PHYSICIANS & SURGEONS,

Plaintiff,

v.

FOOD & DRUG ADMINISTRATION; DR.
STEPHEN M. HAHN, *Commissioner of Food &
Drugs, in his official capacity*; BIOMEDICAL
ADVANCED RESEARCH & DEVELOPMENT
AUTHORITY; GARY L. DISBROW, *Ph.D.,
Acting Director, Biomedical Advanced Research &
Development Authority, in his official capacity*;
DEPARTMENT OF HEALTH & HUMAN
SERVICES; and ALEX AZAR, *Secretary of
Health & Human Services, in his official capacity*,
Defendants.

No. 1:20-cv-0493

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

The Association of American Physicians & Surgeons ("AAPS" or "Plaintiff") seeks declaratory and injunctive relief against the federal Department of Health & Human Services ("HHS"), two of its constituent agencies – the Food and Drug Administration ("FDA") and the Biomedical Advanced Research & Development Authority ("BARDA") – and their respective lead officers (collectively, "Defendants"), based on the following allegations.

NATURE OF THE ACTION

1. AAPS brings this action on behalf of its members and their patients to end the irrational interference by the FDA with timely access to hydroxychloroquine ("HCQ"), which has been donated in large quantities to the federal government for prompt distribution. Specifically, AAPS seeks an injunction against the FDA's Emergency Use Authorization dated March 28, 2020 ("EUA"), which prohibits use of the donated HCQ except for already-hospitalized patients for

An unpleasant truth is that neither the FDA nor the WHO operate simply for the public good. Like the CDC, FDA officials enjoy “revolving door” relationship with Big Pharma. As *Regulatory Focus* noted in 2018:

It’s well known that leaving the US Food and Drug Administration (FDA) for industry can bring a major salary bump, so it should come as no surprise that the number of FDA employees making the leap in 2018 continues to increase.

Biotech company Moderna announced Wednesday that Wellington Sun, former director of the Division of Vaccines and Related Product Applications at FDA’s Center for Biologics Evaluation and Research, will be their new head of vaccine strategy and regulatory affairs.

Last month, Patrick Frey, chief of staff at FDA's Office of New Drugs (OND), left to join Amgen as director of global regulatory policy.

And former OND director John Jenkins was appointed in June to the board of directors of Corbus Pharmaceuticals. Also in June, Elaine Morefield, former deputy office director for review and administration at FDA, was appointed director of product quality at Aclaris Therapeutics, while Gerald Masoudi, former FDA chief counsel, was appointed chief legal officer at Juul Labs.

That news follows the departure of Gayarti Rao, former director of FDA's Office of Orphan Products Development, who moved over to Rocket Pharmaceuticals in May.

Meanwhile, 20-year FDA veteran Badrul Chowdhury, most recently director of the Center for Drug Evaluation and Research's (CDER) Division of Pulmonary, Allergy and Rheumatology Products, took a job in April as senior vice president at AstraZeneca.

Sarah Pope Miksinski, former director of the Office of New Drug Products in FDA's Office of Pharmaceutical Quality, left the agency in February, also for AstraZeneca. And in July 2017, Geoffrey Kim, former director of FDA's Division of Oncology Products, moved to AstraZeneca to become its VP of oncology and head of oncology strategic combinations.

Jean-Marc Guettier, former director of FDA's Division of Metabolism and Endocrinology Products, left FDA in December 2017 for Sanofi, while Niraj Mehta, former associate director for global regulatory policy at FDA moved over to Merck as a director in March 2018....¹⁴

And after Trump pulled U.S. funding of the World Health Organization, its largest financial backer became the vaccine-centric Bill and Melinda Gates Foundation.

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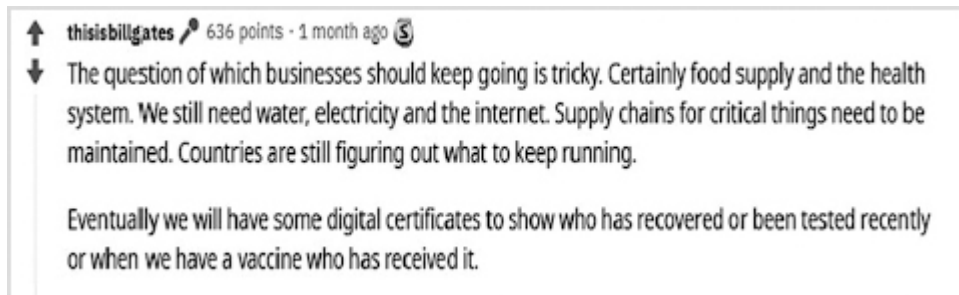
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CHAPTER 23

DEEP STATE GOAL #2: GLOBAL DIGITAL ID

In the future, in order to travel, shop and work, you will probably require proof of vaccination. CNN's Alisyn Camerota asked Dr. Fauci, "Can you Imagine a time where Americans carry certificates of immunity?" He responded: "That's possible. It's one of those things that we talk about when we want to make sure we know who the vulnerable people are and not. This is something that's being discussed. I think it might actually have some merit under certain circumstances."¹

Although many people envision this as a paper certificate, Bill Gates wants it *digital*. He has stated: "Eventually we will have some digital certificates to show who has recovered or been tested recently or when we have a vaccine who has received it." Screen shot:



How does one create a "digital" certificate? According to Rice University, this would amount to a "quantum-dot tattoo."

Kevin McHugh, an assistant professor of bioengineering at Rice since this summer, and a team at his previous institution, the Massachusetts Institute of Technology, report in a cover story in *Science Translational Medicine* on their development of quantum-dot tags that fluoresce with information after they're injected as part of a vaccination.

The tags are incorporated in only some of the array of sugar-based microneedles on a patch. When the needles dissolve in about two minutes, they deliver the vaccine and leave the pattern of tags just under the skin, where they become something like a bar-code tattoo.

Instead of ink, this highly specific medical record consists of copper-based quantum dots embedded in biocompatible, micron-scale capsules. Their near-infrared dye is invisible, but the pattern they set can be read and interpreted by a customized smartphone....

“The Bill and Melinda Gates Foundation came to us and said, ‘Hey, we have a real problem—knowing who’s vaccinated,’” said McHugh, who was recruited to join Rice with funding from the Cancer Prevention and Research Institute of Texas. “They said, ‘We go on vaccination campaigns where people get into Hummers, drive to a rural village, set up a tent and start immunizing people, but they don’t always know who’s been immunized before and what vaccines are still needed.’”²

Bill Gates has long been interested in implantable human devices. James Corbett reports:

In 2014 it was announced that Microchips Biotech, Inc., a company in Lexington, Massachusetts, had developed a new form of birth control: “a wireless implant that can be turned on and off with a remote control and that is designed to last up to 16 years.” According to *MIT Technology Review*, the idea originated when Bill Gates visited Robert Langer’s MIT lab in 2012 and asked him if it would be possible to create an implantable birth control device that could be turned on or off remotely. Langer referred Gates to the controlled release microchip technology he had invented and licensed to MicroCHIPS Biotechnology, and the Gates Foundation granted \$20 million to the firm to develop the implants.³

Add to this the ID2020 Alliance, which seeks to make digital IDs a global phenomenon. Its home page displays the Microsoft logo, along with the logo of Gavi—the Vaccine Alliance that partners vaccine manufacturers with the World Health Organization and World Bank, and which has received more than \$4 billion from the Gates Foundation.⁴ In September 2019 *Biometric Update* reported:

The ID2020 Alliance has launched a new digital identity program at its annual summit in New York, in collaboration with the Government of Bangladesh, vaccine alliance Gavi, and new partners in government, academia, and humanitarian relief.... Digital identity is a computerized record of who a person is, stored in a registry. It is used, in this case, to keep track of who has received vaccination.... “Digital ID is being defined and implemented today, and we recognize the importance of swift action to close the identity gap,” comments ID2020 Executive Director Dakota Gruener.⁵

Gates stated in a speech at the Financial Inclusion Forum in 2015:

Every country really needs to look through these KYC—know your customer—rules to make sure that customers are able to prove who they are. But of course in many countries you don’t have any type of ID system. And the lack of an ID system is a problem, not just for the payment system, but also for voting and health and education and taxation. And so it’s a wonderful thing to go in and create a broad identification system.

Again, India is a very interesting example of this, where the Aadhaar system, which is a 12-digit identifier that’s correlated to biometric measures, is becoming pervasive throughout the country and will be the foundation for how we bring this lowcost switch to every mobile phone user in India. The same type of thing is happening now in Pakistan, and there’s early beginnings of creating these ID programs in Africa as well.

We expect to be able to use the IDs so that when you show up for any government service—say, you walk into a primary health clinic—we’ll be able to take that bio ID very quickly and bring up your electronic health record. Even if you’ve moved from one part of the country to the other, you will be well tracked and well served without nearly as much paperwork or waiting. And so the ID system is foundational.⁶

Obviously, Bill Gates does not see digital ID as merely a tool for recording vaccinations.

In the UK, it was no surprise when Tony Blair, perennial spokesman for the British Establishment, added his voice to the call for a global ID. The *Daily Mail* reported:

People will need a new form of “digital ID” so they can prove their “disease status” as the world moves out of lockdown, Tony Blair has said. The former Prime Minister said that only if people can show easily whether they are clear of coronavirus will industries like international travel be able to restart. Speaking at the virtual CogX technology conference, Mr. Blair said that such a system would operate alongside track and trace programmes as the economy reopens....

Mr. Blair had previously urged the Government to set up a mass testing programme which would see the bulk of the UK population checked for coronavirus, saying it is the only way to prevent a second outbreak....

“It is a natural evolution of the way that we are going to use technology in any event to transact daily life and this COVID crisis gives an additional reason for doing that.... There has always been a good case for introducing some form of digital ID, but I think that case is even more powerful today.”⁷

In July 2020, *Mint Press News* reported how digital ID, vaccination records and payment processing are being integrated into a single system, using Africa as a testing ground:

A biometric digital identity platform that “evolves just as you evolve” is set to be introduced in “low-income, remote communities” in West Africa thanks to a public-private partnership between the Bill Gates-backed GAVI vaccine alliance, Mastercard and the AI-powered “identity authentication” company, Trust Stamp.

The program, which was first launched in late 2018, will see Trust Stamp’s digital identity platform integrated into the GAVI-Mastercard “Wellness Pass,” a digital vaccination record and identity system that is also linked to Mastercard’s click-to-play system that [is] powered by its AI and machine learning technology called NuData. Mastercard, in addition to professing its commitment to promoting “centralized record keeping of childhood immunization” also describes itself as a leader toward a “World Beyond Cash,” and its partnership with GAVI marks a novel approach towards linking a biometric digital identity system, vaccination records, and a payment system into a single cohesive platform. The effort, since its launch nearly two years ago, has been funded via \$3.8 million in GAVI donor funds in addition to a matched donation of the same amount by the Bill and Melinda Gates Foundation.

In early June, GAVI reported that Mastercard’s Wellness Pass program would be adapted in response to the coronavirus (COVID-19) pandemic. Around a month later, Mastercard announced that Trust Stamp’s biometric identity platform would be integrated into Wellness Pass as Trust Stamp’s system is capable of providing biometric identity in areas of the world lacking internet access or cellular connectivity and also does not require knowledge of an individual’s legal name or identity to function. The Wellness Program involving GAVI, Mastercard, and Trust Stamp will soon be launched in West Africa and will be coupled with a Covid-19 vaccination program once a vaccine becomes available.⁸

NOTES

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CHAPTER 24

DEEP STATE GOAL #3: CASHLESS SOCIETY

We've obviously been heading into a cashless society for some time, with electronic transactions—credit cards and debit cards—increasingly replacing money. China—which many view as a prototype for a technocratic totalitarian world government— is virtually cashless now.¹ Even street beggars there take digital handouts in lieu of cash.

