The Psychedelic Library Homepage

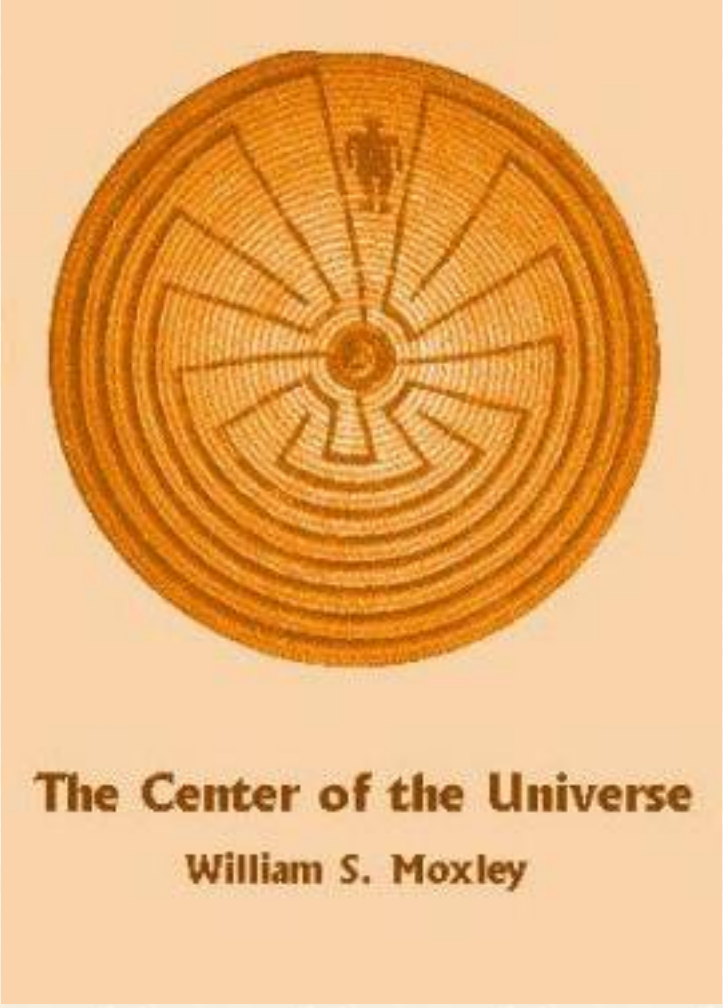
Books Menu Page

The Center of the Universe

A Theory of Psychedelic Experience

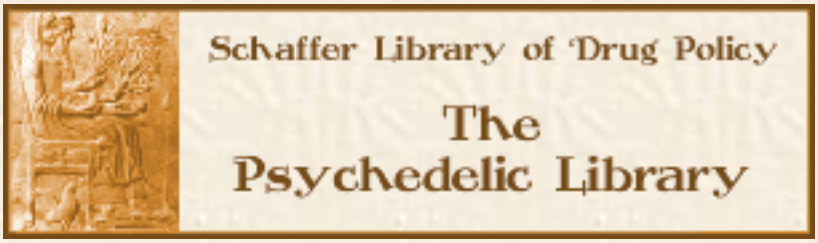
by William S. Moxley

Contents



Send e-mail to The Psychedelic Library: psd_lib@druglibrary.org

The Psychedelic Library | Books Menu Page



The Center of the Universe

William S. Moxley

Foreword

It is perfectly natural that man himself should
be the most unintelligible part of the universe.

—Alan Watts

MAN HIMSELF is the last frontier. The so-called hard sciences, the sciences dealing with objects, atoms and molecules to stars and galaxies, or with numbers, energies, fields and innumerable abstractions, are nearing a degree of perfection unimagined in the wildest fantasies of the medieval alchemists. Yet sciences dealing with man himself, despite the confident tomes warping the shelves of our libraries and bookstores, remain in a state of rapid evolution, to put it kindly. There are even fundamental differences of opinion as to why the study of humankind is so difficult.

Nowhere among the sciences of man do we find controversy and confusion more rampant than in the study of the mind. Some, who profess to study only the hardest of objective facts, have proposed that the mind is nothing but a computer program. Another school of thought would eliminate mind altogether. For several decades the academic tyranny of Behaviorism made it practically obscene even to mention such words as consciousness, belief, intention or free will in a scientific journal, a state of affairs which stifled

progress in psychology for half a century. Now it seems, as Jimmy Durante was fond of remarking, "everybody wants ta' get inta' de act." Several top-rate books and a great many articles have recently appeared, taking up such subjects with a vigor typical of the aftermath of some prohibition or repression, in this case a repression of ideas whose development in the work of such pioneers as William James came to a halt at the beginning of the 20th Century.

It is not my intention to berate the many authors and researchers who have struggled with such problems over the past several decades. They have faced the most difficult problems ever faced in the scientific search for truth, and hard results have been difficult to achieve. Such wide-open fields in fact provide, and have historically provided the greatest opportunity for the scientific revolutionary, who should well know the risks involved in exploring uncharted territory. But I do wish to stress that with all the so-called progress that 20th Century science has achieved, there remains a rather large and important area of understanding that is still in the stone-age of development: man's understanding of himself; and it is the difficulty of the subject, not the intelligence of the professors which is the problem.

With difficult subjects however, we often find with hindsight that fairly obvious leads were ignored at critical periods of research: a few strange ideas advanced by some outsider or non-expert, or some heresy proposed by an iconoclast, seemingly to cause dismay and discord and without serious value to ongoing work. Or perhaps anomalous experimental results were cast aside, ignored as irrelevant or the result of some undetermined experimental or methodological error. All great truths begin as blasphemies, noted George Bernard Shaw. As established experts in a field seldom publish blasphemies, we might learn something from history and pay more attention to outsiders, non-experts and the like, for if their suggestions really are worthless, this should not be difficult to prove, if the theories and models of the established discipline are in order and working efficiently. The historian of science Thomas Kuhn pointed out that scientific revolutions are almost always initiated by young workers, or those new to the field they revolutionize. It may be objected that the non-expert has insufficient grasp of the fundamentals, or is not fluent

enough to distinguish superficial anomalies in a field from important ones, or is lacking in a command of the accumulated technique of the discipline thus making the likelihood of his work being the catalyst for an ensuing scientific revolution negligible. Such objections would be significant in well-developed sciences: we would not expect a non-chemist to revolutionize even a small corner of the field of chemistry, or a truck driver to provide deep new insights in quantum mechanics. But in a field in which a generally agreed paradigm seems a far-distant dream, a field still in the stone-age of development, the outsider, or a well-read amateur, may well be in a position to supply the key to revolution. For one thing, he has no great intellectual investment in one competing school of thought or another. In a field of study ripe for fundamental change where reputations and careers are on the line, we might expect the entrenched experts to be the least likely candidates to introduce revolutionary hypotheses.

In the following pages I propose a rather wide-ranging theory concerning man, his mind and brain, behavior, his evolution and anthropology, his sociology and psychology, religion and apostasy, myth and metaphysic, sciences and certainties, and it will already be obvious that no writer can possibly be an expert in such a wide selection of topics. But my theory may amount to more than armchair speculation if I have discovered and developed one of the important clues largely ignored by the experts, one of the leads which with hindsight will be seen to have provided the key to a revolution in understanding. Of course my lack of expertise in the subjects I need to examine must predictably lead to criticism from the professionals; no doubt I abuse their terminologies and misinterpret some of the finer points of their disciplines, or worse. But I believe that the errors noted will be, for the most part, technicalities, or simply part of the ongoing controversy in a given field and inconsequential to the overall theory I will present.

In constructing this theory, and in the present description of the results of my inquiries, I have tried to live up to the view expressed by Aldous Huxley, when he saw his position as one of bridge-builder between areas of knowledge that had previously been too separated or independent, one body of knowledge ignoring or even rejecting another for no reason other than tradition, or as

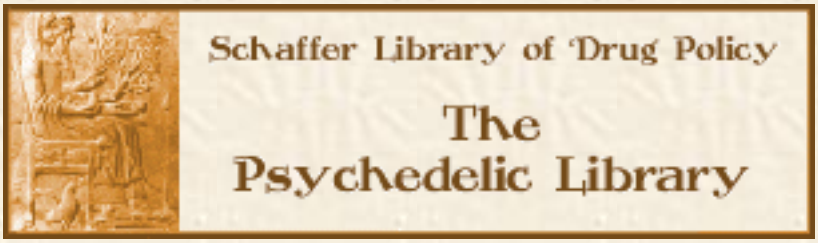
a result of the peculiarities of the way in which students become trained and indoctrinated in a field. Thus the durability of the theory I have shaped will be a function not of the accuracy of fine details which will have to be filled in or corrected over time, but of the overall concept of the theory and its ability to combine and predict: Combine disparate aspects of present understanding and predict future observations and trends in this primary area of man's search for truth. And if it is a good theory, it may also provide an understanding which could assist in improving the condition of man, the relationships between his societies and nations, and the increasingly fragile bond linking him with his only available home, the planet Earth.

I have tried to write a book which will not only hold the interest of a wide audience, but contribute to understanding both by professionals and laymen alike. Thus there are some autobiographical passages, hopefully entertaining and illustrative of yet another, hidden side of the cultural and social upheaval of the 1960's, but the story line is also the history of the ideas which led to the theory and so is intended as an enticement for the non-technical reader to think about some scientific subjects he has probably very little knowledge of, or interest in. For professional readers, or those laymen who already are following some of the current debates in the subjects dealt with here, I have tried to construct the more technical parts of the book so that they flow smoothly, and are unencumbered by the myriad definitions and explanations that would be essential for the non-technical reader. For him, I can recommend that the more difficult passages may safely be quickly scanned, and the terms and ideas expressed therein may be better understood by referring to the Glossary provided at the end of the book. But a thorough understanding of some of the more technical evidence for the theory should not be necessary to grasp its overall intent or scope.

Although it is customary at the beginning of a book to thank the friends and co-workers who have contributed to the author's completion of his task, the many persons who have been instrumental to my own work shall remain unnamed with the exception of other authors whose works are listed in the bibliography. I will not single out any names here for special thanks either, as I have had very limited contact

with them except through their published works. Reasons for these conditions should soon become obvious from what is to follow.

Chapter 1 | **Table of Contents**



The Center of the Universe

William S. Moxley

1. Beginnings

MEXICO, EARLY IN 1968. With a few friends of similar disposition, I have left the deteriorating summer-of-love counter-culture scene of New York City on an adventure destined to occupy the next quarter-century of my life. We follow in the footsteps of many other seekers, both professional and amateur, who have sought to know more about the astonishing collection of psychoactive plants indigenous to the tropical and semi-tropical regions of the New World. Native Americans had discovered these plants many thousands of years before, and almost without exception they came to be of major importance for the tribes and civilizations which grew to prominence long before the arrival of the white man.

Each of us has his own reasons for embarking on such a voyage, the immediate and conscious reasons each would have stated having perhaps little to do with underlying motivations that would be seen as important only from the distant future. One friend has come along, offering to assist me in my as yet vague project of finding and experimenting with some of these mysterious plants. Another is to meet a friend who has established a modest trade with rural farmers who grow the famed variety of cannabis known as Acapulco Gold. Another seems merely to be along for the ride. And of course we are all in that stage of youth where little risk is perceived in launching into the most

uncertain or unplanned projects with little more than a total faith in one's ability to improvise. From the wisdom of middle age, this could only be seen as a recipe for disaster; from the perspective of youth, it is the essence of opportunity.

But, at least for myself, the hidden catalysts which propel me in this uncertain direction are not altogether undiscovered. There is a war going on, I'm supposed to be fighting it. I'm supposed to be a member of a society which has been shaped so skillfully with regard to democratic principles and respect for freedom that it is not only unnecessary, but indicative of some mental or spiritual pathology to question the fundamentals of this system which now finds itself living up to the worst travesties it had imagined of its arch-enemy just a few years before. My fifth grade teacher had impressed me with the fact that the reason I didn't know what propaganda was, was that we simply didn't have that sort of thing here in America. But the Russians...

And then there are these persistent ideas surfacing in my mind about Native Americans, for I had been doing my homework reading about the many ways in which it could clearly be seen that, despite all current mythology, it had been the Native Americans who had had the superior culture and wisdom at the point of contact between themselves and the European invaders. It was the white man who had played the role of barbarian on that sad stage of conquest and slaughter, and it was now the white man who continued in his supreme arrogance by just recently outlawing not only the use, but even further research with these so-called hallucinogenic drugs so important to the indigenous peoples of the conquered land. According to the official doctrine, the effect of these drugs is to mimic psychosis or model something akin to schizophrenia, with the ever-persistent risk of permanent psychological impairment and even suicide. Each one of us has had several experiences with a psychedelic drug and to us it is not the drug experience but the official doctrine that is psychotic and symptomatic of a severe collective psychological impairment in society itself. Never, we feel, was there a successful society so easy to be alienated from, so absurd in its pronouncements and ongoing policies of unending conquest.

The enormity of the Great Sin of European Civilization enters into our conversations only briefly, obliquely, for

these areearly days and we are more attuned to "what if" than to what was. I have brought along some rudimentary laboratory equipment and my assistant and I install ourselves in a little rented bungalow on the outskirts of Guadalajara. We plan expeditions into the countryside both near and far to look for the psychedelic plants which beckon like some species of holy grail oh so unholy to that society we so readily left behind. At the public market buying oranges we discover we have already succeeded in our first objective, for on the upper level there is an entire wing of the market devoted to stalls selling traditional medicines and shamanic items of the most diverse character. Peyote cacti are suspended in rows along the shop windows, and are hawked to gringos passing by. It is difficult to judge whether the twinkle in the eye of the shamanic apothecary at the prospect of daily increasing sales of such a common item is even greater than that in the eye of the prospective rebel from American Ignorance about to embark on the most ancient voyage of mankind.

We negotiate for a fifty kilo sack of peyote cactus to be delivered the next day and depart. To say that our spirits and anticipation are high captures only the most sublunary aspects of the moment. Over glasses of orange juice, my assistant and I review our plans for isolation of a total alkaloidal extract of the sacramental plant, a preparation that should produce the exact effect of peyote taken the traditional way, without the nausea and discomfort produced by the high content of soap in the raw plant material. The active psychedelic fraction of the plant we know contains several closely related alkaloids, and we want to experiment with the hypothesis that this blend of alkaloids produces a psychedelic experience superior to that of synthesized mescaline, the principal alkaloid of the mixture. We have both taken the synthesized alkaloid in New York on one or more occasions, and although the resulting experiences were complex, mysterious, highly instructive, and certainly intense yet gentle, we feel that there was a certain lack, difficult to put your finger on, of the sense of spirituality described by those anthropologists and other researchers who had undergone the experience with the natural product during the Native American ceremonies. The ritual and setting of such ceremonies play a major role we know, but our intent is to test the effect of the

psychedelic preparation itself in determining outcome.

The next few days are occupied with slicing, preparing, and drying the cactus tops, and we even replant the conical tuber-like remains so that they have a chance to regenerate the parts we have amputated. A two-liter Osterizer blender facilitates a primary extraction with aqueous alcohol, and a series of liquid-liquid extractions to separate the soaps, chlorophyll and other miscellaneous impurities results in our proud possession of a small flask containing an amber, semi-crystalline syrup, practically odorless but having the characteristic taste of synthesized mescaline sulfate. From here, chromatographic or other simple processes would be capable of separating the mixture into its component alkaloids, but we are interested in this natural blend and load several double-zero gelatine capsules with two hundred milligrams of the syrupy elixir. From this vantage point, the prohibitionist fanaticism of the land we left only a few weeks ago seems as remote as home probably seemed to those first barbaric explorers who pillaged this land and tried to eradicate forever the knowledge of the mysterious substance we have just bottled. How different our intentions from those of our ancestors! The sense of triumph over the collective stupidity of centuries, even on such a small, fragile, and local scale, perfuses the laboratory and even though it is very late, we have trouble postponing what we know will be a twelve hour visionary experience until the morrow.

Anyone who has tried to write an account of even a mild psychedelic experience will know the minimal power of words to describe that which is not only indescribable, but beyond language itself. Language seems to me as merely a sort of resonance to experience, coming somewhat after the fact, and capable of dealing with only the established habits and routines of thought and perception. The totally novel experience, if such a concept be allowed, can have no ready-made language patterns to activate. And perhaps the reverse is true as well: in meditation, we are told by its adepts, the quieting of the inner dialogue leads to a purified perception of reality, unsullied by the categorizing imperatives of language. Freed from such restrictions, every

experience is potentially unique. Even the most trivial of everyday situations has its originality, but it is the learned, devastatingly efficient habits of the mind which cause one to feel that it is necessary to cope with reality rather than celebrate it. Hence boredom at the apparent sameness of the events of daily routine displaces the inescapable but elusive magic of even a moment of life lived with true freedom.

Somehow the peyote extract we took the next day produced such a freedom from the known; pure experience seemed to flow from some mysterious source to which the resonance of language was not only lacking, but completely superfluous. Those of us who sat together during that voyage sensed this astonishing reality not with fear, nor despair at the inability of normal conscious processes to analyze or explain this strange way of perceiving, but rather it seemed that this state of mind, this method of perceiving reality, was aboriginal, the way things happened long ago when humankind was only beginning his long journey into civilization. And what was more, we clearly realized that this aboriginal mode of perception was not at all primitive, nor limited in its ability to deal with modern life; on the contrary, it utilized and required the entire capacity of one's being, it was in fact larger and more comprehensive than normal everyday, routine consciousness. It seemed that this was the way the mind would work all the time if it were not being impeded by the narrow forms mankind had imposed upon himself through the establishment and maintenance of certain styles of civilized societies. From that point of view, it was obvious that Western Man had, step by step, backed himself into a spiritual corner from which, although he had achieved impressive control of the mundane, physical aspects of reality, he had lost something not primitive, but essential. Thus it seemed that the Native Americans, who had used these miraculous plants as existential medicines since the beginning, had kept possession of that something which the white man had long ago lost, and the Native American societies that resulted were by comparison ecological in the true sense of the word, having a balance and corresponding lack of destructive contradiction both within their societies and also in relation to the environment.

During the next few days, I began to realize that with the new restrictions on research with psychedelic agents,

and the continued marginalization of the remnants of Native American societies, Western Civilization was attempting to drive the final nail in the coffin of a vast body of psychedelic knowledge, the culmination of a 500-year-old process designed to eliminate an embarrassment to the conviction that wisdom and progress were the rationale behind the spread and hegemony of European Civilization to every corner of the earth. And not only the rationale: Western Civilization now appeared to claim to be the sole possessor of the very concepts of wisdom and progress. Anything that could be done to dampen this enthusiasm to ignore, vilify, and destroy everything that was not Modern, not Capitalism, not Democracy, not Advanced, not Scientific, not Civilized, not US, I saw as not only a worthwhile project, but as an undertaking one would be required to do on the basis of simple moral principles. I had no alternative but to apply any modest talents or abilities that I might possess to discovering the mechanisms by which these psychedelic chemicals produce their effects not only on the brain, but on the mind and spirit; to finding the link between the widespread use of such substances among the most ancient tribes of men, and what that might indicate about the evolution of the human species; to understanding what the current fanatical attempts to prohibit the use of these substances and even stifle further research by qualified scientists indicated about the underlying psychology of the Modern American Attitude; to discovering whether knowledge about these and other aspects of psychedelic use might provide a key so badly needed by the whole range of the sciences of man to overcome widely recognized limitations of these sciences not only to explain but above all to improve the deplorable condition of human social interaction in this century of holocaust. Were these the medicines of a long-lost age, of no further use to humankind in his now modern world, or could we discover that they might still be useful, perhaps essential for a future which did not include the suicide of the species?

The moral imperative that I perceived then, combined with the normal predilection by youth for daring deeds, left me with little doubt as to my future course of action. The probability that I would find it necessary to become an outlaw was of no great consequence to me, it was an exciting concept that it might be possible to be an outlaw from

American Civilization and be morally justified in doing so. In fact, I was already an outlaw, a draft-evader, and I had just been dabbling with forbidden fruits in a most serious way, as a scientist practicing his art in defiance of the law of the land. How rare the opportunity to be able to practice a forbidden science in this day and age! The concept itself put paid to many arrogant assumptions about the rationality of the American Way of Life and its justification for eliminating any and all competition to its oxymoronic Philosophy.

I cannot pretend that the work in which I engaged over the next several years was serious research on a par with what our modern academic institutions would accept. But in light of the severe handicaps that have always been the limiting factor for progress in the understanding of controversial or forbidden subjects, I think I may have nevertheless achieved something of value toward a broadly based theory of psychedelic experience. Of course there were others, many others, in fact, who were working on threads of the puzzle presented by modern man's rediscovery of the ancient psychedelic medicines. Some researchers who had, previous to the newly instituted restrictions, been working on the most diverse and interesting aspects of the effects and uses of psychedelics both therapeutic and esthetic, continued their work in diminished, or at least different ways. Although they were forbidden to give a psychedelic drug to any patient or (more importantly) research volunteer whatsoever, substitute methods for activating a psychedelic state were used, sometimes with reasonable success. Some other workers continued with theoretical work based on previously accumulated data, and a very few obtained permission to continue with biochemical experiments with psychedelic drugs given to various laboratory animals. Sadly, permission for such work seemed much easier to obtain when the proposed research might show that the psychedelics were harmful, broke chromosomes, or lived up in some way to the irrational fears of the prohibitionist elements in American institutions. But even if some of these experiments were little more than overdose parties for rats, they produced, valuable data on, for example, the sites of action

of psychedelics in the brain.

Even more tragically, however, some very gifted workers left psychedelic research entirely, unable to continue meaningful work. Prohibition of the use of some substance, like alcohol, tobacco, tea, cannabis, opium, or anything else you can name, is historically so easily shown to be self-defeating, that it bewilders the rational mind to attempt to understand the philosophical outlook of those otherwise intelligent humans who propose that man can be protected from folly by the simple expedient of the passage of law. One would have to hypothesize ulterior, perhaps unconscious motives on behalf of those who propose and maintain prohibitions, or conclude that they are not rational human beings at all. It is several orders of magnitude more difficult to understand the philosophy of prohibition of an avenue of scientific research. This is not to say that there should be no control whatsoever of scientific research activities by publicly-elected government. If over-enthusiastic pursuit of profit by biotechnology companies seems to be leading to dangerous situations such as widespread release of bio-engineered organisms into the environment, safeguards must be installed: the biotechnology enterprise is not simply eradicated by fiat. Government authorities and legislative bodies have not seemed unduly worried about proven deleterious world-wide effects of research on nuclear energy or weapons. The prohibitions on psychedelic research may well indicate ulterior motives and hidden agendas by those at the center of power. More importantly, if more difficult to analyze, the prohibition must indicate some inherent collective psychological conflict at the very core of the belief system of Modern Western Civilization. It is as if, collectively, we have no greater fear than that engendered by the rediscovery of a most ancient, important, and healing practice and phenomenon, the psychedelic experience. This is most curious, and I shall return to the topic in chapter 8.

In the wake of repression then, there arose another group of psychedelic researchers, which like other groups down through the history of acts of repression by the powerful, was effectively driven underground to an at least temporary obscurity. In the middle ages we had the alchemists, purportedly looking for ways to make gold from something less valuable, a project which certainly would

meet the approval of the acquisitive ecclesiastical authorities of the time. The true alchemical quest, if we can believe some modern interpretations, would not at all have met the approval of an authority proclaiming its monopoly on spiritual matters. No one today would deny the historical existence of the underground aspect of alchemy in the middle ages, a science which of course bordered on witchcraft, wizardry, and sometimes sheer lunacy caused perhaps in some cases by exposure to toxic heavy metals such as lead and mercury, favorite substances for the alchemists. Nor will the modern historian of science deny the influence and importance of much of the work of the alchemists for the succeeding generations of researchers who made the beginnings of a modern science out of a diverse collection of arcane experimental data. But the existence of underground science today, practiced by a fraternity of no less colorful and sometimes equally as crazed individuals as the alchemists, must be dismissed as a fairy tale by those authorities who have been instrumental in bringing about the very situation from which underground science must necessarily grow.

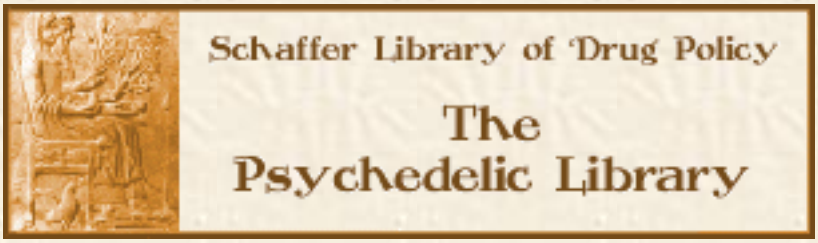
Underground science has many limitations and difficulties which the establishment scientist never need suffer. There are no universities and publicly financed institutions allowing research to flourish and researchers to enjoy a reasonable standard of living including the respect of society and sometimes even fame and fortune. Under severe repression, underground scientists have little chance even for peer review of their work, not to mention journals for publication of their papers, or conferences, research grants, awards, and always the threat of moderate to severe penalties meted out by the Inquisitors, which today includes not burning at the stake, but languishing incommunicado for periods of time that might make some wish for a return to the fiery methods of medievalism. With increasing calls for the application of the death penalty (in the United States) in cases of "major trafficking", we may yet achieve or surpass the medieval traditions.

To be fair, there do exist a few journals, and some excellent books that have been published during the thirty years of Inquisition, and even a few conferences have brought together luminaries in the field of psychedelic research. Since the late 1980's, a very few limited research

projects with humans have been approved using some types of psychedelic drugs in treatment programs for addiction or other psychological problems, or in metabolic studies. But the scope and extent of such research has not even begun to approach that seen already in the 1950's, and certainly the continuation of important and productive research of the 1960's, for example on creativity, or philosophical and religious aspects of the psychedelic experiencxe, has not even been suggested to government authorities for approval. And so the fact remains that for the most important and interesting uses of psychedelics, no one may give a psychedelic drug to a volunteer human being and then publish the results without drug police knocking on, and today often smashing down, the door. Even the time honored tradition of self-experimentation is cause for arrest, and if one is in the wrong place at the wrong time with a few bucks not instantly traceable to justifiable and tax-paid income, civil forfeiture of all moneys and properties by the defendant (still under the presumption of innocence) ensues.

If this seems an exaggerated or surrealistic view of today's world, then the reader is certainly in the establishment camp. For as an underground scientist who has had the pleasure of knowing a few other individuals similarly motivated, I can attest that the fears are real and certainly not the result of paranoia. I have known several who have languished, forfeited, or both. I myself am no stranger to enforced languishing. And it is with a certain caution that I now attempt to reveal my findings while hoping to retain an intact front door.

Chapter 2 | **Table of Contents**



The Center of the Universe

William S. Moxley

2. Models and Theories

LATER ON THAT YEAR. We have slowly been building up a stock of seeds of the "Heavenly Blue" morning glory, Ipomoea violacea, which grows widely in this area of Mexico. A short drive out of the city in any direction leads to the discovery of some extensive stand of the plant, and we look for groups of boys playing and gather them 'round for a short lesson on economic realities. It seems that we offer hard pesos for anyone who will gather these funny little black seeds for us, and be here on this spot in exactly one week. Returning after a week we usually find only one or two of the boys has taken us seriously and actually collected even a coffee-can full. But when the scales come out of the back of the pickup, and hard cash changes hands for what would seem to all excepting gringos a worthless commodity, eyes widen with dreams of transistor radios. Mexico is a tragically poor nation, and our harvest of seeds has, upon last inventory, attained rather amazing levels with very little expense.

Our peyote experiments have been a resounding success. We have sent capsules of our extract to several aficionados of psychedelic preparations, and received very positive reports comparing the natural alkaloidal blend favorably with both synthesized mescaline and other psychedelics. Institutional researchers would of course immediately dismiss our results as anecdotal and subjective, and we

certainly have not troubled ourselves to do "double-blind" experiments as would be expected for "scientifically" legitimate results. The legitimacy of our results is, for better or for worse, not dependent on institutional acceptance, but upon the opinions of those whose wisdom we have come to respect. A peyote shaman, asked to perform a double-blind ceremony using our preparation, would be as correct to ridicule our idea as the institutional scientist for criticizing the lack of such protocol. We quite enjoy the eclecticism of the middle ground we have staked out for our research paradigm.

The modern institutional requirements for acceptance of research have been sometimes accused by even notable scientists as not only too strict and exclusive, but also as being ignorant of the methods of a great deal of exceptional and ground-breaking science before the present period. (See for example the reference in footnote 5, below, for a criticism of the requirement of "blind" and "double-blind" techniques.) Single-case studies, subjective reports, experiments which are not, in principle, repeatable, and other (according to modern dogma) "non-scientific" methods we are free to use and interpret with our own guidelines. When an unrepeatable, subjective experiment leads us to an heuristic or empirical model and thus provides a component for a theory which then accurately predicts and points the way for further research, criticism based upon the nature of the original experiment sends the distinct message that the critic has "his eyes in his pocket and his nose on the ground". And in the field of psychedelic research, more than any other we know, trying to achieve the "hardness" of results that academics insist is so important is often like "trying to catch the wind". (I will presently have more to say about our concepts of models and theories and how they relate to both "hard" science and to the "softer" disciplines such as our own. And in the next chapter I will deal with the multitude of purported "effects" of the psychedelic drugs and why experimentation has so often led to confusion when the presumption of classical cause and effect relationships is the guiding paradigm of experiments.)

The one significant disappointment of the peyote extract is that it is unstable. Within even one week, a 500 milligram dose is just perceptibly less potent, and within a

month the potency of the dose is significantly reduced. Since the stability of the dried cactus tops or "buds" has been reported to be exceptional, a noted authority on the subject calling the buds "practically indestructible", it is obvious that the "impurities" we have removed in our process are essential to preserving psychedelic activity of the raw alkaloidal mixture. This result, combined with the necessity of processing large volumes of material to produce enough extract for even twenty or thirty doses, make any practical use of the product prohibitive. It is expensive to produce and ephemeral. In addition, we feel that any attempts to produce a stable preparation by further processing would probably nullify the advantages of the broad-spectrum alkaloidal extract principle that we have tested. We have therefore turned our attention to preparing and experimenting with extracts of the morning glory.

At least two species of morning-glory seed have been used since antiquity as divinatory agents by the Amerindian shamans of Mexico. The Ipomoea violacea we have collected seems to grow just about everywhere, and is, in fact, the exact same plant that horticulturists have introduced in Europe and the U.S., the ornamental "Heavenly Blue" morning-glory vine. The second psychedelic species, Rivea corymbosa, we have found only further south, but in the scientific literature its reported habitat is the entire coastal area of the Gulf of Mexico. We obtained about a kilo of seeds from a local source, but did not seek out larger quantities since our supply of Ipomoea violacea was quite sufficient, and of the two species, was also the most potent. (1)

An interesting page in the history of the biochemical study of alkaloids was recorded the day in 1960 when Albert Hofmann presented his findings about the identity of the alkaloids of the morning-glory to a symposium in Melbourne, Australia. Until that day, it was believed that the only natural source of the lysergic acid alkaloids was the parasitic fungus of grasses, ergot. In the plant kingdom there are extremely diverse plants, from primitive fungi to the highest species of flowering plants, that produce the biochemical substances known to chemists as alkaloids. These natural plant substances are widespread, and so diverse in their nature that no simple or unique reason for their evolution can be postulated. And their diversity and complexity is such that it is rare to find the same alkaloid

in two different plants even if they are close evolutionary neighbors. When Dr. Hofmann announced that the alkaloids of the morning-glory vine (a plant far removed on the evolutionary tree from the primitive ergot fungus) were also derivatives of lysergic acid, many in the audience of scientists were plainly incredulous. Despite the impeccable reputation of Dr. Hofmann and the Sandoz Laboratories of which he was a director, more than one group of scientists attempted to disprove the findings. One group thought that the seeds used must have been contaminated with some species of ergot-like fungus and published a paper to the effect. Painstaking further work in which seeds were carefully dissected and shown not to be infected with any type of fungal spore or growth finally proved the location of the alkaloids to be concentrated in the embryonic material of the seeds.

We had obtained reprints of all the relevant scientific papers in New York and were now ready to prepare a large sample of the morning-glory alkaloids for further experimentation. As with our peyote extraction, we wished to obtain a total alkaloidal extract of the seeds even though it had been postulated by some that only one alkaloid of the group was the active psychedelic component. Hofmann had shown that probably four or five lysergic acid derivatives were active: lysergic acid amide, isolysergic acid amide, lysergol, elymoclavine and perhaps ergometrine. We thought it of great significance that the first two of these compounds, and the last as well, have a structure practically identical to LSD. The fact that the use of LSD-like psychedelic agents had been as significant as of the peyote cactus or the psilocybin mushrooms, at least in this area of the world, made claims that LSD was a modern, synthesized, and therefore "unnatural" psychedelic drug seem rather ill-conceived. (2)

Hofmann and his co-workers had made several tests of the psychedelic activity of their own extracts, both as broad spectrum mixtures and also of the separated alkaloids, but their self-administered dosages had not reliably produced much more than minor effects. Our first goal would therefore be to obtain an extract which, when taken in a dose roughly equivalent to that used in native ceremonies, produced some effects of significance. We based our extraction procedures both on published analytical work, on generally accepted

routines for chemical extraction of alkaloids, and gave some consideration as well to the methods used by the shamans in preparing seeds for their ceremonies. In tribal use, the seeds are first ground to a fine flour, then soaked in cold water. After a short time, the liquid is filtered off and drunk. This would indicate firstly that the active components were readily soluble in water, and secondly that other components of the seed, not so readily soluble, might possibly interfere with the psychedelic effects or produce diverse effects of their own. Such a hypothesis might explain the inconsistent results of some workers who had experimented with Ipomoea or Rivea seeds and found them lacking in activity.

A second goal for our work would be to try to obtain pure lysergic acid from the seed extracts by chemical hydrolysis. A rather large industry had evolved since the turn of the century which produced the alkaloid ergotamine from a laborious process of growing the ergot fungus on rye grass. Ergotamine had been a widely used lysergic acid alkaloid for decades, but recently other derivatives of lysergic acid had been found to be more useful, and to produce them, the ergotamine yield from ergot was first hydrolyzed to lysergic acid, then appropriately reacted with various amines or other compounds. It was work of this type that had led Hofmann to synthesize LSD by reacting pure lysergic acid, via an intermediate, with diethylamine. We intended to evaluate the possibility that morning glory seeds might someday provide an alternate, or even better source for lysergic acid than the ergot/rye process. (3) We would at the same time be determining if it were possible for an underground chemist, using morning glory seeds instead of ergotamine (which was tightly controlled and difficult to obtain), might produce small amounts of LSD with very little risk. I say small amounts, because the alkaloid content of morning glory seeds had been assessed at barely 0.06%, and assuming normal losses and other factors it would therefore be necessary to process perhaps a hundred kilos of seeds or more to produce even a gram of LSD. Still, due to the vanishingly small effective dose of LSD, such a process was far more a practical possibility than that necessitated by the required minimum dose of peyote extract, more than two thousand fold that of LSD.

With a view to obviating any objections that publishers, general readers, or various drug control authorities might have concerning the description of processes used to produce forbidden substances, I will not further discuss here our experiments along these lines. Any competent underground chemist will certainly, in any case, already know quite enough to formulate his plans for the future. And it should already be evident to the reader what my evaluation of the prohibition of psychedelics signaled about my own intentions. To me, it was one of the greatest absurdities ever perpetrated that persons of reasonable attitude and situation, and with proper guidance, might not have access to substances which had proved not only valuable, but essential to so many societies of man down through the ages. If societies that we ignorantly called primitive could use these medicines to advantage, where was the logic in the belief that suddenly these same substances presented some kind of grave threat to man in the Twentieth Century? One of the top prohibitionist agitators of the time had made the preposterous statement that LSD was "the greatest threat facing the country today...more dangerous than the Vietnam War."(4) If certain excesses and unwise use of the psychedelics were appearing in American society it was not very difficult to see that if one single thing could be designated a cause of the problem, it was the prohibition itself. And how could a society purportedly so grounded in the logic, rationality, and intellectuality illustrated by its great scientific achievements come to be so hoodwinked, so deprived of its rationality, so easily led into absurdity, when it came to the subject of "drugs"?

One clue came from the observation that it seemed necessary to have had some personal experience with the substances. This very same problem had been observed in the early days of psychedelic research, before Prohibition. Almost without exception, the researchers who had themselves taken psychedelic drugs produced much more intelligible and significant work than those who had abstained, for one reason or another. But soon the abstainers were publishing accusations that personal exposure to the substances had caused researchers to be biased, even that they had suffered permanent deformations of personality, were delusional and

no longer competent to judge the results of their own experiments. Two researchers, Cole and Katz, went so far as to flatly state in a paper that "only claims made by therapists who have not themselves taken LSD are valid"(5). As Osmond wryly observed, the same critics who were accusing enthusiastic researchers of having suffered permanent personality changes due to their use of psychedelics, were at the same time denying that such personality changes could be brought about in experimental subjects or patients!

It seemed to us that if such irrational battles were raging in the halls of academia, the only hope for the common man to see behind the curtain obscuring the wisdom of the ages was to be persuaded by a friend to find out for himself. The knowledge of psychedelics was then something that would have to pass from hand to hand among friends of mutual trust and respect; that same knowledge would be met publicly only with outright rejection, or worse: a situation of superb medievalism right here in modern America. Despite the apparent confidence of Modern Civilization that it was the very epitome of rationality, the issue of the prohibition of psychedelics had to be diagnosed as indicative of grave underlying contradictions in the paradigms and beliefs of that civilization. And the nature of these contradictions could only be understood by viewing them as a collective psychological phenomenon, a view which took on a certain forcefulness and poignancy from within the psychedelic experience itself. What a privilege to be party to such knowledge! And it was more than mere knowledge, it was Wisdom for it made you weep to see it thus, and to realize the odds against counteracting or curing the situation, even on the simplest of levels. To correct one's own metaphysical outlook in the midst of such confuision was already an unlikely achievement for most, even with psychedelic assistance.

I should now briefly discuss the meanings of certain terms I have been using. Models, theories, paradigms, hypotheses, even data, knowledge and wisdom can be thrown about rather loosely in today's writing, their meaning more dependent on the intended audience of a book than on precise definitions. If the definitions I will now give are not

acceptable to all, then at least I will be saying what I, personally, take these terms to mean, and what they should be considered to mean when I use them here.

At the beginning, in those early days in Mexico, I certainly had no idea of searching for a theory of psychedelic experience. In retrospect, after the passage of many years, I see that the work that I did and the experiences I gained, combined with further study that has occupied a large part of my time ever since, fit into a pattern the structure of which now seems to constitute a rather interesting and multi-faceted theory about the psychedelic experience, its place in anthropology and evolution, the mechanisms of its functioning, etc. Thus a theory is a broad and explanatory view of a panorama of topics united by a central fact or aspect of reality. A theory is a theory of something, although it may deal with the most diverse subjects in the explaining of that central something. But it falls short of being a paradigm in the Kuhnian sense, (6) because it is an expressed, conscious and explicit structure, continually in the state of further refinement and development. The paradigm is rather a theory or set of theories that has become transparent to the community or society that employs it in their world view. It is a set of implicit principles and views that are so taken for granted that individual components of the paradigm are often quite difficult to discover, so enmeshed are they in the view they represent. A paradigm is also static, or nearly so, it is not normally developing with the addition of new experimental evidence. This is why it is found that a paradigm becomes obsolete, and is replaced by a new paradigm. A theory in development, on the other hand, may evolve in such complex ways that it arrives at a point which may be radically changed from its original form. Thus I do not claim that my theory is in any way a paradigm, or a revolution in the underlying assumptions and world-view now reigning in Western Civilization. But the theory may, in combination with other theories, eventually contribute to such a revolution, as I hope it will.

The elements which make up a theory are models, and may take many forms. A model may be logical, deductive, mathematical, and completely abstract as in the description of a certain process or phenomenon by an equation or set of equations. Einstein's mathematical description of curved

space is a good example: no exercise of the imagination can produce a concrete vision of how empty space might be curved, curvature is always in our experience a curvature of something, and if empty space is anything, it is nothing, not something, according to the common sense way our minds work. The mathematical model of curvature of space makes up a part of the general relativistic theory of the structure of the universe.

Other models may be practically photographic in their imaginability. The planetary model of the atom with its discrete orbiting electrons around a hard little nucleus of another flavor of "stuff" is still a quite useful way of picturing matter at this level. Notice in this example, that the model may be useful, at the very minimum as a teaching aid, even when the "reality" the model describes has been shown to be something quite more complex and nebulous. In "reality", the quantum-mechanical model of atomic structure indicates that electrons are far more like probability clouds or waves than little hard individual particles. Thus a model such as the planetary one may be strictly analogical, metaphorical, perhaps even an outright "lie", and still retain some usefulness in representing aspects of a theory. The theory of chemical combination of atoms into compounds, as in the reaction of sodium and chlorine to form common salt, for instance, can still profit from the planetary model of the atom.

And when we get to the study of life sciences, where "hard" data is often difficult to come by, a model may even fall short of the imaginable metaphor; it may simply be the result of a process of curve-fitting and extrapolation of seemingly random points on a graph, the extrapolation and predictions of the model executed with little more than sheer intuition. Thus a model may range from the logical and deductive hardness of a precise mathematical equation, to something as fleeting and a-logical as a sudden inspiration or intuition about the object of study and how it might behave under various conditions.

Here we might note that a model, no matter how precise it may appear, is never a complete or "true" picture of reality, it is merely a temporary device used to form hypotheses about what kind of experiments to perform. Thus a model can be something as simple as an assumed viewpoint taken just to see what that viewpoint might lead to; it

functions as an heuristic aid toward the formation of testable ideas, ideas which have a high probability of being relevant, either positively or negatively, for the formation of a theory.