James Corbett notes:

In 2012, the Bill and Melinda Gates Foundation helped found the “Better Than Cash Alliance,” which brings together governments, international organizations and the private sector “to accelerate the transition from cash to digital payments globally.”²

The coronavirus crisis has accelerated the drive for a cashless planet. The online journal *Euromoney* noted in its article “Cashless after COVID-19?”:

When the World Health Organization released a statement on March 9 recommending that people turn to cashless transactions to fight the spread of COVID-19, a number of governments and retailers across the world took action.... Some retailers have banned the use of cash in their stores to keep employees and customers safe, opting for contactless payments instead.... This could be the push needed for some countries to become truly cashless.³

Money is considered “dirty.” After all, it could carry that invisible bogeyman, the COVID-19 virus. It's not difficult to see where this could

lead. If a digital tattoo could store your vaccine information, a small upgrade would enable it to store your financial information. As we saw at the end of the last chapter, a system that integrates digital identity, vaccine records and payments processing is already being tested in Africa.

Most of us, at some time, have known that unpleasant feeling of swiping a credit card that doesn't work. What happens when our digital tattoo won't let us buy food, gasoline, or a bus ticket, because we aren't up to date on vaccines, or have in some other way become unacceptable to the government? This is truly the realm of *1984* and *Brave New World*, and I think it appropriate to now quote the Book of Revelation, 13:16-17:

And the second beast required all people small and great, rich and poor, free and slave, to receive a mark on their right hand or on their forehead, so that no one could buy or sell unless he had the mark.

Revelation tells us that the Antichrist will rule the planet. To *govern the world* requires a *world government*. This too has been a Deep State objective for many decades, as I documented in my 1988 book *The Shadows of Power*. So it was no surprise to read this in the March 26, 2020 *Guardian*:

Gordon Brown has urged world leaders to create a temporary form of global government to tackle the twin medical and economic crises caused by the COVID-19 pandemic. The former Labour prime minister, who was at the centre of the international efforts to tackle the impact of the near-meltdown of the banks in 2008, said there was a need for a taskforce involving world leaders, health experts and the heads of the international organisations that would have executive powers to coordinate the response....

“This is not something that can be dealt with in one country,” he said. “There has to be a coordinated global response.” ...Brown said his proposed global taskforce would fight the crisis on two fronts. There would need to be a

coordinated effort to find a vaccine, and to organise production, purchasing and prevent profiteering.⁴

World government has long been equated with a one-world currency. In 1944, Federal Reserve Board Chairman Martin Eccles said: “An international currency is synonymous with international government.”⁵ Just as the European Union has been a regional stepping stone toward a one-world government, so is its “euro” a stepping stone toward a world currency. Looking further back, at the end of World War II, the establishment of the United Nations (incipient world government) coincided with establishment, at the Bretton Woods Conference, of the World Bank and IMF (world financial system). At Bretton Woods, John Maynard Keynes proposed a world currency called *bancor*, but the plan was then considered too radical to gain international acceptance. However, we may now be on the threshold of world currency, but in a form we didn’t foresee back then—digital.

This appears to correlate with what Deep State oligarchs are calling “the Great Economic Reset,” whose pretext is the economic distress caused by the global COVID lockdown. Brandon Smith summarized the situation well writing for *Alt Market*:

For those not familiar with the phrase “global economic reset,” it is one that has been used ever increasingly by elitists in the central banking world for several years. I first heard it referenced by Christine Lagarde, the head of the IMF at the time, in 2014. The reset is often mentioned in the same breath as ideas like “the New Multilateralism” or “the Multipolar World Order” or “the New World Order.” All of these phrases mean essentially the same thing....

Many alternative economists often wrongly attribute the Fed’s habit of making things worse to “hubris” or “ignorance.” They think the Fed actually wants to save the financial system or “protect the golden goose,” but this is not reality. The truth is, the Fed is not a bumbling maintenance man, the Fed is a saboteur, a suicide bomber that is willing to destroy even itself

as an institution in order to explode the US economy and clear the path for a new globally centralized one world system. Hence, the “Global Reset”....

Now in 2020 we see the globalist plan coming to fruition, with the elites revealing what appears to be their intent to launch their reset in 2021. The World Economic Forum officially announced the Great Reset initiative as part of their COVID Action Platform last week, and a summit is scheduled in January 2021 to discuss their plans more openly with the world and the mainstream media.

The WEF also posted a rather bizarre video on the Reset, which consists of a series of images of the world falling apart (and images of factories releasing harmless carbon emission into the air, which I suppose is meant to scare us with notions of global warming). The destruction is then “reset” at the push of a button, with everything reversing back to a pristine human-less world of nature and the words “Join Us”....

The goal is rather obvious—Terrify the population with poverty, internal conflicts and a broken supply chain until they lobby the establishment for help. Then, offer the “solution” of medical tyranny, immunity passports, martial law, a global economic system based on a cashless digital society in which privacy in trade is erased, and then slowly but surely form a faceless “multilateral” global government which answers to no one and does whatever it pleases.

I remember back in 2014 when Christine Lagarde first began talking about the reset. That same year she also made a very strange speech to the National Press Club in which she started rambling gleefully about numerology and the “magic number 7”. Many within the club laughed, as there was apparently an inside joke that the rest of us were not privy to. Well, I would point out that the World Economic Forum meeting on the global reset in 2021 will be held exactly 7 years after Lagarde gave that speech. Just another interesting coincidence I suppose...⁶

NOTES

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CHAPTER 25

CONTACT TRACING/ SURVEILLANCE STATE

With the arrival of COVID-19, the Rockefeller Foundation swiftly and arbitrarily assigned itself a leadership role. It issued a 29-page *National COVID-19 Testing Action Plan*. The foreword reads:

Testing is our way out of this crisis. Instead of ricocheting between an unsustainable shutdown and a dangerous, uncertain return to normalcy, the United States must mount a sustainable strategy with better tests and contact tracing, and stay the course for as long as it takes to develop a vaccine or cure. Any plan to do so must win the faith of private and public sector leaders across the country, and of individual Americans that they and their loved ones will be safer when we begin to return to daily life.

The Rockefeller Foundation exists to meet moments like this. In the past two weeks we have brought together experts and leaders from science, industry, academia, public policy, and government—across sectors and political ideologies—to create a clear, pragmatic, data-driven, actionable plan to beat back COVID-19 and get Americans back to work more safely.

Our National COVID-19 Testing Action Plan lays out the precise steps necessary to enact robust testing, tracing, and coordination to more safely reopen our economy—starting with a dramatic expansion of testing from 1 million tests per week to initially 3 million per week and then 30 million per week, backed by an Emergency Network for COVID-19 Testing to coordinate and underwrite the testing market, a public-private testing technology accelerator, and a national initiative to

rapidly expand and optimize the use of U.S., university, and local lab capacity.¹

At the time of publication, the U.S. House of Representatives was considering the strangely numbered bill, H.R. 6666 “COVID-19 Testing, Reaching, and Contacting Everyone (TRACE) Act.” It would delegate \$100 billion “to conduct diagnostic testing for COVID–19, to trace and monitor the contacts of infected individuals, and to support the quarantine of such contacts” as well as unspecified “other purposes.” Civil libertarians have noted that the bill is fraught with potential to abuse Americans’ freedoms. And as we have seen in Chapter 15, details of this bill, including who would get lucrative contracts, were worked out between Gates Foundation representatives and Congressman Bobby Rush before the COVID outbreak even began.²

And as *National File* reported in June 2020:

Some Republicans are voicing concern after Texas state health officials granted a \$295 million Coronavirus Contact Tracing deal to MTX Group.... It turns out the firm is a partner of Google, *National File* has learned. MTX Group got the contract without conservative Republican Lieutenant Governor Dan Patrick being “in the loop” to the decision process, and Patrick is just one of numerous policymakers questioning the company’s deal with the state, which authorizes MTX to serve as virus investigators charting people’s contacts and relationships....

Department of Health and Human Services (HHS) and Centers For Disease Control and Prevention (CDC) policy confirms that “Contact Tracing” data may be sent to the World Health Organization (WHO) and to law enforcement authorities “to place someone under quarantine or isolation.” The Contact Tracing records, stored at the CDC and elsewhere, can also be sent to the Department of Justice, State Department, Department of Homeland Security, congressional

offices, and to various medical and legal departments and contractors.

Meanwhile, Americans are fearing the political implications of contact tracing, considering that Chelsea Clinton is on the board of trustees of one official contact tracing group [Partners in Health] that has accepted large sums of money from Bill Gates and George Soros organizations....³

Even Israeli intelligence is penetrating America's contract tracing apparatus. As Whitney Webb reports:

A company tied to Israel's military signal intelligence unit, Unit 8200 [the "Israeli NSA"], has recently partnered with the state of Rhode Island to use an artificial intelligence-based system developed in tandem with the Israel Defense Forces (IDF) to profile Americans *potentially* infected and/or "at risk" of being infected with coronavirus, then informing government authorities of their "risk profile." Once flagged, state health officials can target those individuals as well as their communities for mandatory testing, treatment and/or more restrictive lockdown measures.

The firm, Israel-based Diagnostic Robotics, is poised to announce a series of new such partnerships with several other U.S. states as well as major U.S. hospital systems and healthcare providers in the coming weeks, according to a company spokesperson. The first of these announcements came on June 30 regarding the firm's new partnership with Mayo Clinic, which will soon implement the Diagnostic Robotics' "artificial intelligence platform that predicts patients' hospitalization risk." They have also been in discussions with Vice President Mike Pence about the platform's implementation nationwide since April....

Diagnostic Robotics' efforts to predict and monitor entire populations with AI is a potent tool that can be used for many purposes that have little to do with public health. Much like

“contact tracing” software that was first justified by the pandemic has subsequently been used to target and track protesters, Diagnostic Robotics’ predictive analytics and “hotspot” maps can be used for the same ends. Given the track record of the national security states of both the U.S. and Israel, such “unofficial” uses of these “digital solutions” to the pandemic are not just speculative, they are guaranteed.⁴

The millions of Americans now out of work have created a massive idle labor force that can be tapped to become “contact tracers.” In its article “Lost Your Job? Consider Becoming a ‘Contact Tracer,’” CBS News reports: “Experts estimate that between 100,000 and 300,000 contact tracers—who can earn up to \$65,000 per year—will be needed nationwide based on state populations and projected COVID-19 infection rates.”⁵

A California woman, who became certified as a contact tracer, put together a 22-minute video exposing what contact tracing does, documenting her observations with state documents. Excerpts:

Once you get a test that is positive, it goes to a tracer, and that tracer is going to do some research on you, find out a little bit about you and give you a call. Now they’re going to tell you that you tested positive, and that you need to be isolated for a minimum of 10 days on the onset. And it has to be no fever for three days, so if you’re on day nine but you still have the fever you need to add another three days until your fever is cleared. And by isolation I mean *total* isolation—this is nobody near you. Even your dog can’t be there, so you can see here [displays document] that specifically with a person that is symptomatic, they should maintain separation from household animals, as they would any other household members, and avoid direct contact with any of your pets. So you cannot contact your pets, people, anybody in your family.... You could have to go into a hotel room if you have no way of not sharing a bathroom or any space—they will check that out, so you’ll have to show video evidence if the conference is done via

teleconference, walk them around your house, let them know that you have space to be isolated.