A model is thus a device helping to form hypotheses which are then tested experimentally. The results of experiments then can be used to form an improved model, or an alternative model, and this circular process may proceed at great length until a summation process has suggested the outline of a full-fledged theory. But the theory that results is more than just another model, or collection of models, for it is more than just a device: it is something complex, an intricate pattern of relations which in a very significant way is more than just the sum of its parts, because a good theory will have many implications and ramifications beyond those which are immediately evident, or those which took part in its formation. A good theory provides a framework around which further modeling and experimentation falls into place almost spontaneously, rather like the growth of a crystal around a small seed particle immersed in a supersaturated solution. It is perhaps like a nearly-completed jigsaw puzzle, which although was fitted together from pieces which at times only seemed to fit approximately, the overall intelligibility of the emerging scene lends great weight to its probable accuracy and applicability, and further pieces of the puzzle seem to fall into place almost effortlessly. A bad theory, by contrast, tends to accumulate ever-increasing anomaly and counter-argument against it, and it winds up being defended by its last remaining protagonists using the most spectacular of intellectual gymnastics, to no avail.

Thus a good theory may contain among the many models used to construct and support it models which, considered alone, are difficult to accept, or even completely unbelievable in light of previously accepted theory and paradigms. Many of the models or pieces of the theory I will now describe will certainly fall into this category for some readers, particularly those with established professional viewpoints to defend. In the next chapter, for example, I am going to attack the currently accepted model that psychedelic drugs cause a wide range of unpredictable and multi-faceted effects. Most people would not even call this a model, they would call it simple observation! The

alternative model I will propose is deceptively simple, if somewhat tricky to explain, and to support it I have had to create new models of psychological functioning replacing some current models which themselves are so generally transparent and accepted that their status as models would be questioned. Here is the process described above where anomaly leads to an alternate model of some phenomenon, which leads to experiments, further models, further experiments, and so on until an entire theory begins to take shape. If in those early days in Mexico I hadn't the least inkling that I was working on a theory, I was consciously searching for models which made my experiences and experiments begin to conform to a tentative pattern. And at that stage of creative work, it is of advantage to dream up even the wildest and most unlikely models along with the more obvious ones; only once a theory is consciously in the making is more rigorous selection warranted. (This process of the evolution of a theory parallels what we see in biological evolution: in the early stages, the wildest and most bizarre life forms are tried. Later on, after disastrous extinctions have wiped out entire phyla, the course of evolution is found to be much more conservative).

Once the outline of an emerging theory is in place, research may begin to scan widely in many areas. Research may at times consist largely of reading about and re-interpreting results of experiments performed by others, from the new viewpoint represented by the maturing theory. New ways of organizing and explaining data in areas as yet unexamined by the theory begin to show that the theory either has wide implications, or is not as comprehensive as previously thought. This process of testing the theory against many new areas of understanding is what finally yields the most interesting results. For example, just recently I began reading about the new research on brain function now made possible by the latest methods of brain-scanning techniques such as PET and MRI. Interpreting much of the data collected in terms of the psychological and cognitive models I had invented for the psychedelic theory was not only possible, but led to a further refinement of those models and a strengthening of the theory as well. It was especially interesting to note that some of the brain-scan results which had so far only been interpreted in very tentative ways, could be explained rather well using the

psychedelic models of brain function versus cognitive process proposed by my theory.

> Now that the background has been constructed, it is with pleasure and relief that I launch my theory of psychedelic experience into certainly turbulent waters. If it be based on delusion and self-deception the sinking will be so rapid as to be unnoticed, saving me intense embarrassment; if there is a glimmer of truth therein, the violence of the storm in which it must survive might sink it as quickly. I can only grease the ways well and hope I have not left any gaping holes in its structure!

References

(1). For further information on the two species of morning-glory and their use by Mexican Amerindian tribes including a few isolated groups still today, the reader is referred to the Botanical Museum Leaflets of Harvard University, November 22, 1963, Volume 20, No. 6. This issue contains an important article by R. Gordon Wasson, a luminary and one of the originators of the science of ethnobotany, and another article by Albert Hofmann, inventor of LSD, and discoverer of the active principles both of the morning-glory and the Psilocybe mushrooms of Mexico. (back)

(2). As further work by Wasson and Hofmann was later to show, there is a strong probability that an LSD-type psychedelic preparation was also, over a period of two millennia, an important and integral part of religious and intellectual life in an area of the world much closer to our Western Civilization, ancient Greece. See The Road to Eleusis, Unveiling the Secret of the Mysteries, by Wasson, Ruck, and Hofmann, Harcourt Brace Jovanovich, 1978. (back)

(3). We were unaware at that time that two pharmaceutical companies, Sandoz and Farmitalia, were perfecting a method to grow the mycelium of ergot fungus in stirred vats filled

with nutrients. This process was able to produce high yields of an alkaloid much easier to use for further synthesis than ergotamine, paspalic acid. With the introduction of this method, other processes depending on production and harvest of either ergot or morning glories would be of little comparative utility. (back)

(4). A statement by C.W. Sandman, Jr., chairman of the New Jersey Narcotic Drug Study Commission. (back)

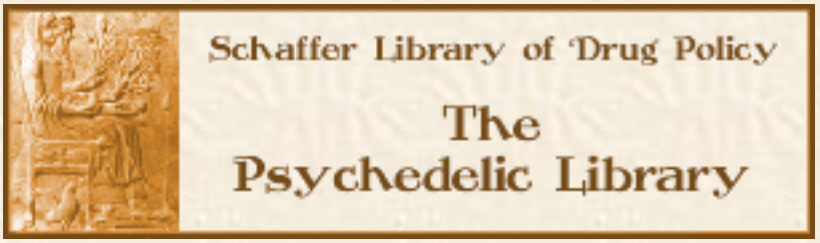
(5). see "Criticisms of LSD Therapy and Rebuttal" in The Hallucinogens, Hoffer and Osmond, Academic Press, 1967, pp197-205. Humphrey Osmond is one of those rare scientists who is equally at home in the research institute as in an Amerindian peyote ceremony, and his research is illustrative of the open-mindedness yet scientific rigor which go hand in hand to produce great scientific advance. Dr. Osmond was the one to introduce Aldous Huxley to psychedelics. (back)

(6). See Thomas S. Kuhn, The Structure of Scientific Revolutions, Second Edition, 1970, The University of Chicago Press, for the introduction of this term into the modern vocabulary concerned with the history and philosophy of science. (back)

Chapter 3 | Table of Contents

The Psychedelic Library Homepage

Books Menu Page



The Center of the Universe

William S. Moxley

3. Effects of Psychedelic Drugs

I had originally thought to write a chapter on the history of use of psychedelic drugs, but there have already been several excellent books and research papers published in this area, and I have nothing new to add. (1) At the risk of leaving out an important body of substantiating evidence for parts of my theory, including the history of what have been thought to be the various effects of the drugs, I will simply recommend that the reader acquaint himself with the subject from the already prolific selection of works, many of which are listed in the Bibliography. The risk is that a reader who holds some prejudice that psychedelic use has merely been the province of a few oddball tribes, or something that could be safely ignored when theorizing in anthropology or human biological and social evolution, will therefore hold the same prejudice when trying to evaluate my theory. Nothing could be further from the truth. Psychedelic use appears to be the rule, rather than the exception, in every corner of the earth where man has developed. And not just in times we may safely relegate to the stone age: I have already mentioned the strong likelihood that lysergic acid alkaloids were important in Greek Civilization over

a period of two thousand years. Once acquainted with the wealth of evidence concerning early use of psychedelic drugs, the reader or researcher who then picks up a new book on anthropology, religion, human evolution and the evolution of consciousness and finds no relevant entries in the index, will have immediate and compelling reasons to question the author's scholarship!

The discontinuance of use of psychedelics for most non-Western societies seemed to coincide with the arrival of European "civilizing" influence, yet stubborn traces of psychedelic use persisted widely until modern times, as witnessed by recent studies of Central and South American Amerindian tribes, and of course the widely known use of peyote by members of the Native American Church. The discontinuance of psychedelic use in Western Civilization itself coincided with the rise of the Roman Church as the primary political power in the world. From the early centuries of the Christian epoch, the use of such substances became the occupation of heretics, outcasts, witches, primitives or other similarly uncivilized, satanic elements. (2) The Church, of course, saw no contradiction in the wholesale slaughter of such groups for their own good. Continuing psychedelic use over the centuries in many parts of the world has thus been a carefully guarded secret, and modern estimates of its frequency and importance are probably grossly underestimated.

The extract of Ipomoea violacea that we had prepared radiated power, just sitting there in its flask. A light amber, odorless syrup which, in the darkened laboratory fluoresced brilliantly blue under ultraviolet light, it was an extreme contrast with the series of messy, difficult to purify, dark-colored and discouraging volumes of intermediate sludge we had treated, and brought to mind the Curies and their arduous separation of a few tiny crystals of glowing radium from a mountain of pitchblende. The difficulties had, however, taught us much about ways in

which we would modify our processes for future work. As for the extract, the following day would see the first test of its activity, with myself as the guinea-pig. I was by this time hardly a novice in self-administration of my own preparations or in the estimation of what effects they might have. I was, in fact, quite adept at taking most any supposed substance of enlightenment and avoiding nasty complications if the brew turned out to be bogus. On many occasions in New York, more than a little caution had been required to avoid not only the classic "rip-off" but also the inevitable dangers that Prohibition naturally produced. Once, a purported sample of magic mushroom I was offered proved to be only a few wasted store-bought champignons laced with powdered datura seeds. Although hallucinogenic, the experience of datura was not the least insightful, nor did it leave me with an experience which hinted at dimensions normally closed to everyday perception. I spent a few unpleasant hours also with Owsley's famous STP, which in the original dose was far too potent for human consumption. Fortunately I took only a quarter-dose, there having been evidence of difficult times for others with this synthetic drug.

The morning-glory extract provided not a nasty surprise, but a powerful surprise none the less. It was by far the most powerful experience I had yet encountered. Perhaps the methods of our extraction had yielded a product more representative of the shaman's recipe than the preparations obtained by other investigators, who reported only modest psychedelic effects. The experience of that day was hardly modest, from the beginning moments it certainly did not fail to inspire reverence and humility, no matter what the direction to which I managed to guide it. The colors and geometric patterns, the rippling waves so often seen in watching clouds in the sky, the slowing of time and other typical effects so frequently described in the literature had some time ago become only minor and unattended aspects of psychedelic experience for me. Certainly, I still noticed these effects, if I took the trouble to pay attention to them. But the psychedelic experience had become for me far more an arena for the Herculean task of attempting to achieve the truly original perspective for viewing the fundamental questions that man has posed since the beginning of time. It was the task of freeing oneself completely from

preconceptions, from habits of thinking that affected the outcome of seeking in unknown and unconscious ways. And of course, it was paradoxical, if not impossible to erase these filters of comprehension completely. To a very significant extent, comprehension consisted of these filters. Nevertheless, the psychedelic experience seemed to go quite a good distance in providing this ability, if one were ready to use it. Particularly the experience of that day.

An additional very serious question that I have examined practically every time I undergo an experience is that of my position in giving a psychedelic drug that I have prepared to another person. The peyote extract, and now the morning-glory alkaloids would be given to friends, and their friends perhaps, and it seemed necessary to explore where the experience of these substances might lead for others than myself. As I indicated above, I would recommend datura for no-one, and Owsley's invention I would strongly recommend against. In the case of providing a psychedelic that I myself have prepared, it is a great responsibility, not so much for any immediate risk that an experience might entail, but rather in the sense that one thus becomes a shaman who initiates another human being into awareness of that mysterious something that forever remains just out of reach. The responsibility is to ensure that the one initiated shall see the significance of this event, of this process of initiation. If not, the ability of a person to achieve such insight may be stifled, if not completely eliminated from that point on, and it is his shaman who is to blame. It is like saving someone's life, in the way some oriental philosophies understand it, if the initiation is successful. Many people, of course, are capable of initiating themselves, I certainly had, and so had many others I had known. But to manufacture psychedelic substances and distribute them widely and at random, as had been done recently in the United States, left something important out of the equation describing the power of these substances to affect important changes in those who experienced them, and in society at large. On the other hand, I could not ignore the argument that the Prohibition had denied man one of his most fundamental rights, and according to the wisdom expressed by the American Constitutional scholar Alexander Bickel,

> We cannot, by total reliance on law, escape the duty to judge right and wrong... There are good laws and there are occasionally bad laws, and it conforms to the highest traditions of a free society to offer resistance to bad laws, and to disobey them.

The details of the morning-glory experience that day had much more to do with my personal idiosyncrasies of the time than with issues relevant to the present narrative. At a high point of the experience, a minor earthquake occurred which, for the life of me, seemed to be provoked by my patterns of thought, seeking answers to questions that had a certain air of being forbidden, questions that no mortal could support the weight of significance the answers would unload upon him. The whole scene would of course be dismissed as an hallucination by my analyst, if I had one. But the earth tremor was real, and it did coincide with the climax of certain thoughts I was entertaining. Although the details of such experiences may sometimes represent battles of the self against its own quirks and limitations, and on a personal level I have quite satisfactorily concluded what the experiences of that day had to teach, one still gains a cumulative and more generally applicable knowledge from profound psychedelic experience. And I believe it was the experience of that day which first started me thinking about the "effects" that these substances produced, trying to understand how they could be so different from person to person and from experience to experience. (And the experience of that day seemed to indicate that psychedelics might possibly cause earthquakes!)

Some researchers had proposed that the effects of psychedelics were more the result of set and setting than of the drug per se. This seemed to be a useful model as far as it went, but really it didn't go very far in my opinion. The setting of a psychedelic experience was simply the surroundings, the comfortable living room or beautiful garden to be contrasted with the sterile and sometimes threatening atmosphere of the hospital wards where some early research had been carried out. The set was defined as the attitudes, motivations, preconceptions, and intentions of the individual, in combination with the introductory

ideas and instructions that were provided by the researchers or guides, if any. Here is a short illustrative example:

> Language, however, may...be used to develop a negative set and setting. Jean Houston (1967) has described one of her initial observations of LSD administration. The subject was told by the psychiatrist that he would have "a terrible, terrible experience" filled with "strong anxiety and delusions." The drug was administered in an antiseptic hospital room with several observers in white coats watching him. As the effects came on, the psychiatrist asked such questions as, "Is your anxiety increasing?" At the end of the experiment, the subject was in a state of panic. The psychiatrist announced to the group that LSD is indeed a "psychotomimetic" substance, which induces psychotic behavior. (3)

Now here is a shaman who has failed most miserably in his responsibilities. What was so appalling about some of this early "scientific" research with psychedelics, was that it was structured not with just an ignorance, but a willful ignorance of methods used by the aboriginal practitioners of the same curing arts as the modern psychiatrists professed to practice. Peyote shamans in the western states of the US were very likely that same day conducting psychedelic sessions in a somewhat different manner:

> The ritual developed by the Native American Church illustrates the use of language to produce a positive set and setting for the ingestion of peyote. A ceremonial leader, the head chief, initiates the singing of songs and co-ordinates requests by individuals for special prayers. The ritual is so arranged and so coordinated to the needs of the communicants that the maximum possible likelihood of a positive spiritual experience is enhanced. (4)

If the prospect of singing for his patients would seem

absurd to the modern psychiatrist, he is also willfully ignorant of the great many psychedelic studies in which recorded music and other aesthetic input was successfully used to create positive set and setting. The work of Hoffer and Osmond, or of Masters and Houston are good examples:

> The LSD treatment is conducted in a comfortable, aesthetically pleasing, spacious room, in no way suggestive of a clinical setting...the therapist wears ordinary street clothes or something more casual, depending on the needs of the patient. No medical or scientific "uniform" should be worn. The session should be presented less as therapy than as educational and developmental experience. The therapist steps out of his role as "doctor" and becomes more the patient's mentor and guide, who will lead him through the unique world of psychedelic experience and enable him to profit from it...
>
> The patient should be exposed to a rich variety of sensory stimuli... Objects, when touched may seem vibrantly alive, and when looked at, may seem to breathe or undergo successive transformations. An orange that is handed the patient may appear to be a golden planet; from a piece of cork may emerge a series of striking "works of art." Joyous music usually is played to help direct him emotionally. Typically, the patient will announce that he is hearing music as if for the first time. All the senses are given an opportunity to respond "psychedelically." (5)

"Psychedelic drugs, such as LSD and mescaline, give rise to awesome and extraordinary mental changes in which perceptions are so altered from normal human experience, they cannot readily be described." Many similar statements have been made, this one is by Solomon H. Snyder in his book Drugs and the Brain. (6) If the concept of set and setting as the determining parameter of the content of psychedelic experience has only limited value for understanding

statements such as Snyder's, we need a new model which not only is capable of showing what cognitive and neurological mechanisms could facilitate such experiences, how the drug might catalyze or initiate a chain of events the content of which would depend entirely on the individual, but also showing why statements about the psychedelic experience have so far been themselves awesome and extraordinary yet decidedly lacking in explanatory power.

I am going to propose a view that attributing fantastic and indescribable effects to psychedelic drugs is naive and misleading. From all we know about the complexity, ineffability, and continually surprising nature of the human mind, attribution of such causal power to a molecule seems a mere projection, and a symptom of the unwillingness to contemplate these characteristics of the mind directly. Neither can we justify attributing such power to mere molecules in view of what is known about the neurological effects of psychoactive drugs in general. The primary neurological effects of psychedelics, like other drugs which affect the central nervous system, must be relatively simple, localized, and perhaps only minimally connected in time with the supposed fantastic attributes which follow. All the facts point toward a simple, quite easily explained mechanism for the neurological action of LSD or other psychedelics. How the mind reacts to this simple change in nervous system operation is another matter, for here it is the complexity of mind itself in question.

The argument is that what LSD or other psychedelic drugs do is simple, what the mind does complex, and if the event of ingesting a psychedelic substance is followed by some amazing mental events, it must be the case that the mind is capable of such events all on its own, or under a variety of diverse influences. The drug is in no sense analogous to a computer program, causing the brain and mind to submit to its instructions; if it were, the effects of the drug would be far more reproducible and typical.

Before describing what simple mechanism could allow a psychedelic drug to catalyze the events of psychedelic experience, let us take a closer look at what have been touted as the "effects" of psychedelic drugs. My task will be to show how each of these effects is not strictly an effect of the drug itself, but one of the many things the mind may do under various circumstances, one being a certain

small yet fundamental change in neurological routines provoked by a drug. The choice of the word 'catalyze' is appropriate, I think, for in chemistry the action of a catalyst is to lower an energy barrier which prevents a reaction from happening, not to actually take part in the reaction itself.

As a starting point in my theory therefore, let us think of the effect of a psychedelic drug as eliminative of some obstacle, rather than additive: the drug functions as a facilitator of inherently possible processes, a substance which by its neurological action allows or assists certain natural processes to occur which might otherwise be rare or improbable. In the following quotation, let us see if we can understand each "effect" not as something that a psychedelic drug does, but as something which we might do, if only rarely, under certain circumstances. The list below, although originally compiled as a phenomenology of ASC's (7) in general (including hypnosis, religious trance, delirious states, various intoxications other than psychedelic, etc.), has been widely agreed to represent the major characteristics observed of the psychedelic state, although some improvement in their description could be imagined. Where applicable, I have edited the descriptions to accord with psychedelic experience alone:

> A. Alterations in thinking. Subjective disturbances in concentration, attention, memory, and judgment represent common findings. Archaic modes of thought (primary-process thought) predominate, and reality testing seems impaired to varying degrees. The distinction between cause and effect becomes blurred, and ambivalence may be pronounced whereby incongruities or opposites may coexist without any (psycho)logical conflict...
>
> B. Disturbed time sense. Sense of time and chronology become greatly altered. Subjective feelings of timelessness, time coming to a standstill, the acceleration or slowing of time, and so on, are common. Time may also seem of infinite or infinitesimal duration.
>
> C. Loss of control. As a person enters or is in an

ASC, he often experiences fears of losing his grip on reality and losing his self-control. During the induction phase, he may actively try to resist experiencing the ASC...while in other instances he may actually welcome relinquishing his volition and giving in to the experience.

D. Change in emotional expression. With the diminution of conscious control or inhibitions, there is often a marked change in emotional expression. Sudden and unexpected displays of more primitive and intense emotion than shown during normal, waking consciousness may appear. Emotional extremes, from ecstasy and orgiastic equivalents to profound fear and depression, commonly occur...

E. Body image change. A wide array of distortions in body image frequently occur in ASCs. There is also a common propensity for individuals to experience a profound sense of depersonalization, a schism between body and mind, feelings of derealization, or a dissolution of boundaries between self and others, the world, or universe. There are also some other common features which might be grouped under this heading. Not only may various parts of the body appear or feel shrunken, enlarged, distorted, heavy, weightless, disconnected, strange, or funny, but spontaneous experiences of dizziness, blurring of vision, weakness, numbness, tingling, and analgesia are likewise encountered.

F. Perceptual distortions. Common to most ASCs is the presence of perceptual aberrations, including hallucinations, pseudohallucinations, increased visual imagery, subjectively felt hyperacuteness of perception, and illusions of every variety. The content of these perceptual aberrations may be determined by cultural, group, individual, or neurophysiological factors and represent either wish-fulfillment fantasies, the expression of basic fears or conflicts, or simply phenomena of little dynamic import, such as hallucinations of light,

color, geometrical patterns, or shapes. In some ASCs, such as those produced by psychedelic drugs, marihuana, or mystical contemplation, synesthesias may appear whereby one form of sensory experience is translated into another form. For example, persons may report seeing or feeling sounds or being able to taste what they see.

G. Change in meaning or significance. After observing and reading descriptions of a wide variety of ASCs induced by different agents or maneuvers, I have become very impressed with the predilection of persons in these states to attach an increased meaning or significance to their subjective experiences, ideas, or perceptions. At times, it appears as though the person is undergoing an attenuated "eureka" experience during which feelings of profound insight, illumination, and truth frequently occur.

H. Sense of the ineffable. Most often, because of the uniqueness of the subjective experience associated with certain ASCs (e.g., transcendental, aesthetic, creative, psychotic, and mystical states), persons claim a certain ineptness or inability to communicate the nature or essence of the experience to someone who has not undergone a similar experience.

I. Feelings of rejuvenation. ...On emerging from certain profound alterations of consciousness (e.g., psychedelic experiences, ...hypnosis, religious conversion, transcendental and mystical states), ...many persons claim to experience a new sense of hope, rejuvenation, renaissance, or rebirth.

J. Hypersuggestibility. …The increased susceptibility and propensity of persons uncritically to accept and/or automatically to respond to specific statements...or nonspecific cues (i.e., cultural or group expectations for certain types of behavior or subjective feelings).

> Hypersuggestibility will also refer to the increased tendency of a person to misperceive or misinterpret various stimuli or situations based either on his inner fears or wishes. (8)

Or consider the following list of effects:

> LSD and peyote are potent psycho-chemicals that alter and expand the human consciousness. Even the briefest summation of the psychological effects of these drugs would have to include the following: Changes in visual, auditory, tactile, olfactory, gustatory, and kinesthetic perception; changes in experiencing time and space; changes in the rate and content of thought; body image changes; hallucinations; vivid images—eidetic images—seen with the eyes closed; greatly heightened awareness of color; abrupt and frequent mood and affect changes; heightened suggestibility; enhanced recall or memory; depersonalization and ego dissolution; dual, multiple, and fragmentized consciousness; seeming awareness of internal organs and processes of the body; upsurge of unconscious materials; enhanced awareness of linguistic nuances; increased sensitivity to nonverbal cues; sense of capacity to communicate much better by nonverbal means, sometimes including the telepathic; feelings of empathy; regression and "primitivization"; apparently heightened capacity for concentration; magnification of character traits and psychodynamic processes; an apparent nakedness of psychodynamic processes that makes evident the interaction of ideation, emotion, and perception with one another and with inferred unconscious processes; concern with philosophical, cosmological, and religious questions; and, in general, apprehension of a world that has slipped the chains of normal categorical ordering, leading to an intensified interest in self and world and also to a range of responses moving from extremes of anxiety to extremes of pleasure. These are not the only effects of the psychedelic drugs... (9)

The authors here do not leave any doubt about their attribution of causes, but to be fair, it must be stated that the more cautious researchers seemed aware, at least to some extent, of the difficulties in such attributions, although without taking the trouble to deny the implication. Hoffer and Osmond put it thus:

> The LSD experience is one about which there can be no argument about priorities between chemical and psychological factors. For there is no doubt whatever the chemical is given first and must cause the biochemical changes which later find expression in the psychological experience... A good deal is known about its [LSD's] phenomenal reactivity. What is not known is which one of its many biochemical reactions is the most relevant in producing the psychological changes. [italics added]. (10)

The authors could be accused of semantic prestidigitation here, but I think it was more a matter of the difficulty of understanding the psychedelic experience rather than a conscious effort to make a statement that would be right no matter what the actual pathway of cause and effect turned out to be. Many researchers of the time show a dawning awareness in their published works of the unsatisfactory implications of the application of classical cause and effect paradigms to many of the more unusual findings in psychedelic research. But if some researchers did not go so far as to state flatly that LSD causes mystical experience, or that LSD causes perceptual time distortions, or that LSD causes any number of other effects which writers are so fond of describing, at most they seemed just to add an additional link in the causal chain, as above. Observe, however, the statements of some (viz., ardent critics of psychedelic research) that LSD caused psychosis, or a schizophrenic-like state, or even suicide. Even court-cases, criminal and civil, were resolved on the basis that psychedelic drugs were a logical cause of various acts or behaviors, or even instances of "mental illness".

In the press and other popular writing, several accounts of hellish, or trivial experiences of an absurd nature were

published by those who considered themselves agnostics, skeptics or clear-thinkers, attempting to minimize or ridicule the sometimes mystical-sounding claims of those such as Aldous Huxley, Gerald Heard, or Alan Watts. These debunking attempts uniformly portrayed the results of the reporter's psychedelic ingestion as a kind of Hollywood movie, as if the drug were some roll of science-fiction film forcibly projected upon his otherwise quite understandable and controllable life. "The drug made me do this, made me see that, caused me to think I was a..." etc. If someone had a negative experience, especially if he were a noted reporter or medical practitioner, then his report left no doubt whatsoever about what the cause was, where the blame lay.

I hope that it is now becoming clear that although the ingestion of a psychedelic drug may be the first event of a series of events that culminates in undeniably profound perceptual and psychological changes, the simplistic designation of the first event as the logical cause of the entire chain of following events makes no more sense than my saying that psychedelic ingestion causes earthquakes. The mind-events of psychedelic experience, I am suggesting, are in an important sense just as "exterior" and coincidental to the ingestion of the drug as was the earthquake I experienced on the roof of my little bungalow in Guadalajara. It is my view that attribution of cause and effect along these lines must be abandoned completely, it is a misleading model of psychedelic experience and must be replaced. Even the idea that a psychedelic drug causes distortions of perception must be scrapped. The whole idea of causation as it is currently conceived relative to psychedelic experience is a metaphor, but unlike the model as metaphor which is a useful device to understand and predict, the metaphor in this case is an impediment to a clear understanding. This is a major reason why the results of psychedelic research have been so difficult to interpret, and also a reason why it was so easy to criticize, even ridicule both the research and the workers who produced it.

> When I took the drug myself, I found that I was suffering from the delusion that I had been psychoanalyzed. I had spent seven and a half years on the couch and over $20,000, and so I thought I

had been psychoanalyzed. But a few sessions with LSD convinced me otherwise.

—Mortimer A. Hartman, Psychiatric Institute of Beverly Hills, 1959

As a first step in my replacement of the trivial model of psychedelic experience, I am going to reverse the situation at hand and ask, not what causes the psychedelic experience, but rather what causes us to be in our "normal" state of mind most, if not all of the time? We might say that the brain in its normal neurochemical state is sufficient cause. The champions of reductionism of course maintain that the mind and its experiences cannot be anything but states of the brain's neurons; this is, of course, Francis Crick's "Astonishing Hypothesis". (11) I, among more notable critics of such strong reductive materialism, would call it (at best) a Premature Hypothesis, considering the present rudimentary state of scientific knowledge about the nervous system. If recent criticisms and counter-arguments against the reductionist position have been less astonishing, (12) they have been more accurate in illustrating present limitations in understanding causation at and especially across the various hierarchical levels of complexity between the physics and the biochemistry of neurons at one extreme, and consciousness and mind at the highest levels of organization. A few paragraphs illustrating the difficulties and paradoxes of the concept causation might be in order, although the topic is hotly debated and I will gain perhaps as many critics as converts from my personal observations:

If, (due to the ambiguity of causation when one attempts to apply the concept across levels of description or complexity), the neurochemical state of the brain is not strictly and exclusively a cause either of normal or extranormal states of mind, this is of course not to deny that there are correspondences between brain processes involving neurons, cognitive processes involving systems of brain parts, and conscious experience involving the total organism. Nor is it to deny the possibility of learning things about one level from studying another. It is the

attribution of causation of events between one level of this hierarchy and another which is fraught with difficulties. Processes at one level are simply not strictly reducible to processes at another, in spite of their mutual interdependence.

The distinction here is important, if seemingly paradoxical, and may possibly be understood better by the observation that two entirely different cognitive processes arriving at two entirely different "states of mind", must have the potential to occur from exactly the same original neurochemical state of the brain. Stated a little differently: exhaustive examination and description of a given brain state or series of brain states (if it were possible) cannot in principle predict the overall conscious experience of the owner of that brain. Conversely, two different dynamic brain states might well have the possibility of corresponding to the same conscious experience. If these considerations were not the case, free will would necessarily be an illusion and absolute determinism unavoidable; only the extreme fringe of philosophy seriously believes this to be the true state of mankind. (13) Absolute determinism is, of course, the position that everyone, all the time, is determined by antecedent, irresistible physical conditions, so that free will becomes as meaningless as the idea that my computer screen might suddenly decide to exhibit a "P" when I tap "Q" on the keyboard. Although computers in good repair normally mind their P's and Q's, consciousness does not.

I see the error of attribution of causation concerning psychedelics as representative of the same error on the larger scale of the whole question of mind-brain relationships. In most current models of consciousness, of which there recently have been many, there seems to me a fundamental ignorance of the logical repercussions of saying, for instance, that the mind, or consciousness, must be caused by the brain. John Searle, the author of one of the more cautious and measured treatises on consciousness (14) nevertheless writes,

> It is an amazing fact that everything in our conscious life, from feeling pains, tickles, and itches to–pick your favorite–feeling the angst of postindustrial man under late capitalism or

> experiencing the ecstasy of skiing in deep powder—is caused by brain processes. As far as we know the relevant processes take place at the micro levels of synapses, neurons, neuron columns, and cell assemblies. All of our conscious life is caused by these lower-level processes, but we have only the foggiest idea of how it all works. (15)

Searle suggests that objections to brain-to-mind causation result from a "flawed conception of causation", and he attempts to split the concept in two: event-causation (a causal relation "between discrete events ordered sequentially in time"), and non-event causation which he illustrates with the example of the collective properties of the molecules of a table "causing" its apparent solidity. But I would suggest that these two concepts of causation are so radically opposed in their meaning and properties, perhaps being logically mutually exclusive, that it would at a minimum be best to avoid using the same term for both processes. Event-causation rests comfortably within the same level of description, whereas Searle's non-event causation violates that comfort. If non-event causation is called instead "facilitation", suggesting that in such a process there are entities and aspects which arise mutually rather than depend causally upon each other, we may lose the security of believing that we know something of the underlying mechanisms of mind-brain relationships, but gain a more pragmatic basis for further understanding. Let us view a collection of wood molecules as "allowing" or "facilitating" the properties we recognize as "table", in the same sense that a valley allows or facilitates the flowing of a river through it: in neither case is causation meaningful if we wish this term to retain any concrete usefulness. Does the valley cause the river? (Actually, the river has caused the valley through the process of erosion!) Yet without the valley: no river! Without the molecules: no table! The table was "caused" by the menuisier who built it: to use the same term in the attempt to see how properties arise mutually with the object or process which manifest those properties only confuses. Causation would logically have to operate bi-directionally in such instances, and thus lose its meaning entirely. Again, it is clear that

attempting to apply the concept of causation across different levels of description becomes paradoxical at best.

Quite obviously the point of view that brain causes mind arises from that argument of poverty, "well what else could it be?" (In other words, "don't bring any mystical entities into this discussion or I will dismiss your view as unscientific"). But if brain causes mind or consciousness, and we are to understand causation in a reasonably logical and precise way, then mind and consciousness are superfluous and inoperative constructs. The two theorems of causation we must agree to are: a cause must precede its effect in time, however briefly, and, because the brain is composed of discrete, non-infinitesimal components, a cause brought about by brain processes may likewise not be infinitesimal, or differential, it must have duration and other measurable characteristics. From here it follows that if mind is caused by the brain, and only by the brain, it may have no properties in and of itself. It is reduced to the status of a gargoyle, or legs on a snake. If brain states cause mental states in exclusivity, then consciousness and mind can have no part in causation whatever, since whatever is proposed as an effect of mind must actually be the result of prior causation by the brain. And according to the great philosophers of both past and present, the whole point of mind/consciousness is that it most definitely does have the power of causation. In a non-trivial sense then, it appears at least as valid to say that mind causes brain as to say the reverse, a paradoxical result to be sure.

So we see that across the various hierarchical levels between the physics and chemistry of neurons of the brain and the human mind, it is very difficult if not impossible to attribute clear-cut principles of causation. Causation seems to enter the picture at each and every hierarchical level, and is not wholly reducible to prior causation at another level of organization. About all that can be said with confidence at this point is that brain and mind facilitate and reflect each other, like the valley and the river, but in no logical sense do they cause each other; that they are parallel processes, and for an analogue of this seemingly paradoxical statement I would compare the mind-brain duality to particle-wave duality in quantum mechanics. The wave attributes of electromagnetic radiation do not cause the particle attributes, nor vice versa. The

two contradictory and mutually exclusive properties always accompany each other, and whether the one is observed or the other depends entirely on one's point of view, i.e., the experiment one performs. Once again we see the importance of point of view, or levels of description. Attribution of causation between levels is inherently meaningless. This is so far a very rudimentary model, I admit, and gives little help for forming testable hypotheses. But we should not feel there is some cosmic guarantee that we can devise an understandable model in this case. There is, after all, some paradox in the using of mind to understand mind, and we should expect some limitations.

Thus the argument that the normal brain causes normal mind, or that psychedelics cause expanded mind or consciousness, are both fallacious explanations. Nevertheless, we can, and have found changes in neural signaling in the brain which are caused, in the classical sense, by the psychedelic drugs. If we can combine the facts of these changes with the vastly improved (yet still very rudimentary) knowledge we now have of the sequential, parallel, and cybernetic cognitive processes that occur in the various brain systems under a wide range of conditions, and test the resulting overall model of neural signaling against an improved cognitive or psychological model of the psychedelic state of mind, a new theory may be in the making. To restate some of the essentials of this theory: it will have to be a theory of processes, parallel processes that are complimentary ways of understanding an overall aspect of reality, of processes of cybernetic control and feedback, of processes in which classical cause and effect may be at best a blurred and uncertain property. If it is objected that inapplicability of cause and effect seems unreasonable, remember that physics had to confront the same kind of paradoxes earlier in this century, and succeeded admirably. There is good reason to believe that theories of the ultimate structure of mind and consciousness will be no less and probably more mired in apparent paradox than theories of the ultimate structure of matter and energy.

But I am getting ahead of myself. As for my theory, or any theory, being a good explanation of consciousness or

mind, no author should dare such a claim today. A woven web of guesses with a very imprecise weave would be a big claim. I shall deal with the implications of my theory for mind, or Mind, only near the end of this exposition, and only as sheer speculation. Let me first deal with the cognitive and psychological models of the psychedelic experience, for these were the aspects that I first explored, and it was through the construction and testing of these models that I was able to devise models of neurological functioning which could explain the cognitive processes that I had observed. Now the cognitive model I am going to describe will be for the moment a "naked model" having no structure to support it, and since the model will be a radical departure, in some ways, from the way we currently believe our cognitive processes to operate, it will be easy for the reader to dismiss it. Bear with me as the pieces of the puzzle fall into place around the chosen starting point.

Remember that above I asked that the first consideration should be: "let us think of the effect of a psychedelic drug as eliminative, rather than additive: the drug functions as a facilitator of inherent processes, a substance which by its neurological action allows or assists certain processes to occur which might otherwise be rare or improbable." I also mentioned above that the psychedelic experience seems to provide a certain freedom from habits of thinking, it almost ensures that one is more sensitive to one's own prejudicial ways of seeing, hearing, perceiving, acting, and most importantly, feeling, reasoning and deciding. So far I have used the term "thinking" (as in habits of thinking), rather imprecisely, including within its domain all sorts of mental processes. I will presently re-define thinking to denote two distinct categories of mental processes, the first pre-conscious and largely automatic, the second comprising the processes we normally think of (!) as thinking: reasoning and deciding, for example. The necessity to provide some careful definitions is evident simply from the number of ways I have used "think" in this introductory paragraph, as well as the obvious overlapping of meaning with other terms. Starting with the common usage and understanding of such terms therefore, I will try to provide more precise and functional meanings as I go along.

Considering the power of psychedelic experience to repress in some way, or at least make one more aware of

habits of thinking as they happen, I am unavoidably led to the idea that such habits are a far more important factor in the normal operation of the brain/mind then has been supposed. But for a long time, something (perhaps the Behaviorist legacy that I mentioned previously), seems to have stifled not only the study of consciousness but also the pursuit of any technical understanding of what a habit is, psychologically and neurologically. The word "habit" is used only non-technically in the literature, with few exceptions, since the time of William James. But it seems to me that a habit, and there is no denying that we "have" habits galore, must consist of something more definable, more describable technically, the concept must have a more heuristic value than merely leaving the term to fend for itself in popular use. (16) A habit, or as I will now call them, Habit Routines, must be something very much like a memory, (17) but different from a memory in that it is routinely and automatically retrieved and employed without any awareness of its presence or effect.

In looking for a possible site for the storage of habit routines, analogous to the idea of memory storage, it occurred to me that probably the "data" (18) of memory and the data of habit routine was the same data, but that it was accessed in different ways, perhaps by different systems in the brain. When a memory is accessed, either intentionally or by some random cue, what pops into awareness is a scene, a representation in the various sense domains of a specific and time-delimited event or series of events. We have a memory of some specific and bounded fragment of the past, although one memory may then cue another representing another period of time altogether. I call this access of memory, Logical Memory Access, or LMA. It is logical in that the specific characteristics of the memory, the various informational fragments from each sensory modality which are accessed, are related in time and place and represent a sequence of events as they appear to have happened. (19)

When a habit routine is called up for use, a process I call Habit Routine Search, or HRS, the elements of the routine do not seem to be bound by the same time and place considerations: they may represent fragments of data that were recorded at many different times and situations, but with one or more defining parameters relevant to dealing with the situation for which the habit routine has been

summoned. LMA and HRS are therefore two different means of accessing the data of long-term memory for two different cognitive results. LMA yields a tangible memory, HRS yields an unconscious evaluation pattern. (20)

I may now advance the hypothesis that the habit routine search is a constant and primary process of cognitive activity of the mind/brain, and furthermore that it is the main and essential, underlying and pre-conscious process in the activity we know as thinking. This part of thinking, (let us call it thinking1), I will define as the unconscious associational and evaluative process including habit routine search which precedes, by just that fraction of a second, the awareness of what is thought through the use of language or other representational modalities such as the imagination and manipulation of visual scenes, the use of gestures, the creation of music and art; these processes are called symbolization. (21) And since the mind/brain is cybernetic, current sensory or environmental input must always include or be mixed with input from trains of thought leading to the instant we are experiencing.

Thus the determining parameters for HRS consist of the environmental moment (the total sensory input), plus ongoing feedback generated by conscious reaction to the current habit routine that has already been generated. We can use the term "thinking2" to denote and include all those secondary processes we would normally call thinking, including symbolization, checking and logical analysis, reasoning, decision and feedback of instructions or modifying parameters to ongoing thinking1. Thinking2 has the properties that some would label as consciousness, but I would, at least for the moment, like to avoid using the word, if only to simplify my descriptive task.

The feedback of instructions and parameters to ongoing thinking1 probably uses what is now called working memory, a short-term limited-capacity memory buffer or store which is the subject of much contemporary research and debate. There are apparently several aspects or domains of working memory: one or more short term stores for spatial and visual information, another for auditory information, perhaps divided between speech-based and musical functions, and perhaps working memory stores for combinations of sensory and cognitive data as well. I will have more to say on working memory, its various aspects and functions, and

possible brain sites for its operation in the next couple of chapters. For the moment I will hypothesize an "information" storage site in the brain which holds instructions provided by one set of thinking functions (thinking2), for the execution of another set of thinking functions (thinking1) which provide the raw material for the process as a whole. Thus the habit routine search of thinking1 in the data of long-term memory is modified and guided by instructions from the decisions of thinking2 held in working memory. These decisions may be deliberate, or largely automatic yet available for introspection. Figure 1 represents a simple flow chart of the processes described.