Now the next is quarantine. Quarantine means I am healthy, I have no symptoms, I have not contracted the disease, but maybe for 14 days they're going to check to make sure that I haven't. So that means again that I cannot leave my house, and as a contact tracer I'm supposed to set you up with social services, so if you have kids and you have no one to care for them, we'll take your kids, we'll take care of that. If you have groceries, we'll do groceries, but you literally cannot be in contact with anybody and you cannot leave your house even if you're healthy. You are still quarantined, not to be leaving the house. Unfortunately, you could be totally healthy, get out of quarantine, and guess what?—be at a restaurant, someone else in the vicinity has it? Be quarantined again....

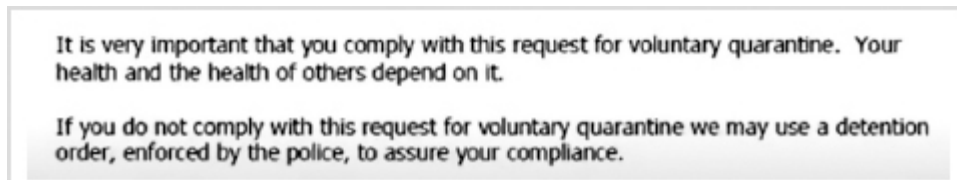
I'm going to ask you who did you come in contact with? And if you tell me "I don't know," I'm going to tell you to look at your phone and we can do it together, and look at your social media, and we'll figure out where you have been. And you need to make sure you know your movies, flight numbers, and anything with large venues. Now some of the places, what they've already instituted now, you have to put your contact information when you go to a restaurant, you go to a hair salon, any of those things, because that way they can track you. You would say I went to this movie, or I went to this restaurant, everybody who's at that restaurant will be contacted then by the contact tracer. So let's say unfortunately I got it, well guess what? My family would have to be quarantined, and not just for the 10 days, they have to be quarantined for 14 days....

Let's say I was on a train; we were all sitting in the same cabin because I was getting to work, and there were 10, 15 people on that train—all of them would need to be quarantined. I had gone to work, everybody at work would need to be quarantined. I went to a restaurant after work—all of them need to be quarantined. Can you see how a disease, when it is

already widely spread, this doesn't make sense to quarantine the population, in terms of you could get quarantined again and again and again? Even though you're healthy and never sick, you will not be allowed to leave your house.

Now you've been hearing that this all is "voluntary," you'll hear it throughout the speeches, I've listened to a lot of governors; I'll put on the Washington governor really quickly so you can hear him, but let me show you, before I do that, a couple of the documents that are out there, this is right on his website.⁶

Screenshot from video:



The situation abroad is similar. Britain's *Guardian* reports:

The Government launched its NHS Test and Trace programme at the end of May. It sees anyone with symptoms told to self-isolate and get checked. If they test positive their close contacts are then also told to self-isolate even if they do not have any symptoms.⁷

Smartphones, of course, already have GPS that can enable governments to track people's exact whereabouts. Now contact tracing apps are being integrated into them. *ZDnet* noted in May:

Apple on Wednesday released iOS 13.5 and iPadOS 13.5. The update includes bug fixes, improvements, and Apple also included a new COVID Exposure Notification feature in iOS 13.5 on the iPhone. The feature is part of Apple and Google's previously announced partnership that enables a contact tracing

API for health officials to build apps and use to fight the spread of COVID-19.⁸

Knowing the level of corruption within governments, it is not hard to envision politicians coopting contact tracing to target enemies and “politically incorrect” individuals for quarantines. Given COVID’s broad dissemination, and the large number of people who are symptom-free but test positive, it would be easy enough to find an instance where a targeted individual had been in the vicinity of someone “COVID positive” and order them into personal lockdown.

NOTES

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PART FIVE



WHAT MAY LIE AHEAD

CHAPTER 26

POSSIBLE SCENARIOS

Trying to forecast the future is always dangerous. The more specific the prediction, the more likely to be wrong. I personally don't know anyone in alternative media who, in 2019, foresaw a lockdown coming in 2020 based on a pandemic.

Another development that blindsided us in 2020 were the devastating riots that erupted after the George Floyd “I can't breathe” incident of May 25. I'd like to briefly address this, because it didn't seem to have occurred in total isolation from COVID-19:

- Alternative media had been mounting devastating challenges to the mainstream depiction of COVID-19. On May 22—just three days before the Floyd incident—the CDC reduced its COVID death rate estimate to only 0.26 percent. It was clear that the increasingly discredited “panic” narrative could no longer be sustained. With its back to the wall, the media greatly benefitted from a new event that diverted public attention from its claims' glaring fallacies, which this book has addressed in earlier chapters.

- The Floyd incident became a hot topic only because mainstream media elected to hype it, above countless other murders and examples of police injustice.

- The incident occurred right after numerous states began easing lockdowns. The unrestrained looting and arson by Antifa and BLM destroyed innumerable small businesses who already had only a glimmer of hope for recovery. It thus extended and amplified the lockdown's economic devastation.

Many questions about the incident itself were ignored by mainstream media:

- Timothy D. Japhet, an attorney in Corpus Christ, Texas, explained on Facebook that he had been George Floyd's court-appointed attorney in Texas starting in 2016, and that Floyd had died in 2017. Japhet is definitely

listed as an attorney in Corpus Christi; why would he invent such a story, which would be easy to debunk? If true, this meant the man in the iconic Floyd videos was someone else.

- A Ford Mercury pulled up behind Floyd’s car and started filming before he was actually arrested. Perhaps it happened that way, but most people wouldn’t start filming before anything of real interest occurred.

- Derek Chauvin—the much-photographed police officer—had worked security at the same Minneapolis club as Floyd, according to Maya Santamaria, owner of the El Nuevo Rodeo, though she was uncertain if they knew each other.¹

- Chauvin kept his knee on Floyd’s neck for almost nine minutes, even after he went unconscious, thus requiring no possible need for restraint. Chauvin didn’t seem to mind being photographed in a highly visible and incriminating posture.

- The public was given fragmentary clips gathered from smartphones, security cameras, and police body cams, often with sound and images redacted. It was unclear if Floyd had at some point resisted arrest. And when the park police (a separate police unit) stopped at the scene, Floyd’s arresting officer handed them a written note. This was unusual and never explained. Did the note possibly say “We are in the middle of an exercise”?

Some suspect the incident was orchestrated. Others believe it unfolded naturally, and was then chosen as the most provocative pretext available for the riots which followed. The aftermath certainly *was* orchestrated. In several cities, palettes of bricks awaited protestors, in locations where no nearby construction was scheduled.² The massive looting and destruction, the “Defund the Police” campaign, the pledging of \$1.7 billion to Black Lives Matter by U.S. corporations,³ the removal of historic statues—and even paintings from the Capitol building—and the exacerbation of racial tensions toward a “divide and conquer” race war, all pointed to a phenomenon that was not “spontaneous” or “grass roots.” Given the revelation in 2016 by DCLeaks.com that George Soros’s Open Society Foundations had donated \$650,000 to BLM,⁴ I am reminded of what Jerry Kirk, one-time member of SDS and the Communist Party, said in his testimony before the House and Senate Internal Security Panels in 1969:

Young people have no conception of the conspiracy strategy of pressure from above and pressure from below.... They have no idea that they are playing into the hands of the Establishment they claim to hate. The radicals think they are fighting the forces of the super rich, like Rockefeller and Ford, and they don't realize that it is precisely such forces which are behind their own revolution, financing it, and using it for their own purposes.⁵

This book is being published in August 2020. Who knows what surprises lie ahead for 2021, or the rest of 2020? There has been speculation about tensions with China or Iran leading to war, and about weather events—natural or engineered. I'd be remiss if I failed to mention—or tried to predict—the 2020 elections, but it is probably not coincidental that so much happened during an election year. Neither party's nominating conventions had occurred yet as I write this. There is talk of mail-in voting in November—which would be rife with opportunities for fraud—and even of the election itself being postponed. Joe Biden does not appear mentally coherent, so if he won, would probably be soon forced to retire for health reasons. This means his candidacy would really be about his Vice Presidential running mate, who would replace him in the Oval Office. If the Democrats swept both houses of Congress along with the Presidency, it could generate a “Big Government” (socialist) state with hardcore lockdown and gun control measures. However, such would meet inevitable resistance from the people. Possibly the Deep State would prefer Trump remain in office, as his approval of a mandatory vaccine would discourage opposition from his followers, the “Deplorables.”

We can't predict the future with any certainty, but a few developments seem *likely*.

For one, it is not possible for governments, federal or state, to sustain the lockdown, with tens of millions of workers on unemployment checks, indefinitely. With governments cut from their main revenue source—taxes on wages—economic decline seems inevitable, and collapse possible. And collapse could induce the economic reset and cashless society discussed in Chapter 24.

Another possibility is food shortages. *Forbes*, which no one would accuse of alarmism, notes:

Food and agriculture is not immune to this impact and we've seen a destabilization of our food system during this pandemic. And this destabilization has infiltrated all aspects of the food chain including farmers, processors, distributors, wholesalers and retailers.

On the one hand, it seems a bit odd to think food would be impacted by COVID-19 given the need to feed the world during the pandemic. However, not all aspects of the agricultural economy are on equal footing. For example, large meat producers have had to temporarily shut down plants as many workers have contracted the virus and contract labor that is critical for crop harvesting has voiced concerns about contracting the virus. This in turn has created labor shortages for growers, processors and retailers. Accordingly, even though demand for food remains high as is apparent from the long lines at your local grocery store, the supply chain to support the demand is in a fragile state....

Smithfield Foods, one of the largest food processors of pork products, became the latest company to announce a shutdown due to the spread of coronavirus among more than 200 of its employees.⁶

Some believe food shortages could reach famine level. *The Guardian* reported in April 2020:

The world is facing widespread famine “of biblical proportions” because of the coronavirus pandemic, the chief of the UN’s food relief agency has warned, with a short time to act before hundreds of millions starve.

More than 30 countries in the developing world could experience widespread famine, and in 10 of those countries there are already more than 1 million people on the brink of

starvation, said David Beasley, executive director of the World Food Programme.

“We are not talking about people going to bed hungry,” he told the *Guardian* in an interview. “We are talking about extreme conditions, emergency status—people literally marching to the brink of starvation. If we don’t get food to people, people will die.”

“This is truly more than just a pandemic—it is creating a hunger pandemic,” said Beasley.”⁷

Will food shortages reach catastrophic famine, or remain more moderate, as *Forbes* envisions? That might depend on how much “Pandemic Two” impacted the food supply. It’s worth recalling that, historically, politicians have used hunger as a tool of control—as when Soviet dictator Joseph Stalin inflicted the horrific *Holodomor* on Ukraine in 1932-33.

No one could be faulted for keeping an emergency supply of food on hand.

One development that seems *highly* likely: a COVID vaccine. The White House’s “Operation Warp Speed” project; the production of hundreds of millions of syringes; AstraZeneca’s manufacture of millions of vaccine doses without even waiting for clinical trial results; the suppression of hydroxychloroquine; the mainstream media’s panic headlines; and of course Bill Gates’s pronouncements that we won’t return to normal without a global vaccine—all these forecast that the Deep State *does* intend having a COVID vaccine administered.

At the time of this book’s publication, there was no justifiable pretext for a *compulsory* vaccine; as we’ve already seen in Chapter 21—the low death rate acknowledged by the CDC, the disease’s declining incidence in various countries, etc. Logically, then, something unforeseen and catastrophic would be needed to frighten the public into accepting mandatory vaccination. Bill Gates may have given us a clue in his April 2020 conversation with Stephen Colbert:

Colbert: Well, Bill, since you tried to warn us about this pandemic and we didn't listen, what's the next thing you're warning us about that's going to happen five years from now that we're not listening to at the present?

Gates: Well, the idea of a bioterrorist attack is kind of the nightmare scenario, because it would be a pathogen with a high death rate. The good news is most of the work we're going to do to be ready for Pandemic Two—I call this Pandemic One—most of the work we'll do to be ready for that are also the things we need to do to minimize the threat of bioterrorism.⁸

On June 25, Gates told a CNN Global Town Hall: ““Better treatment is reducing the deaths, but, particularly as you get into October and November, this thing will be back in big numbers, if we don't restrain our behavior more than it looks like we are right at the moment.”⁹ And on June 26, he told Suzanne Clark of the U.S. Chamber of Commerce Foundation: “This won't be the last pandemic that we face.... We'll have to prepare for the next one. That will get attention this time.”¹⁰

Gates appears to enjoy being cast as a prophet whose wise warnings about impending pandemics went unheeded. However, given the foreknowledge suggested by the proceedings listed in Chapter 15 (Event 201, advance arrangements for the Contact Tracing Act), Gates more likely just has *inside information* about what's next. Therefore I take pretty seriously his warnings about “Pandemic Two.”

What might this consist of? Given evidence we've seen (Chapter 14) that COVID-19 may be a lab-engineered bioweapon, perhaps a more virulently engineered strain of coronavirus will be released in the future. It could be announced that the COVID virus had mutated—by chance, of course—and turned deadlier. With the public already conditioned to accept mandatory masks and social distancing “to protect the population,” mandatory vaccination would simply be a bump up.

However, since a truly lethal bioweapon might threaten members of the Deep State itself, other possibilities are conceivable. One pertains to 5G. We've already discussed (Chapter 16) Arthur Firstenberg's observation that

past pandemics coincided with electromagnetic rollouts; that the telecommunications industry has never safety-tested 5G; that at 60 GHz, 98 percent of transmitted electromagnetic energy is absorbed by atmospheric oxygen; and that China's 5G rollout city was Wuhan, where people were sometimes photographed dropping dead instantaneously. Because 5G waves can be directed as beams, they could, if weaponized, target some individuals while leaving others alone. The *International Appeal to Stop 5G on Earth and in Space*, which has over 300,000 signatories, summarizes the situation:

In order to transmit the enormous amounts of data required for the Internet of Things (IoT), 5G technology, when fully deployed, will use millimetre waves, which are poorly transmitted through solid material. This will require every carrier to install base stations every 100 metres in every urban area in the world. Unlike previous generations of wireless technology, in which a single antenna broadcasts over a wide area, 5G base stations and 5G devices will have multiple antennas arranged in "phased arrays" that work together to emit focused, steerable, laser-like beams that track each other.

Each 5G phone will contain dozens of tiny antennas, all working together to track and aim a narrowly focused beam at the nearest cell tower. The US Federal Communications Commission (FCC) has adopted rules permitting the effective power of those beams to be as much as 20 watts, ten times more powerful than the levels permitted for current phones

Each 5G base station will contain hundreds or thousands of antennas aiming multiple laser-like beams simultaneously at all cell phones and user devices in its service area. This technology is called "multiple input multiple output" or MIMO. FCC rules permit the effective radiated power of a 5G base station's beams to be as much as 30,000 watts per 100 MHz of spectrum, or equivalently 300,000 watts per GHz of spectrum, tens to hundreds of times more powerful than the levels permitted for current base stations.

At least five companies are proposing to provide 5G from space from a combined 20,000 satellites in low- and medium-Earth orbit that will blanket the Earth with powerful, focused, steerable beams. Each satellite will emit millimetre waves with an effective radiated power of up to 5 million watts from thousands of antennas arranged in a phased array. Although the energy reaching the ground from satellites will be less than that from ground-based antennas, it will irradiate areas of the Earth not reached by other transmitters and will be additional to ground-based 5G transmissions from billions of IoT objects. Even more importantly, the satellites will be located in the Earth's magnetosphere, which exerts a significant influence over the electrical properties of the atmosphere.¹¹

Neither the coronavirus nor the lockdown's economic distress have done much to slow 5G's deployment. On April 23, 2020, *RCR Wireless News* reported:

SpaceX, Elon Musk's private American aerospace company, yesterday launched an additional 60 Starlink satellites into orbit, bringing the total number of satellites in the Starlink constellation to 422. That's enough, says Musk, to provide minimal internet coverage.... Because there is no need to lay down fiber-optic cables and because they can carry large amounts of data quickly, Starlink satellites have the potential to bring internet coverage to previously hard—and in some cases, nearly impossible—to reach places.¹²

Here is a conceivable scenario. There is a gradual resumption of economic activity. However, at some point, perhaps the next flu season, the coronavirus makes a supposed "comeback"—Gates's "Pandemic Two." 5G might be turned on full-force, especially at 60 GHz, sickening people, some to the point of death. Mis-labeled a second wave of COVID-19, this would likely be blamed on civil libertarians and constitutionalists for "reopening the economy too soon." Alternative media, including books like this one, could be increasingly savaged as "fake news." The government proclaims,

“We *must* return to complete lockdown.” The weary public says, “No! We cannot tolerate another lockdown!” Bill Gates announces: “No problem! The vaccine is ready.” The CDC and FDA say: “We have approved the vaccine. Anyone who takes it will be given an immunity passport and allowed to return to work.” As an added inducement, those taking the inoculation might be excused from mask requirements. The public now eagerly lines up for shots. They were already acclimated to the “new normals” of masks and social distancing during the first lockdown. It was one thing to stand outside a grocery store for an hour in April; who’d want that in January?

If the Deep State has its way, we would then also see all the other measures Gates and his cronies advocate: forced quarantines mandated by contact tracers; quantum-dot tattoos serving as vaccination proof; digital IDs; and a “global reset” ushering in a cashless society.

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CHAPTER 27

Chapter 27 HOPE AND ENCOURAGEMENT

The news isn't all bad. The Bible doesn't end with the Antichrist, it ends with the return of Christ, the Day of Judgement, and a new heaven and a new earth.

It might be tempting to think: If this is really prophesied, then what's the point of resisting the New World Order? And the answer to that is obedience to God. The Lord's Prayer says: "Thy will be done on Earth as it is in Heaven." A Luciferian system running the world is not God's will; it's a violation of it. We have a duty to stand against evil. In fact, the human race's immediate future very much depends on our opposing this system—whether by resistance, protests, class action lawsuits, and of course, sharing information: by word of mouth, email, social media, communicating with our elected representatives, letters to editors, calls to talk radio shows, and (for those who can) blogs and vlogs.

I grew up in an agnostic home, and I realize that some people will feel annoyed by my depicting the New World Order in spiritual terms. However, the oligarchs themselves do that—at their highest levels, they are consciously, and in practice, Luciferian. This has been documented by (for just three examples): William Guy Carr of Canadian Intelligence in the 1950s (with books such as *Pawns in the Game*); FBI veteran Ted Gunderson, for decades until his death in 2011; and quite recently former Dutch currency banker Ronald Bernard, whose online interviews have gone viral. Anyone doubting that the oligarchy is Luciferian need only look at the normalization of abortion, gay marriage, and transgenderism in our culture. Such systemic changes ultimately occur from topdown influence, not grass-roots activism.

Given the battle's spiritual character, is the church itself awake to what's happening? Some Christian spokespersons are. In the Catholic domain,

Archbishop Carlo Maria Viganò's letter to President Trump garnered much attention:

In recent months we have been witnessing the formation of two opposing sides that I would call *Biblical*: the children of light and the children of darkness. The children of light constitute the most conspicuous part of humanity, while the children of darkness represent an absolute minority. And yet the former are the object of a sort of discrimination which places them in a situation of moral inferiority with respect to their adversaries, who often hold strategic positions in government, in politics, in the economy and in the media. In an apparently inexplicable way, the good are held hostage by the wicked and by those who help them either out of self-interest or fearfulness....

In society, Mr. President, these two opposing realities co-exist as eternal enemies, just as God and Satan are eternal enemies. And it appears that the children of darkness—whom we may easily identify with the *deep state* which you wisely oppose and which is fiercely waging war against you in these days—have decided to show their cards, so to speak, by now revealing their plans. They seem to be so certain of already having everything under control that they have laid aside that circumspection that until now had at least partially concealed their true intentions. The investigations already under way will reveal the true responsibility of those who managed the COVID emergency not only in the area of health care but also in politics, the economy, and the media. We will probably find that in this colossal operation of social engineering there are people who have decided the fate of humanity, arrogating to themselves the right to act against the will of citizens and their representatives in the governments of nations.¹

Not everyone shares Archbishop Viganò's confidence in President Trump, who has given mixed signals—withdrawing U.S support for WHO on one hand, supporting a “warp speed” vaccine on the other. Moving to the

evangelical sphere, Pastor Chuck Baldwin, who was the Constitution Party's Presidential candidate in 2008, writes:

Anyone who has bought into the hype that all of these government lockdowns, a ruined economy, suppression of our liberties and a total disruption of our way of life are for the purpose of saving lives has drunk some serious Kool-Aid. We are supposed to believe that the same people who are enthusiastically promoting the killing of over 60 million unborn babies without so much as a modicum of conscience are somehow crying crocodile tears of compassion because people (including babies) MIGHT die from a flu-like virus? What poppycock!

As I pointed out in this column last week, Secretary of State Mike Pompeo admitted that the corona scare was a government exercise (read: a practice run-through for something bigger). It was an exercise for total government control over our lives. This has been the agenda of Big Government statist in both political parties for decades. With constant fearmongering and hysteria from Big Government hacks in the mainstream media over the coronavirus, the power elite have taken the American people further down the road to serfdom and slavery than any previous attempt.

And I will say it again: This plan would not have worked had Donald Trump not been in the White House. This plan totally depended on evangelical pastors and churches sheepishly going along with it. This they would not have done had a liberal Democrat been in the White House. Are you kidding? Commanding churches to cancel their services—no communions, no baptisms, no Easter services—a total shutdown of houses of worship nationwide? Are you kidding me? You and I both know that if Hillary Clinton were president and she had said that no more than ten people could assemble in church—or anywhere else, for that matter—pastors and Christians would have protested in the streets and would have

defiantly continued their public services en masse. But, because Donald Trump issued the declaration, almost the entire evangelical world bowed the knee to the state without a whimper.

The rest was easy. Restaurant closures, business closures, school closures, travel restrictions, rationed medical care and empty hospitals: Once evangelicals had been neutralized, there was no resistance.

Even so-called patriot leaders such as Oath Keepers Founder and President Stewart Rhodes joined the chorus of Big Government shills calling for government lockdown of our lives. Rhodes' open letter to governors could have been easily written by Big Pharma Fascist Anthony Fauci....

And speaking of Fauci, this little tyrant along with Mr. Global Government himself, Bill Gates, have positioned themselves to make billions of dollars in profits from government-mandated forced vaccinations, which they are both screaming for. And make no mistake about it: Anthony Fauci knows exactly what he's doing....

All of these media hacks fomenting panic and fear; all of these government lockdowns; all of these school closures, business closures and stay-at-home orders are NOT about protecting us from a flu virus. They are all about preparing us for mandated vaccines and total government surveillance and control over our lives—including our jobs, our families, our education, our religious practices, our medical care and our travel.

As it turns out, it looks like the tyrants don't need to confiscate our firearms after all in order to enslave us. Pastors and churches are leading the way for America's voluntary enslavement—all in the name of safety.²

Mount Athos is an autonomous monastic state in Greece, comprising 20 monasteries of the Orthodox Christian faith. In April 2020, one of the most respected figures on Mount Athos, Elder Evthymios of Kapsala, wrote an

epistle concerning how the Orthodox Church should respond to the coronavirus, which I quote in part:

In older times and in similar cases of deadly epidemics, she [the church] would perform sanctifications of the waters (*αγιασμόζ*) and go out in procession with the sacred icons and holy relics. Why should these not be done today as well? “Is the Lord’s hand unable” to help us in these days too (cf. Is. 59:1)?