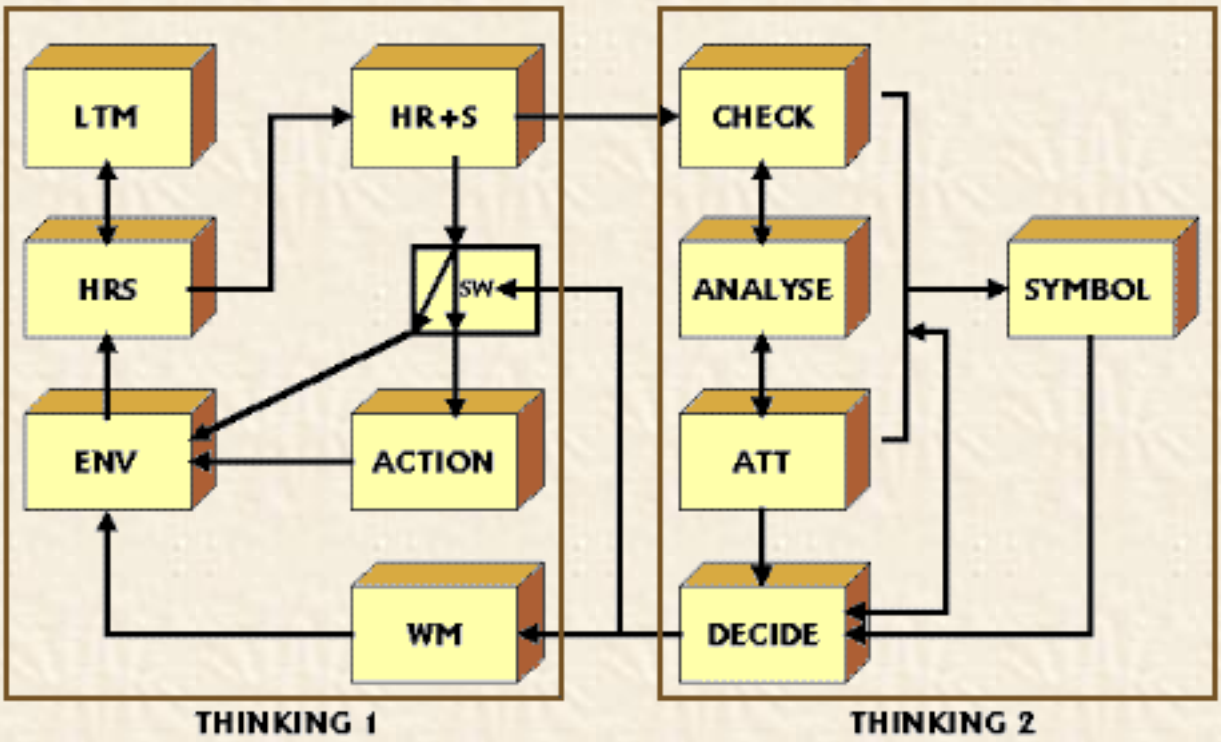


FIGURE 1. Flow Chart of Cognitive Processes. ENV=Environmental moment, all sensory input at the given moment. HRS=Habit Routine Search function, projects ENV into LTM and retrieves the Habit Routine. LTM=Long Term Memory. HR+S=Assembled habit routine plus selected Sensory information. ACTION=implementation of habit routine in physical action or approval of cognitive disposition; may be rejected in "SW", switch controlled by conscious

decision. The HABIT ROUTINE is both a template containing relevant sensory data from ENV, and at the same time a prefabricated plan for reaction to ENV and its WM (Working Memory) input. HR+S is delivered to Thinking2 for Checking, Analysis, Attention, to which Symbolization resonates. These conscious processes are then used for Decision to accept or reject the habit routine and optionally provide input parameters via WM affecting further HRS. Thinking1=unconscious processes not available directly to introspection. Thinking2=conscious processes, but may be automatic and unattended unless Attention is active. Decision based on either unattended processes, or processes scrutinized with Attention and/or Symbolization. Decision may accept, reject, supply parameters, and request further HRS. Decide has a double-headed arrow back to other thinking2 activities to indicate that there are cycles of thinking2 processes possible before deciding then alters ongoing thinking1 processes. Checking and Analysis are merely representative of all such functions which could be said to consciously deal with ongoing cognition, Reasoning, Calculation, etc., could also be included. Checking, Analysis, Attention, and Symbolization could be said to constitute components of Perception or Awareness. Note that the process of LMA is omitted for the present.

To restate the model then, thinking1 is the overall automatic and unconscious process of the comparison of current sensory input plus the result of previous symbolization, checking and decision, (thinking2), with information stored in long-term memory accessed through the process of habit routine search. We are not normally aware of the thinking1 processes at all. Decision, which may be active or passive, (and is mostly the latter), is consequently fed back into the thinking1/HRS process as an additional defining parameter for ongoing HRS. It may also act as a switch nullifying the implicit actions recommended

by the ongoing habit routine. This is probably a very arbitrary and primitive attempt to formulate a schematic flow model of some of the overall ongoing everyday processes of the human mind. And it certainly, along with all other possible models, must be a great over-simplification. But let us just take it as a first faltering step in the direction we think (thinking2!) we want to go in our understanding of psychedelic experience.

Let me illustrate the above proposed processes with a short cognitive story, the kind of scene that happens to us all quite frequently, but which passes with little recognition of just what is taking place. I live in the mountains in an area that has seen rural subsistence farming for a thousand or more years. During this long period, the mountainside has been divided and maintained into flat cultivable strips separated by rock walls put together with no mortar, but a lot of care. Nevertheless, with every prolonged period of rain, the earth swells and a piece of wall somewhere is bound to collapse, needing repair. Occasionally, a rock or two will get rolling and wind up several terraces away from the point of collapse. Thus in my walks around the property, it is common enough to see a grey irregularly-shaped stone, or several, in the midst of the pathway, even when no immediate point of wall damage is evident.

Recently, walking down to the garden, in a mood of simply passively enjoying the walk, thinking not really about any particular topic, perhaps on the border of that state known as day-dreaming, nothing out of the ordinary seems to be happening when...

According to my cognitive model above, we could say that as I am walking, thinking1 is doing its normal, unconscious and pre-emptive job of actively using all sensory input to compare the current ongoing activity of my walk with all that I have learned and experienced, stored in long-term memory. The component process of thinking1, HRS, is constantly retrieving the simplest, most readily available, most easily employable habit routines which match the parameters defined by the totality of sensory environmental input and my pre-organized intention (walking down to the garden), and these habit routines are then supplied, firstly, as templates for the automatic regulation of all ongoing process including the perception and reaction to the

surroundings. Secondly, the habit routine, along with relevant fragments of the sensory data itself, is supplied to thinking2, which at this moment of daydreaming, is doing very little analyzing, reasoning, or deciding about the surroundings. The component process of thinking2, symbolization, is however representing the sensory data (most of which is merely the information of the current habit routine) and making it available for awareness, so that I "see, hear, smell, feel, enjoy..." (and perhaps even explain to myself in language: the mountains are nice today!) my entire surroundings, although I pay no special attention to anything in particular. There is even an ongoing, if vague internal dialog occurring, partly about the surroundings, but also about other matters entirely. This I am not particularly paying attention to either. Thinking2 is relaxing, simply passively "enjoying" the stroll. Unless thinking1 gives some extraordinary signal that something is amiss, or unusual, thinking2 is quite content to let thinking1 supply all interpretations and responses to ongoing activity (action). Thinking2 is therefore interfering minimally, if at all, in the thinking1 processes through the prerogatives of reasoning and deciding feedback via working memory.

...when suddenly, I spy a grey rock in the pathway ahead. As I said, this is not an unusual occurrence, but since I have not seen a rock at this spot previously, thinking2 goes into action, prodded by the novelty signaled by thinking1, and "notices" the novelty and reviews (checking) the actions of thinking1 which has presented the habit routine that, there before me, just like several times in the past, lies a rock that has rolled down from some wall up above. This is a habit routine of interpretation of environmental data (ENV) and carries the action recommendation to accept the novel object as "grey rock". The cognitive processes begin to operate fast and furiously now, even though this is no emergency, just a minor novelty. Fleetingly I am aware of the analytical checking process in thinking2 that indicates, yes, it rained quite heavily last week, (22) so here is the result. Another thread of checking goes on, seemingly at the same time, which finds the information that there is a wall, two or three terraces up from this point, that is known to be in poor repair and likely to have collapsed. I am aware that somehow this

analysis happens at lightning speed, almost instantaneously, and that the symbolization in language with which I can "explain" these positive checks on the habit routine comes slightly after the fact, perhaps after the checking process has already told thinking1 that its habit routine is acceptable, proceed with normal operation. Thus the checking and deciding function in thinking2 seems to be independent, and faster than the symbolization of thinking2 which seems only to resonate to the former operation.

I am just about to approve the habit routine as an accurate and true representation of the novelty which lies before me when, and this happens so quickly as to be almost simultaneous with all that has been so far described, something seems amiss. Perhaps the color was slightly wrong, or perhaps I detected some movement in the object, but with a sudden suspicion like that which one feels when one realizes he has been lied to, thinking2 sends out a strong command to thinking1 (the classic double-take!): suspicious interpretation! Find alternate habit routine! These commands also occur well before any symbolization process can "explain" what is going on. And lo and behold, with this extra prodding and data, the HRS comes up with the more accurate suggestion that here lies a dirty, partially crumpled plastic bag from the local supermarket. This habit routine was probably one of several more that could be called up, in a series of increasing complexity and unlikelihood, and indeed, if the bag had been red, rather than dirty white (almost grey), the "plastic bag" interpretation would have been the first accessed, being the most likely given the ENV parameter of the color red. (All the rocks here are grey.) (23) An interesting after-effect occurs here: I notice that during the next few moments I can view the object and willfully transpose its identity back to that of grey stone, but this ability fades and finally I am unable to interpret the object as anything but plastic bag. The dependence of perceived reality upon preconceptions, i.e., habit routines, is especially demonstrated by this residual if fleeting ability to see the object as either interpretation.

Now if it takes the above amount of words to analytically describe what occurred in probably a half-second, my statement that there are limitations in using the mind to explain mind takes on some relevance. And the above

is certainly an oversimplification! For instance, I believe that thinking1 and HRS can be multitasking, to use a computer analogy. Thinking1 and associated HRS can be interpreting the ongoing activity as described above, and simultaneously be working on another thread of material in reference to my internal dialog, which I mention above as possibly being about something completely different than my walk. I can be actively talking to myself about some subject in which I have many severe prejudices (which are being accessed as habit routines by thinking1), all the while noticing grey rocks, plastic bags, or whatever, which also require the HRS system to interpret. Whether the two threads are simultaneous or "time-sharing", I would not yet care to say. As for even further aspects of complexity, I have also made no mention yet of how the factors of significance or value are attached to the sensory data accompanying a habit routine. More on this later.

Let me postpone further theoretical considerations for a bit to consider how the psychedelic experience fits with the hypotheses presented so far.

The function of a psychedelic drug, according to my theory, is to interfere in some way with the Habit Routine Search function of the brain, and I will call this the Habit Suspension Model of the effect of psychedelic drugs.

Since the habit routine search mechanism has very probably several functional neural pathways and brain parts which support its operation, different psychedelic drugs may affect the system by differing mechanisms yet yield very similar overall results. All further supposed effects of the ingestion of these substances are not direct effects of the drugs themselves, but rather are consequences, which very probably are perpetuated and magnified by cybernetic mechanisms, of the changes brought about in the HRS system of the brain.

Now I do not mean to imply that habit routines are destroyed by the influence of psychedelics, or that the habits are completely suppressed or inaccessible during the time of drug influence. It is much more a process of temporary delay or change in significance and value of habit routines and their consequently changed use in ongoing cognitive processes. The strength of the effect seems dose-dependent. The habit routines seem to arrive slightly out of phase, if I may be allowed an electromagnetic analogy, and

presented thusly to thinking2 do not seem correct or valid recommendations for ensuing evaluation and decision. And it is the habit routines used for perception, analysis, reasoning and symbolization (I will call them the cognitive habit routines) (24) that are primarily affected: habit routines which are used to coordinate movement, such as walking or manipulating objects, are only slightly affected, if at all. Unlike alcohol or some other drugs, even high doses of psychedelics have very minimal effects on physical coordination. As Huxley noted on his first mescaline experience: although he wondered, when it was suggested that he take a walk in the garden, whether he would be physically able to leave his chair, once launchedinto the act he noticed no difficulty or change in coordination.

Now we may state something about the "causes" of the normal state of mind and the psychedelic state: the normal state of mind is facilitated by the constant process of HRS which finds appropriate, personality-typical responses for all ongoing activity. A "response" may be an interpretation or complex perception, an attitude, an emotional reaction, a "prejudice", or a pilot for actual physical action. These responses are habit routines representing the summed totality of ways in which similar situations were dealt with in the past, and these habit routines are presented to thinking2 as pre-structured ways of perceiving and dealing with the ongoing situation so as to minimize or practically eliminate the necessity for thinking2 to doubt perception or alter the response through analytical decision making. Unless thinking2 is signaled of some unusual significance that warrants attention, it may not even become aware of the decisions made on its behalf by thinking1. The process is cybernetic, an endless loop of causation, a process which, after a small delay, may enter consciousness as language and other reflective activities in the process defined as symbolization.

The normal delivery of HR's by the HRS mechanism for use in ongoing cognitive activity is precisely what we call a normal state of mind, a state in which the checking ability and analysis of thinking2 does or needs to do very little. A good analogy would be driving along a well-known road in light traffic: practically all required actions are automatically provided for without conscious effort or the need for evaluation by the analysis and checking of

thinking2. This applies to all physical routines needed to steer, brake, etc., but more importantly to the routines of perception, judgment, and planning needed to decide, for example, whether the child ahead is probably going to ride his bike too close for safety. Although everyone would accept the analogy, I will perhaps not make many friends suggesting that the totality of life is also a simple matter of habit routines (sometimes of somewhat greater complexity than those dealing with highway driving!), separated at infrequent intervals by brief bursts of creativity which may be little more than responses to temporary emergencies. Psychology textbooks may be full of research showing how automatic most actions and thoughts really are, but the reader automatically (!) takes the position that the description is relevant to others, the objects of study, and certainly not to him who is right then scrutinizing the phenomenon. We may deduce, perhaps, that a very powerful habit routine is the one which gives us the impression of being constantly and fully aware, in an analytic, deciding, and creative sense, of our surroundings and thought processes, that habits play only a minor, inconsequential and optional role in thinking. (25) Again, the psychology textbooks are filled with studies which indicate the contrary.

For the moment I must postpone showing the distinction between physical habit routines on the one hand, (as for example the physical, learned routines employed in the actual driving of the car, above), and perceptual and cognitive habit routines on the other. For now, we could say that cognitive habit routines, among their other functions, may constitute a pilot for the selection and implementation of motor routines used to guide and control actual physical movement. I believe that two quite independent systems of the brain are used to store and implement the instructions for these activities. This would explain why, according to my model as well as experimental observations, cognitive and perceptual habit routines are strongly affected by psychedelics, but physical coordination is practically untouched.

It is the normal and pre-emptive operation of the HRS mechanism which is the impediment preventing the normal mind from interpreting sensory and feedback input as anything but common, routine, normal, everyday input.

We are very much the slaves of the habit routine mechanism, and this is to be expected from an evolutionary standpoint. HRS is the mechanism all organisms having even moderately developed nervous systems use to deal with any and all situations which do not present a crisis, situations of normal significance and value for ongoing existence. The habit routine is a short-cut, a pre-established pattern allowing an organism to comprehend and deal with commonly encountered situations quickly and with a very minimum of neurological, cognitive effort. More primitive animals with very little cognitive ability in reserve must rely strongly upon the HRS system. The habit routine mechanism was probably a very early evolutionary development in the animal kingdom for it would have conferred obvious important advantages over any animal which had to treat every single event as unique, an animal which would not gain the benefits of practice and learning about a wide range of everyday situations.

Let us now review the list of "effects" outlined earlier and see how they can be understood in terms of the Habit Suspension Model. As an introduction to the phenomenology of ASCs, I asked, "let us see if we can understand each 'effect' not as something that a psychedelic drug does, but as something which we might do, if only rarely, under certain circumstances." Pretend, for the moment, that you have never even heard of psychedelic drugs. This may not be easy, but for someone with some measure of practiced control over his habit routines, in reading the list, I think it would be quite normal to be able to say, "Yes, I've experienced something like that", or at least admit that someone they know had had similar experiences. In short, the only thing that makes any of the categories awesome or strange, is their purported causal connection with psychedelic drugs. Take the famous alleged time-distorting power of psychedelic drugs. If you were having a very busy and interesting afternoon with your favorite hobby, you might look up at the clock and remark, "holy cow, five-thirty already!". But if you heard from some tabloid-reported source that LSD made you feel it was only about four o'clock when actually it was five-thirty... (or vice

versa).

I think it is obvious that we have habit routines for dealing with the everyday perception of the passage of time, so that when we look at a clock, it is really only to confirm what we already sense about the time of day. If you look at your watch, and it has stopped even twenty minutes previous, something seems immediately wrong unless you are particularly distracted with other tasks. Even upon awakening from a deep sleep in the middle of the night, I quite often find that I know the time to the nearest ten minutes, in spite of living far out in the countryside away from hourly chimes or audible traffic patterns. In the above case of intense absorption in some activity, we have habit routines available such that we expect it to actually be later than it feels, so that when we express amazement that it's already five-thirty, the knowledge that we have been busily engaged does more than a little to take the edge off the amazement, so to speak.

All this is common knowledge. But where my theory begins, is in the attempt to describe the data and systems by which this simple everyday process is implemented, and drastically changed by various influences including psychedelic drugs. The hypothesis that it is installed potential habit routines that deal with everyday perception of time gains some credibility from the knowledge that time perception was quite different before the advent of widespread mechanical time-keeping devices. In medieval Europe, daylight hours were longer or shorter according to the season, somethingthat would probably wreak havoc with our modern sense of time until we had long practice installing the newly required habit routines to deal with the situation.

My theory also departs from simple common knowledge in its attribution of such fundamental importance to the use of habit routine; rather than a habit being an occasional type of response to certain situations,

it is now proposed that the habit routine search is the principal operation in thinking1, always a precedent to awareness and thinking2, and that the habit routine presented to awareness for decision making always constitutes the pre-emptive or default response, seldom overruled by the active analysis and decision of thinking2 except in cases of emergency or particularly unusual

significance of events.

Familiarity breeds indifference, as Aldous Huxley noted, but the cognitive mechanism by which such an aphorism might operate has until now never been proposed. All situations for which a satisfactory habit routine may be summoned are dealt with as automatically, and with as great a measure of indifference, as possible. The artist, the great composer, the creative genius in any field may succeed in seeing the significant when presented with the merely routine, (26) but this is not the normal state of brain operation, nor is it the type of brain operation that evolution has caused to be predominant.

And this is why psychedelic drugs appear to be so overwhelmingly powerful. When awareness is effectively cut loose from the normal and reliable flow of habit routine, everything seems changed, odd, with unusual, sometimes overpowering, but not immediately explainable changes in significance. And as I have indicated, this very change is actively recycled and augmented by cybernetic feedback wherein current evaluation and checking of awareness is fed back into the stream of thinking1 which is seeking out further habit routines, now including parameters which instruct it to look for the unusual, and these new habit routines themselves are then delayed, suspended, or changed in significance. Item C in the phenomenology of ASC's, the sense or fear of loss of control, can be easily understood from the foregoing. An individual's reality, what he automatically believes to be normal and true in his estimation of the world around him, is entirely a matter of the habit routines he has collected, and himself installed, whether by intentional or unconscious practice. If the individual is not prepared to surrender his cherished notions, if he cannot overcome the obvious implication that reality, seen without the aid of preconceived habit routines, must appear relative and not absolute, feelings of loss of control are the naive interpretation to be expected. (And of course, the lesson being taught is, "What control?")

As for the other items listed previously as "effects" of psychedelic drugs, it should not now be difficult to see how they are all the result of an individual's having reduced access to his habit routines which define how he sees, thinks, perceives objects around him, perceives his own body and state of mind, the meaning and significance he attaches

to otherwise ordinary thoughts and perceptions, and so on. So-called perceptual distortions are merely ordinary perception divorced from the normal pre-emptive preconditioning of the habit routine complex through which such perceptions are symbolized. To those who wish to believe that psychedelic drugs cause hallucinations and bizarre perceptual effects, the proposal that perception under the influence of the psychedelic experience is in fact closer to actual reality than normal perception (which is heavily "distorted" by our habit routines) will appear absurd. But the "habit of thinking" (as in Margolis' analysis, see footnote 16) which prevents a paradigm shift necessary to understand the psychedelic experience may well be just this: the whole of our experience has established the conviction, in reality a lie, that what we perceive is automatically and without doubt, reality. Although most current theories in psychology recognize the lie, as individuals we still carry on as if this were a mere scientific technicality which appears in certain laboratory experiments. The example illustrated by the grey stone anecdote shows how misinformed we are in this conviction.

Some of the items in the phenomenology of ASC's may be understood as secondary or cascade effects of the more primary results of suspended habit routine: hypersuggestibility might be interpreted as a result of the feelings of loss of control, sense of ineffability, and change of significance wherein the suggestions of the guide or researcher are given greater weight in the vacuum of normal comprehension of ongoing cognition. Change in emotional expression would likewise be a secondary effect derived from perceived alterations in thinking, feeling of loss of control, etc. The suspension of the normal framework of habit routine for interpreting and symbolizing ongoing experience should obviously result in the sense of ineffability. Feelings of rejuvenation may result from suspension of personality habit routines that have become contradictory or self-destructive, their temporary suspension leading the individual to realize that they are mere routines, and capable of being reformed once seen for what they are. Here we are led to the hypothesis that the personality itself can be understood as a malleable and alterable collection of habit routines; some early psychedelic research suggested as much, and made use of the

idea by successfully treating many personality disorders with psychedelic therapy.

Indeed, the very existence of what we call "personality" as such a strong, pervasive property of a human being argues for the prevalence, importance, and predominance of habit routines and the HRS as the primary cognitive process. Personality, world view, beliefs, desires, opinions, are all understandable as complex assemblies of habit routines. What the Freudians have for so long called the unconscious, may simply be the totality of potential habit routines that can be accessed! (27) A memory is not a memory until it is accessed, therefore an unconscious memory is an oxymoron. But a habit routine, (whose elements consist of the very same data), is not only an unconscious potential pattern for perception, comprehension, and behavior, it is in addition and quite normally, accessed and employed unconsciously, and the process is not available to introspection.

To return to the pathway for just a moment, from my own personal experiences with psychedelic drugs, the grey stone in question would probably have appeared, at first and very briefly, as an object of some significance (it was new to its location) but without an habit routine to immediately identify it. The first thing my thinking2 would sense would be mystery, the object seen as an unknown. Very quickly thereafter, I think it is common during psychedelic experience for the HRS of thinking1 to present multiple interpretations of the object (hence one or more interpretations would logically have to be an "hallucination"); I might have sensed two or more possible identifications at once, whereupon the relativeness of its novelty and significance might stimulate further fundamental changes in my interpretation, and so on. As this process is cybernetic, it can quite run away with itself, so to speak, and the ordinary become fantastic through successive interpretations and alterations of meaning and significance.

The multiple interpretations, the multiple habit routines appearing simultaneously, might be the mechanism whereby it has been noticed by researchers that psychedelic experience can assist in the "recovery and eliciting of vast quantities of unconscious material." It is as if thinking2 is signaling, in the absence of a dependable habit routine, "quick, send me all the habit routines you've got, there's a big mystery going on here." And then the habit routines that

do arrive are also out of whack... (but also potentially very revealing of the personality and the "unconscious"). At this stage there is little to be done except to relax and observe the process as it unfolds. It is instructive to the personality to be shown how dependent it is on normal and perhaps quite artificial automatisms, and it is instructive concerning the underlying nature of reality to observe first hand how its interpretation is also totally dependent on preconceived structures of the mind which may be more or less arbitrary, if not outright deception. If this be madness, schizophrenia, psychosis, or folly, a moderate dose of it is certainly more than a homeopathic remedy for the far greater sickness which quite obviously afflicts modern man "in this century of holocaust."

To conclude this chapter, I will quote at length another account of psychedelic experience and the "effects" as noted by the experiencer. The narrative is that of Aldous Huxley, probably the most famous and widely-read account of psychedelic experience to date.

> I took my pill at eleven. An hour and half later I was sitting in my study, looking intently at a small glass vase. The vase contained only three flowers—a full-blown Belle of Portugal rose, shell pink with a hint at every petal's base of a hotter, flamier hue; a large magenta and cream-coloured carnation; and, pale purple at the end of its broken stalk, the bold heraldic blossom of an iris. Fortuitous and provisional, the little nosegay broke all the rules of traditional good taste. At breakfast that morning I had been struck by the lively dissonance of its colours. But that was no longer the point. I was not looking now at an unusual flower arrangement. I was seeing what Adam had seen on the morning of his creation - the miracle, moment by moment, of naked existence... [I was seeing] a bunch of flowers shining with their own inner light and all but quivering under the pressure of the significance with which they were charged...[And] the books, for example, with which

my study walls were lined. Like the flowers, they glowed, when I looked at them, with brighter colours, a profounder significance. Red books, like rubies; emerald books; books bound in white jade; books of agate, of aquamarine, of yellow topaz; lapis Lazuli books whose colour was so intense, so intrinsically meaningful, that they seemed to be on the point of leaving the shelves to thrust themselves more insistently on my attention...

At ordinary times the eye concerns itself with such problems as Where?—How far?—How situated in relation to what? In the mescalin experience the implied questions to which the eye responds are of another order. Place and distance cease to be of much interest. The mind does its perceiving in terms of intensity of existence, profundity of significance, relationships within a pattern...

From the books the investigator directed my attention to the furniture. A small typing-table stood in the centre of the room; beyond it, from my point of view, was a wicker chair and beyond that a desk. The three pieces formed an intricate pattern of horizontals, uprights and diagonals - a pattern all the more interesting for not being interpreted in terms of spatial relationships. Table, chair and desk came together in a composition that was like something by Braque or Juan Gris, a still life recognizably related to the objective world, but rendered without depth, without any attempt at photographic realism. I was looking at my furniture, not as the utilitarian who has to sit on chairs, to write at desks and tables, and not as the cameraman or scientific recorder, but as the pure aesthete whose concern is only with forms and their relationships within the field of vision or the picture space. But as I looked, this purely aesthetic Cubist's-eye view gave place to what I can only describe as the sacramental vision of reality. I was back where I had been when I was looking at the flowers—back in a world where everything shone with the Inner Light and was

infinite in its significance...

Mescalin raises all colours to a higher power and makes the percipient aware of innumerable fine shades of difference, to which, at ordinary times, he is completely blind... Visual impressions are greatly intensified and the eye recovers some of the perceptual innocence of childhood, when the sensum was not immediately and automatically subordinated to the concept. Interest in space is diminished and interest in time falls almost to zero... Though the intellect remains unimpaired and though perception is enormously improved, the will suffers a profound change for the worse. The mescalin taker sees no reason for doing anything in particular and finds most of the causes for which, at ordinary times, he was prepared to act and suffer, profoundly uninteresting. He can't be bothered with them, for the good reason that he has better things to think about...

'This is how one ought to see,' I kept saying as I looked down at my trousers, or glanced at the jewelled books in the shelves, at the legs of my infinitely more than Van-Goghian chair. 'This is how one ought to see, how things really are'... for the moment, mescalin had delivered me [from] the world of selves, of time, of moral judgments and utilitarian considerations, the world (and it was this aspect of human life which I wished, above all else, to forget) of self-assertion, of cocksuredness, of over-valued words and idolatrously worshipped notions...

[T]he investigator suggested a walk in the garden. I was willing; and though my body seemed to have dissociated itself almost completely from my mind—or, to be more accurate, though my awareness of the transfigured outer world was no longer accompanied by an awareness of my physical organism—found myself able to get up, open the French-window and walk out with only a minimum of hesitation. It was odd, of course, to feel that 'I'

> was not the same as these arms and legs 'out there,' as this wholly objective trunk and neck and even head. It was odd; but one soon got used to it. And anyhow the body seemed perfectly well able to look after itself. In reality, of course, it always does look after itself. All that the conscious ego can do is to formulate wishes, which are then carried out by forces which it controls very little and understands not at all. When it does anything more—when it tries too hard, for example, when it worries, when it becomes apprehensive about the future—it lowers the effectiveness of those forces and may even cause the devitalized body to fall ill. In my present state, awareness was not referred to an ego; it was, so to speak, on its own. This meant that the physiological intelligence controlling the body was also on its own. For the moment that interfering neurotic who, in waking hours, tries to run the show was blessedly out of the way. (28)

What a wonderfully poetic way of describing the normal collection of habit routines that rendered the world ordinary, plain, of merely routine significance: Huxley calls his habit-routine governed personality "that interfering neurotic who, in waking hours, tries to run the show." He notes that his awareness "was not referred to an ego", i.e., that the habit routines of personality that preserve self-image, self-importance, selfness, were no longer available, his awareness "was, so to speak, on its own." And the following line: "All that the conscious ego can do is to formulate wishes, which are then carried out by forces which it controls very little and understands not at all," is nothing but a poetic description of the operation of checking and decision of thinking2 feeding back instructions as parameters for further habit routine search operations via working memory. If we do not control them, at least we may now understand them somewhat better. And note the number of times that increased "significance" is mentioned...

> ... for the moment, mescalin had delivered me

> [from] the world of selves, of time, of moral judgments and utilitarian considerations, the world (and it was this aspect of human life which I wished, above all else, to forget) of self-assertion, of cocksuredness, of over-valued words and idolatrously worshipped notions...

In a word, mescaline had delivered him from habit routines. If the Habit Suspension Model of psychedelic experience is correct, we may begin to see the enormous power of the HRS mechanism to shape our every impression, our every word and deed, for if the profound changes of psychedelic experience are nothing but reduced access to acceptable habit routines, we would have to say that habit routines are the cognitive water we swim in, omnipresent and supportive of our every intellectual movement, yet (until now) perfectly transparent and undetectable to ordinary scrutiny.

At the risk of seeing habit routines everywhere, for a new theory often incites such excesses in its newly acquired adherents, I think it safe to say that most of the "effects" noted by Mr. Huxley, and in the preceding examples as well, can be adequately understood in terms of the Habit Suspension Model. In Mr. Huxley's case, considering his great personal interest in art, the Perennial Philosophy and mystical and spiritual matters, his compassion for the human situation, and his humility, the effects he describes demand such an interpretation.

References

(1). An excellent and recent entry, complete with 121-page bibliography: Pharmacotheon: Entheogenic Drugs, their Plant Sources and History, Jonathan Ott, 1993, Natural Products Co., Kennewick WA. (back)

(2). see for example "The Role of Hallucinogenic Plants in European Witchcraft" by Michael J. Harner, in Hallucinogens and Shamanism, Michael J. Harner, editor, Oxford University Press, 1973. This overall if brief survey is a classic of

the psychedelic literature, not to be overlooked. (back)

(3). "The Effects of Psychedelic Experience on Language Functioning", Stanley Krippner, in Psychedelics, Aaronson and Osmond, Doubleday & Company 1970. (back)

(4). Ibid. (back)

(5). "Toward an Individual Psychotherapy", Masters & Houston, Psychedelics, (Ibid.) (back)

(6). Drugs and the Brain, Solomon H. Snyder, Scientific American Library 1986, p2. (back)

(7). Where the author refers to an ASC, it is an Altered State of Consciousness. (back)

(8). edited excerpts from "Altered States of Consciousness", Arnold M. Ludwig, in Altered States of Consciousness, Charles T. Tart, Doubleday & Company 1972 pp15-19. (back)

(9). The Varieties of Psychedelic Experience, Masters and Houston, Holt, Rinehart and Winston 1966, p5. (back)

(10). "How does LSD Work" in The Hallucinogens, Hoffer and Osmond, Academic Press 1967 p211. (back)

(11). Francis Crick, The Astonishing Hypothesis, Charles Scribner's Sons 1994, see page three for example. (back)

(12)> See for example Stairway to the Mind, Alwyn Scott, Springer-Verlag 1995 (back)

(13). I am for the moment ignoring the hypothesis that quantum indeterminacy may be the source of the brain indeterminacy necessary for philosophically-real free will. (back)

(14). The Rediscovery of the Mind, John R. Searle, Cambridge: The MIT Press, 1992. (back)

(15). "The Mystery of Consciousness", in The New York Review of Books, November 2, 1995, p60. (back)

(16). In The Oxford Companion to the Mind for instance, although "instinct" and other terms frowned upon by Behaviorists have generous entries, "habit" has no entry whatsoever. On the other hand, Howard Margolis, a student of Thomas Kuhn, has written two admirable books concerning "habits of mind" and how they govern perception, judgment, and even scientific beliefs. See Patterns, Thinking and Cognition, 1987, and Paradigms and Barriers, How Habits of Mind Govern Scientific Beliefs, 1993, both University of Chicago Press. (back)

(17). When speaking of memory here, I refer to what is now generally called "long-term memory." (back)

(18). I enclose the word in quotes to denote my dissatisfaction with the current computer-oriented models of much of cognitive science. In using such words as data, information, computation, etc. when speaking about mind and consciousness, one does less of explaining than "conjuring away the barriers between man and machine, between consciousness and mechanism." (Raymond Tallis in Psycho-Electronics). But it is very difficult not to use such terms today, so ingrained is the idea of some equivalence between mind and machine. I hope that the reader will see that as my theory develops, along with new ways to understand the important differences between man and machine, the use of such terms will slowly be replaced by new concepts which obviate their need. Thus I will from this point in the text suspend the tediousness of quotation marks provided the reader will keep in mind the limitations I have expressed. (back)

(19). Recent terminology as well as theory in the field of memory research has blossomed. The process of LMA which I define here would be said to access autobiographical or episodic memory; additionally there have been proposed the terms procedural, semantic, implicit and explicit, short-term, long-term, and working memory to describe other

aspects of memory. I shall define and use these terms as the model develops. (back)

(20). Perhaps an analogy would be helpful here. We might think of a unit of memory as like a single frame of a motion picture. In LMA, a sequence of frames is called up, and experienced as a sequence or "film clip," in temporal order, and with conscious reference to the time and conditions where the frames were recorded. This is not to say that the process may not become degraded, with loss of data, loss of reference to time and place, erroneous mixing of different memories, etc., the ideal expressed merely illustrates the type and mechanics of the process to be understood. HRS, however, would access a variety of single frames recorded at different times and places, a sort of collage of single frames, associated not as a temporal sequence, and not consciouslyexperienced, but unconsciously selected and employed according to a thematic agenda specified by subject content corresponding to current perception. Thus if stopped on the highway by a "law enforcement officer" for no apparent reason, we may be rather hurriedly accessing, in the data of all memories of dealings with the police (our own and knowledge of such dealings by others gleaned from friends, newspapers, etc.), for every possible habit routine that might assist in estimating what is going on. Specific memories of similar scenes might appear fleetingly, but far more important would be the unconscious evaluation patterns supplied by habit routine search that would allow and assist our judgment to calculate just how to react to any eventuality, given the particular parameters of the current situation. Thus if he has just gotten off an excessively chromed Harley, has black ray-bans, razor-sharp creases on his shirt and a penetrating snarl we will automatically react somewhat differently than if he was a school-crossing patrolman, tips his hat and says he thinks our signal light might be out. No deliberate calculation or access of actual memories via LMA is necessary, yet the "data" of many memories is obviously being employed, unconsciously and automatically, to guide our reaction to the situation. (back)

(21). The model described here has parallels to ideas suggested by C.H. van Rhijn, see "Symbolysis: Psychotherapy

by Symbolic Presentation" in The Use of LSD in Psychotherapy, Harold A. Abramson, editor, Josiah Macy, Jr. Foundation, 1960. (back)

(22). This process must also use a habit routine, thinking2 feeding instructions to thinking1 to search for justification that its previous interpretation of "grey rock ahead" is possible. A habit routine is then found which relates the cause and effect pattern learned previously about rain and out-of-place rocks. I do not specifically remember as memories the rainy days and the displaced rocks encountered, but use only "frames" of these memories to obtain the fact that rain has recently occurred on a scale which is known from experience to produce grey rocks in pathways. (back)

(23). This knowledge must also have been retrieved and used through HRS as a parameter ensuring that a grey object be interpreted as probably a stone, and an object of decidedly non-grey hue as not-a-stone. (back)

(24). And here I think that we are dealing with two classes of habit routines, some simple habit routines of perception are probably called up by the arrangement of sensory environmental data itself, i.e., in thinking1, whereas habit routines of analysis and symbolization must be habit routines that are called up by thinking1 on behalf of thinking2. I will therefore sometimes refer to a habit routine complex, signifying a composite habit routine comprising multiple aspects and multiple interlocking recommendations for action. (back)

(25). This might be understood as a habit routine which thinking2 installs in memory through the process of constantly seeing its power to alter the surroundings. The habit routine is that thinking2 is in control, while the reality is that, most of the time, it is on vacation. (back)

(26). The question presents itself: Who can be best trusted to decide what is, and what is not routine, the creative genius or the bored assembly-line worker? (back)

(27). Warning! The reaction to such ideas must also be primarily a matter of habit routines representing one's investment in previous theories. (back)

(28). Aldous Huxley, The Doors of Perception, 1954, Chatto & Windus. Quotation assembled from various sections of the essay. (back)

Chapter 4 | Table of Contents

The Center of the Universe

William S. Moxley

4. The Neuromechanics of HRS — Introduction

BEING AN OUTLAW does have its share of sudden and tragic surprises. The moralist (if he has read this far, out of a taste for voyeurism or some other vice curious to those who know what is right and hesitate not to coerce others to their views), shall now have permission to gloat. Yet it has been my life experience that sudden misfortune occurs to us all, most unexpectedly and just when we thought we were going along quite nicely. Moralists and fanatics of all kinds get their share quite as much as the outlaw, the iconoclast, or the revolutionary, but moralists seem rarely to commit their misfortunes to pen and paper. The worst of misfortunes that men suffer is in my view the slow, life-long and silent tragedy of those who do not, or will not abandon so-called security when opportunity knocks. To be simply dragged along by the responsibility to safety may be instinctual, but it is hardly creative nor does it lead to the fulfillment of the more precious potentialities of being human. To arrive safely at the stage of life where it is certain that the halfway point has passed, yet not even have an interesting story to tell, would be for me a far greater tragedy than the several which awaited.

During the later stages of our morning-glory researches, news reached us that two friends, who had been missing for a few days, had been ambushed and shot dead while on an expedition into the mountains of Michoacan. Several times

previously they had brought back with them the most amazingly potent cannabis for us to sample; in those days seedless marijuana, or sinsemilla, was almost unknown. I remember introducing sinsemilla from one of their mountain forays to a few friends in New York who were well acquainted with all the varieties of hashish and pot that international smuggling could bring to market. With the exception of that rare piece of especially strong Lebanese Red, the sinsemilla won all contests.

In spite of the new climate of liberalism on both coasts of America, for several marijuana smoke-ins had occurred and were mostly tolerated (it even seemed like legalization would not be too long in the offing), in Mexico association with any aspect of marijuana classed one immediately as a contrabandista, and subject to the same wild-west outlaw-style of justice as any train robber, or trafficker of guns, hard drugs, slaves, or revolution. The fate of our mild-mannered hippie friends was adequate proof of this. A few weeks previous, we had been invited to a luncheon in celebration of I-was-never-certain-exactly-what, and around the great table of Mexican haute-cuisine sat the chief of police of Guadalajara, a couple of army generals charged with controlling, among other things, the local drug traffic, a half-dozen other government types, a whole tribe of the most authentic-looking contrabandistas one could imagine, including the major marijuana and hard-drug broker of the state of Jalisco, and three disguised hippies (we had cut our hair short north of the border to ensure ease of entry into Mexico). Well it was a merry time indeed, I am ashamed that I had not then learned enough Spanish to relate here the details of the merriment, but the machine guns were casually reposing along the entire length of the dining room wall in a manner surpassing even Hollywoodian depictions of 1920's Chicago. We hippies, of course, came unarmed.

Perhaps the JohnWayneian fables we had been nourished on from early youth inured us to such signs of impending catastrophe, but the loss of our friends suddenly transformed the mythology of good guys versus bad guys into a sobering lesson. It was not the type of sobriety the moralist will now blame me for not embracing, for that is the sobriety of capitulation to a lie, a lie which is not even one's own. It was more the type of sobriety gained by the hard won contest in which a small bit of wisdom is

wrested from the ritual of initiation which fate so generously supplies in response to boldness. All the ancient tribes had structured their societies with elaborate and demanding ritual contests whereby the young, expressing their natural and new-found boldness, might gain wisdom with minimal risk, but our own advanced Western society had dispensed with such superstition, with the feeble exception of First Communions and Bar Mitzvahs, and so the young found it necessary to express prowess through automotive inanity, alcoholic one-upmanship and other silly sport, the corporal and spiritual fatalities of which seldom prompted scholars to bemoan the demise of ancient ritual. If anything, new layers of laws and regulations, and a few new prisons were expected to do the trick. But I digress.

What the tragedy prompted me to do was not beat a penitent retreat from my errant ways, disobeying laws that were written for my own good, but to remove to safer climes and continue on my researches with redoubled enthusiasm. Since the outlawing of all use of LSD in 1967, the predictable had happened. Clandestine manufacture and distribution had flourished as had bathtub gin several decades before, and parallel to bathtub gin incidents, not all clandestine LSD was of good quality, nor manufactured by those intending that its use be accomplished intelligently. (And as for parallels between alcohol and psychedelic drugs, this is as far as it goes: either, or both, may be legal or illegal, used or abused.) As a chemist, it seemed a worthwhile project to experiment with the various published synthetic methods it was possible to use in the manufacture of LSD and other psychedelics, in order to develop the most efficient processes possible. Efficiency here would mean that the process had to employ a minimum of equipment, easily obtainable chemical precursors and reagents, and still produce a product of more than just acceptable purity, and in maximum overall yield.

And as a shaman concerned with the existential health of my tribe, it was also my duty to discover and relate all possible knowledge to the people who would need such information to use the psychedelic substances wisely. This aspect of my work turned out to be by far the more difficult, for not only had we lost touch with (eradicated, actually) much ancient wisdom gained over millennia by the shamanic traditions, but the modern political, social, and

even scientific climates made it practically impossible to recapture much of that early wisdom in the natural way. The modern situation colored and distorted our abilities to reproduce the mindset that would naturally see the psychedelic experience as sacrament: the modern orientation had first suspected the diabolical, then the insane, and soon thereafter was trying to discover how to use psychedelics as weapons of war and subterfuge.

Luckily, my friends, who were experienced in that sort of thing, were able to import my laboratory back across the border no questions asked. And so I found myself, back in Somewhere U.S.A., (still a draft evader), and with an interest that attracted over the next several years various groups of persons wanting to promote the clandestine use of psychedelic drugs, for reasons which seemed to change from noble to pecuniary in proportion to the success achieved.

Unfortunately the prohibition of psychedelics has for the last quarter-century prevented much progress from being made on elaborating the details of the neurological effects of LSD and other psychedelics in the human brain. As I mentioned previously, the very modest amount of work that has been done was with laboratory animals, or in vitro cultures of nerve cells, and has in general been directed toward toxicological or forensic ends. Thus there is not alot of reliable data available on how normal doses of psychedelic substances affect normal neurochemistry in normal human subjects experiencing the more valuable and interesting aspects of psychedelic experience.