During the third decade of the twentieth century, my village was struck by a plague which killed fifty little children in a few days. They could not dig the graves fast enough.

Then they brought the skull of Saint Charalampes from Saint Stephen’s in Meteora and the plague immediately ceased.

Ever since the Lord performed the Mystical Supper and handed down the most holy mystery of the Divine Eucharist, the world-saving Divine Liturgy has not ceased to be celebrated to this day.

Neither Diocletian, nor the Turks, nor the communists in Russia, nor the Germans during the years of the occupation managed to stop the Divine Liturgy and the faithful from approaching Holy Communion.

And now, with the fear of the virus, the churches have closed down and the faithful are deprived of the saving grace of the mysteries, of which they have so great a need. On the contrary, while everyone here [in Greece] remains fearfully silent, in the Orthodox Churches of Serbia, Bulgaria, and Georgia divine worship continues unhindered, the churches are open, Divine Liturgy is celebrated, and the faithful are not afraid of being affected by the virus.

The protective measures employed by the present government are unconstitutional, unbearable, extreme, and unfair to the Greek Orthodox, while they have also created an atmosphere of terrorism, which the media aggravate.

Yes, the virus exists and we must protect our health and the health of those around us. Fear, however, must vanish, because when man is in a state of fear he cannot think and act rationally and discreetly....

Many are anxiously expecting the defeat of the coronavirus by the invention of the vaccine, which will be obligatory for all. As for us, we refuse to be vaccinated.

Whoever is afraid, let him receive as many vaccines as he likes, but he should know that they may produce unforeseen and grave side-effects, as was the case a few years with the vaccines against the bird flu done to children, many of whom became paralysed.

Likewise, many of those who received the vaccine against hepatitis B contracted multiple sclerosis, and the same happens with other vaccines as well. Unless God guard us, what can vaccines and medicine do? . . .

We have superior vaccines and the “medicine of immortality,” the holy Mysteries....

And while everyone is struggling to confront the virus, some people have other things in mind and as their goal. Top doctors and scientists are pointing out that what is happening is a discipline test: the goal is to manipulate the people in the direction they want.

This seemed strange and incredible until recently, but it is not imaginary, since men are now publicly saying that “The coronavirus pandemic has brought to the fore the need for a world-wide democratic government” (George Papandreou) and proposing that “each man have on him a microchip with biometrical data in relation to this virus or to other epidemic measurements” (Evangelos Venizelos).

These people are openly speaking of the mark [of the Antichrist] and world-wide dictatorship, but do we get it? And what are we doing? Saint Païsius has spoken and written so much about this topic.

Can we possibly trust these men who have enslaved us to the foreign lenders and who are now leading us into slavery to the Antichrist?³

Archbishop Viganò, Pastor Baldwin, and Elder Evthymios, each in their own way, exemplify “awake” theologians who understand realities of geopolitics and how they relate to faith and prophecy. Unfortunately, they are in the minority amongst churchmen—as is true in any walk of life for people living “out of the Matrix.”

However, I take encouragement in the words of such men, hoping that they, and other “red-pilled” clergymen, will be beacons for the churches.

Louis Farrakhan of the Nation of Islam has also spoken out. *NewsOne* reported:

One of the many timely references made in Nation of Islam Minister Louis Farrakhan’s address on the Fourth of July was about the development of a vaccine for the COVID-19 pandemic that has upended 2020 and threatened more public health havoc moving into the new year....

“I say to my brothers and sisters in Africa . . . if they come up with a vaccine, be careful,” Farrakhan said before expanding his warning to include Black people in the United States, as well.

“Do not take their medications. We need to call a meeting of our skilled virologists, epidemiologists, and students of biology and chemistry,” Farrakhan implored. “We need to give ourselves something better”....

Farrakhan also called out the prominent proponents of the vaccine, including Dr. Anthony S. Fauci, the director of the National Institute of Allergy and Infectious Diseases, for having what he said was the audacity to insist that a vaccine was the best way to combat the coronavirus. He said Fauci and others were more interested in population control than public health.

“They’re plotting to give 7 billion 500 million people a vaccination,” Farrakhan said incredulously. “Dr. Fauci, Bill Gates and Melinda, you want to depopulate the earth. What the hell gives you that right?”⁴

As an author who has appeared on many podcasts, I am hearing more and more reports of both political and spiritual awakening. Amid the darkness are positive trends. Even “Matrixed” citizens who once scoffed at “conspiracy theorists” are beginning to sense, in their inner being, that something isn’t right with the lockdowns and the illogical statements uttered by bureaucrats and the media. Bill Gates and the Deep State may have made the mistake of flooring the accelerator—pushing the agenda too hard instead of “boiling the frog”—thus unintentionally jolting people awake.

- Even in the mainstream media, some are speaking up. John Bolt of *Sky News Australia* has been bitingly critical of his country’s lockdown. Tucker Carlson of *Fox News* minced no words:

[W]e do think it’s worth four minutes taking a pause to assess whether or not they were in fact lying to us about the coronavirus and our response to it. And the short answer is this: Yes, they were definitely lying. As a matter of public health, we can say conclusively the lockdowns were not necessary. In fact, we can prove that. And here’s the most powerful evidence: States that never locked down at all—states where people were allowed to live like Americans and not cower indoors alone—in the end turned out no worse than states that had mandatory quarantines....

The media definitely don’t want to revisit what they were saying just a few weeks ago, when they were acting as press agents for power-drunk Democratic politicians. Back then, news anchors were ordering you to stop asking questions and obey.... And then Memorial Day arrived in May, and some states started to reopen. Millions of grateful Americans headed outdoors for the first time in months, and the media attacked

them for doing that. They called them killers. Swimming with your kids, they told us, was tantamount to mass murder....

But it didn't take long for that message to change completely. In fact, it took precisely five days.... If all of this seems like a pretty abrupt pivot, fret not. Rioting is not a health risk as long as it helps the Democratic Party's prospects in the November election. Rioting will not spread the coronavirus....

But that doesn't mean you get to go outside. You don't. Thanks to coronavirus, you do not have the right to resume your life, and if you complain about that, it's "white nationalism." That was their professional conclusion....

We were all played. Corrupt politicians scared us into giving up control over the most basic questions in our lives. At the same time, they gave more power to their obedient followers, like Antifa, while keeping the rest of us trapped at home and censored online. In other words, they used a public health emergency to subvert democracy and install themselves as monarchs.⁵

Fraser Nelson wrote a post for Britain's *Telegraph* entitled "The Threat Has Passed, So Why Are Our Civil Liberties Still Suspended?"

The virus seems to have peaked by lockdown on 23 March. None of this was known at the time. Instead, we had panic and Prof. Neil Ferguson saying that 250,000 would die unless rules were mandatory. So politically, the Prime Minister had no choice. He has since remarked to colleagues how surprised he has been both at how easy it was, in the end, to take away people's freedom—and how hard it is, now, to give it back.

Rather than a presumption towards liberty—that people should be free unless there's a compelling reason to restrict—the coronavirus crisis has ushered in a new idea. That restrictions must stay, unless it can be proven that it's safe to lift them. It's a pretty hard test to meet as the science is—still—pretty far from consensus. The government's own scientific

advisers are in safety-first mode, convinced that they'll be blamed if anything goes wrong. Ministers find themselves up against a new foe: the precautionary principle. So children are denied basic education because unions say classrooms are unsafe and ministers can't prove otherwise. Most of the Cabinet regards the two-metre social distance regulation as a recipe for economic ruin. There was no scientific evidence behind this distance in the first place, but it's hard to prove that one metre is better because the whole thing is arbitrary....

Lockdown was for just three weeks at first, to "buy time" for the NHS to get ready. We then stayed locked down to "flatten the curve." Deaths peaked on 8 April and have fallen 90 per cent since. London has barely two dozen COVID diagnoses a day— yet the city's 1.4 million children are not allowed to go to school There are no longer "excess deaths" detected in any age group. Four out of five UK COVID cases, now, report no symptoms. It is nigh-on impossible to justify Britain's restrictions on today's threat.... Some 1,500 paediatricians wrote to the government yesterday, urging ministers to consider how school closures will scar "the life chances of a generation of young people."⁶

- In the spring of 2020, protests against the lockdown erupted worldwide. Noteworthy: they were peaceful, void of the looting and destruction that accompanied so many of the protests following the Floyd incident. James Corbett has highlights from numerous lockdown protests at <https://www.corbettreport.com/are-there-lockdown-protests-qfc-060/>.

- Sometimes more vigorous protests succeeded. As *The Unz Review* reported in July:

The relentless advance of coronavirus terror has been broken. Recalcitrant Serbs rebelled against their President when he ordered them back under house arrest. After two days of street battles with dozens of policemen hospitalised, the sturdy protesters won; the authorities surrendered and gave up their

plans to lock Belgrade down. Shops, pubs and restaurants in Belgrade will have an early evening curfew; but this is much better than the full lockdown they intended.⁷

- In Chicago, six Romanian-American churches announced they were re-opening in defiance of Governor J.B. Pritzker's unconstitutional order. Their open letter laid out the safety guidelines they would follow, which exceeded the CDC guidelines that allowed Target, abortion clinics and liquor stores to stay in business.⁸

- People in law enforcement are beginning to speak out. Seattle police officer Greg Anderson, a veteran of the Iraq War as well as of 10 years on the police force, posted a viral video on YouTube. After refusing to take the video down, he was fired. Excerpt:

I've been in law enforcement for ten years and I'm speaking to my peers, other fellow officers, people in any kind of law enforcement position. I've seen officers nationwide enforcing tyrannical orders against the people, and I'm hoping it's the minority of officers, but I'm not sure anymore, because every time I turn on the television, every time I turn I look to the Internet, I'm seeing people arrested or cited for going to church, for traveling on the roadways, for going surfing, opening their businesses, going to the park with their families. or doing nails out of their own house, using their own house as a place of business, and having undercover agents go there and arrest them and charge them—with what? With a crime?

I don't know what crime people are committing by doing nails in their own house, but we're seeing this more and more and more, and we need to start looking at ourselves as officers and thinking: "Is what I'm doing right?" Now I want to remind you that regardless of where you stand on the coronavirus, we don't have the authority to do those things to people just because a mayor or a governor tells you otherwise. I don't care if it's your sergeant or your chief of police. We don't get to violate people's constitutional rights because somebody in our

chain of command tells us otherwise. It's not how this country works.⁹

- Courageous medical doctors are speaking up; this book has already cited many. Sherri Tenpenny, MD (www.drtenpenny.com/), Annie Bukacek, MD (<http://hhckalispell.com/>) and Carrie Madej, MD (https://www.youtube.com/channel/UCOVus4q3qrOyKV_cxyfwhw) have all been outspoken. Kelly Victory, MD, has an informative 17-minute video summing up the COVID situation at <https://www.bitchute.com/video/FFzc6ppAQAjW/>. California MD Jeff Barke stated at a May rally (excerpts):

What if the experts are wrong? What if “quarantine the healthy” doesn’t actually save lives? [Applause] What if wearing a mask in public is not effective? My name is Dr. Jeff Barke, and I’m here representing thousands of physicians across the country, whose voices are being silenced because we don’t agree with the mainstream media and the experts who are telling us what to do. [Applause] Never in the history of this great Republic have we quarantined the healthy....

As a physician I can tell you, yes, this virus is dangerous but as we see the statistics come in, we’re realizing that the fatality rate of this virus is in the ballpark of a bad seasonal influenza. What we’re also knowing is that just like other respiratory viral illnesses in the past, we get over this virus by achieving herd immunity. We can never achieve herd immunity by keeping the herd quarantined. It’s time that we protect the vulnerable and the most at risk when we allow the young and the healthy to open the doors and go back to work. Do not let your voices be silenced.¹⁰

Dr. Mohammad Iqbal Adil, Consultant General, laparoscopic and colorectal surgeon for the United Kingdom’s National Health Service, and who has worked in teaching hospitals for 30 years, has turned whistleblower:

The recent so-called “pandemic” of the coronavirus has created an extraordinary humanitarian crisis all over the world.

...

For the last two months the entire world has been locked down, they are in home arrest, they have been isolated, threatened.... All the large and small businesses are clamped down, and it’s an extraordinary situation where all the schools are closed and 1.8 billion children in 180 countries are affected.

...

It’s a pyramid where the 1 or 2 percent people are controlling the 98 to 99 percent of people all over the world, and in the middle of the pyramid is a vicious and merciless police, military and bureaucracy. The poor public has no support by these law and order maintenance authorities, because they work not for the public, they work for this top 1 to 2 percent filthy rich....

Every patient who is admitted to the COVID ward due to chest infection, flu, pneumonia and respiratory problems, or [even] heart or cancer problems, is labeled as “COVID-19 positive,” which is increasing the number greater and greater all over the world. That’s why the “Worldometer,” which is fake, a calculator, I don’t know who is controlling this “Worldometer” and who is sponsoring them....

Also they want to create a vaccination for that, so that everybody would have a vaccination which will be electronically monitored through the computers and through the electronic tags, and it would be like a quantum tattoo on their wrist or arm.... That is going to happen in the near future, believe me on that.¹¹

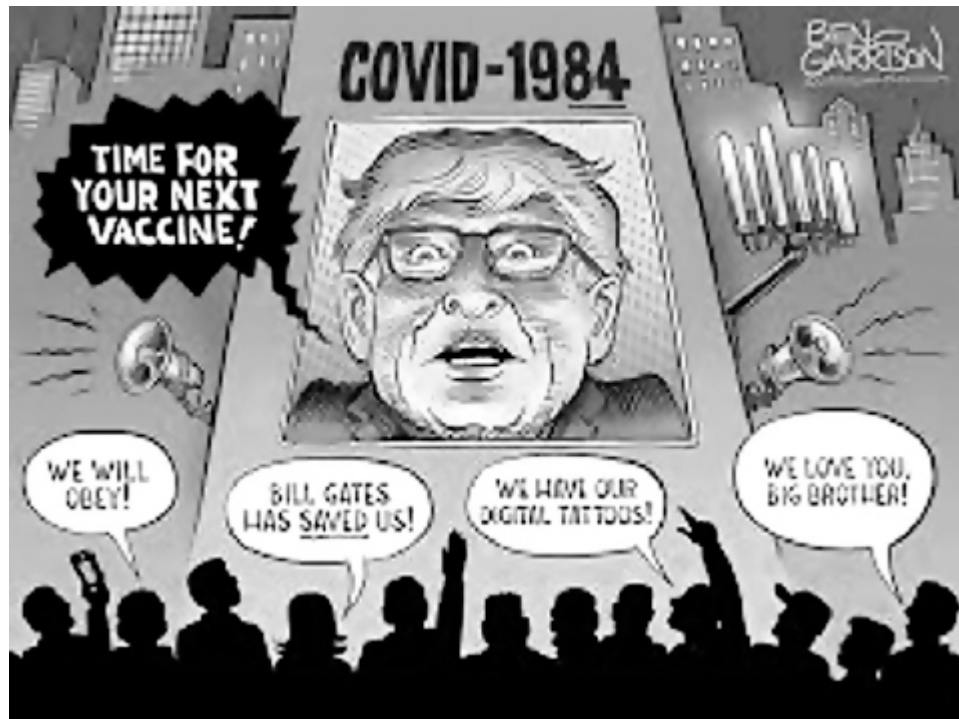
As we have already mentioned, health care providers in Michigan filed a lawsuit against Governor Gretchen Whitmer as her unprecedented lockdown is threatening the lives of many non-COVID patients across the state by denying them needed surgeries and preventative care.¹²

- Norway canceled its contact tracing app over privacy concerns. Associated Press reported in June that “the Norwegian Data Protection Agency said, amongst other things, that the low infection rate meant data gathering on the app could no longer be justified against privacy concerns. ... The app was suspended ahead of an Amnesty International report analyzing contact tracing apps from Europe, the Middle East and North Africa, which found that the Norwegian app was one of the most alarming for privacy because of its ‘live or near-live tracking of users’ locations. The rights group said it shared its findings with authorities earlier this month and urged them to change course. ‘This episode should act as a warning to all governments rushing ahead with apps that are invasive and designed in a way that puts human rights at risk,’ said Claudio Guarnieri, head of Amnesty’s Security Lab.”¹³

- While I don’t encourage violence, there is much footage of 5G towers being burned down; people are aware of what’s coming.

- David Icke gave a viral interview about the New World Order and its plans on *London Real*. The video had over four million views before it was banned by YouTube; it can still be seen on Icke’s website at <https://davidicke.com/2020/04/06/david-icke-live-london-real-today-330pm-uk/>.

- Cartoonist Ben Garrison, who has over 200,000 Twitter followers, has produced a cartoon of Bill Gates presiding over a “COVID-1984” world with mandatory vaccines.



Credit: Ben Garrison, <https://grrrgraphics.com/>.

- Black comedian Terrence K. Williams, with over 800,000 Twitter followers, produced a video Tweet where he said he'd rather shoot "fried chicken grease" up his arm than a Bill Gates vaccine.¹⁴

- *Russia Today* reported:

Russian tennis legend Marat Safin has suggested the coronavirus pandemic could be a pretext for the mass implanting of microchips into humans, as the former world number one gave an unexpected take on the crisis.

"I think they are preparing people for 'chipization' [chip implants]," Safin, 40, said in an Instagram chat with Russian outlet *Sports.ru*. "Back in 2015, Bill Gates said we'll have a pandemic, that the next enemy is a virus, not a nuclear war. They did a simulation at the Davos [economic] forum of what it would be like. I don't think Bill Gates is a predictor, he just knew."

“I think with this virus the situation isn’t like what we’re being told, but people believe it all, the horror stories on TV. Some people believe civilization will end; I don’t believe that. We’ll just be going around with chips soon,” Safin added, continuing his unorthodox take on the current crisis.

In a further twist, the two-time Grand Slam winner even suggested there were shady forces at work that may be behind recent events. “They’ve put the whole world [in lockdown] at home, so everything works,” said Safin. “I think there are guys even bigger than world leaders who are the real masters of money, the masters of the world, they can turn things around easily. Call it a shadow government, call it whatever you like. I think we don’t even know they exist. The Rothschilds and the Rockefellers are well-known names, but someone else is behind them.”¹⁵

- Italian Member of Parliament Sara Cunial delivered a blistering seven-minute speech in May in which she said, in remarks directed at Prime Minister Giuseppe Conte: “Next time you receive a phone call from the ‘philanthropist’ Bill Gates, forward it directly to the International Criminal Court for crimes against humanity.”¹⁶

- A “We the People” petition that calls for “Investigations into The Bill & Melinda Gates Foundation for Medical Malpractice & Crimes Against Humanity” has garnered more than half a million signatures. If you’d like to sign it, it’s at <https://petitions.whitehouse.gov/>.

In an age of instant information, truth can travel fast. Bill Gates is being savaged on social media like never before. And maybe he, like fellow billionaire Mike Bloomberg, will learn: You can’t buy the people, and you can’t buy the truth.

I think it would be fitting to close with a quote from Robert F. Kennedy, Jr.

Every part of our lives will be subject to control. This virus is about training us for submission, training us to do what we’re told. To not go to the beach unless we’re told, to not kiss our

girlfriend without their permission. They're turning us into production units and consuming entities. They are going to rob us not only of our democracy and our liberties, but our souls. They are going to inject us with the medicines they want and they're going to charge us for the diseases they give us. They are going to control every part of our lives. What we are doing at Children's Health Defense is using the last instruments of democracy we have left—the Courts—to fight them. We are in the last battle. We are in the apocalypse. We are fighting for the salvation of humanity. We all knew this was coming, though I never believed it would come in my lifetime. But here it is.¹⁷

For Further Reading and Viewing

Alternative media features too many awesome websites and YouTube channels for me to list comprehensively; here is a selection that can help keep you updated on the COVID situation (as well as other pertinent issues). If video channels are censored following this book's publication, look for backups on Bitchute:

The Corbett Report <https://www.corbettreport.com/>

No More Fake News (John Rappoport's website)
<https://nomorefakenews.com/>

The End Game (Spiro Skouras channel)
https://www.youtube.com/channel/UCkKOQNYoZjaa_8V0uPOueeQ

Children's Health Defense (Robert F. Kennedy, Jr.)
<https://childrenshealthdefense.org/>

"Facts about COVID-19" by *Swiss Policy Research* (regularly updated)
<https://swprs.org/a-swiss-doctor-on-covid-19/>

The HighWire with Del Bigtree
<https://www.bitchute.com/channel/okiFK5CwQrZS/>

Dr. Rashid Buttar <https://www.drbuttar.com/> YouTube:
<https://www.youtube.com/user/drbuttar>

London Real (with Brian Rose) <https://londonreal.tv/> Dr. Dolores Cahill
<https://dolorescahill.com/>

Dr. Henry Makow <https://www.henrymakow.com/>

SGT Report channel <https://www.youtube.com/user/SGTbull07>
UnHerd channel
https://www.youtube.com/channel/UCMxiv15iK_MFayY_3fU9loQ
Dr. Sherri Tenpenny <https://www.drtenpenny.com/>
David Icke <https://davidicke.com/>
Gateway Pundit <https://www.thegatewaypundit.com/>
The Last American Vagabond
<https://www.thelastamericanvagabond.com/>
The New American magazine <https://www.thenewamerican.com/> 5G
Crisis <https://www.5gcrisis.com/>
Cellular Phone Task Force (Arthur Firstenberg site)
<https://www.cellphonetaskforce.org/>

Dr. Judy Mikovits does not have a website at this time, but look for her online interviews and read her book *Plague of Corruption*.

For periodic “breaking news” and up-to-date information pertinent to the content of *COVID-19 and the Agendas to Come, Red-Pilled*, visit <https://jamesperloff.com/covid-book-updates/>.