If for the past several years experiments could have been performed using volunteers, especially experienced psychedelic users, in the attempt to accumulate some reliable data, the task I will now attempt would be far more straightforward. For example, I suspect that if the new and powerful scanning techniques of PET and MRI were combined with the experimental ingenuity of some of the top cognitive neuroscientists to illuminate the brain mechanisms paralleling cognitive processes altered by psychedelics, we would rather quickly find out alot more about not only the mechanisms of action of psychedelic drugs, but many other neuro-psychological realities as well. If mere speculation

about the psychedelic experience has led me to discover a major new brain function (assuming that the HRS mechanism is as important as I suspect, and corresponds to various discoverable patterns of neural signaling in the brain), imagine what a little serious research is likely to turn up. Needless to say, even the underground scientist of independent means is unlikely to have access to Positron Emission Tomography equipment.

Nevertheless, I have gleaned enough data from existing research to at least advance a few preliminary guesses as to the neuromechanics of the Habit Suspension Model of psychedelic experience. But before I venture into this minefield of complexity I must discuss some further implications and illustrations of the habit routine search cognitive process that I have hypothesized. In proposing the habit routine search mechanism as a fundamental but previously undiscovered brain/mind process not only out of necessity to explain psychedelic effects, but also from the perspective of other psychological, anthropological, and evolutionary viewpoints, I hope to build some badly needed bridges between these disciplines utilizing the new model.

The phenomena discussed below, when viewed through the new lens of the HRS model, start to be understandable in a new way. But in addition, since current discipline-specific models leave much to be desired in attempting to explain at least some these phenomena, they demand a new and global way of understanding them. The habit routine interpretation is not just an alternative model for aspects of reality already well modeled, but a viewpoint which may be able to unite poorly understood and diverse phenomena under a common theoretical outlook. All of the topics I will mention deserve more space than I can give them here, some would require a lengthy analysis, but at the risk of over-simplification, I don't believe I need an exhaustive treatment to show just how wide the application of the habit routine model might conceivably be. My attempts to propose neurological models also will require reference back to these many topics:

Anthropology

In anthropology, our understanding of the phenomenon of shamanism and the ability of shamans to temporarily divest themselves of their culture-bound cognitive limitations

using psychedelic preparations suddenly becomes much more than the drugged delusions of the primitive mind as some have suggested. The historian of religion Mircea Eliade wrote in 1951, "But we have seen that, in shamanism itself, narcotics...represent a decadence and that, in default of true ecstatic methods, recourse is taken to narcotics to induce trance." (1) Naturally, if one's whole viewpoint concerning "narcotics" has been shaped by the Prohibitionist Ideal of Twentieth Century Western Civilization, it would have been difficult indeed in 1951 to recognize the true significance of the use, not of narcotics, but psychedelics by tribal peoples. But Eliade's view is stillclung to today by more than a few so-called scholars, yet paradoxically their own "culture-bound cognitive limitations" strikingly revealed in the mentioned Prohibitionist Ideal are as in need of cure as were those of the tribal peoples they see as decadent.

The great importance of shamans and psychedelic drugs to so many early societies can now be seen much more in terms of the temporary yet cumulative cognitive advantages that psychedelic experience would have conferred. The success of shamans in curing some of the diseases of tribal members under their care takes on new meaning, as does the use of psychedelic agents in rituals for initiation into adulthood, for devination and the making of important decisions, and more. Psychedelic experience as habit suspension unites the understanding of many aspects of the life and evolution of Early Man. And far from being a decadent substitute for "true ecstatic methods" as some insist, I will show that psychedelic use was and remains the genuine article for which many less efficacious substitutes were tried and abandoned. The stability, longevity and ecology of many ancient societies could only have been a by-product of cultural wisdom; if limited and narrow from our modern point of view, such wisdom certainly was not accidental, and in some respects represents ideals which modern industrial civilization has not even pretended to espouse. Our knowledge of ancient psychedelic plants and their use is the subject of many excellent books and reviews now available (2); the knowledge represented in these works goes far beyond the primitive views that were prevalent in 1951.

The transformation of shamanism into organized religion, a much discussed though poorly understood process, was most

certainly a process which was paralleled by the discontinuance of the use of psychedelic preparations. Insofar as this transformation has also been one in which doctrine and dogma have not only replaced, but forbidden direct individual experience of spiritual realities, it would be difficult to maintain that the change worked for the benefit of the individual in need of spiritual fulfillment. It seems obvious that the transformation was a political one, brought about by those requiring control over their subjects through the creation and manipulation of cognitive habit routines, and especially the prevention of the use of methods enabling the individual to bypass the limitations imposed on him.

The transformation was certainly not a refinement which led to peace and harmony among early civilizations having organized religions and priesthoods. Lack of peace and harmony among nations and civilizations has, in fact, become the most important behavioral characteristic of the human species insofar as it threatens that species with extinction. Individuals, robbed of their access to direct experience of religious truth (and here there is no substitute: religious truth is something that must be personally experienced), become members of a society which can be coerced by petty tyrants into all sorts of collective insanities. In a future chapter I will extrapolate the importance of early shamanism and the use of psychedelic plants in two directions: firstly to show that a very significant role for psychedelics can be hypothesized in the early evolution of man; and to supply yet one more sermon on the faults of modern civilization and what might be done about it.

Meditation and Other Techniques

The understanding of meditation techniques, sensory deprivation, religious ecstasy provoked by various insults to the body, and the panoply of other methods that human individuals seeking enlightenment and self-transcendence have employed down through the ages becomes unified by the present model of habit routine search and suspension. I propose that all these diverse techniques are more-or-less effectivemethods for achieving what the psychedelic drugs do more efficiently and directly, viz., to suspend one's programming as represented in the personal collection of

habit routines. If there is something to be said for the "naturalness" of non-drug methods, methods whereby the individual is purportedly gaining the ability to achieve transcendent states at will, there is even a stronger statement to be made by the obvious unnaturalness of the more violent and self-destructive methods of certain religious ascetics: extreme fasting and mortification of the flesh, such techniques must be seen as quite primitive substitutes for the use of natural psychedelic plants, quite benign by comparison.

Note that I do not propose that these various techniques affect brain operation through exactly the same mechanisms: the outcome of altered or suspended habit routines may be realized by quite different mechanisms and points of intervention in neurological operation, both neurochemical or self-induced, as I have already suggested. The hypothesis of the HRS system being the fundamental and primary cognitive operation of the nervous system upon which all the ensuing processes of thinking are based, fits well with the proposal that there would likely be many diverse ways to alter the system as a whole, especially considering the cybernetic nature of most if not all brain processes.

Instinct

The operation of what have been called instincts, both in animals and man himself, may now be understood in a new way. Although the capacity and characteristics of memory in animals are generally agreed to be very limited compared with man, the use of data implanted by experience, as well as the genetically-expressed data of the collective experience of a species, not as long-term memory in LMA, but as data for the operation of HRS, seems a promising new approach in ethology. Chapter 6 will explore some of this territory.

Personality and the Unconscious

In psychology and psychiatry we may begin to understand better what the personality is, where and how the neurological data that result in observed personality traits is stored and accessed. A more physiological and operational understanding of the properties of the "unconscious mind" may now be possible, and may extend to understanding how the prevalence of irrational belief can coexist in the same

society, even the same individual, with logic and rationality. We may be able to apply the new concepts to the understanding of phobias, neuroses, and personality disorders, the power of propaganda and the phenomenon of crowd madness, the neurocognitive correlates of prejudice, and the practice of methods by certain individuals which seem to render them much less susceptible to these major human weaknesses.

Human - Animal Dichotomy

The fundamental difference between man and animal is an ancient question, still debated from the perspective of many opposing viewpoints. The habit routine model may provide a new assessment of man's uniqueness in his ability to suspend or modify the operation of habit routine at will, (with practice), and so develop and cultivate the ability to be creative. I think it is safe to say that animals have the ability to be creative, at least in a simple way, but they exhibit such ability only when there is little alternative, as in a crisis, or in experiments designed to elicit such behavior. They do not do so out of the exercise of free will, so much is obvious. Man can, however, cultivate and practice the art, and dwell in a creative state by choice, but this is not to say that most human beings make the required effort to do so to any significant extent. Thus proposed differences between man and animal have to date always seemed merely a matter of degree rather than substance, animals exhibiting any suggested trait simply on a less complex level. Tool-making, language, music and dance, and other examples could be cited. Understanding the difference as a major reorientation from a habit routine governed mode of existence to at least a potentially Creative-Individual Mode (3) may be the characteristic which is more of substance than degree. Further exploration of this topic must also await future chapters.

The Binding Problem

The so-called binding problem in philosophy and psychology, the lack of an adequate psychological or neurological theory to explain how unitary consciousness arises out of the multiplicity of sensory signals which arrive at the brain, (and the multitude of independent channels of sensory processing that have recently been

demonstrated), may have a solution using the ideas I have suggested. With the recent elaboration of Parallel Distributed Processing models of brain function, where it is not even suggested that there is a central structure "responsible" for consciousness, the binding problem has become even more mysterious, to philosophers at least. But if our unitary conscious experience is not the experience or awareness of the totality of sensory input (and mental reflection) itself, but rather the after-the-fact experience of our own habit routines activated by the sensory data, and overlaid with only a sparse sampling of the sensory data relevant to the habit routine complex called into play, the binding problem disappears.

The relative absence of brain structures which associate all the sensory data from the various sensory inputs and intermediate processing areas to produce overall unitary or "bound" awareness is no longer a mystery, because unitary experience of external reality is an illusion. What we experience are the cognitive or perceptual structures provided by our own habit routines which enable the evaluation of only the most salient or attended to aspects of external reality; we see, hear, and understand only what we have already seen, heard, and understood, plus a small fragment of new sensory data which relates agreement or disagreement, the presence of novelty or sameness. It is through this deceptively small window upon the external that we exercise our apparently powerful abilities of free will and creativity. The power over external events which results, although demonstrably quite limited, seems great, great enough to install in us an illusion of control far greater than the evidence warrants.

If one of the fundamental questions in cognitive science has been whether perceptual data for which there is no conscious awareness can influence behavior, then from the above it can be seen that not only is this possible, but since the total sensory input is used primarily (almost exclusively) to select habit routine complexes in thinking1, which is entirely a pre-conscious operation, then the conclusion is that sensory data is primarily unconscious and the primary "causative" agent in behavior! I will return to the binding problem during my discussion of the brain systems which enable the construction of habit routines.

The Experiments of Benjamin Libet

The time delay between sensory signaling and the subjective conscious perception of sensation which has so carefully been demonstrated by neurosurgeon Benjamin Libet and other experimenters may also have a simpler explanation than those proposed so far. Libet and others have shown that a pin-prick of the finger, for example, transmits a signal to the cortex of the brain via the thalamus, which arrives in a few thousandths of a second. All sensory signaling except olfaction is similarly transmitted: first to the thalamus which acts as a sort of relay-station distributing the signals to the appropriate domains of the cortex. Yet conscious perception of the pin-prick can by various experimental techniques be shown to be delayed by up to a half-second, while "cerebral neuronal adequacy" is achieved. (4) It is proposed that there is then "a subjective referral backwards in time, after neuronal adequacy is achieved, which antedates the [perception of the] experience to correspond to the time of early cortical responses..." [the onset of signaling measured after a few thousandths of a second].

The alternative view that I propose is that the original sensory signaling, passing through the thalamus, is projected to all the appropriate areas of the cortex, and it is this signal, by comparison with all the stored data representing the frames of memory, which generates the habit routine complex which is then used in the thinking2 processes of perception and symbolization. The time delay corresponds precisely to the time necessary for all the thinking1 (pre-conscious) comparisons of current sensory signals with LTM (long-term-memory) to assemble the habit routine complex to be presented to thinking2.

According to my view then, the original signals from the periphery of the body, projected upon the cortex by the thalamus, are not at all the "data" of which we become aware. This original sensory "data" will be selected, trimmed, and mostly eliminated during the process of HRS (habit routine search), and only details from the data which are relevant to the habit routine complex brought to awareness will be included. Thus the greatest part, by far, of the "data" which is experienced, the supposed "bound awareness" of external reality, is merely the data that already existed as LTM.

The problem of how experience is referred backwards in time is also neatly resolved since what is experienced is the habit routine complex generated from sensory data received at the time of the pin-prick or other peripheral input: the habit routine complex represents the sensory data at the instant of reception into thinking1, not at the (up to) half-second later instant of perception in thinking2. The variability of the time delay may represent the level of complexity of the HRS process required in each case, a strong sensory signal is perceived more rapidly than a minimal one because less cognitive effort is required to construct a habit routine when the salient data is stronger than the background sensory information. Remember that both strong and weak signals arrive at the cortex with the same small time delay ("a few thousandths of a second").

The idea that "perception is a function of expectation" (5) is, of course, not new. But the dependence has so far been seen more as a minor imperfection or inconvenience, easily over-ridden by careful observation especially by he who is in the act of studying such phenomena. The new view provided by my theory shows that very attitude to be a product of the "minor inconvenience", the magnitude of its influence being directly proportional to the certainty of its negligibility. I repeat: in a very literal sense, we see what we have already seen, hear what we have already heard, think what we have already thought, believe what we have already believed, and I'm afraid in most instances in most people most of the time, little else. Illusions to the contrary may well be provided and sustained by installed habit routines! Disagreement with this analysis may well provide evidence for its accuracy!

Further Experiments

In a further series of investigations, Libet was able to show a similar and apparently much more mysterious anomaly. A carefully executed series of experiments seemed to call into question the operation, perhaps even the existence of "free will" as we know it. Again, the results were indicated by the existence of various time delays in neural signaling relative to tasks that the subject was asked to carry out. Here is an abstract of theoriginal article:

Voluntary acts are preceded by electrophysiological

"readiness potentials" (RPs). With spontaneous acts involving no preplanning, the main negative RP shift begins at about -550 [milliseconds]. Such RPs were used to indicate the minimum onset times for the cerebral activity that precedes a fully endogenous voluntary act. The time of conscious intention to act was obtained from the subject's recall of the spatial clock position of a revolving spot at the time of his initial awareness of intending or wanting to move (W). W occurred at about -200 ms. Control experiments in which a skin stimulus was timed (S), helped evaluate each subject's error in reporting the clock times for awareness of any perceived event.

For spontaneous voluntary acts, RP onset preceded the uncorrected Ws by about 350 ms and the Ws corrected for S by about 400 ms. The direction of this difference was consistent and significant throughout, regardless of which of several measures of RP onset or W were used. It was concluded that cerebral initiation of a spontaneous voluntary act begins unconsciously. However, it was found that the final decision to act could still be consciously controlled during the 150 ms or so remaining after the specific conscious intention appears. Subjects can in fact "veto" motor performance during a 100-200-ms period before a prearranged time to act. The role of conscious will would be not to initiate a specific voluntary act but rather to select and control volitional outcome. It is proposed that conscious will can function in a permissive fashion, either to permit or to prevent the motor implementation of the intention to act that arises unconsciously. Alternatively, there may be the need for a conscious activation or triggering, without which the final motor output would not follow the unconscious cerebral initiating and preparatory processes. (6)

Although Libet himself commented in the closing section

of his paper, "...it is important to emphasize that the present experimental findings and analysis do not exclude the potential for 'philosophically real' individual responsibility and free will", several writers have, at least in popular presentations, rather exaggerated the possible implications of the experiments:

> ...The conclusion is that we are deluded in believing that each of us is a free agent who may decide to take an action. Such a decision is an interpretation we give to a behavior that has been initiated someplace else by another part of ourselves well before we are aware of making a decision at all. In other words, the decision has been made before we are aware of the idea to even make a decision. If "we" are not pulling the strings, then who or what is? The answer is, it is an unknown part that is unfathomable to introspection. (7)

> ...Here we have physiological confirmation of Ambrose Bierce's definition of 'intention' as apprehending the imminence of an action. Behind the scenes the blind brain-mind is determining what action to take, and when to initiate it. And as it sends out messages to the muscles to move, so it also initiates processes that may end up as a conscious prediction of the act that is already on its way. Consciousness, however, ignorant of its own foundations, takes this prediction, and re-interprets it as control. (8)

Actually there are some elements of truth in these observations, as I hope to show below, but they do not support the implied positions of the authors. The peer commentary in the same journal as Libet's original article, it must be said, did not at all suffer from the same exaggeration, but presented a range of quite perceptive criticisms of the methodology of the experiments and suggested several less extreme psychological, neurological and philosophical conclusions, yet Libet was in my opinion able to support his position effectively. But none of the

commentators seemed able to simplify the experimental results and their implications with a new modelof what might actually be taking place. Let me first describe some further details of the experiments:

Each experimental subject was asked to observe a kind of TV monitor on which was projected a spot of light rotating around the center of the screen. This was the timing device: psychological and sensory events were timed by observing their occurrence relative to the clock-position of the spot of light. The subject could then relate, for example, the timing of a pin-prick or other event such as a decision, to the position of the spot at say, three o'clock. The subject was then asked, at a completely random moment chosen by himself, to suddenly flex the fingers of his hand, and observe the clock-position of the spot of light at the moment of his being aware of having made the decision to flex his fingers. What was consistently found was that an electrical signal in the cortex of the brain, the "readiness potential", would appear about four-tenths of a second before the subject signaled his awareness that he had made the decision to flex, and that the actual flexing of the muscles appeared about two-tenths of a second after the apparent time of the decision. The fact that these were considered startling and unexpected experimental results is illustrated by the depth and intensity of controversy that ensued in trying to explain the results within the framework of the various critics' paradigms. What was debated by all was the question of volition. How could the decision to take a voluntary act, which in anyone's book must certainly be a conscious event, be preceded by an unconscious event of such regularity that the timing of the ensuing muscle movement could be predicted from it?

The answer, according to the habit routine model, is that there was no volition whatsoever concerning the decision to flex the fingers. This was a "decision" pre-programmed to take place as an instruction in working memory for the selection and implementation of habit routines that would lead to the desired movement. The trigger for this decision was another instruction in working memory, the instruction to "choose a random moment". The volition involved in the overall process consisted of the voluntary programming of working memory by the subject to carry out the instructions of the experiment, nothing more. And

nothing less, especially, for in this process we observe quite unambiguously the operation of free will: the subject chooses quite freely to follow the instructions of the experiment, and consciously programs his working memory with the recipe for carrying out the desired sequence, viz., choose a random moment, notice the position of the timing device, and then flex the fingers.

Owen Flanagan has expressed a similar interpretation of the experiment. But his philosophical intent seems to be to argue against any idea that mind might be anything other than something caused by physical, observable-in-principle brain processes. He calls his position on the mind/brain debate "constructive naturalism", but seems to fall into the same trap concerning causation that I mentioned previously:

> I conclude that Libet's results, far from offering solace to the suspicious epiphenomenalist, are precisely the sort of results one would expect if one believes that conscious processes are subserved by nonconscious neural activity, and that conscious processes play variable but significant causal roles at various points in different cognitive domains. (9)

The first proposition, "conscious processes are subserved by neural activity", is in logical contradiction to the second, "conscious processes play causal roles". If the first proposition is taken to mean that for every conscious process that may be defined or intuited to exist, then there is necessarily a real, durational, and logical sequence of neurological operations in the brain which precedes and causes the conscious activity (causation must have duration and precede the effect which results), then the conscious process of the second proposition must be included: it must also be caused by neurological activity, and so its apparent causative power is only a reaction to previous neurological causation. As I stated above, the mind, or consciousness, is thus reduced to having no actual causative power at all, it becomes an inoperative concept.

I must also reiterate my own position that this argument does not automatically make me a "suspicious epiphenomenalist" nor a closet mysticist. The mind/body

debate has, like so many other debates, become polarized into a binary reductionism: if you're not in the one camp, you must be in the other. If you don't believe that the physical manifestation of the brain "causes" all the mental, intentional, qualitative, subjective, and yes, spiritual manifestations of the human (to say "organism" would already be admitting to the reductionism I am questioning), then you must be an advocate of mysticism, i.e., unscientific.

My previous analogy to the dual nature of electromagnetic radiation is apt, I think, for it illustrates the same debate that occurred in physics long ago: is light a particle or a wave? Or both simultaneously? Does the particle nature of light cause its wave aspects? Or vice versa? All these questions may only be asked from the point of view of classical physics, they only have meaning from the classical view. Once quantum mechanical physics enters the scene, no one even attempts to answer the questions on the classical level. If my guess that brain and mind are parallel aspects of a more fundamental reality is nebulous, perhaps it will take on some relevance when a "quantum mechanics of philosophy" will be available. Whether a process of mind studying mind will accomplish such a feat is still an open question.

I hope I may be forgiven for having diverged considerably from my analysis of Libet's findings to repeat an argument of the previous chapter, for I think that the argument and the logical inconsistency it points out lend some credibility to the use of the habit routine model as a way to resolve many aspects of current debate. The habit routine model is far from being a mystical proposition, yet it seems that many questions which previously forced opinion into either the reductionist or mystical extremes are now moot. If the habit routine model does not itself show how mind and brain might be parallel and complimentary aspects of the same thing, it at least weakens some arguments that such a view must be unscientific. To continue with the habit routine view of Libet's results:

I would propose that the time of the onset of the "readiness potential" corresponds exactly with the implementation of the instruction in working memory to "choose a random moment", and that the ensuing delay corresponds to the time necessary to activate the habit routine search process to produce a pattern which seems to

the subject to satisfy the instruction, "choose a random moment." At this point, the second and third pre-programmed instructions to notice the time, and then flex the fingers is launched, and the ensuing delay again corresponds to the time necessary to select and activate the various habit routines necessary to implement the physical action. The subjective timing of the intention to move the fingers occurs when it does because it must await the success of the first instruction to choose a random moment. When conscious awareness is satisfied that this criterion has been met, it "approves" the continuation of the instruction sequence in working memory. Notice that I have adhered to my intuition that mind and brain are simultaneous, not causative in either direction; in this example the readiness potential is the physical attribute of the larger process which is implementing the instructions of free will.

Hallucinations

I have already alluded to the idea that the so-called hallucinations resulting from psychedelic experience are not "real" or strong hallucinations at all. In this case, normal sensory data, perceived without the usual framework of acceptable habit routines to organize and categorize the perceived sensations, becomes itself seemingly hallucinatory (in the naive subject) because it is perceived "as is". And, as I mentioned previously, the perception of such sensory input, especially if the set and setting of the experience are threatening (as in the above account of a hospital-setting LSD session), will through feedback to further thinking1 habit routine search produce even more bizarre results, greater feelings of loss of control, etc.

Classical hallucinations produced by brain pathologies and various diseases are a quite different phenomenon, as was noted by many of the early psychedelic researchers. It was in fact the widespread dissatisfaction with the term "hallucinogen" (and also "psychotomimetic") which led to the coining of the term "psychedelic" as a properly descriptive name for these substances. Classical hallucination produced by brain pathology (or as manifested in the delirium tremens of end-stage alcoholism, for example), is probably outside the domain of the habit routine model, although the psychological and cognitive results of certain nervous system diseases may assist in devising the neurological

model of habit routine search. In the next chapter I will discuss some types of brain damage which provide such evidence.

Subliminal Perception

Many diverse psychological experiments have been able to show that information from a briefly encountered experience, although not subsequently accessible to normal recall of memory, nevertheless provides data which the subject uses "unconsciously". (10) In recent studies, the terms "explicit memory" and "implicit memory" are used to denote sensory information which can, or cannot be consciously recalled. The terms correspond roughly to what I have called LMA, or logical memory access (explicit memory) and the output of the habit routine search system (implicit memory). But defining the two as different types of memory obscures what the habit routine model makes clear: the memory "data" is the same, it is the method of access which is different.

A typical experiment would run something like this: Subjects are given a brief exposure to a word presented on a screen. A 30 millisecond showing is not long enough for the subject to recognize that he has seen anything at all, yet in subsequent testing the word will be identified more frequently from lists of random words than statistics would predict. Research on subliminal perception had been motivated by studies of amnesic-syndrome sufferers, who had often been observed to have intact implicit-memory function despite gravely affected ability to recall autobiographical events. A patient afflicted with amnesia might be taught a procedure, for example, and shown by testing to have retained at least some information that he had learned. Yet he would have absolutely no memory for the time or place nor the procedure in which he had learned this information.

Daniel L. Schacter (footnote 8) has identified five types of evidence for the dissociation or independence of these two memory processes and concluded, "Taken together, the...studies constitute solid evidence for a fundamental difference between implicit and explicit memory." The evidence, I believe, fits the Habit Routine Model like a glove, but it is not at all necessary to propose independent memory systems to explain it. The Habit Routine Model proposes that the same memory "data" from exactly the same distributed sources in the various domains of the cortex,

are accessed and assembled by two different processes, one automatic, ongoing, and pre-conscious (HRS in thinking1), the other voluntary, deliberate, and accomplished by feedback of cues assembled from conscious analysis and evaluation of thinking2 (LMA).

The model illustrates how HRS can retrieve information from the briefly perceived, subliminal exposition, yet LMA, which must have reference to a process of duration, cannot access the same data. The film frame/clip analogy is useful here: the 30ms exposure is recorded, just like all sensory data, but it represents only a frame of a film. LMA must access a sequence of frames during recall, a series of time-related frames of a certain duration, a "film clip". This may be a result of the nature of the cues which are used in LMA, or perhaps just the inherent operating characteristics of the brain system which reconstructs conscious memories. Or it might be hypothesized that the memory of an instantaneous cross-section in time, like the 30ms. exposure, would simply not register in consciousness, thus no process of cue-construction necessary to retrieve a memory would be possible.

An interesting experiment suggests itself to attempt to show the operation of information collected and useable as habit routines, but not accessible in LMA. A series of images is shown, all subliminally, demonstrating one of several possible logical relations between several different generic objects depicted in the images. By "generic" I mean that the objects do not have individual or "personal" characteristics, but denote a type, or a class. Numbers or letters in a non-descript font would be a good example, as would simple geometric figures. In each image is also a prominent and unchanging "reference" object which does have intrinsic specific characteristics, a photograph of Jack Nicholson perhaps. The images may be interspersed with other images, both subliminal and perceptible, or they may even be inserted in a short film, for instance.

Afterwards the subject is asked to deduce a possible logical relation between the several types of generic objects, now shown continuously, in one case with the reference object shown, and in another case without the reference. To deduce any one of the several possible logical relations between the generic objects requires a logical sequence of brain/mind operations, including attention and

decision, reference to previously learned knowledge of similar cases, it requires deliberation of a complex nature. The logical relation between the generic test objects implied by the series of subliminal frames, if deduced preferentially over other possible logical relations when the reference object is included, would indicate that habit routines had been installed by the data in the images; the co-presentation of the reference object should reinforce the habit routine learned about the logical relation indicated by the images. And not only would the routines be invisible to LMA, but even recall of the objects themselves would be nil.

Note that some preference for the required logical relation should be present even without the reference object. The prediction is that a small preference should be found without, and a larger and much more significant preference with the reference object present. This is because the reference object has obvious and strong individual characteristics which would be expected to activate the assembly of habit routines in which it played a part, whereas the test objects have little or no specific characteristics. The experiment would demonstrate that even complex logical decisions, supposedly made on the basis of consciously applied information and calculation, are nevertheless guided by invisible and pre-emptory patterns installed in memory in perhaps involuntary and illogical ways. (What would be logical about preferentially choosing one of several relations among geometric figures based on a picture of Jack Nicholson being present?!).

Context - Dependent Memory

This proposed experiment is a reduction to the subliminal perception level of a more general phenomenon called Context-Dependent Memory, which was described as long ago as 1690:

> The British associationist philosopher John Locke refers to the case of a young man who was taught to dance. His lessons always took place in the same room which contained a large trunk. Alas, it subsequently proved to be the case that: "The idea of this remarkable piece of household stuff had so mixed itself with the turns and steps of all his

> dances, that though in that chamber he could dance excellently well, yet it was only while the trunk was there." (11)

Experimental studies of context-dependent memory in recent years have established the importance of the effect, but no general cognitive model has been proposed which might explain its operation. The application of the habit routine model may consolidate understanding of several currently studied aspects of memory. Baddeley reports a particularly interesting study, the results of which lend themselves directly to interpretation using the habit routine model. This interpretation of context-dependent memory will additionally lead us into another question of importance for understanding HRS and LMA and how these processes are initiated:

> Is it actually necessary for the subject to return physically to the same environment for context-dependent effects to work, or is it sufficient to imagine the original environment? This was explored in a study by Smith (1979) who had his subjects study 80 common words in a distinctive basement room on the first day, and then attempt to recall them on a second day in either the same room, or in a fifth-floor room with very different contents and furnishings. Subjects who recalled in the original basement room tended to remember about 18 words, significantly more than those who remembered in the different upstairs room, who recalled only about 12. Of particular interest however was a third group who were tested in the different upstairs room, but instructed to try to recollect as much as possible of the original learning environment before starting to recall. They remembered an average of 17.2 words, not significantly different from those who had physically returned to the learning environment. (12)

The habit routine interpretation of these experimental results would be as follows. The original session in which

the 80 common words were studied was, like all ongoing cognitive activities, organized around and facilitated by habit routine complexes which each individual has developed over his lifetime of conscious activity. They would be roughly similar for all the subjects, but not identical, some persons obviously having developed routines for study (the memorization of a list in this case) which are somewhat different and more or less effective than those of other individuals. Nevertheless, for a given subject, habit routines typical for that subject are used for the learning process, and the information learned is incorporated into memory as further habit routines based on the learning routines. Thus the learned data is itself organized into habit routines related to those used in the learning. We might think of the learning routine as a sort of template on which the data to be learned is imbedded. But more than just the "data" of the words is recorded! All habit routines are potentially re-assembled from the entire sensory and cognitive input of the moment (including the habit routines brought to bear in implementing the ongoing process): if the words were printed in red ink, if Beethoven's Fifth Symphony were playing at the time, if one had an annoying itch, all these, including the general surroundings of the room and the emotional "feel" thus elicited in the learner, are part of the habit routine which contains the information concerning the words studied.

In the above experiment, recalling the words later is improved if the subject is tested in the same room; here the word information embedded in the habit routine created at the time of learning is accessed more reliably by the presence of the sensory input of the room (which matches elements of the original habit routine). But improvement is also noticed just by asking the subject to imagine the original learning location. In this instance, the habit routine is activated by thinking2 imagining the original scene and supplying this as an input parameter to HRS via working memory.

It has been noticed in many studies that if the words to be learned can be organized in some way, either intentionally with a mnemonic or categorization process, or "unconsciously" by the influence of context, as is the case here, then subsequent recall is much improved. We may view this effect as the production of habit routines having an

internal organizational structure, a cross-linking between elements of the routine, so that recall or recognition may be brought about by more numerous cueing situations. The context in which the learning is taking place, the basement room, provides an organizational framework, as would more intentional or contrived methods such as relating the words to certain categories or classes.

This brings us to the related question of the difference between recall and recognition. In word learning experiments, a subject can be tested for his recall of words, i.e., the words that he can remember on demand; or for recognition, wherein he is given a list of words only some of which were words to be learned. The subject then goes through the list and replies yes or no to each entry. Baddeley discusses the many experiments that have been done and the methods used to correct for various errors inherent in the procedure. (13) It has been shown that, as a rule, recognition is far better than recall, scores for the former being typically twice or more the scores for recall. A single case study (of myself) illustrates the disparity and suggests also that using the experimental paradigm of learning and recall of words (as opposed to images, or composite sensory patterns) may not tell the whole story:

In the 1950's and 1960's I often frequented small record shops to buy cheap (I was a student) and usually out-of-print jazz record albums. Album cover design, even then, was crucial in promoting records that were not expected to be big selling items, and so many were quite original in appearance. When sifting through the bins, I almost never erred in knowing if I had already bought an album, yet a printed list of titles was much less helpful. To this day I can look at an old jazz album on display, and tell immediately if I already own a copy in my collection of well over a thousand. A list of titles is much less effective. And if asked to recall the cover art from a well-known album, I will usually fail for most items. Out of a thousand, I can right now bring to mind the cover of perhaps twenty or thirty, yet somewhere in my head is the "data" required to recognize them all. I predict, on the basis of my own experience here, that if experiments on recall vs. recognition were performed using visual and perhaps audio material, as well as composite sensory input, the disparity between recall and recognition would far outpace the results

found for word study tasks.

Baddeley notes, "The question of how recall and recognition are related is one of the oldest in the study of memory. It is also one that remains complex and controversial." I think that the Habit Routine Model may have some ability to simplify the controversy, for the distinction between recall and recognition parallels closely the distinction I have made between LMA and HRS. In recognition, the result comes about automatically and rapidly through HRS, the effect of context being entirely "pre-conscious", an operation of thinking1 processes; whereas in recall, the context can be consciously recreated to assist in the process as in the experiment above. Thus in the recall of words learned in the basement room, the subject can improve his score by simulating the context, using LMA to intentionally reconstruct the look and feel of the basement room. In the experiment that I have proposed (showing a series of subliminal images containing the constant context or non-generic item), the context item automatically supplies access to habit routines which produce the response. In the basement room experiment the working memory is intentionally programmed with a reconstruction of the context (in the case of the upstairs recall), which then as a parameter for ongoing thinking1 assists in recall.

Filling In

Another phenomenon of recent interest and debate which may benefit from a habit routine interpretation is filling in. In its simplest aspect, it has long been known that due to the particular structure of the eye, there is a small blind spot on each retina at the position of its attachment to the optic nerve. The portion of the visual scene projected here is therefore not represented in the visual cortex of the brain, yet we have no awareness that there are two blank spots in our field of view. (A simple experiment that all children are taught shows the reality of the blind spot.) The process whereby the brain nevertheless produces an apparent continuous field of view is called filling-in, and some examples of recent research and controversy are nicely summarized by Francis Crick. (14) Although the filling-in of the blind spot may be a quite simple process in normal persons (the retina itself may play some

supporting role) a more extensive and higher-order kind of filling-in is known to occur with brain-damaged patients. Crick reviews the research of Ramachandran (15) and his colleagues and concludes,

> Filling-in is probably not a special process peculiar to the blind spot. It is more likely that, in one form or another, it occurs at many levels in the normal brain. It allows the brain to guess a complete picture from only partial information-a very useful ability. (16)

The Habit Routine Model agrees entirely with this assessment that only partial information arrives at conscious awareness, yet an apparently seamless perception of reality results. But the model goes even further in saying that most, or nearly all, of the data we believe we are perceiving is the data produced by the "filling-in" that the habit routine search process has provided. It is not surprising then that such a powerful system can fill in the minor amounts of data lacking due to the characteristics of the retinae, or even of damage to the visual cortex of the brain.

Synaesthesia

Along with the renewal of interest in consciousness and the mind/body problem in the wake of the demise of behaviorism has come a wave of new theories about long-known yet little-understood phenomena such as synaesthesia, the cross-over or confusion of two or more sensory domains. Popular books about such long-standing enigmas have reached a wide audience. In observing the disparity of proposed theories attempting to explain some of these phenomena, it becomes evident that psychology and the study of the mind is still in its infancy. But also, due to the breakneck pace at which research is now eliciting important if uncoordinated results, it seems of paramount importance for some part of this wide area of exploration to devote its efforts to providing linkages between the various disciplines, attempting to design overall theoretical frameworks which deal with all the phenomena on a unified basis. If not, I fear we are in for even greater overall confusion,

disagreement, and controversy. In reaction, a new brand of behaviorist, mechanistic, nothing-but-ism is likely to take hold to again stifle creative approaches in man's study of himself. I make these comments here because a recent book on Synaesthesia (17) illustrates the lack of coordination in recent theoretical approaches. I should not single out this book from the many others which have purported to "explain" consciousness or various aspects thereof; reading several of these is more like watching a sporting match than an exposition of a deliberate research undertaking.

The quotation from The Man Who Tasted Shapes above, in the section on Benjamin Libet's time-delay research, exemplifies the point, I believe. One-upmanship contests, perhaps encouraged by editors and publishers, take precedence over accurate representation of others' work. As for synaesthesia, Cytowic presents interesting theoretical ideas, but limits them by inaccuracy of presentation of supporting evidence. This is certainly the case where he attempts to present results of psychedelic research to support his ideas. (18) Reported synaesthesia during psychedelic experience has occurred frequently enough to warrant attention. Yet scientific attention is so severely limited by research restrictions that it is certainly a dubious conclusion that psychedelic synaesthesia has anything more than coincidental parallels to naturally-occurring synaesthesia. Cytowic remarks,

> Ethical considerations guarantee that 1950s-era government research into the effects of LSD on humans will never be repeated. While no contemporary research exists, however, the older data about the drug's general effects on the nervous system are reliable.

The statement reveals, I fear, a dual ignorance. If the unethical 1950s-era research he refers to is that undertaken by the CIA, (and highly unethical it was, along with much if not most other CIA "intelligence" activities), then Cytowic displays a glaring unawareness of the research of the dozens of workers who administered many thousands of psychedelic experiences in which ethics were not only respected but a primary consideration. But if Cytowic is ignoring this much

greater body of highly ethical research for the abominable fumblings of the weapons and mind-control crowd of MK-ULTRA/CIA fame, it is highly questionable to then express confidence about "older data being reliable."

It is simple enough to explain psychedelic synaesthesia in terms of habit routine suspension, (I will leave it as an exercise for the reader!), but I believe that the habit routine model may also succeed quite well in explaining naturally occurring synaesthesia. Cytowic states that synaesthesia is a product of the limbic system, not the cortex, and with this the habit routine model is in moderate agreement. I will show in the next chapter the interplay between the cortex and various centers of the limbic system which brings about the various habit routine cognitive operations. But rather than having to postulate an enhancement of limbic activities, or the actual crossing-over at some point of sensory signals as others have done, (both of these hypotheses depend on the supposition that it is the bound awareness of all the sensory domains which consciousness perceives), a simple and small change in the limbic activities which access and apply habit routines is the only hypothesis necessary.

Once again we see that if it is not bound sensory awareness of which we are conscious, but rather our own habit routines, the mechanism underlying the phenomenon is easily imagined, rather than requiring several hypothetical nervous system operations unsupported by any existing research. And once again I think, the habit routine model shows its capability to moot certain questions of controversy by providing an overall structure in which previously misunderstood or misinterpreted phenomena are now brought together.

The Newly - Sighted

Another such phenomenon recently discussed in a popular book (19) concerns persons who have been blind for many years and whose sight is then restored, the "newly sighted". Oliver Sacks relates the rare yet typical case of Virgil, a man blind since early youth due to heavy cataracts. At the age of fifty, he undergoes the relatively simple and risk-free operation for cataract removal. All are hopeful for wonderful results, yet, as has been noted in the handful of cases with other newly-sighted patients, curious and

difficult problems arise and persist, and the final result has often been disappointment and tragedy: Not because sight is not restored, but as Sacks relates in a lengthy and fascinating account of Virgil's tribulations, sight seems to be extremely difficult to understand and interpret in such a situation. According to the habit routine model, we could say that firstly, Virgil had no available perceptual habit routines to be activated by visual stimulation, therefore what he "sees" is only color and motion in a practically random and significance-less pattern. With effort and practice, he is able to interpret some of the visual data in terms of the world as he has known it through his other senses, but he has immense difficulty in learning these interpretations: they must be repeated each time anew. For instance, visually he cannot tell his dog from his cat. The instant he touches one or the other however, its identity is obvious. Relating the visual data to the touch is not retained however, for the next time he encounters the animal visually, again he is lost.

Secondly, cognitive aspects of the habit routine complexes are also lacking. This was illustrated by Virgil's inability to see photographs and pictures as anything but random if interestingly colored surfaces, even after he had been practicing with his new vision for awhile. Along with previous cases, he could not see people or objects in the pictures, even after he had learned to recognize them in the flesh. He simply did not comprehend the idea of representation for there were no cognitive habit routines available which would allow and facilitate such interpretation.

And thirdly, since all Virgil's existing habit routines consisted of structures building upon his previously available senses, (it had been remarked how his sense of touch and smell were acute, and far more developed than in normal persons), there was no possibility of intuitive or automatic cross-modal association between his new vision and his established cognitive schemes for understanding the world around him. With a cane, he could walk up a stairway easily, yet the vision of the same stairway gave no comprehension of its three-dimensional structure and how one might navigate it. This, in spite of knowing for certain that what was being viewed was the same object that could be climbed with ease bytouch alone. There were no cognitive

habit routines enabling a connection between the reality as perceived by the two sensory methods.

I refer the reader to Sack's description of Virgil's symptoms (which one might call them in the sense that they are the result of a deficit, in this case a deficit of habit routines of perception and cognition necessary for the function of meaningful vision). With the elaboration of each strange effect, the habit routine interpretation is easily and effectively summoned to organize and understand the situation as a whole. In one sense, Virgil was in the situation of a young child, trying to learn and establish the habit routines necessary for interpreting a strange and colorful visual world around him. Yet in another sense, since his brain and cognition had already fully developed in other directions, taking account of his deficit, he could not hope to achieve what the child does effortlessly. In the young child, the entire cognitive structure of habit routines is nascent and plastic; at fifty years of age this structure is rigid, established, and not amenableto radical change such as the sudden introduction of a new sensory pathway. In such a case as Virgil's we can see that the total absence of habit routines enabling the interpretation of vision renders the visual sensation incomprehensible; visual data arriving in thinking2 awareness without any organizing habit routine structure results only in a profound and, in the end, often tragic confusion which becomes a liability rather than a gift.

Perception of Language

I believe it is difficult, if not practically impossible in some situations, to experience raw sensory data; we cannot avoid experiencing external reality in terms of our own habit routines. Consider what happens when we hear someone speak a few words. If the words are in a language which we ourselves speak, they are immediately and unavoidably transformed into meaning! Try studying some difficult subject while a conversation is going on, or worse, an abusive TV advertisement is running. We are practically incapable of hearing such auditory sensory data as just noise, the meanings of the words keep attracting our attention. But the meaning is not inherent in the sound! If the language is not a familiar one, no meaning is produced! What is the difference? We experience our own habit

routines, as I have stated, and when we hear auditory input which calls forth habit routines of meaning, it is these habit routines which are pre-emptively experienced, not the pure sound of the words. Even for a foreign language, our habit routine search process is still active (if less insistent), trying to pick out short successions of syllables which might have a correlation to our own language, in the attempt to get at least some fragmentary meaning out of the noise. The point is, we are practically incapable of just listening to speech as pure noise, the habit routine search system simply overrides the will to do so. The habit routines turn the sound of speech into meaning, automatically, unavoidably. (Interestingly, in meditation, one practices the art of "quieting the internal dialog", of experiencing reality without analyzing it, without attaching one's own semantic interpretation to it. As I mentioned above, meditation seems to be a method for suspending the significance and use of habit routine in ongoing awareness.)

Now it is not conscious episodic memory, or LMA which gives us the ability to understand language; we do not actively recall the many instances in which we learned the meanings of the words and their combinations. Yet the data that was installed by these instances is certainly being used. For a particular word I may perhaps be able to recall the event of learning its meaning, but this is not what is used for present understanding. Rather, the sum total of all instances in which the meaning took on relevance for me is accessed (to continue with the analogy of a film), asa collection of frames, by the habit routine search process, and this collection of frames is the habit routine called forth through which meaning is produced in awareness. The fact that one can use a word in conversation quite accurately, yet find it difficult to produce a satisfactory definition of that word upon demand, illustrates the two cognitive processes. Providing a definition requires LMA, (or at least considerable conscious analysis of context to deduce what the meaning must be), whereas the automatic use of a word in proper and meaningful context is entirely controlled by the habit routines generated in the thinking1 processes.

If it is easy to see how auditory input of language results overpoweringly in the experience, not of the pure

sound, but of the meaning of that sound, (and hence the habit routines which produce that meaning), I would ask the reader to go back over my arguments concerning the other sensory modalities. The experience of vision, for example, must be parallel to audition of language: we do not experience the raw sound, nor the raw visual scene, but rather the meaning to which we habitually attach that sensory input. I cannot stress enough, we experience what we have already experienced; the view, if it has been stated in many contexts down through the ages, now represents a new and radical paradigm shift for understanding perception and psychology, for understanding ourselves in a radically new and more complete way.

Illusions

There are textbooks full of examples of visual, cognitive, and even auditory illusions. How do they work? One of my favorites, since I started playing around with a video camera and learning how to control the "white balance" so as to achieve accurate color representation in my films, is the Land Effect, named after the inventor of the Polaroid Land Camera. The absolute values of colors as perceived by a standard measuring instrument, like the charge-coupled-device (CCD) in the video camera, change radically according to the color balance or temperature equivalent of the ambient illumination. As I film my wife in the shade of a north-facing wall, thence to walk out into full southern-exposure sunlight, the colors of her costume undergo a radical metamorphosis in the final film, if I have not correctly regulated the characteristics of the CCD of the camera, the "white-balance", in order to take account of the change in illumination. If I film her in close-up, and set the white balance to automatic, then the costume colors remain fairly true to what we expect, but at a price: the background colors change alarmingly. If I film her little walk from further away, with the white balance locked to the setting which produces the correct background, then it is the costume colors which change. But as I observe the same scene with my normal vision, no apparent metamorphosis takes place: blues are blue, reds are just as red no matter where she walks, the background and the costume are perceived without significant change even though the color balance of light actually striking my retinae is changing just as

radically as it is at the surface of the CCD. Am I to assume a "white-balance" feedback signal to my retinae, adjusting their characteristics? There are no such neural pathways in the brain. And any such regulation would not be expected to correct for the costume and the background simultaneously.

Whatever mechanism is producing this color constancy effect must therefore be in the brain itself, in the processes of cognition, although some preprocessing of "data" has been hypothesized to occur in the retinae of the eyes. Edwin Land and other researchers of the effect have come up with a mathematical model of how various nervous system "computations" of intensity information from the entire visual field might allow constancy of color perception, but I suspect that mathematical computation theories of brain operation are all, in some sense, artifacts which may have good predictive power, but are not really good models for understanding what the brain is actually doing. I, for one, am quite certain that my brain is not calculating integrals or differential equations due to its demonstrated failure to do so on my final "diffy" examinations! Admittedly, due to the very limited and tentative knowledge about the mind that the neurosciences have so far been able to provide, mathematical models may be all we have, in some cases. Computer analogies for mind processes all suffer more or less from this same failing, which is why I may (as noted previously) enclose "data" and "computations" in quotes when discussing mind processes.

Land's experimental findings can be summarized by stating that the perceived color of an object in the visual field does not depend solely on the color of light entering the eye from that object, but on the entire spectrum of light arriving from all locations in the visual field. The application to the habit routine model of perception is obvious, I think. We would say that the habit routines for the constant perception of color values overrule to a large extent the actual signals relayed by the retina. But if habit routines can counteract actual color changes with such efficiency that we are not aware that any correction is taking place, why then doesn't it happen while I watch the curious effect in the film of the scene which live, caused no such drastic change? Actually, I have noticed that after watching such a distorted film many times, as when editing it, that I do begin to get used to the odd change in color

values, and correct for it, or at least ignore it (which might be practically equivalent). Such habit routines can and are inevitably developed to some degree in artificial situations such as the film editing, but are strong and well-developed for the experiences of daily life situations since they have been practiced and reinforced since early childhood. In agreement with Land's theory, we do "calculate" the color of the object perceived by comparison with the entire visual field. But we do so through the use of habit routines which define what colors to expect when we see sky, grass, stone wall, tree, etc., and such habit routine information is only weakly established, if at all, when divorced from natural three-dimensional surroundings, as in the case of watching the TV film.

There are parallel situations concerning the perception of the constant size of objects. Some very interesting illusions have been produced to confuse our nervous system's ability to tell us the absolute size of an object in spite of the wildly varying size of image projected on the retinae, if the object is moving for example. Again, I believe we can improve upon mathematical models of how size constancy is accomplished with the habit routine model. Constancy is again produced from the constancy of the habit routines in use by the perceptual system. The habit routines are what is perceived.

A Cognitive Illusion

Another quite fascinating illusion that has been around for quite some time was discovered by J.S. Bruner and Leo Postman in 1949. (20) I will quote Thomas Kuhn's account of the experiments for its concision, and also because he raises a couple of interesting points:

> In a psychological experiment that deserves to be far better known outside the trade, Bruner and Postman asked experimental subjects to identify on short and controlled exposure a series of playing cards. Many of the cards were normal, but some were made anomalous, e.g., a red six of spades and a black four of hearts. Each experimental run was constituted by the display of a single card to a single subject in a series of gradually increased exposures. After each exposure the subject was

asked what he had seen, and the run was terminated by two successive correct identifications.

Even on the shortest exposures many subjects identified most of the cards, and after a small increase all the subjects identified them all. For the normal cards these identifications were usually correct, but the anomalous cards were almost always identified, without apparent hesitation or puzzlement, as normal. The black four of hearts might, for example, be identified as the four of either spades or hearts. Without any awareness of trouble, it was immediately fitted to one of the conceptual categories prepared by prior experience. One would not even like to say that the subjects had seen something different from what they identified. With a further increase of exposure to the anomalous cards, subjects did begin to hesitate and to display awareness of anomaly. Exposed, for example, to the red six of spades, some would say: That's the six of spades, but there's something wrong with it-the black has a red border. Further increase of exposure resulted in still more hesitation and confusion until finally, and sometimes quite suddenly, most subjects would produce the correct identification without hesitation. Moreover, after doing this with two or three of the anomalous cards, they would have little further difficulty with the others. A few subjects, however, were never able to make the requisite adjustment of their categories. Even at forty times the average exposure required to recognize normal cards for what they were, more than 10 per cent of the anomalous cards were not correctly identified. And the subjects who then failed often experienced acute personal distress. One of them exclaimed: "I can't make the suit out, whatever it is. It didn't even look like a card that time. I don't know what color it is now or whether it's a spade or a heart. I'm not even sure now what a spade looks like. My God!"... [italics added]. (21)

The first italicized sentence raises the question of what kind of illusion is actually happening here. The reaction to the anomalous card is so automatic and reliable that one is tempted to say that it is a perceptual illusion taking place, that the subject actually perceives the anomalous card as a normal card. But unlike many perceptual illusions, in which the illusion persists even when knowledge of deception is gained, here, as shown by the second of the italicized sentences, the illusion tends to disappear after the trick is discovered. It seems therefore that the illusion is cognitive, having to do with the analysis or evaluation of perception rather than perception itself. A perceptual illusion may rely on habit routines that are fundamental to the functioning of the perceptual system they involve, and thus be very difficult to counteract. An example would be the now famous line drawing which can be seen alternately as a vase, or as two faces in profile, but never both simultaneously. (22) An illusion depending on the analysis or higher processing of perception, as I believe the anomalous card trick shows, can be overcome almost immediately by the installation of new or modified habit routines via working memory, which are supplied as parameters for further habit routine search which then takes into account the new data that anomalous cards are likely to be presented. It would be interesting to know more about the few persons mentioned in the experiment who had difficulty seeing through the trick even after they knew about it.

At this point it might be useful to recall my view in the last chapter that at least two different categories for habit routines are postulated, although since a habit routine is a composite of data from many sources, in multiple sensory and cognitive domains, the categories will certainly overlap or be simultaneously applicable in some situations. But as far as it is useful, we may refer to habits of perception, and habits of cognition. The latter will be understood as the habit routines which are used for analytical and reasoning tasks, or the production of meaning from language as discussed above, while the former produce such things as the visual illusions mentioned.

I have suggested the term habit routine complex to denote that the unitary habit routine which is constantly

constructed and presented to the awareness of thinking2 consists of all these types or aspects simultaneously. Thus if we can usefully isolate a part of an overall habit routine and see it as a habit of cognition, or a personality trait, such a dissection will be only a theoretical operation for heuristic purposes. The actual habit routine complex is an entity constructed from all levels of brain/mind operation from simple perceptual tasks to complex intuitive, deductive and associational processes such as the expression of personality.

Personality as Habit Routine

The very existence of strong, purportedly inalterable "personality traits" seems to me a perfect illustration of the prevalence and importance of habit routines in producing the range of reactions to the daily life process. As with the language example above, we do not use LMA to consciously search our memories for the data revealing how to act in a typical situation, consistent with our established "personality". We react typically, but automatically to certain situations, if not practically all situations, as an observer who knows us well will attest. Others know us by our personality, which when seemingly a bit different due to unusual troubles or a very bad mood, will invite sincere inquiries of "what's wrong? You're not yourself today!"

People who know us certainly do not expect radical or even moderate personality change from meeting to meeting; if encountered, someone will surely recommend a few sessions on the couch, or medication. The most startling and tragic event of diseases like Alzheimer's is perhaps not the gradual loss of memory and function, but the loss and/or change of personality which accompanies the disease. For the family relative who loved the person as expressed through personality, we may hear the lament, "he's just not himself anymore." What could the personality be, if not a large collection of routines suitable for automatic use; what data could personality arise from if not the very same data from which we extract conscious memories, yet accessed in an unconscious, rapid and automatic fashion by a cognitive/brain system not under conscious, analytic and deliberative control? The thinking1/thinking2 model outlined in the previous chapter is a far more descriptive and operational framework than simply saying that personality is

a property of the "unconscious mind," as if there were some separate compartment, some independent source of data wholly other, completely independent of the conscious mind. It is the same data. It is the method of use and the neurophysiology of access which is different.

Cognitive illusions and intellectual traps are more difficult to explain than visual illusions, no matter what the theoretical model. But why shouldn't our opinions and beliefs, our prejudices and expectations, our ideas about reality, our personal metaphysical outlook, the very patterns we use to evaluate what we believe to be truth or lies, also be not only governed by habit routines, but actually be identical with habit routines modified only slightly, in the ongoing perceived normality of daily existence, by the precise monitoring of one's present intellectual intentions? I don't deny that extensive self-evaluation ever takes place, but in most individuals it may take a life-crisis to stimulate it, while the creative genius and artist may dwell there frequently. But since we all need to swim in some kind of water, the normal everyday joe has practically no awareness of his habit routines, and the artist little realization that partial immunity to habit routines is his own peculiar suspension medium. But if cognitive, evaluative aspects of habit routines are as important as we see the visual ones to be, psychiatry may be a far more primitive endeavor than had been suspected even by the pessimistic.

As so often happens when one invents a model, or attacks some problem with a new way of thinking, a search of the literature reveals that someone has already covered the territory and proposed something very similar. But the habit routine model is itself applicable here: in having re-invented the idea from a new perspective, without having previously been acquainted with older work, I may have avoided falling into certain traps or habit routines that the original work would have installed in the process of learning it. Thus I discovered, long after coming up with the idea of habit routine suspension as the mechanism of psychedelic experience, that Sir Frederick Bartlett in 1932 had proposed that memory and learning were represented in

the mind by being embedded in large scale structures which he called schemas or schemata, "...an active organization of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response". (23) But in having developed my own approach first, I arrived at a view of the function of schemas, or habit routines in my terminology, which attributes to them a more fundamental and primary importance than even recent developments of schema theory imply. Daniel Schacter notes that, "Although Bartlett's notion of a schema is rather fuzzy..., and his experimental results have not proved easy to replicate..., his approach has exerted a strong theoretical and experimental influence on cognitive research... Mandler...provides a useful summary of the cognitive conception of a schema:

> . . . [a schema] is a spatially and/or temporally organized structure in which the parts are connected on the basis of contiguities that have been experienced in space or time. A schema is formed on the basis of past experience with objects, scenes, or events and consists of a set of (usually unconscious) expectations about what things look like and/or the order in which they occur. The parts, or units, of a schema consist of a set of variables, or slots, which can be filled, or instantiated, in any given instance by values that have greater or lesser degrees of probability of occurrence attached to them. Schemata vary greatly in their degree of generality-the more general the schema, the less specified, or the less predictable, are the values that may satisfy them. (24)

Baddeley summarizes the characteristics of schemas shared by the various recent interpretations of schema theory. The parallels to my own idea of habit routines will be obvious, but I shall presently point out the important differences in the two conceptions. (Baddeley is here summarizing a paper by Rumelhart & Norman):

> Schemas have Variables

Schemas are packets of information that comprise a fixed core and a variable aspect...

Schemas can Embed One Within Another
Schemas are not mutually exclusive packages of information, but can be nested...

Schemas Represent Knowledge at all Levels of Abstraction
The concept of schema is broadly applicable, from abstract ideologies and concepts such as justice, to very concrete schema such as that for the appearance of a face.

Schemas Represent Knowledge Rather than Definitions
Schemas comprise the knowledge and experience that we have of the world, they do not consist of abstract rules.

Schemas are Active Recognition Devices
This is very reminiscent of Bartlett's original emphasis on effort after meaning. (25)

With a little editing, both of these sets of characteristics could be used to define the nature of habit routines. I have in fact learned much about what I expect of habit routines from a study of modern research on schemas. But there is a fundamental difference between the two concepts. Schemas were hypothesized as hierarchical structures resident in the mind/brain which provided an organized template on which knowledge and memory was stored, as well as for the incorporation of new knowledge or learning. Habit routines, by contrast, do not have any independent or inherent existence until they are called up, actually manufactured and assembled from LTM data by brain systems which I shall define in the next chapter. Although in speaking of habit routines, I continually refer to them being accessed or called-up for use, the terminology is only a convenience, for I do not wish to imply that habit routines have any independent a priori existence in the storage medium of the brain, which stores only the frames of

memory; a habit routine is constructed, in my view, each time anew as required by the current ongoing cognitive state. HRS is thus a process of reconstruction rather than something akin to looking up a reference in a library. Also, it must be remembered that Attention does not refer back to habit routines after having received sensory information in need of organization. Quite the contrary, for the information which is at any moment available for Attention has already been constructed from habit routine data via unconscious thinking1 processes.

In addition, much of the research that has been conducted in the effort to illustrate the characteristics of schemas has used language oriented material in the experimental tests. The accuracy of memory in the recall of stories recounted to subjects was studied, for example, to explore how the learning of the story was superimposed upon schemas about typical aspects of stories in general. But since I have proposed that language is itself only a resonance to thinking1/2 processes, (symbolization), occurring well after and only in reaction to habit routine search and resulting thinking2 processes of checking, analysis, and so on, then of necessity habit routines do not themselves exist in terms of linguistic structures. Language itself is not what is stored in LTM, although the means (the data for the construction of habit routines) to produce or reconstruct it most certainly are. I have proposed that the HRS process is one of the earliest to have been evolved in the animal nervous system, and this would certainly not agree with the hypothesis that the data of habit routines was stored in terms of language (an error and abuse-prone, add-on option only available on the very latest models of animal life!) The study of the manifestation of habit routines through experiments utilizing language therefore misses their essential character. If we can observe the effects of habit routines through the study of symbolization processes we must not overlook the fact that we are not eliciting the properties of habit routines themselves, only their effect upon subsequent mental events.

An argument of economy supports the contention that habit routines are constructed rather than accessed in situ. If schemas or habit routines existed already structured in LTM, then a particular important bit of information that related to many different habit routines would have to be

stored in many different ways, redundantly, in order to be present in the very many habit routine structures requiring it. If the habit routine is manufactured afresh each time it is needed, the bit of information need only be stored once. This is an oversimplification however, since it is debatable whether the storage of "data" in the brain can be conceived of on the computer model of the storage of "bits" or "bytes" of "data". Nevertheless I still believe the argument of economy above is significant.

My belated discovery of schema theory as such a close fit to my own model was in one sense a disappointment. It is always gratifying to believe that one's work has originality. But I also found an encouragement: If I had proposed the habit routine model of cognition as a deduction from observations of the effect of psychedelic drugs, (and in this I was sure to have many, many critics), yet the model proposed had so many similarities to a theory which "has exerted a strong theoretical and experimental influence on cognitive research" in Schacter's words, then my ideas about psychedelic experience might not be too far off the mark. I had arrived at a theoretical viewpoint from my study of psychedelic experience which replicated current thinking in cognitive science, about which I had studied very little.

I hope I have been able to convey the cognitive nature of habit routines as I understand them. If "Bartlett's notion of a schema is rather fuzzy", I expect that it will also be said that my own notion of habit routines is also somewhat nebulous. But the same could be said of many current theoretical approaches to the working of the human mind. The controversies and radically opposed paradigms in this endeavor are a sure sign that our knowledge is yet primitive and introductory, but also that a fruitful and rapid evolution of understanding is imminent. In this chapter I have tried therefore, not to propose a precise definition of what a habit routine may be, but rather to illustrate some of the things it may be in relation to several known phenomena. I am intentionally leaving the concept of a habit routine open to further development and more precise elaboration. If the habit routine search and suspension model is in fact useful and widely applicable, it

will take more time and better minds than mine to develop the idea satisfactorily. It is an ongoing effort on my part to study the great volume of theories, models, opinions, data and sheer speculation that has been advanced in the very difficult task of understanding the human mind and how it works, but professionals in this field who spend their lifetimes in the universities and laboratories are far better equipped than I to continue this work.

Necessarily, I have omitted mention of many research studies about phenomena which seem to fit well with my model, but which would have overly encumbered the present text to describe. If at the end of the last chapter I mentioned the risk of seeing habit routines everywhere, the reader will now see that, if they are not omnipresent, my model at least intimates that they are pervasive in a way that has not at all been suspected in theories of the operation of mind/brain. I believe that habit routines are fundamental, that HRS is the primary cognitive operation of the brain/mind, coming before and providing the very structure for the operations of mind of which we have everyday awareness; and very importantly, due to these characteristics, that the HRS process is greatly obscured by its own operation. Only in the modification of its operation (gradual and unsurprising in the case of meditation, for example, radical and unmistakable in the case of psychedelic experience), can we even suspect its existence, and attempt to understand its characteristics and functions.

In the next chapter I will attempt to postulate neurological mechanisms of the brain which might be associated with the formation, use, and modification of habit routines, as well as some of the other functions of mind that I have discussed. Due to the present state of our knowledge of the nervous system, my attempt will certainly be fraught with error, not least because my own knowledge of neuroscience is self-taught, and only (so far) a year in the making. But I thought it would be useful to at least define some neurological possibilities for the habit routine model, and it has been quite alot of fun to do so. If professional neuroscientists will find it child's play to show where I have erred, I would ask their indulgence to suggest better neurological models rather than use my admitted status as a novice to reject the whole theory of psychedelic experience. In the act of too facile a dismissal of the new ideas, (as

has repeatedly happened in the history of science), they might in the present case be providing evidence for the very theory they are rejecting out-of-hand!

"...Psychedelics actually break habits and patterns of thought.
They actually cause individuals to inspect the structures of their lives and make judgments about them."

—Terence McKenna

References

(1) Shamanism, Archaic Techniques of Ecstasy, Mircea Eliade, Princeton University Press 1951, 1972 p417. (back)

(2) See Richard Evans Schultes and Albert Hofmann, Plants of the Gods, McGraw-Hill 1979; Schultes and Raffauf, Vine of the Soul, Synergetic Press 1992; and the numerous references therein. (back)

(3) This is a term I shall employ in later chapters. (back)

(4) See "Neuronal vs. Subjective Timing for a Conscious Sensory Experience", and other reprinted papers of Benjamin Libet in Neurophysiology of Consciousness, Benjamin Libet, 1993, Birkhäuser Boston. (back)

(5) References here could be cited back to ancient Greece, I suspect. But a very cogent example is John R. Searle, The Rediscovery of the Mind, 1992, MIT Press, p136. See also Nicholas Humphrey, A History of the Mind, 1992, Simon & Schuster, chapter 14. Both of these, and other recent popular treatments give a good overview of such hypotheses in 20th Century research, and what they might indicate about the process of perception and the nature of consciousness. (back)

(6) Behavioral and Brain Sciences 10 (4), (1987) p781. The original article and extensive peer commentary appeared in

ibid. 8 (4), (1985) pp529-566, "Unconscious cerebral initiative and the role of conscious will in voluntary action". (back)

(7) Richard E. Cytowic, M.D. in The Man Who Tasted Shapes, p170, 1993, Jeremy P. Tarcher/Putnam (back)

(8) Guy Claxton in Noises from the Darkroom, p224, 1994, Aquarian/HarperCollins (back)

(9) Consciousness Reconsidered, Owen Flanagan, 1992, MIT Press, pp136-138. (back)

(10) See Michael I. Posner, Foundations of Cognitive Science, MIT Press 1989, pp695-697 "Memory", by Daniel L. Schacter for a summary and further references of original research papers. (back)

(11) Quoted from Human Memory, Theory and Practice, Alan Baddeley, 1990, Allyn and Bacon, p268. (back)

(12) Ibid., p270 (back)

(13) Ibid., p271ff. (back)

(14) The Astonishing Hypothesis, Francis Crick 1994, Charles Scribner's Sons, in chapter 4, "The Psychology of Vision" pp54ff. (back)

(15) Crick lists the references: Ramachandran, V.S., "Blind Spots" Scientific American 266:86-91; "Perceptual Filling In of Artificially Induced Scotomas in Human Vision" Nature 350:699-702; and "Filling In Gaps in Perception: Part 2, Scotomas and Phantom Limbs" Current Directions in Psychological Science 2:56-65. (back)

(16) Ibid., p. 57. (back)

(17) The Man Who Tasted Shapes, Richard E. Cytowic, M.D., 1993, Jeremy P. Tarcher/Putnam (back)

(18) Ibid., p128-129. (back)

(19) An Anthropologist on Mars, Oliver Sacks, Alfred A. Knopf , New York 1995. See the chapter entitled, "To See and Not to SEE". (back)

(20) Bruner and Postman, "On the Perception of Incongruity: A Paradigm," Journal of Personality, XVIII, (1949), 206-23. (back)

(21) Thomas S. Kuhn, The Structure of Scientific Revolutions, Second Edition, 1970, The University of Chicago Press, pp62-64. (back)

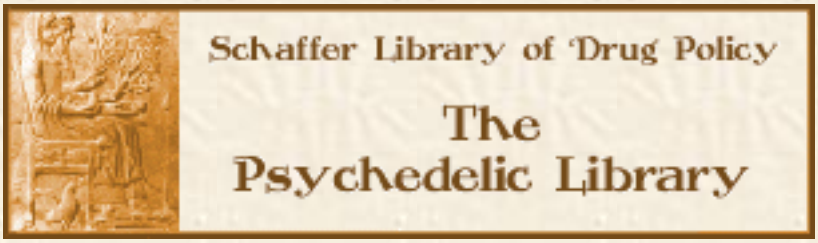
(22) See Francis Crick, The Astonishing Hypothesis, 1994, Charles Scribner's Sons, chapter 4, "The Psychology of Vision" for some nicely illustrated examples of the vase/profiles and other visual illusions. (back)

(23) F.C. Bartlett, Remembering, 1932, Cambridge University Press, p201. (back)

(24) J.M. Mandler "Categorical and Schematic Organization in Memory", 1979, quoted by Daniel L. Schacter in Foundations of Cognitive Science, Michael I. Posner, ed., 1989, MIT Press, Ch 17, "Memory" p692. (back)

(25) Ibid., pp 336-337 (back)

Chapter 5 | Table of Contents



The Center of the Universe

William S. Moxley

5. Neuromechanics — The Minefield

PROPOSING A REASONABLE NEUROLOGICAL MODEL for the operation of the habit routine search process is not the first minefield that I have had to navigate. Back in the U.S.A. it seemed a straightforward thing to continue the research which so few seemed to have the motivation for; several people had offered varying degrees of support for such projects, but as I mentioned previously, motivations are a funny thing. My own seemed at the time to be relatively uncomplicated, and in retrospect, although I may tend to tidy up my autobiographical act with a few convenient omissions and over-telling of some of the high points, je ne regrette rien.

Coincidences, mysteries, personal lessons, and strange experiences of the most diverse character, as significant and soul-searching as the Mexican earthquake experience, continued with a very suspicious frequency. I have previously mentioned my ability to bear up under the influence of any drug or shamanic potion, and I sometimes found this ability of even greater value in dealing with the people and day-to-day events playing a part in the unfolding of my work. The idea that the shaman himself must deal with forces and destinies on a far more fundamental level than the members of his tribe is, of course, the very spirit and tradition of shamanism. If powerful psychedelic experiences were to benefit members of the tribe, the shaman must have

already explored the same territory, and gone well beyond to the very limits of his abilities. In the present case where the shaman not only administers the powerful medicines, but actually creates them with the tools of modern science, his knowledge and intentions are perhaps even more important.

Thus, in the case of what turned out in some ways to be a rather successful collaboration between myself and a trio of avowedly enthusiastic partners, the passage of time and the achievement of some degree of success seemed to distort the relations between us in a way very reminiscent of a kind of vicious parody of the psychedelic experience itself. Meetings and discussions of plans and goals at first were nothing less than inspiring. Between us we had the connections and ability to obtain the necessary raw materials, manufacture a high-quality product, and distribute it in such a way that it would reach the right people.

We certainly did not advocate or intend any sort of mass distribution of psychedelics resulting in their misuse or ignorant use, which would only call attention to a situation easily besmirched by adverse publicity. Sensational, fear-mongering publicity had already made it much more difficult to properly initiate or introduce a newcomer to the psychedelic experience. There was certainly a case to be made that many negative experiences were a direct result of the adverse publicity itself, for in the early, pre-publicity days of psychedelic research, "bad trips" were a rarity, even among alcoholics and psychiatric patients. With normal research volunteers, the statistics noted by the many researchers indicated the astonishing safety of psychedelic drugs, not risk. Now the publicity made it seem that, although an Aldous Huxley or Alan Watts might get through a psychedelic experience unscathed, the normal member of society should realize that the potential risk was overwhelming. And this kind of official attitude weighed heavily on the person interested to undergo an experience: even if such a view could in principle be seen for the hysterical, prohibitionist, puritanical mindset that it in reality was, the slightest lingering doubt had the possibility to poison a person's trust in himself and his shaman.

It is perhaps easier to see demons where there are none to be found. And if demons are encountered, the idea

that they are exterior, real, and caused by something other than oneself is certainly not conducive to understanding their meaning. As the Habit Routine Suspension model demonstrates, the psychedelic experience is no roll of science-fiction film projected upon consciousness from the outside. If demons are encountered, they are in reality our everyday friends seen without the normal range of categorizations which render them ordinary and insignificant.

The demons which appeared to disrupt our successful enterprise were therefore more real than those of the imagination. I can only suspect a hidden agenda on the part of my co-workers, but the nature of their intentions at the end was so at odds with the honest enthusiasm of the beginning that I suspect that the hidden motivations must have developed over time. From the original enthusiasm there seemed finally to have evolved a plan to demonstrate once and for all that the psychedelic experience was, in fact, illegitimate, or at least unnecessary, its insights illusory, its history merely primitive self-delusion. To arrive at the establishment reactionary position through first having professed a more universal and enlightened view seemed to me altogether impossible. This demon was real. And what was I going to do about it?

The final scene was quite surreal. The night before, one of my partners presented me with a five-hundred dollar banknote, subtly making sure that I noticed the portrait on the face of the bill, that of the "assassinated leader", William McKinley, twenty-fifth president of the United States. At most, I felt only the slightest premonition of the events the next day would bring, for which we were planning a day of skiing, and restaurant to follow. Whether the banknote, and perhaps other similar but unrecognized intimations were apparent I do not remember, but in the morning I decided to take a small dose of LSD, to appreciate a day in the high snowy mountains from a different perspective. In retrospect, I find that I instinctively tended to undergo a psychedelic experience at points in my life where a certain crossroads was about to be reached, when perhaps only vaguely realized intimations of important changes to come had appeared. Without fail, the experience would precipitate whatever it was that was pending, and ignite the insight and decision that would usher in a new

direction.

My friends were newcomers to skiing, and I had promised to help them get their sea-legs, so to speak. Upon arriving, I sent them off to the rental shop to secure their equipment, and I took a test-run on the nearest slope. It was exhilarating! Although there was quite a crowd that day, the scene was magnificent. Arriving at base, my friends had not yet reappeared, so I continued on up again to the irresistible heights. The next time down the crowd was getting thick enough to make locating my friends problematic, and in my present state of exhilaration I couldn't begin to devise a sure-fire method for finding them. I had to assume that, although our original plan seemed to be going astray, they would nevertheless have suited up and found some incidental help with their first few glides on skis. After a few more runs I began to feel, in contrast to my exhilaration, a gnawing guilt that I had ignored my friends, even if through a concurrence of events which I could not have foreseen. The LSD experience, despite the very modest dose that I had taken, was attaining a peak more spectacular (in more ways than one) than those amongst which I was gliding.

Suddenly my friends appeared, and I knew that my neglect had ruined their day. But the intensity of my feelings, and their reaction as well, seemed all out of proportion to the reality of the situation. There was far more significance afoot than a simple evaluation of the day's events would warrant. My apologies, and their subdued yet somehow exaggerated insistence that it didn't really matter, were a mere facade for the emotion that was all too evident in just a glance. Somehow aspects of the entire relationship in our joint involvement in the psychedelic project were metaphorically represented here, and they were threatening a tumultuous final act upon the stage whose players had to date seemed so reassuringly without calculation or subterfuge.

The situation while driving back continued to intensify. I began to see through the cracks in reality, the physical manifestations of which became more and more a flimsy veil affording less and less protection against immediate dissolution into the hidden dimensions beyond. If my friends were worried about my driving on the slippery roads, I think that they too must have sensed, more

importantly, that loyalties and intentions concerning our collective enterprise was the real issue that was coming to a head. At the restaurant, under the influence of good food and wine and associated conversation, the electricity subsided somewhat, and it seemed that things might be patched up with a resulting return to a situation that we all now realized had more of deception than honesty. If we could return to business as usual, we all now knew that on a more fundamental level, all was changed. This is not, and never has been, a situation from which effective shamanism can work its benefits to the full.

Later at their house, in front of a warm log-fire, I continued to ponder on this last point. So far, absolutely nothing explicit had actually been discussed concerning the impending crisis that we each knew to be imminent. An outsider could not have detected that anything more than the superficial was transpiring, yet in each others' presence, a mere glance was like a trumpet fanfare announcing major discoveries about a hidden side of our co-involvement. It must have been past midnight when in walked partner number three, whom I had seen only a few times. He lived quite far away, and I was surprised to see him at this late hour, but the others apparently had expected his arrival. After some lengthy and private discussion in the kitchen, they reappeared, and, very tentatively at first, began to suggest to me a most surprising plan.

I had recently been working on some advanced techniques for making our product in a more purified form, and had been meditating about my experiments probably as a way to suspend thinking about the more serious implications of the day's events. At my partners' first mention of LSD I immediately launched into an attempted discussion of my recent experiments, perhaps also hoping to repair the situation: At every stage of my work it was of primary importance to me to be able to continue, even if this involved having people associated with the project who neither knew nor cared about the larger implications. If a partner was interested in nothing but the cash-flow, for example, I tried to cope with the deficit temporarily until something better presented itself.

But something was seriously wrong here. One of my partners was now saying to me that he didn't like the effect of LSD, it seemed dirty to him, made him sick rather than

giving him inspiration. Despite the day's events and the suspicions that had been aroused I was quite shocked, and speechless. Gradually the hidden agenda was presented: what I was to do, was to prepare a large batch of placebos. Make up what I would say was a batch of the purest LSD that had ever been made, give them away free to all my contacts for distribution, and pass along the message that everyone was to wait until the vernal equinox, then take the new psychedelic together. The trick was, they would be entirely inactive, blank doses with nothing but an implied message from... Yes, from whom? Who was the author of this message? Was this idea a brainstorm of my partners, suddenly having seen a vision that drugs were the tools of the devil? The apparent honesty of our relationship so far in contrast to the way that the plan was presented, and the things that were said that night, including the implied threats (the McKinley banknote was burning in my pocket), and also the implied promises of new and greater projects and responsibilities for me if I could only see the wisdom of this plan, made it plain to me that the tiger I had by the tail was rather larger than I had heretofore suspected.

Well, the activation of my consciousness by the dose I had taken, and these astounding changes of identity made manifest that day, made the indoctrination as effective as a lengthy torture and brainwash session in North Korea. I quite forced myself to believe the idea had some merit, and for the next few days, more than half-heartedly prepared a large batch of chocolate covered placebos in line with the master plan. The chocolate coating was to prevent anyone examining the underlying substrate and possibly suspecting that there was less than meets the eye about this plan for a glorious first-day-of-spring celebration.

I carried through with the lie to the bitter end, I don't think there were any suspicions, and I myself boarded a train for the Grand Canyon to be (1)out of reach when the chocolate hit the fans and (2)in a nice spot in case of the highly unlikely event that the Millennium was actually going to begin that day. It didn't, and the feedback from the experiment was less than respectful. My former partners disappeared from the scene to cope with more petty problems and new coincidences materialized out of nowhere to enable the next stage of my ongoing quest.

There is an old Negro Spiritual that was in the 1940's made into a "Jazz Soundie", the equivalent of today's rock video as seen on MTV. I have a wonderful 3-minute version of "Dem Bones" by the Delta Rhythm Boys, sung in close four-part harmony; it starts with the refrain,

Ezekiel connected dem...DRY BONES,

Referring of course to Chapter 37 of the Old Testament Book of Ezekiel in which the prophet is commanded to "Prophesy upon these bones: and say unto them, O ye dry bones, hear the word of the Lord." Whereupon, as in the refrain of the song,

Oh, de toe bone connected to de...FOOT BONE,
De foot bone connected to de...HEEL BONE,
De heel bone connected to de...ANKLE BONE,

And so on up to "de HEAD BONE". I hadn't watched my collection of "Soundies" in quite some time, but humming in the shower late one night, meditating on my recent neurological studies and lack of satisfaction of their power to explain processes of mind except in a very rudimentary manner, the tune suddenly popped into my headbone. It occurred to me that current neuromechanical models of how the collection of parts in the brain is supposed to produce mind, behavior, thinking and perception, was very much a Dry Bones Model of Neuromechanics. (Substituting brain part names into the song quite ruins the rhythm however: de caudate nucleus connected to de...CEREBELLUM, de locus coeruleus connected to de...ANTERIOR CINGULATE GYRUS, you get the point.)

The textbooks carefully told the student what was connected to what, and suggested sometimes that a particular part "was thought to be involved in" some function or other. And to my further dissatisfaction, slowly compiling again and again my own map of brain connections, my studies had

revealed that practically every brain part was connected to every other brain part: each brain map I plotted quite soon became filled up with arrows, and quite useless. It seemed that mainstream neuroscience, in spite of its great and rapidly increasing wealth of assuredly precise data, had little to say about the functions of all these parts on a systems level; understanding how to get to psychology from neurology, how to get mind out of brain, was still at the level of expecting dry bones to suddenly, as the song's second verse goes, after "dem bones" have been connected,

Dem bones, dem bones gonna'...WALK AROUN'...

The neuroscientists, without such divine intervention as Ezekiel had access to, simply were not able to show decisively how connections of the nervous system could produce even simple psychology, much less consciousness itself. My own efforts to suggest brain systems and connections that might allow the operation of the habit routine search cognitive process would therefore be no less tentative and imprecise, certainly due for major revisions as new evidence was discovered.

In the case of memory, so fundamentally important to everyday life and to the operation of my proposed habit routine system, it is therefore still very much a matter of debate as to how information is stored in or associated with the properties of the neurons in the central nervous system. The "data" representing the various types of memory, including habit routines, must in some sense be "in the brain" and by extrapolation must somehow be associated with the properties of neurons and their connections, but the wide diversity between current theoretical viewpoints illustrates more our lack of precise knowledge than an emerging paradigm. Perhaps the most popular model of information storage at present is that of the adjustment and long-term maintenance of the strengths of the connections between neurons. This is supposed to occur by the modification of the neuron's synapses, the junctions by which neurons communicate using chemical neurotransmitters.

This "neural network" or "synaptic weight" model

lends itself to ready simulation on a computer and is probably on one end of a scale ranging from extreme reductionism, to another extreme which reductionists usually brand as mysticism. An example would be the ideas about memory advanced by Rupert Sheldrake, that the actual memory information is resident in some quasi-independent memory field which may allow such phenomena as telepathy, apparent reincarnation and so forth, the physical brain being merely the sender-receiver of memory to the common field by a process of morphic resonance. (1) In looking at the broad range of sometimes very enigmatic properties of memory, and the admitted uncertainty and disparity of views by the experts, no model should be routinely dismissed if it has any explanatory power whatsoever.

The synaptic-weight model probably owes its status to the power and success of computer science, the enormous investments and hence large number of talented scientists working therein providing a momentum of opinion which may unduly limit the credibility of other well-constructed but competing models. It cannot be denied that very impressive mathematical models and computer simulations of "intelligence" have been demonstrated, and shown to have similarities to the ways in which we believe human intelligence to operate. It has also been well demonstrated that synapses between neurons (as well as the size and connectivity of the neurons themselves) can and do change their characteristics for varying lengths of time under the influence of learning processes. The power and sophistication of neural network models (see for example descriptions of the operation of the Hopfield Network as a mechanism for the storage/retrieval of information) (2) are certainly impressive. The fundamental question which remains to be resolved, however, is whether the brain works anything like a computer. There is currently raging a most entertaining debate on this subject, some of the most powerful intellects of our time are joining the battle, (see, among others, works by Churchland, Claxton, Crick, Dennett, Edelman, Flanagan, Fodor, Freeman, Gazzaniga, Hofstadter, Humphrey, McGinn, Penrose, Searle, Tallis, Tulving, the list is so long there is no recourse but to leave out mention of many more. Some titles are listed in the Bibliography).

Steven Rose, himself a veteran of many years of

research attempting to identify brain sites involved with storage of engrams or memory traces, has recently summarized criticism of the computer-like, information-processing model of brain operation. (3) Particularly of interest, as Rose points out, is a critique by the neurophysiologist Walter Freeman, for it is solidly based on research findings: Freeman insists that, although changes to various individual neurons can be observed to happen as a result of learning, the "information" that is learned does not subsequently exist as "bits of data" recorded in these neurons (the computer paradigm). Rather, the memories of the learning exist as fluctuating dynamic patterns of electrical activity generated by the entire brain. As Rose puts it,

> [The] experiments say that it, the engram, is not confined to a single brain region. But I want to go further than this, and to argue that in an important sense the memory is not confined to a small set of neurons at all, but has to be understood as a property of the entire brain, even the entire organism. (4)

An intriguing suggestion has been that the storage of information in the brain is analogous to the storage of information in a hologram, a model which was first developed by the neurosurgeon Karl Pribram in the 1960's. (5) The idea that brain activity might be non-local, a process of the generation of distributed waves of activity which interact to form interference patterns, had been suggested in 1942 by Karl Lashley, whose pioneering research on the brain had inspired Pribram during their collaboration at Yerkes Laboratories. Freeman's experimental findings, as well as the observations of Steven Rose above, are exactly what one would expect from a brain operating on holographic principles. The view of memories existing as "fluctuating dynamic patterns of electrical activity generated by the entire brain", could not embody holographic principles more strongly.

Although criticism of the so-called holographic paradigm has come from many directions, the parallels between the mathematical and physical facts of optical

holography and many known properties of memory and the brain suggest that further research will tend to support rather than discredit the model. In a recent paper Pribram elaborates on some of these parallels:

> The following properties of holograms are important for brain function: (1) the distribution and parallel content-addressable processing of information – a characteristic that can account for the failure of brain lesions to eradicate any specific memory trace (or engram); (2) the tremendous storage capacity of the holographic domain and the ease with which information can be retrieved (the entire contents of the Library of Congress can currently be stored on holofische, or microfilm recorded in holographic form, taking up no more space than is contained in an attache case); (3) the capacity for associative recall that is inherent in the parallel distributed processing of holograms because of the coupling of separate inputs; and (4) the provision by this coupling of a powerful technique for correlating (cross-correlations and autocorrelations are accomplished almost instantaneously). (6)

It is a curious fact of the history of neuroscience that Pribram's work during the 1960's and 1970's was almost unanimously rejected by the mainstream: he was for two decades practically the only proponent of the theory of distributed representation of memory (distributed coding) in the brain. At the time, nearly all theoretical work leaned strongly toward the assumption of detector-cell coding, (7) a model strictly analogous to computer, bit-storage processes, with a precise location in the machine being responsible for the storage of a uniquely defined unit of information. Today the mainstream neuroscientists have taken the opposite tack: distributed processing and storage is their byword, yet Pribram's holonomic theory is still widely rejected, even though in an important sense it is part of the foundation of recent theory. Francis Crick's assessment is typical:

> This analogy between the brain and a hologram has often been enthusiastically embraced by those who know rather little about either subject. It is almost certainly unrewarding, for two reasons. A detailed mathematical analysis has shown that neural networks and holograms are mathematically distinct. More to the point, although [artificial] neural networks are built from units that have some resemblance to real neurons, there is no trace in the brain of the apparatus or processes required for holograms. (8)

To state that neurosurgeon Pribram and his recent mathematician colleagues "know rather little about either subject" is a bit stiff, and the observation that there don't seem to be any lasers or such holographic equipment in the brain itself demonstrates ignorance of the two subjects. Pribram counters such criticism with the warning, "It is important to realize that holography is a mathematical invention and that its realization in optical systems...is only one product of this branch of mathematics." In other words, optical holography is merely a special case of a wider and more fundamental process for the encoding and reconstitution of information. For this reason it was suggested that the term holonomic (9) be used in reference to brain/mind properties, a term I shall adopt here. The term holonomic as used in physics, also indicates that the process is not a static, frozen-in-time representation as is a hologram, but a dynamic, continuous one.