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INDEX

Abramović, Marina, [114](#)
Active Denial System (ADS), [103](#)
Adil, Mohammad Iqbal, [5](#), [193-94](#)
Africa, [116](#), [155](#)
air pollution, [106](#)
Akunis, Ofir, [97](#)
Amnesty International, [194-95](#)
Anderson, Greg, [192](#)
antibiotics, [106](#)
Antichrist, [159](#), [188](#)
Antifa, [173](#)
Antioco, Joseph, [65](#)
ApiJect Systems America, [120](#)
Asian Flu (1957), [39](#), [102](#)
Association of American Physicians and Surgeons, [147-48](#)
AstraZeneca, [121-22](#), [149](#)
Atlas, Scott, [20](#), [52-53](#)
Attkisson, Sharyl, [63-64](#)
Atzmon, Gilad, [91](#)
Australia, [11](#)
Ayyadurai, Shiva, [83-84](#)
Azithromycin, [138](#), [143](#)

Bailey, Sam, [23-24](#)
Baldwin, Chuck, [184-86](#)

Baller, April, [29](#)
bankruptcies, [3](#)
Baric, Ralph, [89](#)
Barke, Jeff, [193](#)
Bartlett, Richard, [131](#)
bat soup, [81](#)
Beasley, David, [177](#)
Benfer, Emily, [6](#)
Berg, Chris, [62-63](#)
Bergman, Ronen, [91](#)
Bernard, Ronald, [183](#)
Beshear, Andy, [9](#)
Bezos, Jeff, [114](#)
Bhakdi, Sucharit, [14-15](#)
Biden, Joe, [175](#)
Bigtree, Del, [28](#), [75](#), [198](#)
Bilderberg Group, [114](#)
Bill and Melinda Gates Foundation, v, [51](#), [54](#), [90](#), [93](#), [95-96](#), [113](#), [115](#), [116](#), [122](#), [132](#),
[146](#), [149](#), [153](#), [154](#), [156](#), [158](#), [164](#), [196](#)
Bill of Rights, [9-11](#)
biosafety labs
 Chapel Hill, [85-86](#), [88-89](#)
 Wuhan, [86](#), [88](#), [89-90](#)
Birx, Deborah, [51](#), [59](#)
Black Lives Matter, [173](#), [174](#)
Blair, Tony, [155](#)
Blaylock, Russell, [25-26](#), [28](#)
Blumenthal, Richard, [103](#)
Bolsonaro, Jair, [44](#)

Bolt, John, [189](#)

Boom, Marc, [130](#)

Boyle, Francis, [84-86](#), [88](#)

Branson, Richard, [114](#)

Brazil, [44-45](#)

breast milk, artificial, [114](#)

Bretton Woods Conference, [160](#)

Britain, [5](#), [11](#), [15-16](#), [51-52](#), [53](#), [59](#), [65-66](#), [167](#), [190-91](#)

Brown, Gordon, [159](#)

Brownstein, David, [26-27](#)

Broxmeyer, Lawrence, [106](#)

Broze, Derrick, [101](#)

Brzezinski, Zbigniew, [109](#)

Budesonide, [131](#)

Bukacek, Annie, [193](#)

Bush, Zack, [105-106](#)

Buttar, Rashid, [74](#), [87-89](#), [198](#)

Cahill, Dolores, [28](#), [75](#), [198](#)

Camerota, Alisyn, [152](#)

Canada, [70-71](#), [121](#)

carbon dioxide levels, effect of masks on, [26](#), [31](#)

Cardillo, Anthony, [138-39](#)

Carlson, Tucker, [55](#), [189-90](#)

Carr, William Guy, [183](#)

cashless society, [158-61](#)

CBS, [40](#), [46](#), [63-64](#)

CDC, [26](#), [38-39](#), [63-64](#), [73](#), [96](#), [127](#), [135-36](#), [138](#), [164](#), [173](#)

Cellular Phone Task Force, [198](#)

censorship, v-vi, 19, 54-55, 63-64, 93-95

Centers for Disease Control and Prevention. *See* CDC

certificates of immunity, 152, 155-56

Chauvin, Derek, 174

children and COVID-19, 18-19, 20, 43-44, 191

Children's Health Defense, 197

China, 24, 81, 83-84, 85, 111, 158 *See also* Wuhan

chloroquine, 127, 143 *See also* hydroxychloroquine Christ, 183

Chronic Fatigue Syndrome, 90

church services, 9-11, 185, 187, 192

civil liberties, 9-11, 123-24, 164, 190-91, 192

Clark, Suzanne, 178

Clinton, Chelsea, 164

Clinton, Hillary, 185

Colbert, Stephen, 3, 177-78

Coleman, Vernon, 15-16, 50

Colorado, 10

Comfort (hospital ship), 69

Connecticut, 42-43

contact tracing, 95-96, 163-68, 194-95

Conte, Giuseppe, 196

Corbett, James, 46, 90, 111, 115, 116, 153, 158, 191

Corbett Report, v, 101, 197

Coronavirus. *See* COVID-19

coronaviruses, 75, 81

Coulter, Ann, 44

COVID-19, *passim*

 alternative theories of, 105-106

 5G theory of, 101-103

bioweapon/bioengineering theory of, [83-91](#), [111](#)
children and, [18-19](#), [20](#), [43-44](#), [191](#)
death rates. *See* death rates and COVID-19
infectiousness of, [24-30](#)
meaning of acronym, [v](#)
origin of, mainstream explanation, [81-82](#), [87](#)
testing and, [65](#), [73-76](#)
vaccines for, [97](#), [119-24](#), [127-28](#), [131-33](#)

COVID-19 Testing, Reaching and Contacting Everyone (TRACE) Act, [96](#), [164](#)

Cowan, Thomas, [102](#), [105](#)

Crimson Contagion, [95](#)

Crowe, David, [73](#)

Crown Castle International, [113](#)

Cunial, Sara, [196](#)

Cuomo, Andrew, [43](#), [68-69](#), [129](#)

cytokine storm, [48](#), [131](#), [133](#), [135](#) *See also* pathogenic priming

Darkness, The (British band), [97-98](#)

death rates and COVID-19, [52-53](#), [127](#), [129](#)
 compared to other causes of death, [37-39](#), [51](#)
 conflation of COVID with other diseases, [15](#), [58-60](#)
 death certificates and, [62-66](#)
 future possible changes, [49](#)
 nursing homes and, [68-71](#)
 modeling, [24](#), [51-53](#)
 versus number of cases, [129-30](#)

Deep State, [45-46](#), [83-84](#), [110](#), [159-60](#), [184](#), [194](#), [196](#)

Defense Department, U.S., [119-20](#)

dengue, [134](#)

Denmark, [11](#)

Dershowitz, Alan, [123-24](#)

Desai, Sapan, [142](#)

Diagnostic Robotics, [165](#)

digital ID, [152-56](#)

Disney, [46](#)

“Doctor B,” [48-49](#), [76](#)

domestic violence, [4](#)

Doucette, Cece, [103](#)

Doyle, Larry, [96](#)

Easter Is Cancelled (album), [97-98](#)

Easter services, [9-10](#), [97-98](#)

Ebola, [28](#)

Eccles, Martin, [160](#)

“Economic Reset,” [160-61](#), [176](#)

elections, [175](#)

EMFs (electromagnetic fields), [101-103](#) *See also* 5G

End Game, The, [197](#)

Epstein, Jeffery, [113](#), [123](#)

Erickson, Daniel W., [29-30](#), [53-54](#)

Esper, Mark, [119](#)

Estulin, Daniel, [114](#)

European Union, [160](#)

Evans, Gerald, [25](#)

Event 201, [93-95](#)

evictions, [6](#)

Evthymios, Elder, [186-88](#)

exosomes, [105](#)

Ezike, Ngozi, [59-60](#)

Fair, Joseph, [42](#)

fake news, [40-46](#)

famine, [176-77](#)

farming, [4](#)

Farrakhan, Louis, [188-89](#)

Fauci, Anthony, [50-51](#), [89-90](#), [122](#), [123](#), [131](#), [134](#), [143](#), [152](#), [186](#), [189](#)

FDA, [145](#), [147-48](#)

 movement of employees into pharmaceutical companies, [148-49](#)

Federal Reserve, [6](#), [160](#)

Ferguson, Neil, [51-52](#)

Firstenberg, Arthur, [102](#), [105](#), [198](#)

First International Eugenics Congress, [115](#)

5G, [101-103](#), [113](#), [178-80](#), [195](#)

 and 60 GHz effect, [102](#)

 detailed description from *International Appeal*, [179-80](#)

5G Crisis, [103](#), [198](#)

Floyd, George, [173-74](#)

flu. *See* influenza

flu shots, [74-75](#)

Food and Drug Administration. *See* FDA

food shortages, [4](#), [176-77](#)

Ford, Gerald, [135](#)

Fort Detrick, [83](#), [86](#)

France, [11](#), [138](#)

Franchi, Gary, [83](#)

Franklin, Benjamin, [9](#)

Frei, Rosemary, [70-71](#)

funeral homes, [65](#)

gain-of-function research, [85](#), [90](#)

Garrison, Ben, [195](#)

Gates, Bill, [v](#), [3](#), [90](#), [113-17](#), [119](#), [122](#), [123](#), [164](#), [186](#), [195](#), [196](#)

digital ID and, [152-55](#)

eugenics and, [115-16](#), [153](#), [189](#)

investments of, [113-14](#)

“Pandemic One” and “Pandemic Two,” [3](#), [177-78](#)

petition against, [196](#)

Robert F. Kennedy, Jr., remarks by, [115-16](#)

vaccines and, *passim*

See also Bill and Melinda Gates Foundation

Gates Foundation. *See* Bill and Melinda Gates Foundation

Gates, William H., Jr. (Bill Gates’s father), [113](#)

Gateway Pundit, [198](#)

Gavi, [154](#), [155-56](#)

Gerberding, Julie, [136](#)

Germany, [14-15](#), [58](#)

GlaxoSmithKline, [132](#)

global ID, [152-56](#)

glyphosate, [105-106](#), [113](#)

GMOs, [113](#)

Gold, Simone, [68-69](#), [141](#), [144](#)

Goodman, Jason, [123-24](#)

Google, [11](#)

Greece, [11](#), [186-87](#)

Gruener, Dakota, [154](#)

Guarnieri, Claudio, [195](#)

Gunderson, Ted, [183](#)
Gupta, Sanjay, [123](#)
Gupta, Sunetra, [128](#)

Hakusui, Shigeaki, [102](#)
Hamilton, Charles E., Jr., [10](#)
Havas, Magda, [102](#)
Haydon, Ian, [123](#)
hCG (human chorionic gonadotropin), [112](#), [116](#)
Heneghan, Carl, [25](#)
herd immunity, [18-19](#), [193](#)
HighWire, The, [198](#)
HIV, [86](#)
Holodomor, [177](#)
H1N1. *See* swine flu (2009) Hong Kong, [84](#)
Hong Kong Flu (1968), [39](#), [102](#)
H.R. 6666, [96](#), [164](#)
hydroxychloroquine, [127](#), [138-48](#)
clinical trials of, [138](#), [145-47](#)

Icke, David, [195](#), [198](#)
ID2020 Alliance, [153-54](#)
Illinois, [59](#)
IMF, [160](#)
immune system, [29-30](#)
Imperial College, [24](#), [51-52](#)
India, [115](#), [147](#), [154](#)
Indiana, [10](#)
Indian Council of Medical Research (ICMR), [147](#)
influenza, [38-39](#)

Asian flu (1957), [39](#), [102](#)
Hong Kong flu (1968), [39](#), [102](#)
Russian flu (1889), [102](#)
Spanish flu (1918), [102](#)
swine flu (1976), [135](#)
swine flu (2009), [54-55](#), [63-64](#)
Ingraham, Laura, [63](#), [139-41](#)
Inovio, [131](#), [132](#)
Invisible Rainbow, The, [102](#)
Israel, [91](#), [97](#), [165](#)
Italy, [58-59](#), [128](#), [196](#)

Japhet, Timothy D., [173-74](#)
Javits Center, [69](#)
Jefferson, Tom, [25](#)
Jensen, Scott, [62-63](#)
Johns Hopkins Center for Health Security, [93](#)
Johnson & Johnson, [121](#)
jury trials, [10](#)

Kansas, [10](#)
Katz, Chen, [97](#)
Katz, David, [18](#)
Kaufman, Andrew, [105](#)
Kawasaki disease, [44](#)
Kennedy, Robert F., Jr., [89](#), [115-16](#), [133](#), [197](#)
Kentucky, [9](#)
Kenya, [116](#)
Kettner, Joel, [16-17](#)
Keynes, John Maynard, [160](#)