Further rebuttal, including a short history of the criticism of the holonomic theory can be found in a recent paper by Pribram and his colleagues. (10) The most recent and complete exposition of holonomic theory is presented in a book covering the 1986 John M. MacEachran Memorial Lecture, (11) delivered by Pribram. The book demonstrates that the holonomic theory has progressed both conceptually and mathematically far beyond its introductory position of the 1960's; it is the original and necessarily simplistic exposition of the theory which is still attacked by the critics of today who remark (along with other trivial

complaints) that "there don't seem to be any lasers in the brain".

Other criticism of the holonomic model of memory storage and retrieval has been derived from the perceived contradiction with the accepted dogma that regulation of synaptic weight must certainly be the only possible storage mechanism in the brain. Synaptic weight distributions are quite amenable to neural network, viz. computer-like models of brain/mind function, but it was very difficult to see how synapses could function as a storage medium for the interference patterns implied by holonomic models. Yet the idea of learning and memory storage by neural networks is itself by no means universally accepted. Concerning the much-touted ability of computer analogues of neural networks to learn, Jerry Fodor remarked: "Much has been made of this, but, in fact, it's a tautology, not a breakthrough." (12)

A very promising idea which would obviate some of these objections to the holonomic model has been the recent suggestion that the site for storage of information is not the synapse per se, but associated with the microtubules making up the cytoskeletal structure of the neuron itself. (13) (The synapse is known to be in indirect yet intimate contact with the microtubule structure of the neuron.) This model has the immediate advantage, as Hameroff points out, of increasing the potential effective complexity and storage capacity of the brain by about seven orders of magnitude, (14) but there are many other attractive aspects to the model as well.

It would seem that the synapses are concerned primarily with the large-scale systems of the brain, they are the functional units enabling coordination and signal transfer between distinctly separate, sometimes distant locations. For example, they enable the experimentally-demonstrated phenomena of the sequential processing of sensory information from primary sensory cortex through several levels of associational cortex. Another example would be a neuron in a brain-stem nucleus such as the locus coeruleus: it may project the entire distance to an area of the cortex before synapsing on another neuron. As a first consideration, the synapses thus seem involved with the switching and transfer of information (analogous perhaps to the transistors or switches in the central processor of a computer). To assign them the double duty of also being the

storage site for the information which they manipulate seems merely a default position (the synaptic-weight model). There is more logic to the idea that the information that is manipulated via the synaptic connections has been accessed in structures or locations independent from the synapses, otherwise the duty of the synapse in one function would seem to necessarily limit its capacity for the second function.

Having looked into the neural network models of brain function, I realize how easy it would be to reject the foregoing argument if one is convinced of the validity of such a model. But it is my own view that, although neural networks seem to simulate brain/mind operation in some trivial respects, the "connectionist" paradigm as it is called is as primitive and misleading a model of the human brain/mind as is the planetary model of the atom (discussed in chapter 2). From this viewpoint, neural networks may be useful for modeling "intelligent" processes up to the level, say, of creating robots for assembly-lines or for playing chess, but to extrapolate from there to say that by adding a few more bells and whistles, or even many additional layers of mechanical or electronic complexity to these beasts, we will then have duplicated the human mind in a machine... Well, to me and many others that is sheer folly. I am all for letting the connectionists connect, and the AI (Artificial Intelligence) crowd continue their quest to reproduce themselves asexually, but they do tend to pummel the less-well financed competition with epithets worthy of the flat-earth advocates of a bygone age. Hence the present riposte.

The combination of the holonomic storage/retrieval model with the hypothesis of micro-tubule based storage sites thus seems even more promising: Hameroff's paper even suggests that the microtubules of neurons might provide a location where coherent photons would operate (viz., the kind of light necessary for optical holography). In constructing my own model of brain operation, I have tried not to depend irrevocably on any particular view now contending, including the more conservative ones. Yet due to the wide disagreement between the positions of the several groups of theorists, I have felt justified to freely use some of the more speculative suggestions such as holonomic operation and storage, if only as temporary visual, heuristic devices. Since my intention is merely to suggest a

possible mechanism for the operation of the habit routine system, (and at the present stage of neuroscience, it would be unrealistic to hope for more), my overall theory of psychedelic experience would not be damaged by further research indicating the brain had many further tricks up its sleeve. The holonomic, microtubule hypothesis, although it may well be found to describe the actual operation of the nervous system, will for my purposes merely provide a convenient conceptual model facilitating the understanding of the operation of the brain systems responsible for habit routine search and suspension and other proposed operations involved with psychedelic experience. I thought it valuable, however, to introduce the holonomic model on a level which would show that it was far more than "New Age Techno-Babble", an implied if not explicit critical view now prevalent.

Figure 2 illustrates the location of just a few of the major brain-parts for the benefit of the general reader. But in the interest of brevity and concision, I will not attempt to diagram or explain entry-level details of the model I shall now present, either in the case of the properties of neurons, or the general views concerning the functions of the various brain components taking part in my own theoretical view. For the layman, the Glossary will be of some help, but a survey of a textbook such as Principles of Neural Science (Kandel, Schwartz & Jessell), would be indispensable for evaluating the proposed model in detail, and comparing it to standard textbook views representing current paradigms.

FIGURE 2. The Right Half of the Human Brain. Viewed from a vertical plane bisecting the brain into its left and right hemispheres. A through F: Areas of the cortex. A: Prefrontal area. B: Anterior Cingulate Gyrus. C: Frontal Lobe. D: Parietal Lobe. E: Occipital Lobe (primary visual cortex). F: Temporal Lobe: most of this area of the cortex is on the outside of the far side of the brain, hidden in this view. G: Cerebellum. H: Thalamus. Encircling the Thalamus are the Hippocampus, the Amygdala, the Basal Ganglia and other parts of the limbic system. I: Pons. J: Midbrain, area in which are found the various brain stem nuclei including the Raphe Nuclei, the Locus Coeruleus, the Substantia Nigra, etc. K: Medulla. L: Spinal Cord.
(Modified from Nieuwenhuys, et. al., The Human Central Nervous System).

I have mentioned that most brain areas are connected to most other brain areas, the multiplicity of connections between parts becoming obvious and soon quite bewildering when one starts examining the various brain "maps" in Nieuwenhuys' book, for example (the source of the diagram in figure 2). In addition, it is found that nearly all of the connections are two-way, the connections between the thalamus and the primary sensory areas of the cortex, for example, being reciprocated by nerve pathways (backprojections) in the opposite direction. It is problematic therefore to construct a diagram for the supposed "flow of information" in the brain: if the retina of the eye, for example, sends its "visual data" to the thalamus (which has been likened to a relay-station for sensory data), and then the thalamus sends this signal to the primary visual cortex for the first stages in the processing of visual information, why should the primary visual cortex send a nerve pathway directly back to the same area of the thalamus from which it has just received the data? The backprojection is not insignificant: recent findings indicate in the case of vision that there are ten times as many nerve fibers in the "backwards" direction as in the direction in which "information" is supposed to flow! The size and importance of the various interconnections (15) seems to indicate that the actual sensory "information", the environmental data ENV in figure 1, constitutes only a minor part of what is being "processed" in the brain! Current computer "data-flow" models of brain operation cannot explain the facts of the existence and relative importance of backprojections, as even the best workers in the field will admit.

But this is exactly what one would expect for a brain architecture that operated according to the habit routine model of cognitive function. The environmental data merely provides cues for the elaboration of the far more complex informational entity of which we become aware, the habit routine complex. It is far more complex, because it is generated from the entirety of previous experience stored in memory, whereas the actual environmental data is quite limited in scope not least by the limits of the sensory organs themselves. In size and complexity, the nerve pathways carrying the primary sensory information to the

cortex are among the less important connections of the brain. To be sure, the environmental input is necessary: when you shut your eyes, vision promptly ceases. But this effect itself may be heavily dependent upon the operation of habit routines. We are all absolutely and automatically certain that vision must cease when we close our eyes, and would be profoundly confused, (if not shocked into psychosis!), were it to be otherwise, even for a few seconds.

There is a computer analogy that could be made in the attempt to account for the curious facts of neural reciprocating connectivity, that the signaled area must send back a return signal indicating that it has received information, like two modems do as they talk to each other. But this would not explain why return pathways are so much larger. I would propose that something much more interesting is taking place. In the case of the nerve pathways from the thalamus to the primary sensory cortex areas (and back again) for the various sensory modalities, I believe it is useful to hypothesize that a reverberation is being established with the two-way signaling, and that this reverberation is a dynamic informational entity having holonomic properties.

The thalamo-cortical reciprocating nerve connections set up for each sensory domain a dynamic reverberating holoprojection of information, which is constantly updated and modified with the newly arriving signals from the sensory organs. It would require a much higher density of nerve pathways to set up and maintain such reverberation than to feed in the flux of newly arriving ENV data, thus explaining the relative importance of the brain connections between the sensory receptors, the thalamus, and the areas of the sensory cortex. The suggestion of similarity to the projection of a holographic image is intentional, for I believe that, not only are the mathematical principles which predict and describe optical holography applicable to memory storage, but also to the ongoing operation of many of the systems of the brain. In comparison to optical holography, it can also be maintained that the relation between a given unitary nerve signal (the electrical action potential of a neuron) and the overall holoprojection to which it contributes, is analogous to the relation between the unitary nature of one grain of photoemulsion making up a

hologram (the "photograph" of the interference patterns produced in optical holography), and the resulting projected holographic image. The single grain of emulsion on the photographic plate may only be either "on or off" like the neuron, yet it theoretically represents the entire holographic projection, (16) albeit with a resolution of zero. It is the same for a single action potential: it represents the entire holoprojection, but with zero resolution.

Someone familiar with holography would certainly ask, but how and where are interference patterns produced, certainly any holonomic process implies their existence, for it implies the interference of two or more signals? Dropping one pebble into a still pond produces concentric waves, but dropping two pebbles produces an interference pattern between the two sets of waves. So it may be with the nerve signals of the brain. It is well known that neurons in their various nerve pathways have a background rate of firing which, for all intents and purposes, seems to be merely random noise. Here is pebble number one. Pebble number two (in the case of the primary sensory holoprojections), is the impinging signal from ENV (of figure 1), the signal coming from the sensory receptors.

Thus the resulting holoprojection is the product of a dynamic interference pattern resulting from at least two distinct signals, and is amenable to expression as mathematical transform coefficients analogous to the mathematical operations which describe optical holography. In the nerve pathways maintaining a primary sensory holoprojection, the microtubules of these neurons record and dynamically maintain the transform coefficients which represent the information necessary for the neuron firings to maintain the reverberation. The coefficients are constantly updated with the sensory signal from the environment, which also exists as a transform of the interference patterns actually received by the sensory receptors. Thus there are two sets of coefficients representing the two signals, together they contain the information necessary to maintain the dynamic holoprojection in time. It will be seen that even the background firing of the neurons, the resident signal, is not merely random noise, for it is generated from the coefficients resident in the microtubules and represents the holoprojection in

temporal cross-section. The constant arrival of the ENV signal produces the dynamic aspect of the primary holoprojection.(note)

But the combination of signals to produce interference patterns does not end with the primary sensory holoprojections, for as I shall explain below, holoprojections themselves combine and overlap, they become superimposed under the guidance of certain brain components so as to produce further interference patterns and thus further composite holoprojections. It can be seen that the "processing of information" in the brain is therefore accomplished using entire simultaneous fields of bound "data" from several, or even the entirety of all ongoing processes. The hypothesis of such a process conflicts radically with the computer, neural network model of the brain in which the serial processing (in parallel pathways) of discrete bits of information is the proposed mechanism. If experimental results begin to confirm the holoprojection model of brain operation, they will be a significant argument against the pursuit of strong Artificial Intelligence as it is presently conceived. Let us see how the fields of information I have called holoprojections might function in stages of brain operation beyond the primary sensory realm. First let us take a closer look at the thalamus, which plays so central a role in generating the primary sensory holoprojections which are the data fields upon which all further brain activity is based.

The thalamus itself is composed of many different nuclei, widely connected to other brain areas and interconnected as well. Thus in discussing the various functions of the thalamus, it must be kept in mind the great diversity of independent yet interrelated parts and functions comprising this centrally-important component of the brain. In the case of vision, after the signals have passed from the retinae through the optic chiasm which combines and distributes the visual signals from both eyes to the left and right hemispheres of the brain (the thalamus also is divided bilaterally), the visual signal that is to be used for updating the primary visual holoprojection enters a thalamic nucleus called the lateral geniculate nucleus, or LGN. The LGN then signals the first stage of the part of the cortex involved with vision, the primary visual cortex, and it is from this area that we note the very

important nerve pathways which return directly to the LGN. It is merely a convenience to say, for example, the signal is "passed" from here to there, and "then" passed...etc., for we must remember that all these processes are dynamic, continuous, and as I have proposed, reverberating and holonomic.

The function of the LGN of the thalamus thus appears to be as a "driver" for the reverberation between the LGN and the first stage of the visual cortex. As I have suggested, this reverberation may be thought of as a holoprojection which has at least two functions. Firstly, this informational entity is the first stage in the generation of (the visual aspect of) the habit routine complex, it contains the information which will activate from the frames of memory (stored in distributed manner in the same visual areas of cortex), the actual information which makes up the habit routine presented to thinking2 processes. Secondly, since this holoprojection carries, at least potentially, the original or "genuine" visual information, it will be used under certain circumstances to generate aspects of the visual scene that are detected as significant and to which the attention is directed. This will occur by a comparison or superimposition of the primary visual holoprojection with another holoprojection set up by the habit routine search system. (As explained below, significance detection may use the primary sensory holoprojections, or the memory data activated by these holoprojections instead).

An additional function of the primary visual holoprojection results in the phenomenon of iconic memory, the very short term visual memory trace that has been experimentally demonstrated. (17) An informational fragment of the primary visual holoprojection, since the entire holoprojection is being constantly updated with new visual data, would be expected to have a very short "half-life" comparable to the 200 to 500 millisecond iconic memory (up to three or four seconds under certain experimental conditions). Experiments with iconic memory have shown that it persists for greater periods when preceded and/or followed by a simple dark field containing little or no new visual information. Likewise, it may be interfered with by the process of masking in which a bright field of view, or interfering patterns are shown. This is exactly what would

be expected for the visual holoprojection model. A paucity of new visual data arriving to update the holoprojection would allow the reverberation to persist "as is" for a greater length of time. Data intentionally designed to confuse or interfere with the iconic memory would have the effect of overwriting the relevant aspects of the holoprojection (the transform coefficients stored in the microtubules of these neurons).

The extraction of the iconic memory must occur by other systems involved with thinking2 processes, again probably by the comparison or superimposition of holoprojections. There is more than speculation in the idea that such projections might be superimposed and compared to show similarities and differences, for the same kind of process can be carried out with optical holograms (in practice, I am informed, there are technical difficulties to overcome, but no theoretical restrictions). Two slightly different optical holograms, for example, could at least theoretically be projected so that they cancel each other except for the aspects in which they differ: only the differences would appear in the projected image. Likewise, two radically differing holograms having just a few identical features could be projected to emphasize their common features. In the brain, the process might be as simple as the addition and subtraction of the transform coefficients stored in the microtubules of the contributing neural systems. This would produce another set of coefficients representing the superimposition.

At the same time that the primary visual holoprojection is being generated, of course, all the other sensory systems are generating their own holoprojections, by similar mechanisms involving sensory receptors, the thalamic relay nuclei concerned with those senses, and areas of the cortex. Thus for hearing we get an audio holoprojection from which can be extracted echoic memory (analogous to iconic memory). The audio holoprojection is used to activate the audio domain of the frames of memory going into the generation of the habit routine complex. Tactile sensations and proprioception likewise produce their reverberations, and so forth.

The binding and superimposition of all the primary sensory holoprojections is accomplished by a scanning mechanism only recently detected by neurological

experiments. (18) This scanning operation is also carried out by a nucleus of the thalamus, the intralaminar nucleus. Now what is scanned is not the actual primary holoprojections themselves, but the memory information which they activate in the various regions of the cortex. This activation occurs as the holoprojection signal transits through the pyramidal cells of the several layers of the cortex taking part in the reverberation. The sum total of all ongoing sensory holoprojections, impinging on the memory data distributed in the same areas of the cortex that take part in the set up of the various holoprojections, activates this memory data such that the intralaminar nucleus, acting again as a driver for the generation of a holoprojection, creates the habit routine complex holoprojection. The memory data in this process is thus analogous to the role of primary sensory data in the generation of the primary sensory holoprojection. Remember that we are hypothesizing that this memory data is associated with the microtubules of the neurons in the cortex and not their synapses, so while the neurons and their synapses in the circuit between the thalamic relay nuclei and the cortex are maintaining the primary holoprojection using the signals from the sensory receptors, the holoprojection itself, as an interference pattern, is resonating with the stored interference patterns in memory resident in the microtubules.

The habit routine complex holoprojection is the bound informational entity presented to thinking2 processes, having the various properties already described in chapter 3. The memory information used to generate the habit routine is, as just proposed above, analogous to the original sensory information: the sensory signals are used to set up the primary sensory holoprojections, and the activated signals from memory are used to set up the habit routine holoprojection. In each case we have a thalamic nucleus acting as the driver for the process, using an input of transform coefficients to produce the holoprojection. But the intralaminar nucleus scan which sets up the habit routine is deriving its input from the entire cortex, not just the primary sensory areas. The habit routine complex is much more than just primary sensory information taken from memory, for remember that a habit routine contains pre-programmed associations with ideas, with habits of thinking, and it also contains recommended actions (including not only

physical responses but thoughts, opinions, implied value judgments, etc.), that represent the sum total of ways in which similar situations were dealt with or reacted to in the past.

The higher domains of the cortex itself are using the primary sensory holoprojections to derive associational information such as that concerning depth perception, for example (from both audio and visual sources in combination), as well as perception of motion, types and categories of perceptions, as well as cross-modal associations. Thus the primary holoprojections generate far more from the memory data than just elementary sensory information. This is why the ILN scan cannot be simply of the primary holoprojections themselves, but of the result of the entire sequential associative process they generate in the cortex. The process extends over the entire cortex. For instance, at the most advanced level of associational processes in the frontal cortex regions, you have a bound, unitary, and multi-sensory short-term-memory of events (and your reaction to these events) that just happened a moment ago, produced by successive stages of associational cortex operation. This memory information is also scanned and becomes part of the habit routine complex. In this sense even current experience is very much like a reverberation, for current evaluation of reality is based upon the interpretation of reality just experienced which has been re-injected into the ongoing habit routine complex. Thus the significances that thinking2 decides to examine more closely by extracting information from the primary holoprojections are actively perpetuated. Using this mechanism we can increase the proportion of "raw reality" in the current habit routine to override the "interpretation" of reality that would be supplied by the unmolested habit routine alone. And here is where the psychedelic experience comes in. The process which is so startlingly activated by psychedelic drugs, is the very same process that we can accomplish, if on a more limited level, as just described. Let us look closer at this overall process, for it involves the generation of additional composite holoprojections which have more to do with conscious thinking2 operations, including free will, than with automatic sub- or pre-conscious thinking1 processes and their holoprojections.

The nuclei of the thalamus are also important for

the generation of these composite holoprojections, but at this stage, other brain nuclei become partners with the thalamus and cortex. Again, these older, more "primitive" parts of the brain act as drivers in dialog with the cortex to produce the composite informational fields. (19) Among the brain components taking part are the locus coeruleus and raphe nuclei of the brain stem, the amygdala, hippocampus, the basal ganglia and cerebellum, among others. It is certainly an ambitious statement to say that I will attempt to explain the role of some these brain areas, but here goes:

First let us consider the role of the locus coeruleus and the raphe nuclei, for it is the nerve pathways connecting these two brain areas with the cortex and with each other that are the primary site of biochemical action of the psychedelic drugs. It is with these nuclei that I must show how significance detection and the suspension of habit routine is accomplished. I would propose that the locus coeruleus is the master functioning body, the driver which through dialog with essentially all brain areas but particularly the thalamus, the raphe nuclei and the cortex, produces the composite holoprojection containing information about significance or salience not only in the environment, but also even in the ongoing processes of thought leading to ideas, opinions, etc. I will refrain from presenting a diagram of the connecting nervous pathways between the various brain areas cited as it is extremely difficult to do so meaningfully at this stage. Certainly, as I have already said, there are plenty of connecting pathways between all of these brain parts, there are rather too many, it would seem.

Now the statement that the connections between the raphe nuclei, the locus coeruleus, and their connections to the thalamus and cortex are the primary site of biochemical action of the psychedelic drugs is based quite solidly on recent brain research. (20) We know that LSD and other psychedelics, for example, exert powerful influence on the operation of neurons emitting and receiving at their synapses the neurotransmitter, serotonin. There remains considerable mystery as to how the drugs react with these neurons, whether they activate or inhibit serotonin receptors, which types of serotonin receptors are affected, and so forth. There is also considerable mystery as to how these affected neurons might bring about the overall

psychological result. The first question remains, at the present state of research, very difficult to answer. But it is with the second question that I believe we should start, for there seems to be enough information now available to formulate a model.

It is generally agreed by neuroscientists today that the locus coeruleus acts as a kind of novelty or significance detector, its activation (in animals) has been shown to increase in response to stressful or noxious stimuli, preferred food and other complex arousing events, and even to changes in body systems such as the level of oxygen or carbon dioxide in the blood. The psychedelic drugs have been repeatedly shown to greatly increase the activity of the locus coeruleus, but not when applied directly to the cells which make up the nucleus. Thus it has been hypothesized that the state of the locus coeruleus must be influenced by another nucleus or system which itself is directly affected by psychedelics. Some relevant facts concerning the locus coeruleus:

> The locus coeruleus (LC) consists of two dense clusters of noradrenergic neurons located bilaterally in the upper pons at the lateral border of the 4th ventricle. The LC, which projects diffusely to virtually all regions of the neuraxis, receives an extraordinary convergence of somatic, visceral and other sensory inputs from all regions of the body and has been likened to a novelty detector. Thus, the LC represents a unique nodal point both for the detection of significant changes in the internal and external environment and for relaying this information to the remainder of the central nervous system. It is not surprising that hallucinogenic drugs, which produce such dramatic changes in perception, would alter either directly or indirectly the function of LC neurons. (21)

In keeping with the holonomic model, I would propose that the locus coeruleus is the driver which produces a composite holoprojection consisting of the superimposition and canceling of primary holoprojections including the habit

routine holoprojection to yield a field of information concerning significances in the ongoing experience of the organism. The detection of significance, or salience, normally is derived from the same memory data from which the habit routine complex is generated, and is merely a repeat detection of salience that has occurred in the past. When the test animal mentioned above is shown a preferred food, for instance, and its locus coeruleus is shown to increase in activity, the salience detected is obviously relative to memory data of the preferred food. But when I am the test animal in a French restaurant, when some unknown yet succulent dish is placed before me, I begin to extract information directly from the primary sensory holoprojections to try to deduce the composition and possible methods of preparation of the mysterious delicacy. Memory information in the habit routine will still be the primary source of information in these deliberations, but my Attention will guide the process to actual examination of the "genuine" sensory data contained in the primary holoprojections. As I mentioned above in introducing the functions of the primary holoprojections, we see that salience detection may use the primary data, but normally, and routinely, salience is merely a repeat performance of previous detection, based on the habit routine complex itself.

The connections of the locus coeruleus which accomplish the detection of normal salience from the habit routine data may be simply the interconnections with the cortex. The locus coeruleus receives a modest input from only one area of the cortex, the prefrontal cortex, but it sends its output to the entire cortex. We see again (as in the case of the pathways between the thalamus and the primary sensory cortex) the situation where the "return" signal is far more important than the "input" signal, and this suggests, as in the nervous pathways taking part in the generation of the primary sensory holoprojections, a reverberation, in this case the salience detection holoprojection. (22) The signal from the prefrontal cortex is the final stage of the entire process of association, so it will obviously represent the complex associational memory data of past salience detection that was experienced. The return pathways to all cortex areas might also be thought of as facilitating the cancellation or ignoring of all features

of the habit routine except for the salient entities, so that the resulting holoprojection contains only information about these entities. Thus the Attention is directed to the salience which practically jumps out of its surroundings. The locus coeruleus has several inputs besides that from the prefrontal cortex, but these inputs function to modulate the holoprojection generation in various ways. A particularly important control of the process is accomplished by the raphe nuclei.

The raphe nuclei of the brain stem are particularly important to salience detection and to the psychedelic experience because they contain the great majority of neurons of the brain which use serotonin as a neurotransmitter. Some of the earliest work on the effect of LSD in the brain found that "LSD and other indoleamine hallucinogens...have potent, direct inhibitory effects upon serotonergic neurons located in the raphe nuclei of the brainstem." (23) Now it has been well established that the serotonergic neurons of the raphe nuclei project heavily to the locus coeruleus, and likewise that serotonin inhibits the firing of the type of neuron found in the locus coeruleus. (24) As mentioned above, studies have also confirmed the psychedelic agents have as their target at least some of the many types of serotonin receptors on neurons both of the areas signaled by the raphe nuclei, and on the raphe serotonin neurons themselves (autoreceptors). The raphe neurons also project widely throughout the brain, to all areas of the cortex, (strongly to the prefrontal cortex from which the locus coeruleus derives its input), the thalamus, the amygdala, virtually the entire nervous system. Thus I would propose that the raphe nuclei are the principle mechanism of control, the driver which guides the mode of function of salience detection, as well as the manner in which the detection is used and subsequently stored in memory. It appears that Attention and other thinking2 process use the serotonergic system of the brain, based in the raphe nuclei, to direct the detection and use of salience, but not simply by "inhibition" as would be implied by the observed "inhibitory" action of serotonin on the neurons of the locus coeruleus, or the observed "inhibition" of serotonergic neurons by LSD.

It is a curious fact of the human brain, that fully 75% of the neurons therein are supposedly "inhibitory

neurons", whereas in the monkey the figure is 45%, and in the cat a mere 35%. (25) Clearly these facts must have some tremendously important significance, not only for the type of functioning they imply of the brain, but in some sense they must tell us something very important about the psychological differences between man and animals, particularly the great disparity of intellectual capacity. A not very convincing speculation has been that the large proportion of inhibitory neurons allows a "streamlining of thinking" in which groups of brain cells are more quickly returned to a state of readiness after some operation. (26) I would propose that the inhibitory neurons do not "inhibit" in such a literal manner, but rather are concerned with the superimposition of holoprojections in which a cancellation or subtraction of information results, such as the manner in which all peripheral information from memory going into the generation of the salience holoprojection is removed so as to yield a composite holoprojection consisting of only the detected entities. It might be said that human mental powers, as opposed to that of lower animals, reside primarily in the ability to discriminate between and detect widely differing types of significance not only in the environment but within thought patterns of abstractions and concerning ideas and constructs of the intellect. These human feats, I would propose, are accomplished using the wide network of inhibitory neurons functioning to produce composite holoprojections derived through the comparison and subtraction of informational fields one from another, to reveal patterns the complexity of which far outstrips the power of lower animals to detect.

There are probably several brain operations, brought about by combinations of brain parts including a nucleus of the midbrain or brainstem as a driver, which generate such composite holoprojections. The detection of emotional content, or valence, is probably accomplished using the amygdala as a driver in dialog with the cortex and other nuclei, superimposing the same primary holoprojections as are used for salience detection. But the salience detection of the locus coeruleus, controlled and modulated by the raphe nuclei connections throughout the brain, generates what is probably the most important holoprojection of the brain/mind, (or in any case, second only in importance to the habit routine holoprojection). And it is upon the

generation of this salience detection holoprojection that the psychedelic drugs exert their effects.

Now it was soon noticed, after the inhibitory effect of LSD and similar psychedelic drugs on the raphe nuclei was discovered, that other psychedelic agents such as mescaline and the phenethylamine family did not produce the inhibition. The indirect effect on the locus coeruleus was, however, as important as with LSD. The effect is indirect, for as mentioned, the application of psychedelic agents to locus coeruleus neurons themselves fails to alter their activity. But since the locus coeruleus salience detection system involves the entire cortex, and the serotonergic neurons of the raphe nuclei project to the entire nervous system, it is evident that the control of salience detection would be alterable at many different sites of potential psychedelic drug action. A direct change in the raphe nuclei is the possible primary action in the case of LSD, whereas a change in the effect of the signaling by the raphe neurons, either in the locus coeruleus or possibly the cortex itself, might be the mechanism for mescaline. The overall effect is in both cases a change, which appears to be an increase, in the rate and type of salience detected by the locus coeruleus system. I am tempted to repeat some of Huxley's observations about significance quoted at the end of chapter 3, but instead will quote Alan Watts, here writing about his first experiment with psychedelic drugs:

> "I have said that my general impression of the first experiment was that the "mechanism" by which we screen our sense-data and select only some of them as significant had been partially suspended. Consequently, I felt that the particular feeling which we associate with "the meaningful" was projected indiscriminately upon everything, and then rationalized in ways that might strike an independent observer as ridiculous—unless, perhaps, the subject were unusually clever at rationalizing. However, the philosopher cannot pass up the point that our selection of some sense-data as significant and others as insignificant is always with relation to particular purposes—survival, the quest for certain pleasures, finding one's way to

some destination, or whatever it may be." (27)

I have suggested above that there are two modes of salience detection, the first merely automatic and based upon previously experienced situations, and a second which is based on the genuine data of the primary holoprojections. Remember my little story of noticing the grey rock in the middle of the pathway. Automatic salience detection brought it to my awareness, and interpreted it relative to previous experience. Yet some unconsciously perceived anomalous data, a slight movement, a color not quite in keeping with experience, caused me to suspect an error, and choose to examine the raw sensory data itself and Decide that something was amiss. At this point the original habit routine was overruled, and a new interpretation actively demanded by the Attention. This was accomplished by use of the working memory, thought to be a function of and resident in the prefrontal cortex, the same cortical area from which the locus coeruleus receives its sole input. Remember also my stated feeling that under the influence of psychedelics, it seems that the habit routines of interpretation in this case would be at least momentarily suspended, and after a moment multiple habit routines might arrive at thinking2 processes. All these observations seem to indicate that psychedelics would be interfering with the habit routine holoprojection, rather than the salience holoprojection. But according to my neurological model so far, it would appear that psychedelic agents interfere with the control exerted on the salience holoprojection by the raphe nuclei and the serotonergic neurons extending widely to all areas of the brain.

I would now propose that the profound alteration of the salience holoprojection by psychedelics, illustrated both by neurological data and by the practical observations of Huxley, Watts, and many others, causes the individual, using the conscious mechanisms of thinking2, to himself suspend the dependence on the habit routine holoprojection. It is the cumulative effect of not only added salience detected in the ENV both external and internal, but of the interpretation of this increased salience as itself extremely significant, that leads to a veritable avalanche of salience detection which simply overwhelms normal

acceptance of and dependence on the habit routine system.

The habit routines are still assembled and are there in the background, but they are almost completely ignored by Attention, Decision, and other thinking2 processes amidst the flood of salience perceived. Thus, the psychedelic experience is, in an important sense, voluntary, and this would explain the ability to achieve such states through meditation and other voluntary mechanisms. That the habit routines are still assembled and available to some extent is illustrated by the common ability during the lucid end-stages of psychedelic experience to recognize a duality in experience: a perception of the way things appear with "the doors of perception" cleansed, and a simultaneous recognition of how the same scene would appear in a normal state of mind governed by habit routine. Such realization extends to the perception one's personality traits, one's prejudices and automatisms of behavior, from a viewpoint that is essentially outside of the self and beyond the ego. In this state I believe, the habit routines have been completely suspended in function, and salience detection is using the information of the primary holoprojections.

At the request of thinking2, the primary sensory holoprojections become the subject of meticulous examination, genuine reality floods through, the habit routines ignored. The raphe nuclei must in some sense be acting as a control mechanism for this switch-over, allowing the locus coeruleus system to create superimpositions of the genuine data rather than the memory data. This switch-over probably occurs in the cortex itself, by the control exerted by the serotonergic neurons from the raphe nuclei which contact both inhibitory interneurons and the pyramidal neurons of the cortex. (28)

Experimental evidence supporting the above model relating the neurological operations of brain systems and the habit routine search and suspension hypothesis of normal and psychedelic functioning has been easy to find in the literature. Of course, due to the current state of neuroscience, it is often found that alternative interpretations of experimental results, leading to radically different models, is possible. Such is the case

here, and for any specific experiment which I might use as evidence for my model, others would find it just as easy to use the same data for another view. For this reason, as well as in the interest of brevity, I shall mention only a few examples. A thorough survey would require at least another volume, and the more important chapters of the present volume still await exposition.

A vast body of literature concerning brain function and its perturbation by brain lesions goes back more than a century. A great many studies have been done concerning patients whose brains have sustained damage through accidents or necessary brain surgery, and experimentally, countless numbers of animals of every description have undergone destruction, disconnection or removal of various brain areas in the attempt to localize various sensory, motor, and cognitive functions of the brain. With such a wealth of evidence, it is not hard to find studies that might support almost any model one would care to dream up.

I will mention just a few cases which have been well documented, and which deal with damage to the areas of the prefrontal cortex. This brain area, it will be remembered, has been suggested both in the literature and in my own model as an important center involved with the working memory and with the most complex levels of associative processing by the cortex. Such association might be expected to facilitate complex cognitive phenomena such as the expression of personality traits, decision making and attention, voluntary action and free will, the perception of and reaction to complex social situations, i.e., the most complex and human of cognitive functions. (It is the frontal lobe, and especially the prefrontal area that has seen such a massive expansion and development in the recent evolution of the hominids.) Remember also that it is from the prefrontal cortex that the sole cortical projection to the locus coeruleus occurs. Projections from the prefrontal cortex also extend to the raphe nuclei and the amygdala.

The model I have devised would therefore predict that disruption of frontal lobe integrity should produce alteration of salience detection and the evaluation and expression of emotion, and radical changes in the assembly and use of habit routines, especially as they apply to these most advanced cognitive and affective functions. Since the connections to the locus coeruleus, raphe nuclei, and

amygdala hypothesized to be important in my model project from the prefrontal cortex, interference with salience and valence functions should certainly be observed in cases of prefrontal damage. And prefrontal damage resulting in an impaired function of working memory in supplying parameters for the ongoing habit routine search process should produce symptoms identifiable as resulting from impaired generation, access to, or use of habit routine in ongoing cognitive operations.

A very famous case of brain injury in the prefrontal area, recently the subject of a book and various newspaper articles, is that of the construction foreman Phineas P. Gage. In 1848 Gage sustained a massive brain injury when an explosives procedure went terribly wrong and sent an iron tamping bar vertically through the frontal region of his brain. Miraculously, Gage seemed at first practically unaffected, even walking some distance, and conversing with his men on the way to medical attention. It was only later that the peculiar kind of mental deficits that necessarily result from this type of prefrontal injury came to light. The case has recently become the subject of detailed attention thanks to the work of Hanna Damasio, who was able to reconstruct the precise location of Gage's brain damage using state-of-the-art computer techniques to analyze the features of Gage's skull, a museum exhibit at the Harvard Medical School Museum for over a hundred years. An overview of this work together with a detailed examination of the symptomatic evidence in the case is presented in a recent book. (29)

It was said of Gage that he became a different man, his entire personality was radically changed. It seemed that he had completely lost access to his previously acquired social conventions and rules and had become childish, irresponsible, yet strangely undiminished in terms of episodic and autobiographical memory, language ability, even, one might say, intelligence. In terms of the habit routine model: In the daily yet complex social relationships in which personality is expressed, it appeared that Gage's behavior was capricious, or even random, the habit routines of personality which are among the most complex and highly associative aspects of the habit routine complex, were no longer accessible (reconstructible) from the memory of the frontal cortex and by consequence, his automatic social

behavior was based not upon previous experience but was instead arbitrary and random rather than merely childish. In theory, it seems, he could still reason out how one should act in a given situation, but when forced into a decision by a life situation, he was essentially powerless to apply such reasoning. This may illustrate how dependent we are on habit routine for making decisions and for the expression of personality. In the case of personality traits, it would obviously be impossible to calculate logically and consciously how to react to a situation in accord with our established personality. The reaction must be automatic and instantaneous. If this is also the case with at least some aspects of decision making, a statement I previously made becomes even more pertinent: "We see what we have already seen..." and decide in ways that we have previously decided to an overwhelming degree.

The symptoms described by Antonio Damasio (30) could well be explained in these terms, but in addition, Damasio describes the case of a prefrontal patient which he had himself examined in detail. The patient, referred to as Elliot, had undergone surgery for the removal of a tumor at the base of the frontal cortex, just above the eye sockets. Surrounding brain tissue had also been removed or damaged, and thus a large portion of the prefrontal cortices were dysfunctional. As with Gage, the largest part of the damage was in the ventromedial (lower-central) area, and many of the symptoms were repeated, such as radical personality change. But particularly striking were symptoms that might be interpreted as resulting from interference with the salience and valence systems involving connections from the damaged prefrontal region to the locus coeruleus, raphe nuclei, and to the amygdala. These symptoms might be categorized as a lack of ability to plan ahead, to make decisions concerning strategy and the immediate future, almost, one might say, a deficit of free will. The obvious intelligence which Elliot retained could not be mustered to organize even simple sequences of activity as required for his job, for instance. In addition, he exhibited an emotional flatness or detachment in striking contrast to his pre-operative character.

Interestingly, a lengthy series of psychological tests indicated that, like Gage, Elliot could theoretically make such decisions, such as those pertaining to moral

judgments, ends and means problem solving, awareness of consequences concerning both events and social situations, etc. But when a real life situation forced a decision based on habit routine, the theoretical knowledge seemed impossible to apply. In the theoretical situation, we could say that the records of social information in memory were actively and intentionally used to reconstruct the required decision from scratch, whereas in the life situation what was required was an automatic referral to the habit routines representing such decisions that had been made over a lifetime: the records of previous decisions as represented in the highest levels of habit routine had been destroyed along with frontal cortex, (31) whereas the previous memories themselves upon which the previous decisions had been based were still intact in other areas of the cortex.

The combination of decision deficit with emotional flatness led Damasio to construct a model he calls the Somatic-Marker Hypothesis, and it has attracted much favorable comment. (32) I will not describe it here, but will instead offer my own interpretation of the concurrence of the two symptoms. We could describe an inability to make rational decisions not only as due to deficits in the assembly of the highest levels of the habit routine complex, but also on the basis of faulty salience detection, since the relative significance of events and aspects of reality, both present and in memory, must obviously play an important role in constructing plans based upon contingencies and the evaluation of probabilities and strategies. With both of the above cases, Gage and Elliot, there was a theoretical ability to make decisions, based upon reasoning processes utilizing episodic and autobiographical memory of events themselves. Likewise, reasoning processes and memory would be able to deduce significance both in the internal and external environments, but the automation of salience detection would be deficient. The key to understanding the overall syndrome, however, is seeing that the generation of emotional content by a holoprojection driven by the amygdala must be a process based on information in the salience detection holoprojection. It is with the various significances detected in the external and internal environment that emotional expression deals, all routine and superfluous information merely falls by the wayside and is ignored. The SD holoprojection feedback to all areas of the

cortex accomplishes this cancellation or ignorance of irrelevancy, to leave the detected significances in stark contrast relative to the background. From this holoprojection of detected significance comes the data from which the emotional value or valence is generated.

It is easy to see, then, that if the salience detection system is perturbed or interrupted, a naturally resulting symptom should be emotional flatness, or even randomly expressed emotion since the amygdala is not itself damaged but merely has little or no accurate information to work with. Elliot himself realized perfectly well not only his inabilities in making decisions in the face of real-life situations, but also how subjects or situations that had once caused him strong emotion no longer evoked any reaction whatsoever. Here we can see that, since he remembers subjects which formerly caused an emotional reaction, he can also theoretically evaluate emotional content just as he can theoretically evaluate significance, reconstructing the information from long-term memory. But it is the automated accomplishment of these functions which has been perturbed, and in real-life, on-the-spot decision making, reconstruction does not and cannot substitute for the automated processes.

According to Damasio's hypothesis, the deficit for decision is based on the deficit of emotional content, but I believe the situation is quite the reverse, that emotion is based on significance detection necessary in the process of automatic decision-making, and that both of these functions are based upon intact operation and connections of the prefrontal cortices to the locus coeruleus and the raphe nuclei.

Now I cannot tell from Damasio's descriptions whether the actual connections projecting from the frontal cortex to the locus coeruleus, amygdala and raphe nuclei were damaged or severed during Elliot's operation. It would seem in Gage's case that the trajectory of the iron bar might well indicate that these connections were destroyed: they are grouped together into the medial forebrain bundle, an important nerve pathway passing directly through the ventromedial area. This pathway also contains the projections returning from the locus coeruleus and raphe nuclei which connect to all areas of the cortex. Whether the severing of the medial forebrain bundle alone produces a

syndrome similar to the actual destruction of prefrontal cortex is not known, but if my hypothesis is correct, the severing of the medial forebrain bundle connections to the locus coeruleus and raphe nuclei should produce a very similar result as is seen in cases such as Gage and Elliot. Damage to the frontal cortices may have to be quite widespread to bring about the same result as the simple severing of these nervous pathways.