Kirk, Jerry, [175](#)
Kostoff, Ronald, [101-102](#)
KSAT, [40-41](#)
Kvachkov, Vladimir, [109-111](#)

Lagarde, Christine, [160-61](#)
Lamont, Ned, [42-43](#)
Lancet, [25](#), [87](#), [142](#), [144](#)
Lane, H. Clifford, [50](#)
Langer, Robert, [153](#)
Lanza, Michael, [65](#)
Last American Vagabond, The, [198](#)
Lee, John, [65](#)
Lemoine, Jean-François, [86](#)
Levine, Rachel, [70](#)
Levitt, Michael, [53](#)
Liosatis, Jason, [85](#)
lockdowns, [3-33](#)

- civil liberties impact, [9-11](#), [185](#), [190-91](#), [192](#)
- economic impact, [3-7](#), [175-76](#)
- health impact, [4-6](#), [24](#), [30](#)
- mental health impact, [4](#), [24](#)
- school closings, [18](#), [19](#), [20](#), [191](#)
- were they necessary? [14-21](#)

London Real, [195](#), [198](#)
Lozano, Ivette, [139-41](#)
Luciferianism, [183](#)
Lundberg, Ferdinand, [45](#)
Luther, Shelley, [10](#)

Madej, Carrie, [132](#), [193](#)
Magufuli, John, [75-76](#)
Makow, Henry, [198](#)
mark of the Beast, [159](#), [188](#)
masks, [10](#), [11](#), [25-31](#)
Massihi, Artin, [29-30](#), [53-54](#)
Mastercard, [155-56](#)
McHugh, Kevin, [152](#)
McNamara, Robert, [109](#)
meat, lab-grown, [114](#)
media, mainstream, [v](#), [40-42](#), [46](#), [182](#), [189](#)
Merck, [121](#), [136](#), [149](#)
MERS (Middle East respiratory syndrome), [51](#), [85](#), [88-89](#)
Michigan, [4-5](#), [10](#), [194](#)
Microchips Biotech, Inc., [153](#)
Microsoft, [114](#), [116](#), [153](#)
MIGAL, [97](#)
Mikovits, Judy, [74-75](#), [90-91](#), [198](#)
Military World Games, [91](#)
Minnesota, [62](#)
Mises Institute, [6-7](#)
Mississippi, [9-10](#)
Moderna, [121-23](#), [131](#), [132](#), [149](#)
Mölling, Karin, [19-20](#)
Monsanto, [105](#), [113](#)
Montagnier, Luc, [86](#)
Montanari, Stefano, [127-28](#)
Moore, Mary Tyler, [135](#)
Moynihan, John, [96](#)

MTX Group, [164](#)

Musk, Elon, [180](#)

Myasnikov, Alexander, [21](#)

Napolitano, Andrew, [6](#)

Nass, Meryl, [87](#), [145-47](#)

National Institute for Allergy and Infectious Diseases (NIAID), [89-90](#), [122](#)

National Institutes of Health (NIH), [89](#), [122](#), [131](#), [134-35](#), [143](#)

National Vital Statistics System, [63](#)

Nature, [88-89](#)

NBC, [42](#)

Nelson, Fraser, [190](#)

Netflix, [96](#)

New American, The, [198](#)

New England Journal of Medicine, [25](#), [50-51](#), [142](#), [144](#)

NewsCorp, [46](#)

New York, [43](#), [64](#), [65](#), [68-69](#)

New Zealand, [23-24](#)

9/11, [110](#)

No More Fake News, [197](#)

Norway, [194](#)

Nuremburg Code, [124](#)

nursing homes, [68-71](#)

Occupational Safety & Health Administration. *See* OSHA

oligarchy, [45-46](#)

Open Society Foundations, [175](#)

Operation Warp Speed, [122](#)

OSHA, [30](#)

Osterholm, Michael T., [19](#)

Owens, Candace, [42-43](#), [46](#)

Oxford University, [53](#), [121](#)

oxygen,

5G impact on at [60 GHz](#), [102](#)

impact of masks on levels of, [28](#), [30](#)

Pandemic (Netflix series), [96](#)

“Pandemic One” and “Pandemic Two,” [3](#), [177-78](#)

Partners in Health, [164](#)

pathogenic priming, [134](#) *See also* cytokine storm

“patient zero,” [81](#), [83](#)

Patrick, Dan, [164](#)

Paul, Ron, [129-30](#)

PCR test, [73-74](#)

Pence, Mike, [165](#)

Pennsylvania, [69](#), [70](#)

Perez, Jean-Claude, [86](#)

Pfizer, [121](#), [131](#)

pharmaceutical industry, [55](#), [135-36](#) *See also* specific companies

pharmacies, [139-41](#)

Philip, Prince, [109](#)

Philippines, [134](#)

Pine Street Inn shelter, [73](#)

Planned Parenthood, [113](#)

police, [10](#), [11](#), [174](#), [192](#)

Polio, [115](#)

PolitiFact, *v* Pompeo, Mike, [185](#)

population reduction, [109-112](#), [115-16](#)

Pritzker, J.B., [192](#)

Project Veritas, [64-65](#)
protests, [97](#)
 after George Floyd incident, [173](#), [174](#)
 against lockdowns, [191-92](#)
 in China, [84](#)
Püschel, Klaus, [15](#), [58](#)

quarantines, [53-54](#), [166-67](#), [193](#)
Quick, Becky, [119](#)

Rancourt, Denis G., [27-28](#)
Rand, Jory, [138-39](#)
Raoult, Didier, [138](#), [144](#)
RAPID USA, [120-21](#)
Rappoport, John, [63-64](#), [132](#), [197](#)
Redfield, Robert R., [50](#)
religious freedom, [9-11](#), [185-88](#), [192](#)
Revelation, Book of, [159](#)
RFID chips, on syringes, [121](#)
Rhode Island, [165](#)
Rhodes, Stewart, [186](#)
Richards, David, [52](#)
rioting, [173](#), [174](#), [190](#)
Rockefeller Brothers Fund, [96](#)
Rockefeller Foundation, [98-99](#), [111-12](#), [163](#)
Rose, Brian, [198](#)
RSV (respiratory syncytial virus), [134](#)
Ruscetti, Frank, [90](#)
Rush, Bobby L., [96](#), [164](#)
Russia, [21](#)

Safin, Marat, [196](#)
Sanofi, [132](#), [149](#)
Santamaria, Maya, [174](#)
SARS, [51](#), [75](#), [85](#), [86](#), [88](#), [93](#), [133](#), [135](#), [143](#)
SARS-CoV-2. *See* COVID-19
satellites, for 5G, [179](#), [180](#)
schools, [18](#), [19](#), [20](#), [191](#)
“second wave,” [19](#), [21](#), [130](#), [178](#)
Seneff, Stephanie, [105](#), [106](#)
Serbia, [191-92](#)
Sgarbi, Vittorio, [59](#)
SGT Report, [87](#), [198](#)
Shi, Zhengli, [85](#), [88](#)
shopping, [20](#)
Sikora, Karol, [66](#)
Singapore, [11](#), [131](#)
Sixty Minutes, [135-36](#)
Skouras, Spiro, [93](#), [197](#)
Slaoui, Moncef, [122](#)
smartphones, [168](#)
Smith, Brandon, [160](#)
Snopes, [v](#)
social distancing, [10](#), [11](#), [19](#), [23-25](#), [28-30](#)
Soriot, Pascal, [121](#)
Soros, George, [164](#), [174-75](#)
SpaceX, [180](#)
Stadler, Beda M., [29](#), [74](#), [129](#)
Stalin, Joseph, [177](#)
Stanford University study, [52-53](#), [127](#)

Stergiulis, Seraphim, [11](#)
stock market, [98](#)
Streeck, Hendrik, [20](#)
suicide, [4](#)
Summit on Family Planning, [115](#)
sunlight, [20](#), [24](#), [113](#)
Surgisphere, [141-43](#), [144](#)
surveillance state, [113](#), [164-68](#)
Swaminathan, Soumya, [145](#)
swine flu (1976), [135](#)
swine flu (2009) (H1N1), [54-55](#), [63-64](#)
Swiss Policy Research, [197](#)
syringes, [120-21](#)

Taiwan, [130](#), [131](#)
Tanzania, [75-76](#)
Task Force on Vaccines for Fertility Regulation, [112](#)
tattoo, quantum-dot, [152-53](#), [194](#)
Tenpenny, Sherri, [193](#), [198](#)
testing, for COVID-19, [65](#), [73-76](#), [163](#)
Texas, [10](#), [130](#), [164](#)
Thomas Paine Podcast, [96](#)
Time-Warner, [46](#)
Todaro, James, [143](#)
TRACE Act, [96](#), [164](#)
Trump, Donald, [3](#), [4](#), [51](#), [84](#), [119](#), [143-45](#), [148](#), [149](#), [175](#), [184](#), [185](#)
Trust Stamp, [155-56](#)
tuberculosis, [106](#)
Tunisia, [11](#)

Turner, Ted, [109](#)

Ukraine, [177](#)

ultraviolet light, [20](#), [24](#)

unemployment, [3-6](#)

UnHerd, [198](#)

United Kingdom. *See* Britain Unit 8200, [165](#)

U.S. biological defense program, [83](#)

Vaccine Injury Act, [132](#)

vaccines, [115-16](#), [187-88](#), [189](#)

certificates of immunity, [152](#), [155-56](#)

common cold and, [128](#)

coronaviruses and, [97](#), [133-34](#)

COVID-19, [97](#), [119-24](#), [127-28](#), [131-33](#), [194](#)

dengue, [134](#)

DNA, [131-33](#)

mRNA, [132-33](#)

population control/use against fertility, [111-12](#), [116](#)

RSV, [134](#)

SARS, [133](#), [135](#)

swine flu (1976), [135](#)

swine flu (2009), [55](#)

testing of, [121-23](#), [133-35](#)

ventilators, Medicare compensation for, [63](#)

Victory, Kelly, [193](#)

Viganò, Carlo Maria, [184](#)

Virology Journal, [143](#)

viruses, alternative view of, [105](#)

Vitale, Nino, [30](#)

vitamin D, [131](#)

Wain-Hobson, Simon, [88](#)

Walker, Jay, [120-21](#)

Wallace, Chris, [119](#)

Warnsholz, Jordan, [5](#)

Webb, Whitney, [165](#)

Weinstein, Harvey, [123](#)

Whitmer, Gretchen, [4-5](#), [10](#), [129](#), [194](#)

WHO. *See* World Health Organization Williams, Terrence K., [195](#)

wireless radiation. *See* EMFs, 5G Wittkowski, Knut, [18-19](#)

Wodarg, Wolfgang, [17-18](#), [55](#)

Wohlgelernter, Dan, [68-69](#), [144-45](#)

Wojcicki, Susan, [54](#)

World Economic Forum, [93](#), [161](#)

world government, [159-60](#)

World Health Organization, [28-29](#), [53](#), [54-55](#), [66](#), [75](#), [112](#), [141](#), [145-46](#), [149](#), [154](#), [158](#),
[164](#)

Worldometer, [37](#), [194](#)

Wuhan, [81](#), [83-84](#)

biosafety level-4 lab, [85](#), [86](#), [88](#), [89-90](#)

5G in, [101](#), [103](#)

seafood market, [81-82](#)

Military World Games, [91](#)

Young, Robert O., [102](#), [105](#)

YouTube, [54-55](#), [101](#), [102](#), [195](#)

Zakaria, Fareed, [115](#)

Zaks, Tal, [132](#)

Zangrillo, Alberto, [128](#)

Zuckerberg, Mark, [114](#)