There is another type of damage to the frontal cortex which produces rather different results. So far, in the two cases mentioned, the principal damage was to the ventromedial areas, just above the eyes and centrally located. When damage to the dorsolateral areas also occurs, psychological tests indicate an important deficit in working memory accompanies the syndrome. These same tests, given to Elliot, showed no disability whatsoever in his working memory function. Inasmuch as the working memory has been proposed here as an important part of the process of habit routine search, its disruption should alter the process in certain ways. In the cases of ventromedial damage cited above, I proposed that the actual memory information necessary for construction of the highest associative levels of the habit routine complex had been destroyed. But with dorsolateral damage as well, an important part of the system which carries out the habit routine search is destroyed: the ability to supply parameters for the search is impeded.

It was proposed that conscious and unconscious parameters guiding the successive scans producing the habit routine complex were introduced via the working memory. The ILN scan, incorporating WM parameters would, on the succeeding scan retrieve a modified selection of memory information according to the parameters previously scanned. And it was proposed that this "small window on reality" was essentially the only normal way to guide the processes of thinking1 using free will or intentional creativity. In experimental situations we notice deficits in precisely these domains. Fuster, in his book on the prefrontal cortex, states that "In general terms, ablation studies indicate that the cortex of the dorsal and lateral prefrontal surface is primarily involved in cognitive aspects of behavior. The rest of the prefrontal cortex, medial and ventral, appears to be mostly involved in affective and motivational functions..." (33) (such as salience detection and emotional

evaluation.)

In human prefrontal patients, a striking experimental demonstration of working memory disruption due to dorsolateral damage is the Wisconsin Card Sorting Test, here described by Dudai:

> The subject is presented with a series of stimulus cards and a deck of response cards. The cards bear coloured geometric patterns (e.g. a single blue star, three red circles), and can be matched by categories (e.g. colour, form, number). The examiner selects a sorting category (e.g. colour), but does not inform the subject. The latter is instructed to place a response card in front of a stimulus card, wherever he or she thinks it should go. The examiner then informs the subject if the response was right or wrong, and the subject uses this information to obtain correct responses in the following matches. After ten consecutive responses, the examiner shifts the sorting category without warning, and the subject must unveil it again to obtain correct matches. The procedure is then repeated with other sorting categories. Patients with prefrontal lesions find this task abnormally difficult. The interpretation is that they have difficulties in using temporarily stored information to regulate their actions. (34)

The function of working memory as a parameter store for ongoing habit routine search is well illustrated by the experiment. The original instructions for the experiment, which the subject has little difficulty in following, create a simple habit routine for performing the sorting according to the first learned category. But when the category is changed, the habit routine developed for the experiment remains fixed, its alteration by new working memory parameters is difficult if not impossible. Most prefrontal patients with dorsolateral damage have great difficulty in this test, but Elliot, whose damage was limited to ventromedial areas, passed it with flying colors.

Now the evidence concerning prefrontal damage and

its interpretation using my model takes on some additional relevance in consideration of the following experimental findings: In a series of experiments using PET brain scan techniques to observe subjects in altered states of consciousness brought about by psychedelics, the primary effect noted was a significant increase in the activity of the frontal cortices. (35) This result, in combination with Aghajanian's findings of greatly increased locus coeruleus activity caused by psychedelic drugs, lends my interpretation some credibility. Under the influence of psychedelic drugs, the cognitive functions of working memory and habit routine search, significance detection and emotional value detection are all working overtime, and they all are facilitated by the prefrontal cortices. Whether this is all mere coincidence, or an indication that pieces of a very intricate puzzle are falling into place only time and further research will tell.

A vast quantity of experimental evidence awaits the organizing ability of some yet-to-be-discovered overall model of brain function. In reading the many papers dealing with just the prefrontal cortex in the recently published The Cognitive Neurosciences (36) for example, one is immediately impressed with both the wealth of experimental information available and the corresponding wealth of models, terminologies, and hypotheses which attempt to organize this information. But such a cornucopia of viewpoints must certainly be a sign that we modelers are very much like the collection of blind men describing the elephant from the feel of merely local areas of the overall beast. Who will be the visionary to discover the viewpoint from which all these models and observations become a united whole? I certainly cannot pretend that the cognitive and neurological models I have presented here fulfill that function. I would be the first to admit the highly speculative nature of the above neurological model that I have presented, and would not be surprised nor indignant if it were said that the area that I was describing was not even part of the elephant!

In my view, the only claim for consideration of my ideas stems from their origin in the attempt to explain the

body of evidence that has accumulated concerning the psychedelic experience, evidence which has been almost entirely disregarded by the mainstream of science for nearly thirty years. Had it not been for such neglect, which in part was forced by an idiotic international effort to fight an unwinnable, self-defeating and therefore irrational "war on drugs", it seems to me that several fields of study of human psychology and neuroscience would have by now achieved far greater insight than is the case.

But we can blame not only the drug warriors, the politicians and intelligence organizations, the religious moralizers and puritanical oafs for this ignorance: scientists too are to blame, perhaps equally so. It was easy for me, from the outside of the scientific establishment, to see that one of the most important discoveries ever made by Western science was being ignored, even vilified. But from the inside of that scientific enterprise, it was apparently no easier to see what was happening than it was for those inside the traps of religious fanaticism or the carefully cultivated paranoia which is the paradigm for institutions providing much of the raw material for the politicians: the intelligence organizations.

Scientists, at least outside the realm of their own specialties, often seem as prone to narrow-mindedness as are other intelligent yet confused men. It seems to be almost instinctual that men follow such narrow pathways through life, and the habit-routine model is certainly also an attempt to show how such narrowness might actually be derived from an inherent neurological feature of the human organism, rather than something which we must label instinctual for want of a better understanding. The functioning of our nervous systems utilizing the habit routine system might be taken as a convenient excuse for the current deplorable state of civilization, this "century of holocaust," but now that I have laid bare the roots of the situation, it is a lame excuse at best. In the next chapter I will explore the idea that this inherent neurological and cognitive feature has been an essential (yet now for man a skeuomorphic or vestigial) characteristic in the stages of evolution not only of man, but of all animal life.

References

(1) Rupert Sheldrake, The Presence of the Past, 1988, William Collins, publisher. (back)

(2) A brief but concise description of the Hopfield Network may be found in Crick, The Astonishing Hypothesis, ibid., pp182-185. A more technical and thorough exposition is found in Churchland & Sejnowski, The Computational Brain 1993 MIT Press, p82ff. (back)

(3) Steven Rose, The Making of Memory, Bantam Press (Great Britain) 1992, see chapter 13. (back)

(4) Ibid., p322. (back)

(5) Karl H. Pribram, Languages of the Brain, 1971 Brandon House, New York, recently reissued (1988). See also his essay "What the Fuss is All About", in The Holographic Paradigm, Ken Wilber (ed.), New Science Library, Shambala 1982. Other articles in this volume discuss the possibilities and limitations of the model. (back)

(6) "From Metaphors to Models: the Use of Analogy in Neuropsychology", Karl H. Pribram in Metaphors in the History of Psychology, David e. Leary, ed., 1990, Cambridge University Press. (back)

(7) Sometimes called the "grandmother cell" model, in which a unit of learning or recognition (of your grandmother, for instance) was supposedly associated with a single brain cell or strictly local set of interconnections between cells. (back)

(8) Francis Crick (1994) ibid. p185. (back)

(9) Introduced by George Leonard to refer to entities having the nature of a hologram, The Silent Pulse, Dutton, New York 1978. (back)

(10) "Spectral Density Maps of Receptive Fields in the Rat's

Somatosensory Cortex" in Origins: Brain & Self Organization, Karl Pribram, ed., 1994, Lawrence Erlbaum Associates. (back)

(11) Brain and Perception: Holonomy and Structure in Figural Processing, Karl H. Pribram, 1991, Lawrence Erlbaum Associates. (back)

(12) Times Literary Supplement, London, August 25, 1995. (back)

(13) See "Quantum Coherence in Microtubules" by Stuart R. Hameroff, Journal of Consciousness Studies 1, No.1, 1994 pp91-118. (back)

(14) In the brain there are approximately 1011 neurons (100,000,000,000), 1015 synapses, but Hameroff estimates that there may be 1023 dynamic sites or states associated with the microtubules. (back)

(15) See "Perception as an Oneiric-like State Modulated by the Senses", Llinás and Ribary, in Large-Scale Neuronal Theories of the Brain, 1994, MIT Press. On page 113 is a summary of brain connectivity illustrative of the inadequacy of current "information-flow" models. (back)

(16) In producing a holographic image by illuminating a holographic photographic plate (the hologram) with coherent light, the same image is produced by directing the light through only a small part of the plate as is produced by illuminating the entire plate. But the image in the former case carries much less definition, it is of lower resolution. (back)

(17) A review of the experiments is in Human Memory, Theory and Practice, Alan Baddeley pp14-18. (back)

(18) See "Perception as an Oneiric-like State Modulated by the Senses", Llinás and Ribary, in Large-Scale Neuronal Theories of the Brain, 1994, MIT Press. (back)

(19) I might go so far as to suggest that most, if not all

cognitive functions of the brain are accomplished by a dialog among two or more brain parts, and not by a single area acting alone to effect some cognitive result which is then passed on to another area. The multiple holoprojection model is entirely in accord with this suggestion. The model has conceptual similarities to another important "checks and balances" feedback system of the body, the hormonal system. (back)

(20) A publication containing the most recent research findings of the important workers in this field is 50 Years of LSD: Current Status and Perspectives of Hallucinogens, Pletscher and Ladewig, editors, Parthenon Publishing, 1994. The book presents papers submitted to a symposium of the Swiss Academy of Medical Sciences in October 1993. (back)

(21) Ibid., "LSD and phenethylamine hallucinogens: common sites of neuronal action", G.K. Aghajanian. (back)

(22) Another way of thinking about the disparity between "input" and "output" signals again illustrates a basic conceptual fault with the computer model of brain function. In the case of the locus coeruleus for example, it has been stated that since its "output" extends to such diverse regions, its functions must also be multiple and widespread. This view has the underlying assumption that the locus coeruleus is sending information it has processed from its modest input, to many locations where this data is then used for many different functions. But the alternative view I have proposed is that the locus coeruleus accomplishes only one function. The multiple and widely connected "output" pathways are not to be seen as sending information, but rather as requesting or accessing information of a widely diverse nature (relating to the detection of salience in many domains, situations, and complexities). The result of this request is then cycled back to the locus coeruleus via its modest input from the frontal cortex, as a reverberating holoprojection. (back)

(23) Ibid, p27. (back)

(24) Chemoarchitecture of the Brain, Rudolf Nieuwenhuys,

1985 Springer-Verlag, p40. (back)

(25) From references mentioned in Stairway to the Mind, Alwyn Scott, Springer-Verlag 1995, p94. (back)

(26) A suggestion of Donald Hebb, recounted in Stairway to the Mind, ibid., p94. (back)

(27) "The New Alchemy" in This Is It, Alan Watts, Random House, 1958. (back)

(28) Aghajanian in 50 Years of LSD, ibid., pp33-34 (back)

(29) Descartes' Error, Antonio R. Damasio, G.P. Putnam's Sons, 1994, chapters 1 & 2. (back)

(30) Ibid. (back)

(31) One could view the situation also as an inability of the intralaminar nucleus of the thalamus to include in its habit routine-generating scan the information from the destroyed frontal region. This is probably the more useful if not accurate view, as opposed to the view that frontal lobe "information" has been destroyed. (back)

(32) Ibid., p173-ff. (back)

(33) The Prefrontal Cortex, Joaquin M. Fuster, 2nd edition 1989, New York: Raven Press, p74. (back)

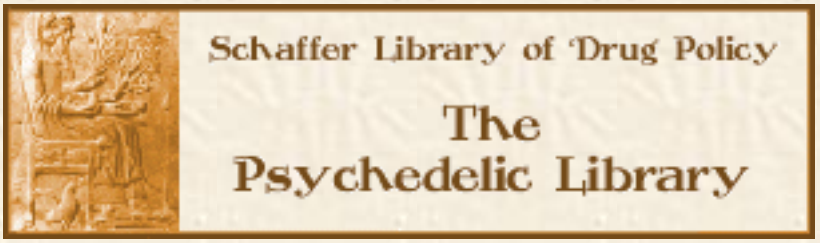
(34) The Neurobiology of Memory, Yadin Dudai, Oxford University Press 1989, p263. (back)

(35) F. X. Vollenweider and colleagues in recent papers summarized in "Evidence for a cortical-subcortical imbalance of sensory information processing during altered states of consciousness using positron emission tomography and [18F]fluorodeoxyglucose" in 50 Years of LSD, ibid., pp67-86. (back)

(36) Michael S. Gazzaniga, editor, The Cognitive Neurosciences, 1995 The MIT Press. (back)

(note) Update to the 1996 edition of The Center of the Universe: The proposal that background neural activity is not mere random noise is supported by recent findings indicating that background neuron firing is fractal in nature. In the Journal of Neuroscience (vol 17, p 5666) Malvin Teich of Boston University notes that the average release rate [of neurotransmitter packets] fluctuates as dramatically from minute to minute as from second to second. Such repetition at different scales is a hallmark of fractals. (Quotation from New Scientist, 16 August, 1997.)(back)

Chapter 6 | Table of Contents



The Center of the Universe

William S. Moxley

6. Instinct

THE IDEAS EXPRESSED SO FAR, particularly those in the last two chapters, were not the starting point for the present theory of psychedelic experience. They were, on the contrary, only recently developed along with my also recent interest in cognitive neuroscience and the organization of the human brain. But rather than present the components of my theory in the chronological order of their development, for the purposes of this book it was desirable to construct a theoretical framework within which my principle hypothesis would, when revealed, already have a persuasive foundation. The actual starting point of the theory began with an idea which occurred to me several years ago during my tenure at an institution of "enforced languishing". I had plenty of time to consider at length my experiences, and to re-read the many volumes I had collected along the way (volumes which, somewhat unbelievably, due to their titles and subject matter, I was nevertheless permitted to possess). A part-time library engagement (and a friendly library "director") also allowed me to order in on loan any book I might desire. The entire situation, despite the shabby surroundings and lack of intellectual companionship, was not unlike a very productive sabbatical from my former routines.

Thus I began early on in my study to think again about things that I had experienced in Mexico, to consider mankind's early and ubiquitous use of psychedelic medicines

especially with regard to the aboriginal practices of shamanism, early religion, the curing arts. And given the universal importance of psychedelic plants and preparations for early man it was not a great extrapolation (but a surprising one nonetheless) to begin to suspect that the use of these sacred drugs must go right back to the very origins of man; they must have played a role in his evolution from proto-humans, from whatever species it was that was definitely advanced animal, but definitely not-yet-mankind.

Whatever the characteristics of this proto-human species were, (1) it is generally agreed that they were hunter-gatherers who explored widely for food from many diverse sources. Evidence also indicates that climatic changes and other factors had provided a strong impetus for proto-man to migrate from his African home to the most distant regions of the earth, thus bringing him into contact with the diverse psychedelic flora of many new habitats. The period of this migration, the middle to late Paleolithic, coincides precisely with evidence of the birth of human culture illustrated by the recovery of artifacts such as complex tools, body adornments, artwork, evidence of music, etc. McKenna (2) has presented several persuasive arguments indicating that such generally agreed characteristics which typified the proto-human species would have ensured that its members frequently came into contact with a range of psychedelic plants. But to hypothesize a role for psychedelic plants in the evolution of man was easy, to discover what kind of psychological and cognitive leap was entailed in that miracle of evolution, and what function psychedelic plants played therein, especially whether their influence was a necessary, merely facilitating, or just coincidental factor, that would require some diligent study and inventive thought.

Although I had studied chemistry and physics in a top university, my knowledge of the biological sciences was quite limited. In trying to get some ideas about what might have been the psychological condition of proto-man, and how psychedelics might have affected that condition to bring about major change, I naturally started with only the most elementary of conceptual tools, the first of which being that somewhat discredited concept called instinct. To the psychologists of the last century the existence of instinct was self-evident. William James, introducing an extensive

chapter on the subject in his famous opus The Principles of Psychology wrote,

> Instinct is usually defined as the faculty of acting in such a way as to produce certain ends, without foresight of the ends, and without previous education in the performance. That instincts, as thus defined, exist on an enormous scale in the animal kingdom needs no proof. (3)

Yet soon the Behaviorists, in a half-century crusade to objectify the science of psychology, would first dispense with the terms, and later with the very concepts of many such self-evident entities for lack of simple experimental techniques capable of isolating, measuring, and controlling them. The difficulty or inability to accurately measure the predictions of a model is, of course, a serious flaw, for the purpose of a model is precisely to suggest experiments that will yield meaningful measurement. The Behaviorist stratagem is thus understandable, and would probably have been better justified had the science of psychology already attained a level of perfection comparable to that of early 20th Century physics or chemistry. In retrospect, and in consideration of the still very rudimentary state of the discipline, the strategy must now be judged as one of desperation, for despite the Behaviorists' long and powerful onslaught, concepts such as instinct and consciousness remain far too vital to justify the elimination of the terms from the lexicon of psychology. As I have already pointed out, the study of consciousness is now enjoying a major and fruitful revival, and I think that I can show how at least one aspect of what has been called instinct is now describable, and perhaps even measurable, in physiological terms.

At the start of my quest therefore, before I had worked out some of the cognitive and neurological mechanisms for the Habit Routine Model, I necessarily found myself toying with the concept of instinct. Believing that the influence of psychedelic drugs on proto-humans might have been a necessary catalyst for the rapid (4) transformation to culturally modern Homo sapiens, there seemed two possibilities to explore. Either the psychedelics might have

added something to the psychological abilities of proto-man (which turned out to be the conclusion of McKenna's views), or conversely, perhaps the repeated and cumulative effects of psychedelic drugs had eliminated an impediment to further psychological evolution, an impediment which, up until that point in evolution, had been not an impediment but a characteristic favorable or essential for the reproduction and survival of the species. And that characteristic, it seemed, should be something very much like an instinct, an innate psychological tendency governing the normal behavior of the species. I am assuming that, in the ultimate stages, the change from proto-man to humankind was preponderantly if not entirely a psychological change, the facilitating physiological changes such as greatly enlarged brain capacity having already been present.

The latter hypothesis seemed the more powerful, for if it had been necessary to add to the abilities of proto-man, the normal processes of evolution are always willing and able to provide such addition. This is the whole idea of evolution. Additions to the abilities and design features of a species follow necessarily from the essentials of the process. Thus the hypothesis that psychedelic drugs might have added to the abilities of proto-man would have carried with it the probability that such addition would not, in the long run, have been necessary. The mere passage of time, and further selection pressures, would have surely led to the same result. Under this hypothesis, the psychedelics would only have provided a facilitation to an ongoing process, or perhaps been merely incidental to it. It didn't seem that the ubiquitous use of psychedelics by early man would have resulted from a merely coincidental influence; the great importance of these sacred plants for early man in every corner of the earth indicated to me that they had been essential and necessary for the evolution of humankind. If this were the case, their prevalence of use and central importance for early man would naturally follow.

But if evolution relentlessly provides any required new feature, we also see the strange result that occurs sometimes when a feature becomes obsolete, the case of the vestigial vermiform appendix on the large intestine being the example known to all. Evolution is remarkably efficient at slowly bringing about any design feature that is required for the production of new abilities and new species, but

does not pay much attention to the intentional removal of design features that have become obsolete, even if they become mildly unfavorable as in the case of the appendix. Design features may persist through sheer conservatism or "force of habit", as for example the persistence of a full range of digital bones in the fins of whales and other once-terrestrial species; and if the feature has been an important one at some stage of development, it will be very difficult to eliminate. One would suspect that such a feature would have to become a significant disadvantage before selection pressures and the normal course of evolution would bring about its gradual removal.

Now if evolution could produce physiological "skeuomorphs" (design features which have persisted despite becoming disused or non-functioning (5)), then it seemed that the same process might have occurred in the realm of psychology. Perhaps instincts, once valuable to a species or range of species (perhaps even the entire animal kingdom), might have become not only skeuomorphic, but a factor which would impede further psychological development in a given species. Although such a skeuomorphic instinct would present no disadvantage to the species in its given form, it might well tend to prevent a radical evolutionary jump such as that between animal and humankind. The existence of evolutionary dead-ends in the physiological sense (6) might illustrate the parallel concept of the case of the advanced ape who had every physiological capacity necessary to be a philosopher, a mathematician, yet...

My hypothesis began to take shape: an instinctual or innate psychological drive or tendency that had been an essential and defining feature of advanced animal life had become the barrier which prevented proto-man from achieving the most important of all evolutionary quantum leaps. And it was this barrier, this very powerful and efficient psychological trait or instinct which had been eroded and then (at least temporarily) suspended by proto-man's exposure to psychedelic drugs.

It would be valuable at this point to provide a definition and examples of the concept of instinct as it

applies to my theory. As I hinted above, I intend to show how the instinct in question is actually something describable in physiological terms, but a clearer understanding results, I think, from treading the same conceptual path from instinct to brain systems that I myself took in constructing the theory. A few general suggestions concerning the various possible mechanisms of instinct, and what kind of information constitutes an instinct might help to alleviate some objections to the concept by the more demanding adherents of hard science. Perhaps we might also find that what was once piled together under the label "instinct" is actually a range of quite different and independently organized processes.

It is quite true, for example, that we have not the foggiest notion of how fledgling cuckoos, at the end of their fall migration, find their way to the same trees in Africa where their parents are nesting, despite the fact that the parents leave Europe a week or more in advance of their progeny. Saying that the young cuckoos have an instinct to do so tells us very little, and it is far-fetched to suppose that the parent birds "teach" their progeny how to make the voyage before their early depart. Equally improbable, despite "nothing-but" arguments of "what-else-could-it-be?", is the proposal that cuckoo genes or nervous systems come equipped with maps of Africa. The use of "instinct" as a mere label that only pretends to impart an understanding of how such a phenomenon might arise has justifiably drawn criticism. Thus the distinguished anthropologist Gregory Bateson has commented, (in a "Metalogue", between Father and Daughter),

> Daughter: Daddy, what is an instinct?
> Father: An instinct, my dear, is a explanatory principle.
> D: But what does it explain?
> F: Anything—almost anything at all. Anything you want it to explain.
> D: Don't be silly. It doesn't explain gravity.
> F: No. But that is because nobody wants "instinct" to explain gravity. If they did, it would explain it. We could simply say that the moon has an instinct whose strength varies inversely as the square of the distance…

D: But that's nonsense, Daddy.
F: Yes, surely. But it was you who mentioned "instinct," not I.
D: All right-but then what does explain gravity?
F: Nothing, my dear, because gravity is an explanatory principle.
D: Oh... (7)

Such an instinct as cuckoos have still evades description in terms of brain systems or genetic codes, and thus to call it an instinct is about as far as we can go. In the last century, due to a very primitive understanding of the nervous system, practically all habitual behavior of animals had to be labeled instinct. "Early psychologists sought to identify a drive for every aspect of behavior: a hunger drive responsible for feeding, a thirst drive, a sex drive, etc. It proved impossible to classify animal behavior in this way without resorting to a reductio ad absurdum involving drives for thumb-sucking, nail-biting, and other minutiae of behavior." (8) The examples of proposed instincts for thirst and hunger illustrate how an inability to explain a trait of behavior and the resulting retreat into mere labeling, can later be resolved with further knowledge. Science has today discovered a great deal about the physiological systems which control and produce hunger, thirst, and more. With more advanced knowledge of the brain, some phenomena which were once called instincts, and which were indistinguishable from other phenomena like the cuckoo's navigational abilities, can be shown to result from elementary brain-systems operation. Such will be the case with the "instinct" I have in mind as a candidate for proto-man's impediment. (9)

The perceptive reader will certainly, remembering my cognitive and neurological models of earlier on, see where this argument is going. But the pathway that was followed, I believe, is not only an interesting view of how one model leads to the next in theory building, but also of how the pieces of this large puzzle were manipulated to form an overall and convincing picture.

At first, and very crudely, it seemed to me that proto-man might have had some kind of instinct that could be viewed as a "narrow-mindedness", a strong repression of, or

inability to use the obvious and recently expanded theoretical capacity of his brain. I soon coined a nice term for the effect, the sophiolytic instinct, a behavioral drive that prevented the ape from becoming wise, that actually "cured" him of any tendency to become wise, for an ape who suddenly decided to ape not an ape, but a Socrates, would not be very popular with his mates! He would be excluded from the group, become solitary with no chance of reproducing either his weird psychological abilities (through teaching perhaps) nor any physiological "adaptions" that had suddenly enabled him to use his tremendous brain capacity more fully than his contemporaries.

The model began to improve as I realized that such a sophiolytic instinct should be part of a pair of characteristics which would be precisely what all advanced animal life would profit greatly from. An animal should have a much greater mental and psychological capacity than it needs in normal everyday life, for that capacity would be of enormous value in crisis situations, or other infrequently encountered situations where the animal is called upon to be creative in some sense. Obtaining food from a new source, coping with unusual threats to life or habitat, and many other imaginable situations would demand a level of "creativity" in an animal. If extra brain capacity could provide for overcoming merely habitual and stereotyped behavior in times of need, this should obviously be a favorable evolutionary development in the animal kingdom.

But likewise, it seemed that there would have to be a strong tendency for an animal not to use his creative abilities on a daily basis. Any creative potentials of an animal would have to be dormant or actively inhibited in the normal routines of existence, and this would also favor survival and reproduction because it would lend great stability and coherence of behavior between the members of a group, and within species as well; individuality would be suppressed during routine existence in favor of group and species stability. Indeed many species have mechanisms for isolating and expelling members of a reproductive group who exhibit unusual or disruptive behaviors. Such behavior would often have indicated that a given individual might be diseased, or afflicted with some genetic defect, so a species' ability to isolate such individuals would be a favorable characteristic for maintaining species integrity.

These mechanisms and the sophiolytic instinct would therefore ensure that members of a group all "toe the line" and do not become too much the individual, in spite of the possession of cognitive capacities going sometimes far beyond those required for routine existence.

The evolution of animal life is not at all a matter of one exceptional individual providing genetic material for the future, but of the slow selection of many slightly better adapted individuals providing for future inheritance. The hypothesis of excess cognitive capability coupled with a mechanism for the normal suppression of this capability seemed to fit these requirements quite well. (10) And what was more, the dual characteristic should become more and more important with the complexity of the species considered: the most advanced animals in terms of social situation, reproductive requirements, nourishment-obtaining abilities, protection strategies, etc., should be the very animals which would profit most from excess and reserve cognitive abilities, and it would be in these very species that the most efficient, powerful and precisely applied suppression of these abilities in everyday routine would be required. The maximums here would have attained their summit in the proto-human species, the recent and sudden increase in cranial capacity indicating a vastly increased cognitive reserve, and my speculations indicating that the restraining mechanism, the proposed sophiolytic instinct, must also have attained a corresponding power and efficiency.

This scenario seemed to provide a paradox for evolution. On the one hand, in order for evolution to produce modern man, it would have had to proceed through stages in which animals gained more and more neurological and cognitive ability, and especially a reserve of such ability, yet an essential requirement of this gain would be that it needed to be increasingly suppressed for normal routines of daily existence. It would therefore become impossible for an advanced animal to use this cognitive power at will, to enter a mode of life, by conscious choice, in which the creative ability might be used routinely rather than only in extremis. To break through this evolutionary barrier between proto-human and Homo sapiens would require an extraordinary and external influence capable of dissolving this barrier. All the neurological equipment would be in place, thanks to the normal evolutionary processes, but the final

breakthrough would have to be something that the normal processes of evolution could not provide. And the drugs which enabled that cognitive breakthrough were conveniently scattered about the planet in plenitude...

If these hypotheses are at all valuable, it should be possible to see evidence in animal behavior of the processes they describe. The idea that animals, even lowly insects, have quite amazing abilities available for use in case of novel challenges has been experimentally demonstrated for many different species. Greater cognitive abilities are likewise reflected by correspondingly larger nervous system capacity compared with similar species exhibiting less versatile behavior. A lengthy review of recent work on "intelligence" in animals is not necessary here, a few examples will suffice to show convincingly that not only our recent evolutionary neighbors, apes and chimpanzees, have significant cognitive reserves, but that the hypothesis of excess cognitive capacity describes a universal trait of animal life.

Although recent presentations by Gould & Gould (11), Griffin (12), Byrne (13), and others show many examples of rudimentary insight, context-switching intelligence, and conceptual thinking in animals as diverse as beavers, honeyguides, and even insects such as wasps and bees, certain hard-science advocates have done their best to raise objections against such evidence. Donald Griffin has reviewed such argument and presented an admirable rebuttal to what he considers to be a taboo against considering that non-human animals might have subjective mental experiences or an ability to "think", albeit in very primitive ways.

> The taboo...has become a serious impediment to scientific investigation. Effective indoctrination—often accomplished by nonverbal signals of disapproval—inhibits students and young scientists from venturing into this forbidden territory, and those that do so encounter criticism and ridicule. One result is that students of animal behavior are inhibited from reporting versatile

> behavior that suggests conscious thinking; and scientific journals sometimes refuse to publish data or interpretations that support the inference of animal consciousness. (14)

I will mention only examples of intelligence in apes and chimpanzees, because here the weight of evidence is exceptional. In suggesting some ideas about the importance of young animals' play for cognitive development, Richard Byrne (15) mentions a seeming paradox: Gorillas in captivity regularly show extensive skills in the use of tools, yet in the wild, tool use in gorillas is practically non-existent. He notes that only young chimpanzees and humans "invest much time in play with detached objects. But under the artificial conditions of captivity, young gorillas also play with objects". Byrne's proposal that infant play with objects might be a causal explanation of the paradox may have some validity for gorillas, but apparently ignores that many other tool-using species also do not exhibit play with detached objects in juveniles. But he also notes that "gorillas evidently have the latent potential to play with objects in childhood, and to use tools to solve problems in adulthood, yet they do neither in the wild-why?" [my emphasis].

The question is answered with the hypothesis of a sophiolytic instinct being the factor which all but guarantees that much advanced behavior capability in animals will remain as "latent potentials" under normal conditions, especially if we understand that the sophiolytic instinct must be a powerful and primary one, surpassed only perhaps by instincts for sexual behavior without which, of course, there would be no animals around to study. Without the sophiolytic instinct, the force ensuring group stability, survival, and reproduction, individuals would have constantly been far more subject to the vicissitudes of the environment, to dispersal and separation from potential mates, to dangers resulting from their constant "inventiveness" and individuality in dealing with everyday situations better handled with habit than innovation. The latent potential which Byrne concedes is evident for apes, is a simple and elegant illustration for the concept of the dual characteristic of excess cognitive capacity and the

sophiolytic instinct. Byrne asks practically the same question later on, (p158):

> Ape mentality: why not more? ...But we are still confronted with a paradox: if cognitive abilities are so useful in social and other spheres, as we like to imagine they are, why aren't these demonstrations much, much more common and obvious in these animals which apparently can show the cognitive skills occasionally?

Nicholas Humphrey, in his paper "The Social Function of the Intellect" asks the same question:

> We are thus faced with a conundrum. It has been repeatedly demonstrated in the artificial situations of the psychological laboratory that anthropoid apes possess impressive powers of creative reasoning, yet these feats of intelligence seem simply to not have any parallels in the behaviour of the same animals in their natural environment. I have yet to hear of any example from the field of a chimpanzee (or for that matter a Bushman) using his full capacity for inferential reasoning in the solution of a biologically relevant practical problem. Someone may retort that if an ethologist had kept watch on Einstein through a pair of field glasses he might well have come to the conclusion that Einstein too had a hum-drum mind. However, that is just the point: Einstein, like the chimpanzees, displayed his genius at rare times in 'artificial' situations—he did not use it, for he did not need to use it, in the common world of practical affairs. (16)

For apes especially, the answer is that the sophiolytic instinct, in these advanced animals, has attained the height of its development and effectiveness, for it needs to restrain a nervous system with tremendous inherent capability. And in light of Humphrey's comments I might add something obvious, perhaps painfully so, to which I shall

return later: the sophiolytic instinct is certainly not something that miraculously disappeared once humankind was on the scene, and its power (like the power of other important instincts) is negligibly reduced by awareness of its effect, or of its skeuomorphic nature for man.

Let us consider another example of excess cognitive capacity, in the chimpanzee. No-one would disagree with the proposal that the use of language is one of the most advanced cognitive abilities that has developed. Thus, in the exploration of potential cognitive abilities of our closest evolutionary neighbors, the attempt to teach some form of language to chimpanzees has been going on for a long time. As usual, any apparent success in this project has been immediately met with objections, mostly from the lingering remnants of the Behaviorist School of Thought (at least they readily admit that they themselves think!). A difficulty has been that chimpanzees simply do not have the physiology for speech (as opposed to neurophysiology), hence spoken language of any complexity is physically, but not necessarily cognitively impossible for them. Thus attempts have been made to teach chimps various types of sign language as used by the deaf, and quite good results have been obtained.

The work of B.T. and R.A. Gardner with a chimp named Washoe constituted a breakthrough, in which the animal was taught to use correctly about 130 words of the American Sign Language over a period of four years. Of particular note was: the achievement of this and other chimpanzees to invent novel word combinations for new objects and concepts; the fact that chimps in some of these projects began to communicate between themselves using the language; and evidence that there began a cultural transmission of the newly acquired ability. For example, Washoe's adopted son, even though the experimenters never used the sign language in his presence, nevertheless learned over fifty signs directly from Washoe. (17)

Perhaps the most striking example of language ability in chimpanzees has come from the work of David Premack and of Sue Savage-Rumbaugh and Duane Rumbaugh. These workers succeeded in teaching chimpanzees a symbol-based language, using either colored plastic shapes to denote words ("lexigrams"), or in another approach the use of a keyboard-based language in which keys are marked with arbitrary, not

iconic or representational symbols:

The most ambitious project to teach language to chimpanzees was initiated by Sue Savage-Rumbaugh and Duane Rumbaugh. With their colleagues they developed a keyboard-based language. Each key is marked with an arbitrary symbol. When pressed, a key lights up and its symbol appears in sequence on a screen, so the chimpanzees can keep track of their lexigram sequences. The researchers used a word-order grammar with a generic interrogative symbol to initiate question sentences. The chimpanzees in these experiments are typically taught a vocabulary of 75 to 90 words.

The computer-mediated keyboard approach allows unprecedented accuracy in recording the linguistic progress of chimpanzees. Analysis of the painful transition from the one-word stage of using a lexigram to identify an object to a two-word level that permits interrogation (by both humans and the chimps) shows that in these experiments the symbols initially are learned as operants for obtaining things (usually food). But once the two-word concept is mastered for, say, asking the name of a particular food, the chimp realizes how it applies to all other objects. This kind of mental breakthrough opens new horizons for the chimp and at the same time demonstrates that they understand concepts like "food" and "tool."

In a further extension of language use, the keyboard-based approach has allowed two chimpanzees to communicate with each other. The chimps had to learn that the keyboard and screen could be used for two-way exchanges; just mastering the techniques for answering researchers' questions or making requests was not enough. But once the chimpanzees grasped the idea of exchanging information, they were able to cooperate to solve problems. To take a typical example, one chimp would figure out what sort of tool it needed to get at food left by a researcher, and then use the keyboard to ask the other animal (in an adjoining room) for that implement; the second chimp, who was

> unaware of the particular problem, would pass the requested tool through a small opening. Again, there was every evidence of a conceptual threshold having suddenly been reached: training accelerated and error rates plummeted. Moreover, the chimps began to engage in what seems to be interactive play via the keyboard link. (18)

The idea of "a conceptual threshold having been reached," is precisely what would be expected from my hypotheses: the excess inherent cognitive capacity of the chimps is sufficient for significant language abilities, but chimps in the wild have never achieved these abilities because there is a powerful, if not almost unbreachable barrier which needs to be overcome to allow a specific manifestation of excess cognitive capacity to be used routinely. Thus it requires great and careful effort to teach chimps the rudiments of language in experiments like these, but once a certain stage is reached, once the significance of the new situation and ability has temporarily nullified the sophiolytic instinct, the new abilities themselves become part of the normal routine of the chimps, and are even taught to youngsters independent from further human training.

I should mention one further example in which even greater abstract reasoning ability in chimpanzees has been demonstrated. This is a particularly valuable body of evidence for my hypotheses since it illustrates that a particular cognitive ability, once liberated from control by the sophiolytic instinct, may then facilitate the liberation of further cognitive abilities which would not have been possible for the animal to learn or employ without having achieved the first ability. I will use another extended quote from Gould & Gould to describe the work, the title of this section is "Chimpanzee Logic":

> Though the reasoning abilities of keyboard-trained chimpanzees have not yet been explored in any systematic way, Premack has tried teaching a variety of logical operations to both language-trained and untrained chimpanzees. In the simplest tests, the chimps were faced with the task of'

labeling pairs of objects as either "same" or "different." This problem is unlike the same-different concept tests described earlier. In the usual form of the task the experimenter shows an example and then a pair of objects, one of which is the same as the example and the other different; the animal is rewarded for choosing the member of the pair that is different. In the Premack study, however, the two objects to be categorized were presented simultaneously. Language-trained chimps learned this discrimination, whereas untrained chimps did not.

Premack also attempted to teach the concept of analogies: A is to B as C is to D-lock is to key as can is to can opener, to choose one of the most abstract examples he used. The usual format of the test was to present an incomplete analogy and offer a choice of three different objects to finish the verbal equation. Language-trained chimpanzees eventually handled these tasks with nearly an 80 percent accuracy rate; chimps without language training, on the other hand, never mastered even the simplest analogy: "apple is to apple as banana is to...."

Another task familiar to students of child development is proportionality. Language- trained chimps could choose an object—a half circle rather than a full or three-quarter circle—that corresponded to the proportion visible in the test object (a half-filled glass of water, for instance). Chimps without language training could master this task only so long as the choice objects they had to select from were similar to the test object. Interestingly, Premack found that his language-trained chimp had no difficulty with a related concept that proves very difficult for children: conservation of volume. Young children judge the amount of liquid in a glass or the mass of clay in a lump by its height or length; thus they behave as though there is more water in a tall, thin glass than in a short, squat tumbler, even if they have seen each filled from identical containers of liquid. The language-trained chimp

tested on this task required no instruction: from the outset she recognized the two amounts as being the same. To be fair, though, this chimp was nearly 20 years old at the time, and she had had plenty of opportunity to learn the basic facts of fluid physics before testing ever began.

Finally, Premack has taught language-trained chimps to complete cause-and-effect sentences of the form "whole apple plus X produces cut apple," offering three objects (a bowl of water, a knife, and a pencil, for instance) as possibilities for X; in other tests, the goal was to supply the final item, as in "dry sponge plus bowl of water produces Y." The language-trained chimp mastered these tasks with a minimum of training; untrained chimps failed. (19)

Clearly, advanced apes have extensive latent language capabilities, and even what would have to be called a capability for logical reasoning, and one wonders what might be developed by these animals by the training of a hundred generations of chimps, first by human instructors but later by cultural transmission. Unfortunately such experiments are difficult to carry out without access to a time machine, and physicists seem loathe to provide us with either a theory or the technique for constructing one. But extensive experimentation attempting to use psychedelic drugs as facilitators for this process are called for, and might well reveal a facilitation, perhaps cumulative, for the animals' rapid overcoming of sophiolysis and resultant achievement of quantum leaps in their cognitive development. Again unfortunately, government restrictions on psychedelic research, and especially a strong reluctance for scientists to engage in research with such "discredited drugs of abuse" make it certain that such work will not soon be attempted. Perhaps the absurdity of my comment on time machines will call attention to the even greater absurdity of the impossibility of undertaking, in the present social, political, and scientific climate, even the most elementary of psychedelic research projects.

Gould and Gould continue with a few careful comments about what the chimpanzee research might indicate, and

certainly caution is necessary when research has barely begun in a field. But the evidence outlined above, if not yet sufficient for other conclusions, clearly demonstrates the validity of the concept of excess cognitive capacity and the sophiolytic instinct. Yet leaving the model at the stage of postulation of yet another mysterious instinct without physiological basis would not have amounted to much more than another instance of New-Age technobabble if the facilitating neurocognitive mechanisms for its operation could not be found or hypothesized.

The next stage of my model-building toward the psychedelic theory therefore involved an attempt to see how the sophiolytic instinct might actually operate on a physiological level. The fact that it seemed to be such an important instinct hinted that a fundamental operation of the nervous system might produce what at first would be seen as an instinct, much as the discovery of fundamental neurological operations had elaborated the nature of such former "instincts" as those for hunger, thirst, or breathing. The idea that instincts were essentially habits, or exhibited themselves as such, and the realization that the implementation of a habit could only be using the contents of long-term memory in an unconscious way, led to the models described in chapters three and four. These models were then seen to have a wide explanatory power across a range of phenomena, as my examples in these chapters showed. Thus the sophiolytic instinct became the primary cognitive operation of the nervous system of all advanced animal life, the habit routine search function. Now it was no longer necessary to posit a skeuomorphic instinct, of mysterious origin and operation, to see how the result that such an entity would produce was instead brought about by a normal brain operation utilizing brain areas common to all mammals right back to the most primitive.

The sophiolytic instinct thus turned out to be merely a descriptive artifact resulting from the way animal nervous systems have evolved to operate, the HRS system as the primary cognitive operation, and the requirement of activation of the SD (significance detection) system, dependent on unusual ENV (environmental) events, for overruling of the HRS patterns as templates for thinking2 and behavior. As to the question of why evolution produced a nervous system that detected, not reality directly, but a

representation of current reality drawn from memory data through the process of HRS, I think that it can be seen that at each stage of animal evolution, the former type of nervous system would always lend a greater survival value than the latter. With the very first organisms that became capable of "taking a decision", it seems to me that such decision taking should be a far more efficient and dependable process if it were based on habit rather than fresh analysis of the entire environmental input which, at a minimum, would require far more time and "brain power". Thus we can see the normal and necessary parameters of evolution as the factor which has produced the "sophiolytic instinct" which is the "suppresser of creativity", the characteristic that we humans are still very much slaves to in lieu of active, strenuous and constant striving to free ourselves from our in-built "narrow-mindedness". Needless to say, it is my opinion that the judicious use of psychedelic drugs to aid in this effort is precisely the Rx that is called for, just as it has been for the ancient Greeks at Eleusis, for the Native Americans, for so many other tribes down through history.

References

(1) The term "proto-human" is intended to denote anatomically modern Homo sapiens, before any significant cultural attributes had yet appeared. Anatomically modern hominids probably go back 150,000 years or more, yet the initial stages of development of culturally modern man occupied a very brief period, between ca. 50,000 to 30,000 years ago, the Upper Paleolithic. (back)

(2) At roughly the same time of my own musings about early man, and unbeknown to me, Terence McKenna was writing about his own evolutionary hypothesis. It was first outlined in a paper Mushrooms and Evolution (personal communication 1988), and later developed in his popular books including Food of the Gods (Bantam 1992). (back)

(3) William James, The Principles of Psychology Vol. 2,

authorized Dover edition of 1950 p383. (back)

(4) "Rapid" on an evolutionary scale, i.e., perhaps on the order of ten to fifty thousand years, whereas normal evolutionary changes, especially important ones, are in general thought to take far longer. (back)

(5) Nicholas Humphrey, in A History of the Mind (p196) introduces the use of the term in the present context, and adds that such features are "no longer subject to selection on utilitarian grounds". (back)

(6) Such as the case of the Koala Bear and other examples described by Arthur Koestler in The Ghost in the Machine, Chapter XII. (back)

(7) Gregory Bateson, Steps to an Ecology of Mind, Random House, 1972, Part I, "Metalogues". (back)

(8) The Oxford Companion to the Mind, ibid., "Instinct" p374. (back)

(9) From the foregoing, instinct thus seems a mere label for phenomena which have not yet been explained on a more reductionist level. But perhaps there is a more hopeful future for the term, and phenomena of behavior and variations thereof which can profit from a new conception of the term. Recent advances in the science of chaos and complexity might suggest that at least some instincts, those not explainable in simple physiological terms for instance, might be something like state attractors for behavior patterns, analogous to the attractors seen in other complex adaptive systems. See for example Complexity, Life at the Edge of Chaos, Roger Lewin, MacMillan 1992, especially the example on page 176, and also The Origins of Order, Stuart Kauffman, Oxford University Press 1993. An instinct seen as a biological state attractor for behavior would be more like a mathematical function than some undefined "innate drive" supposedly hidden away in an organism's "genes", and this behavioral attractor would guide the formation of habit routines in an individual animal. Under the influence of such a function, habit routines in different animals of the

same group or species would be very similar, but yet show the small variations commonly seen in instinctual behavior. The idea of instinct as a probabilistic state attractor for the formation of habit routine is perhaps only a more modern description of William James' idea that "most instincts are implanted for the sake of giving rise to habits, and that, this purpose accomplished, the instincts themselves...consequently fade away." (The Principles of Psychology, ibid., vol. 2, p402). Since my conception of the sophiolytic instinct is reducible to the operation of brain systems however, these speculations would not be of use to the present work, and I will leave their development for some future project. (back)

(10) The "dual characteristic" might at first seem to be tautological: a "reserve" capacity would necessarily imply the selective or only occasional use of that capacity, otherwise it would not be "in reserve". But if we concentrate first on the aspect of suppression, and then see that this is only an introductory and oblique way of understanding what an important cognitive system of the brain is naturally producing, and further, that other brain mechanisms allow the over-ruling of the first system, then we see that the tautology is merely the result of a rudimentary description of the overall phenomena. Here again is illustrated how an introductory model, primitive and not very useful in itself, can lead nevertheless to more advanced models overcoming the original limitations. (back)

(11) James L. & Carol Grant Gould, The Animal Mind, Scientific American Library 1994. (back)

(12) Donald R. Griffin, Animal Minds, The University of Chicago Press 1992. (back)

(13) Richard Byrne, The Thinking Ape, Evolutionary Origins of Intelligence, Oxford University Press 1995. (back)

(14) Griffin, ibid., p6-7 (back)

(15) Byrne, ibid., p86-87 (back)

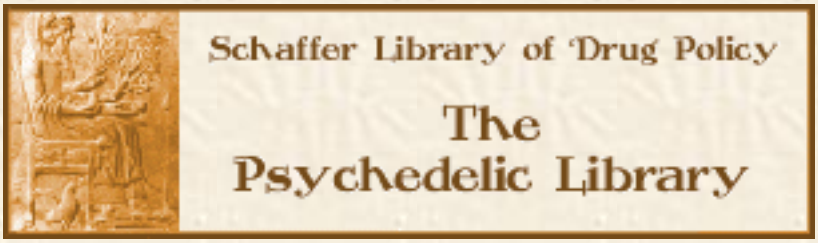
(16) from: Growing Points in Ethology, (1976), P.P.G. Bateson and R.A. Hinde, eds., p307, Cambridge University Press. (back)

(17) See the account in Gould & Gould, ibid., pp183ff. (back)

(18) Gould & Gould ibid., pp186-187. (back)

(19) Gould & Gould ibid., pp189-190. (back)

Chapter 7 | Table of Contents



The Center of the Universe

William S. Moxley

7. Evolution

Drugs will not be brought under control until society itself changes,
enabling men to use them as primitive man did;
welcoming the visions they provided not as fantasies,
but as intimations of a different, and important, level of reality.

—Brian Inglis (1)

EARLY MAN'S RELATIONSHIP with the psychedelic plants he discovered was a symbiotic one. These plants, which had long before evolved biochemical mechanisms to produce substances whose ultimate, if incidental function was not to be realized for millions of years, suddenly provided the key whereby the very process of evolution might overcome a most formidable barrier. Homo sapiens, the (potentially) Wise Man was born, and dozens of obscure species of fungi, flowering vines, roots, seeds, trees and cacti, became revered partners with him to produce an experiment in evolution which would truly be a final experiment: Either it would eventually succeed in producing an enlightened world society in which the rule of the Perennial Philosophy occurred not through force of authority but simple good sense, enabling humankind to undertake a conscious and deliberately ecological stewardship of his small corner of the universe, or it would end in the probable destruction of all advanced life on the planet. There would be no turning back once the

barrier of the sophiolytic instinct had been breached.

The symbiotic partnership at first enabled a relatively small population of Early Man to prosper, to migrate rapidly from his birthplace to all the corners of the earth, to initiate a veritable explosion of culture wherever he went, and to displace all more primitive species and races of archaic man, the descendants of Homo erectus which had migrated out of Africa eons before. But as the experiment progressed and culture, technology, and thus power accumulated, repudiation of the beneficial symbiosis sometimes occurred in the various regions of early civilization. Unfortunately it is a simple fact that accumulated power and technology may, with the greatest of ease, be used with malign intent, and thus be used by the ignorant to enforce their folly on the wise. Wisdom is by definition incapable of using force, technological force at least, to assuage ignorance. Advantageous Ends are simply not obtainable by Deplorable Means. As the first organized societies grew and accumulated technology, some inevitably succumbed to the temptations which occur all too easily to the ignorant, including the subjugation and eradication of neighbors whose continuing wisdom threatened their power structures. The catalytic factor which had made culture and technology possible in the first place was, again and again, ignored, and one by one, such societies declined and were extinguished, their achievements to be forgotten along with their perversions. And so the story continues.

In the early years of my work, and with the spirit of the 1960's still fresh, it seemed that it was yet possible to ameliorate by stages and eventually reverse the destructive momentum that had been building for centuries in the most modern and recent, and world-encompassing of civilizations, Western Civilization (for want of a better term). The Twentieth Century had provided horrors which were the logical extrapolation and epitome of many centuries of psychedelic ignorance, and there was something new: the horrors of the Twentieth Century were in essence terminal ones for they could no longer be exceeded without a resulting collapse of the civilization which had brought them about, and the novelty was that this time, the collapse would preclude the possibility of picking up the pieces once the ignorance and stupidity of the powerful had run its course. But having been born into, and grown up within the

best and the worst that civilization had ever offered, it was natural to hope that the good could be preserved, the bad at least slowly corrected, a small group of wise persons begin to re-establish the ancient symbiosis at first stealthily and cautiously, the resulting new vision becoming eventually an irresistible ground-swell. Today I am not so sure.

The scenes of my several attempts to be a modern shaman for the tribe of Western Man provided contradictory and paradoxical results. In one sense, I was attempting for the first time a "scientific" rather than ritual and intuitive approach to shamanism. The teaching and experience of the psychedelic state was not to be interpreted, as in previous societies, in terms of myth and ritual, but in terms of a truly scientific understanding of the eternal religious questions concerning origins, destinies, and meanings of the life-process. This understanding would extend even to the biological processes of the human nervous system which corresponded to the psychedelic state of awareness. It seemed possible for the first time to answer many of the questions for which Early Man could only compose tales and enact symbolic ritual, it seemed that we might finally grasp where the Essential Mystery of life lay. We would be able to see how all the religions, all the ancient philosophies, were describing a truth with means inadequate to the task, so that their result was not wrong but merely incomplete, each description like that of one of the blind men exploring some local region of that famous elephant. Now for the first time we seemed to have all the tools necessary to step back and view the beast all-at-once, and use the former limited techniques to confirm what we now could take in at a glance.

Another important difference in what modern "scientific" shamanism was attempting was that the psychedelic experience had in the past been a factor in human evolution, whereas now we were attempting to make it an essential part of our technology, a guide enabling the wise use of that technology. It was obvious that we could not achieve an evolutionary effect on such a rapid timescale, we could not expect to recapitulate the phylogeny of the effects of psychedelic experience on Early Man with the ontogeny of modern psychedelic research. The new function of psychedelic experience, although helping the individual to overcome the disadvantages and limitations of habit-routine governed

existence, just like it had done for Early Man, was not this time a causative factor in the establishment of culture and civilization, but would instead have to correct a psychedelically long-ignorant civilization from the path of self-destruction. Such an accomplishment had never before been realized, at least not on the global scale required today.

The intent of this approach was therefore to be directed not just to the benefit of a local tribe as in former ages, or even the now global tribe of psychedelic seekers, but at a corrective experience for the evolutionary life process itself. It seemed therefore that we were involved with an evolution of the function of psychedelic experience. If at first the symbiosis had made possible the great experiment, its role was now to help confirm the inevitable showdown implicit in such an experiment: given the awakening of mankind from the slumber of animal existence, an awakening in which man acquires the creative ability, the sense of right and wrong, and all the other God-like attributes, it is inevitable that such a gift will be repudiated, and man assume for whatever reason that he is self-made, not born of the primitive elements of the earth nor of his animal ancestors, a pretense of omnipotence. The result of this great experiment would thus usher in an age in which humankind in its entirety would finally live up to its potential, or perish. If psychedelic ignorance had in the past contributed to the demise of localized civilizations, this time the fate of the entire planet, and all life thereupon, was at stake.

Although the energies which I set in motion in this project I know have reached a great many people, and provided a catalyst to the more positive of these possibilities, the scenarios within which I have had to operate never seemed to take on a continuing spirit of the cooperativeness and enlightened action that might be expected from a knowledge of the intent of such a project. The chocolate-covered placebo fiasco was neither the first nor last of the scenes filled with trivial disputes, cross-purposes, deceptions and dishonesty, scenes certain to detract from the business of effective shamanism. Business was, of course, one of the problems.

Ideally, the enlightening medicine should be free; to attach an earthly value to a sacrament can only devalue the

meaning of the situation in which it is given. But we co-conspirators could neither afford to work "for free" in our society of institutionalized greed euphemistically called competition, nor could we expect others to do so. And the prohibitionary restrictions of the late 1960's ensured that people who wished to spread the knowledge of psychedelic wisdom would often have to deal with unscrupulous intermediaries who would as soon deal cocaine or other contraband. Cash flow was the sacred element for such as these. And paradoxically, the prospective psychedelic initiate also required that a price be paid for the potion, so paradigmatic was the principle of all things having their price in this "capitalistic" society. The power of shamanism in this mundane world had become in one way like that of the psychiatrist, the effectiveness of his treatment having been shown by statistical analysis to be proportional to the size of his fee!

In attempting a modern shamanism I was also at a great disadvantage not having the direct contact with tribal members which had always been an essential feature of the shamanic art in former societies. Rather than direct guidance, the instructions that went with the potion had to traverse the several hand-to-hand transactions between myself and the final recipient. I also had to assume that public information such as that in the published works of Huxley, Watts, and the many other gurus of our time would be studied and employed. In the modern situation, it was also obvious that there could be no public pronouncement of the intent of such a project in guiding societies to a new and ecological direction, although many authors had suggested as much, at least obliquely. Personally, it would have been absurd to proclaim that this was my intention, not least for the danger of intervention by the enforcers of the unenforceable. Today, having years ago retired from any active continuation of my former activities, it has become possible to publish an analysis of the intentions and particulars of that handful of persons, the modern-day shamans who were instrumental to the early years of the psychedelic movement.

It is not hard to understand why, with these retrospective views now available, that of the various scenes and collaborations of partners involved in the project, the smaller and more improvisational efforts were

the more successful. The same seemed to be true of other groups doing similar projects. Bigness was a certain harbinger of disaster. When big plans were made, large quantities of psychedelics produced, and sizable sums changed hands, scenes collapsed, friends became enemies, or at least no longer friends, and those who, like myself, seemed to have an inner vision of the overall purpose of the project encountered the most unlikely coincidences which set in motion the beginnings of a new collaboration to attempt again that which had just failed. Many times the coincidences which arrived, in the course of my own shamanic journey, were so unusual and unbelievable that I just ignored them; it would have been pointless to speculate as to the origin or cause of such unlikely events.

The overall lesson that was illustrated by my experiences with several groups of collaborators was that a modern technological and scientific approach to shamanism, although rewarding for individuals and small groups able to exist on the periphery of modern "bigness", was not going to restore the equilibrium between man and nature within the confines of the present social reality of Western Civilization. The modern and artificial distinction of man being apart from nature seemed to be a direct result of psychedelic ignorance, and the "bigness" of the modern system of life exaggerated the distinction so much so that the ecology of the life of early psychedelic man simply could not be re-created within our modern system. Hence every attempt to produce sizable quantities of psychedelics inevitably met a swift retribution; and each time there occurred a new wave of popularity of psychedelic use which attracted public attention, that use seemed to degenerate quickly into misuse, and the majority of those seekers lose sight of the spirit of their original awakening, just as had entire civilizations before them.

The tribal nature of the societies of early man had provided the ideal milieu for beneficial psychedelic use, and the nature of our own society now prevented its own conversion to a more ecological, satisfying, and psychedelically-educated way of life. The only project that made sense therefore, was to attempt to influence only small groups of people, individuals who would themselves integrate their psychedelic experience by blending in discreetly with our modern insanity to influence again only a small circle

of friends, keeping a spark alive and teaching valuable activities that would be necessary for a future in which the inevitable if slow collapse of modern civilization into chaos would eventually restore regional and small, "tribal" societies to their former importance. Whether that future was to be a time of great pain and destruction, or relatively benign, no-one could hope to predict. Certainly, psychedelic education would help to promote a beneficial transition and prepare those so educated for the inevitable changes that lay ahead. The psychedelically-educated would hopefully be able to provide the wisdom necessary to guide others through a transition that will certainly be difficult, yet perhaps not cataclysmic if the goal of modern shamanism were to be adequately realized in time.

It has long been the accepted wisdom among most scientists, as well as the common mythology of public perception, that the rise of tool-making, i.e., technology, was an important, if not defining characteristic of the evolutionary process connecting advanced apes to Early Man. Specifically, it has long been hypothesized that Darwinian selection for increasingly intelligent hominids came about through selection for the best abilities to make and use tools. In the extreme, at least before recent studies of tool use and especially tool-making in some animal species, the technology of tools was thought to be a primary defining characteristic separating Homo sapiens from the animal kingdom. Also among extremities of interpretation has been the idea that tool-making and early technology might even have been the force driving the extraordinarily rapid increase in the size of the primate brain, from the first hominids of two or three million years ago with a brain volume of about 400 cubic centimeters, to modern man with a brain volume more than three times this figure.

It is understandably important to science to explain this evolution in brain size, for it has often been noted that, on an evolutionary timescale, the rapidity of the change was practically unprecedented. Since the middle Pleistocene, about a half-million years ago, the rate of increase was particularly rapid, so much so that it has even been suggested that the enlargement might actually have been

somewhat pathological, leading to a being whose irrationality and capability for wanton destructiveness equals or excels his creativity. Certainly, the history of the Twentieth Century has been a pinnacle of both tendencies, and also requires an explanation, and a resulting solution, if we wish to ensure our future survival. But even though we may have vestigial organs such as the appendix, and "skeuomorphic instincts" as I have discussed, blaming our present situation on purported faults of evolution is neither productive nor scientifically logical. The mere proposal of a hypothesis that we have too much brain power for our own good goes a long way to suggest that we must therefore have the brain power to correct any such tendency to let foolishness dominate our lives; scapegoating is seldom a productive hypothesis.

It now appears that the tool-making hypotheses also have resulted less from a careful analysis of the data than from superficial concurrence of two tendencies. We have complex technology, we have large brains, animals have neither. Seeing that there are facilitations and parallels between technology and brain power does not, however, provide more than circumstantial evidence for causation. And recent work now makes it extremely likely that the ability to produce technology, it has been called object-intelligence for want of a better term, has been a development that has "piggy-backed" upon a much more important development in intelligence, that which is required for social transaction. A recent collection of the important papers providing the foundation for the theory of Machiavellian Intelligence has been published as a book (2), and I will not present an extensive argument here for its well-founded conclusions. One quotation should suffice to illustrate that even anthropologists such as Thomas Wynn, who might be surmised to have a "vested interest" in the importance of tool-use and making in the development of early hominids, has whole-heartedly agreed with the new view:

> Given the evidence of brain evolution and the archaeological evidence of technological evolution, I think it fair to eliminate from consideration the simple scenario in which ability to make better and better tools selected for human intelligence. At almost no point in hominid evolution was there even

> a provocative correlation. The earliest known hominids, Australopithecus afarensis, had a brain larger than an ape's of equivalent size, but as far as we know, no greater reliance on tools. Early Homo at 2 Ma [million years ago] had a much more 'encephalized' brain, but the tools and even the context of use were not beyond the capacity of modern apes. Homo erectus did possess technology that was outside the range of ape behaviour, but by this time, 1.5 Ma, much of the encephalization of the Homo line had already occurred. In sum, most of the evolution of the human brain, the presumed anatomy of intelligence, had occurred prior to any evidence for technological sophistication and, as a consequence, it appears unlikely that technology itself played a central role in the evolution of this impressive human ability. (3)

As one of the contributors to the book remarked, Wynn's paper "is a bombshell to the older 'Tools makyth Man' view... Wynn throws the question of the cause of human brain size back into the realm of the invisible: either the social relationships or the lifestyle which produced technology, not the technology itself." (4)

The conclusions of the Machiavellian Intelligence hypothesis fit well with my own theory, and lead to the most probable evolutionary scenario for the influence of psychedelic plants in the emergence of modern humans. The arguments of the hypothesis show that the complexity of logical operations required for social interaction in large groups of individuals is far greater than that required for tool use or making, or for that matter any other activity of primate species. (5) Studies of societies of monkeys and apes in both natural and controlled environments strongly support the theoretical arguments. The brain size of various species of modern primates, for example, has been closely correlated with the size and complexity of the social groups of the various species studied. The complexity of social interaction would increase geometrically with the number of possible interrelations between animals in a group consisting of three or more generations of relatively long-lived animals. Complex dominance relationships, alliances,

group undertakings such as efficient foraging and hunting, lengthy childhood, and relatively constant possibility of mating activity add to the complexity. The demands of increasing social complexity was a development requiring far faster biological evolution of the equipment which facilitated it than any previous set of demands such as tool use and manufacture, climate change, interactions with other species, or other hypothesized evolutionary pressures. Thus it is reasonable that the rapid increase in brain size among primates requires no other explanation, despite its unprecedented speed.

The proposal of early influence of psychedelic plants on hominid evolution as a factor in brain enlargement (between one and five million years ago), as suggested by Terence McKenna, is therefore difficult to support. Criticism of McKenna's theory as presented in his Food of the Gods has been sometimes dismissive, (6) and although I find much of value in the book, I would have to agree that his proposals that psychedelics were "mutation-causing" agents that "directly influenced the rapid reorganization of the brain's information-processing capacities" are unsupported by evidence, and unnecessary in light of the much more reasonable Machiavellian Intelligence hypothesis. The temptation to explain the rapid evolution of the primate brain has led more than one author to error, however. What McKenna overlooked was a much more recent period of prehistory in which a proposed psychedelic influence fits a wide range of facts like a glove. In the preceding chapters I have outlined many of these facts, and it remains now to show at what period an intervention of psychedelic influence is most likely in consideration of several areas of knowledge about fossils, human genetics, climate changes and catastrophic events, and other sources of information. The necessity for psychedelic intervention has already been established in previous chapters, the question of when such intervention occurred is the present concern.

Before presenting possible evolutionary scenarios however, let me explore further the idea of social complexity and its relation to the habit routine model of cognitive operation I have proposed earlier. I stated that the power of the habit routine cognitive system would have increased with the increasing complexity of animal species, and would have reached its summit in proto-man. The

Machiavellian Intelligence hypothesis and its proposed increasing social complexity fits perfectly with my surmise. Increased social complexity and the evolution of a large, expensive to support nervous system go hand in hand with extreme reliance on habit routine generation as the primary cognitive mechanism. One major consideration is that a large brain requires an excellent and copious diet, a requirement that would be fulfilled best in a social group able to cooperate on the highest levels to procure and share a wide variety of nutritious foods. An ability to avoid toxic plants as well would depend on complex social relationships as I will show in a moment.

It might be said that all these requirements would be an argument against the use of psychedelic agents in such social groups, an argument with which I entirely agree! The increasing social complexity and food requirements are arguments for the increasing power of sophiolytic tendencies and habits that would prevent any cognitive breakthrough to using the new brain for purposes other than the maintenance of social order and survival, a significant strengthening of the habit routine system. Experimentation with new foods, such as psychedelic plants, would not in normal circumstances have been a common, or even likely occurrence. Two quotations concerning the diet and food sources for primates will illustrate the point, the first quotation concerning the necessity for a rich and complex diet, the second on the ways this is fulfilled while yet preventing exposure to toxic (or presumably psychedelic) items:

> Monkeys and apes have to balance their diet, which they do by wide ranging and yet selective eating; this is nicely illustrated by a study of Sri Lankan monkeys, Macaca sinica, by Marcel Hladik. By careful observation and quantification of their feeding, and phytochemical analysis of their food plants, he was able to show that for these 'frugivorous' monkeys, fruit was always more abundant than they could ever need. However, the monkeys had large day ranges and occupied a home range too large for efficient defense as a territory. Why? Their ranging was apparently a consequence of a need to eat fungi, rotten wood, insects, bark, shoots-a whole range of items that

allowed them to make up the protein, vitamin, and mineral deficiencies of the energy-rich ripe fruit (Hladik 1975). The need for a balanced diet forces many primates to eat items that are hard to find. In studying baboon ecology, I was continually amazed at the subtle cues that they must use to identify some of their plant foods; at the most harsh time of year, the main survival foods were all either underground, or tiny and inconspicuous. (7)

Mother primates of several species pull their infants away from novel objects (two species of macaque), or remove foods from infants if the food is not part of the diet (chimpanzee). Caro and Hauser suggest that the latter might be 'accidental', but having seen it happen in gorillas, I doubt this (Anne Russon, who has noted the same in orang-utans, shares my scepticism). An infant gorilla was fiddling with and chewing at a leaf (of a species not normally eaten), facing away from the mother who was eating herself, when the mother broke off her feeding, reached over the infant's head and took the leaf, dropping it well out of the infant's reach. In the case of a chimpanzee watched by Mariko Hiraiwa-Hasegawa (1986), the mother not only did the same, but systematically picked every other leaf of the same species in the infant's reach and placed her foot firmly on the pile of leaves! But in any of these cases, the function is unclear: does the behaviour serve to teach, or simply to remove infants from danger? (8)

It has been proposed (9) that the dietary requirements of animals with complex nervous systems was itself a factor in the evolution of hominid intelligence, the increasing need for a high-quality diet selecting for advances in intelligence and larger brains, which itself would demand further dietary improvements. This must certainly be the case, but I think that the methods used by advancing species to procure better and better diets are themselves aspects of

social behavior, and thus fall under the hypotheses of Machiavellian Intelligence. It was only through the advancing complexity of social life that the dietary requirements could be met, either for the actual procurement and sharing of foodstuffs or for the transmission of the knowledge of how to obtain them, and how to avoid serious errors such as ingesting toxic items.

As I have just suggested, if increased social complexity and the need for a correspondingly complex diet to satisfy the needs of a large brain indicate anything, they would seem to argue against much use of psychedelic plants in advanced apes and proto-man. Indeed, an individual who accidentally ingested a plant which disrupted his function and place in such a social system would most likely lose that place, and possibly be ostracized and excluded from the group. This is the substance of Andrew Weil's comments on McKenna's hypothesis (footnote 6). Psychedelic influence on H. erectus and even more remote human predecessors is of course possible, as McKenna's model suggests, but I believe it was unlikely, and if so, unimportant to either social or neurological evolution. Certainly, evidence is very sparse indeed, and there are important counter-arguments to be considered: For example, H. erectus lived on 3 continents in various habitats and through several periods of disruptive climatic change for a period of 1 or 2 million years, yet remained in a relatively unchanging state, with few signs of significant cultural or technological innovation. This is certainly a sign of normal, slow evolution, not psychedelic evolution. By contrast, the culture of early Greece, with psychedelic influence, advanced dramatically from a quite primitive state to an advanced civilization in the space of a thousand years or so. In addition, the progression from Australopithecus to erectus to sapiens involved many different anatomical developments, not only brain size and reorganizations, but speech-enabling changes to the larynx, (10) even an enlargement of nerve canals in the spine suggested as facilitating the precise diaphragm control needed for speech, (11) and many other anatomical changes. This is certainly an argument for slow gradual evolution, not psychedelically-enabled or "psychedelic-mutagenic" evolution as suggested by McKenna.

From the preceding arguments concerning social stability, we may thus surmise that the influence of

psychedelics on our immediate ancestors must have also involved some other simultaneous and important changes or events which helped to suppress the described tendencies to greater and greater dependence on habit routine and the sophiolytic mode. Some unusual change must have occurred to allow and ensure that psychedelic use would occur on a significant scale and would rapidly and irreversibly transform the habits of the hominid group that was the precursor of modern humans.

It is necessary to point out, however, that the very brain changes which facilitated social evolution and a powerful habit routine cognitive system would be the same changes that would make an eventual psychedelic intervention most effective: A greatly expanded cortex to allow the storage of long-lasting and complex memory data used for habit routine search, would also implement creativity that was far more than random trial and error, creativity that could intentionally produce wide-ranging positive results: we would not expect attempts at creativity by a small-brained animal to result in much more than increased risk for that animal. A greatly expanded portion of the cortex involved with "association processing" allowing the assembly of habit routines of a multisensory and intentional complexity, would also facilitate highly effective creativity. And a greatly expanded frontal cortex, the seat of working memory and other advanced cognitive abilities, facilitating habit routine based upon simultaneous nested levels of intentionality, would likewise be instrumental to a being requiring the frequent use of improvisation in situations which involved simultaneous trains of logical operations. The same nervous system improvements that enable advanced habit routine generation and use also provide for psychedelically-enlightened operation that is productive and creative, and not just hazardous to an animal. Here we have an additional argument against the influence of psychedelic agents at an early, small-brained stage of hominid evolution: psychedelics would not have "worked" on animals with limited brain capabilities. We might say that psychedelics haven't really "worked" on humans either, considering our backsliding tendencies to ignore (and eradicate) psychedelic tribal wisdom that has accumulated for millennia. The present state of Western Civilization in this "century of holocaust" is a direct result of that

ignorance, and if it should lead to the scenarios of devastation and collapse which have all too often been predicted by some, we will have to conclude that the great experiment, the psychedelic intervention, will indeed have been a failure.

One further argument will suffice to eliminate from consideration an early psychedelic influence on hominid evolution. The role of language in hominid development has been another hotly-debated topic of late. It is my contention that the psychedelic state of consciousness would have been of little or no value for an individual, and would have provided no evolutionary breakthrough for a social group which did not already have the benefit of complex language abilities. Psychedelic use and its effects are most valuable as a cumulative phenomenon. The psychedelic experience must not only be individually integrated but socially integrated as well, if it is to provide a key to rapid cultural advance. There must arise a "psychedelic culture" which is transmitted and developed from one generation to the next, and through which the beginnings of shamanism can arise. Without symbolic language, it is difficult to see how such a process might happen. Once a fairly complex language ability had evolved, however, we may imagine that psychedelic experience would have provided an impetus for further important language development into abilities concerned with the expression of the abstract, the mythical, the artistic, language capable of elaborating and transmitting tradition, the hallmark of culture.

Whereas written language is a cultural phenomenon which must be taught, (a child who is not taught to read and write will certainly not pick up the ability spontaneously), spoken language is assimilated spontaneously. Spoken language is a biologically-inherent feature of the human brain, a realization that became apparent to the linguist Noam Chomsky several decades ago. Steven Pinker, a former student of Chomsky, has made several conclusions concerning language and its evolution which are pertinent to a hypothesis of the time period in which psychedelic influence might have played a role in human evolution. (12) On the strength of much recent research, Pinker concludes that the first anatomically modern humans already spoke the equivalent of modern human language. Since language is intrinsic to the brain structures which produce and

interpret it, language must have co-evolved with those structures, and have been fully realized with the advent of the brain with which it co-evolved. Spoken language was therefore not "invented" at a late stage of that evolution, (although reading and writing most certainly were). Since language is inherently a social phenomenon, this proposed co-evolution of brain and language fits nicely with the Machiavellian Intelligence hypothesis of brain advances being driven by social requirements, including the advancement of language capability.

Pinker notes therefore that "language did not first appear in the Upper Paleolithic beginning about 30,000 years ago, contrary to claims frequently seen in archaeological...and popular science treatments." (13) The idea that psychedelics would not have "worked" on our small-brained forbears such as Australopithecus is supported by the proposed necessity of the existence of complex language as a precursor for the beneficial influence of psychedelics, and considerably narrows the time frame in which such influence must have played its role. Using conclusions from linguistics and brain evolution, we see that such a time frame should extend from about 150Ka to 50Ka (thousand years ago). I shall further narrow this window of opportunity for psychedelic influence in my arguments to follow. The important conclusion which has just been developed is that psychedelic plants in the environment cannot have played any significant role in either the early development of language, nor in the parallel development and tripling in size of the hominid brain during the period from about 3Ma to the appearance of anatomically modern humans about 150Ka.

Considering the importance of language in evolution, and the importance of language for various modern arguments as to how the process of man's evolution took place, some further comments are appropriate which will tie together some ideas expressed in previous chapters with the task at hand. It is widely hypothesized, quite correctly I believe, that major enhancements to spoken language occurred during the Upper Paleolithic with the appearance of anatomically modern hominids. As Pinker has noted, certain observers thus wish to believe that language itself was practically non-existent before this period. The argument of language being inherent to the brain structures which produce it, and therefore of the necessity that language co-evolved with

those brain structures is a powerful rebuttal of such ideas, but additional evidence also favors the co-evolution claim. As noted in the last chapter, rudimentary language abilities have now been definitively shown to exist in our closest relative, the chimpanzee. It was also noted that language abilities are not used by chimpanzees in the wild, but the fact that these primitive language capabilities exist at all must indicate that rudimentary brain circuitry for producing language nevertheless exists. If such circuitry was present, albeit in very primitive form, at the period of divergence between the Panidae and early hominids, it is unreasonable to assume that such circuitry might continue to evolve for the next several million years, to be used suddenly at the Upper Paleolithic to produce complex language which had no precedent whatsoever. The only argument here could be that these brain areas which later permitted spoken language were all along used for another function altogether.

Although I feel that chimpanzee language ability, and certainly the arguments of Pinker and other linguists, strongly favor the continuous existence and development of language throughout hominid development, the alternative use argument just cited brings us to another consideration which is important to my theory. Referring back to figure 1 in chapter 3 and the associated text, it will be seen that according to my cognitive hypothesis, language is but one, if the most obvious and important, of the symbolizing functions of the thinking1-thinking2 conglomerate. In other words, language, the serial realization of thinking in abstract symbolic form, is not itself the material or medium of the thought process until a late stage, and is not necessarily a part of the thinking process at all. My model is, of course, in contention with the majority of recently proposed cognitive models of the function and construction of language, and I do not expect its easy acceptance: only the evidence of the many-sided picture that my theory of psychedelic experience presents might have the power to convince scientists today that the cognitive model of thinking1-thinking2 processes might have some general applicability. The neurologist Harry Jerison, for example, proposes that language itself is the medium of reflective thought and imagery:

"The role of language in communication first

> evolved as a side effect in the construction of reality," proposes Harry Jerison, a neurologist at the University of California, Los Angeles, who has made a special study of brain evolution. "We can think of language as being merely an expression of another neural contribution to the construction of mental imagery." Brains throughout evolutionary history have been shaped to construct an inner world appropriate to a species' daily life. In amphibians, vision provides the principal element of that world; for reptiles, an acute sense of smell. For the earliest mammals, hearing was additionally important; and in primates, a melange of sensory input creates a complete mental model of external reality. Humans, says Jerison, have added a further component: language, or more precisely, reflective thought and imagery. Thus equipped, the human mind creates an internal model of the world that is uniquely capable of representing and coping with complex practical and social challenges. Inner reflection, not outer communication, was the facility upon which natural selection worked, argues Jerison. Language was its medium-and, at the same time, an efficient tool for communication. This hypothesis now has wide support. (14)

Too bad. I believe the hypothesis that language is the medium of the construction of mental models of reality, is misguided. But it wouldn't be the first instance in the history of science where the experts were wrong. Firstly, as stated here, the model implies that without language, the construction of mental models of the world, by animals for instance, is minimal. Yet the habit routine cognitive model shows that the habit routine, constructed by thinking1 processes and analyzed by thinking2 processes, is the mental model of reality we are concerned with, and that the transformation into language or other forms of symbolization is a subsidiary, secondary, and non-essential process occurring in thinking2. As I have argued previously, the habit routine system has been the constant companion of animal life from the beginning, it is the primary function of all animal nervous systems, not just advanced ones such

as our own. It is interesting how close the above quotation comes to the idea of the habit routine model as the mechanism of construction of the "mental model of external reality," ("a melange of sensory input creates a complete mental model of external reality") but then misses the necessary conclusion. Jerison's model would have the symbolization function as the primary cognitive operation, but that would require that the "raw material" of symbolization be the primary sensory information rather than the generated habit routine, and a great deal of evidence, summarized in previous chapters, argues against this model.

Language is not at all the medium of the thinking processes which precedes symbolization, which is a resonance to the habit routine and its analysis. Language as it is realized, or other forms of symbolization such as the production of gesture or music, perhaps also the expression of emotion via facial expression and general posture, are serial processes, yet the habit routine, the internal model of the world, is iconic. It is a Gestalt, a constantly changing and updated holistic entity not requiring elaboration through a serial process of point for point representation with abstract symbols as does language. Our basic thinking process is in terms of icons or Gestalts, holoprojections, which later, and sometimes very laboriously, may find only incomplete and unsatisfactory expression through the symbolization processes. Consider this statement by Albert Einstein, describing the way he considered his creative thinking to occur:

> "The words of the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities in my case are . . . visual and some of muscular type. Conventional words and other signs have to be sought for laboriously only in a secondary stage."

Thus many recent views of language and thinking miss the essential fact that the great part of what constitutes thinking, both conscious and pre-conscious as with the construction of the habit routine, has nothing to do with the serial process of spoken language at all. The creation of the mental model of reality is not "linguistic" except in

the sense that we might define a new type of "language" constituted not of words and the rules for serially connecting them, but of the very iconic Gestalts that are created by habit routine search. The evolution of the ability to produce the habit routine Gestalt started probably with the very first animals, as I have discussed, but the evolution of spoken language only began much later. The two evolutionary processes are very far apart indeed, as are the brain processes which produce them.

The problem of the modern understanding of these facts probably arises from the nature of the methods of modern Western science itself. It is, above all, a descriptive undertaking, and therefore a serial process rather than an experiential, iconic one. So in attempting to "scientifically explain" many of our cognitive abilities using descriptive language, we must necessarily let serial symbolization rule our paradigm to such an extent that we ignore certain aspects of the ongoing iconic thinking process which is the seed of our explanations. Thus the possible Gestalts which would themselves, if we became aware of them, allow us an experience of the nature of the iconic thinking processes which precede symbolization, of how they provide the basis for symbolization, are ignored by the requirements of our paradigm to provide only serial explanation: these ignored Gestalts, the iconic habit routines which would give a view of the nearly invisible underlying thinking processes, do not activate the significance detection system piloted by the locus coeruleus, because we have ruled them out from consideration by the programming of working memory with the specifics of our paradigm, this is the conscious feedback process which is an input, along with sensory information, to the habit routine generation process in thinking1 (see again figure 1). Except in the reflection of those unusually perceptive and gifted individuals such as Einstein who have developed life-long habits of looking for the significant in what everyone else deems the routine, the iconic nature of basic thinking processes is therefore rendered invisible. As I have shown, of course, the psychedelic experience can produce this very same result reliably and safely, although it requires considerable experience with the drugs to understand that this is what is happening, and to use the effect to its potential. I might say, perhaps not too

ponderously I hope, that this entire book is the symbolization in language of an iconic entity or Gestalt, a "mental model" of my theory that I have been slowly constructing over the years. I "know" full well its entire content and form, and yes, it seems to be visual and even "muscular" in a certain sense, but its translation into serial language is another affair altogether, requiring entirely different types of effort than the construction of the informational entity which I am describing. Interestingly, the symbolization in language does have a feedback to the characteristics of the iconic Gestalt: the fine points of its significance, the small details of the interrelations of its parts seem to be refined as the experimental process of symbolization attempts to capture its essence in words.

Other parts of my theory, such as the neuromechanics of HRS, the cognitive operations mapped in figure 1, and other "pieces of the puzzle," are models, useful aids, heuristic devices useful until better models come along, a development which must surely come to pass considering the speculative methods which led to their proposal. But the suggestion of an evolutionary scenario for human development attempts to establish an actual series of events in history, if pre-history. Considering the very fragmentary evidence in the fossil record, and the indirect nature of other modern evidence to be described below, the chance for error in proposing the story of how Early Man made his way out of Eden is humbling. As we have seen above, the first theory of psychedelic evolution, that of McKenna, has suffered, perhaps terminally, from a dose of counterargument all too easily supplied by the critics.

Much of McKenna's book remains admirable however, for instance his presentation of evidence indicating the probable importance of psychedelic plants for the very early tribal societies which lived on the Tassili Plateau of southern Algeria, or Çatal Hüyük in central Anatolia. These are examples, along with ancient Greece and the Eleusinian Mysteries, which illustrate the rapid flowering of culture possible in societies in which there is strong, if not

incontrovertible evidence of psychedelic use. The importance of psychedelics for early man certainly suggests an important evolutionary influence as well: the trick is to deduce, using a wide variety of ancient and modern evidence, when and where, and why that evolutionary influence might have taken place. Let me start by considering some modern reinterpretations of the fossil evidence which have recently received overwhelming support from one of science's most recent and fascinating developments, molecular genetics.

Chris Stringer, who is today the head of the Human Origins Group of the Natural History Museum in London, recounts a most interesting tale of scientific discovery in his recent book, African Exodus, co-authored by the science writer Robin McKie. It is the kind of story which has epitomized the romance and excitement of scientific discovery and revolution as perceived by the lay public, stories such as the Curies' discovery of radium or Galileo's road to revolutionary views of the heavens. The important periods of these scientists' work were, of course, marked far more by hard work than by romance! But not only is the story of these recent discoveries concerning human origins of interest to the general public, it represents a scientific revolution of important scope, comparable to the recent revolution in geology with the advent of the discovery of plate tectonics, or even the revolution in physics earlier in the century.

The first chapters of African Exodus are concerned with a close examination of the "bones and stones," in which Dr. Stringer shows how the Multiregional Hypothesis (15) of human evolution, the predominant model for most of this century, has just recently been discredited in favor of an Out-of-Africa (actually an Out-of-Africa II) (16) model. A new mathematical technique, multivariate analysis, used by Dr. Stringer during his several years of work on the fossils, led him to doubt the validity of the multiregional theory early on in his career. But only a small minority of paleoanthropologists were ready to listen to new analyses of fossil characteristics which called into question the status quo of their profession, for many great scientists of the past decades had analyzed these same fossils and there was wide consensus that a multiregional scenario was the correct one. The upheavals and conflicts typical of a newly-born scientific revolution ensued. A revolutionary new idea

proposed by a small group of scientists, at first rejected as absurd by the establishment, soon began to topple that establishment. Chris Stringer and Robin McKie introduce the book:

> For the past few years, a small group of scientists has been accumulating evidence that has revolutionised our awareness of ourselves, and our animal origins. They have shown that we belong to a young species, which rose like a phoenix from a crisis which threatened its very survival, and then conquered the world in a few millennia. The story is an intriguing and mysterious one, and it challenges many basic assumptions we have about ourselves... It is a remarkable, and highly controversial narrative that has generated headlines round the world and which has been the subject of a sustained programme of vilification by scientists who have spent their lives committed to the opposing view that we have an ancient, million-year-old ancestry. The debate, which reverberates in museums, universities and learned institutions across the world, is one of the most bitter in the history of science. (17)

What finally broke the dam of resistance to the new ideas was the entry upon the scene of revolutionary new techniques from a field which had previously played no role whatever in paleoanthropology, molecular genetics. Until very recently, the possibility that we might learn something about the evolution of our distant ancestors by studying the genetic makeup of living humans was hardly even suspected, and of course the techniques for doing so completely unknown. But all this changed rapidly as the science of molecular genetics grew from its infancy in the 1960's to the powerful tool it is today. The use of genetic analysis for understanding evolution, the science of molecular anthropology, also had its beginning the 1960's, with the pioneering work of Allan Wilson (later to be a key player in the confirmation of the Out-of-Africa scenario) and Vincent Sarich. It was their early work that began to topple many sacred cows of paleoanthropology, the first to fall being

the idea that apes and humans had diverged very early, between fifteen and thirty Ma. By comparing protein structures of modern apes and man, Wilson and Sarich concluded that the separation could have been no earlier than 5Ma. "We were variously ignored, abused and scorned," recalls Sarich. But it was the first of many venerable precepts of paleoanthropology that was to fall to the new techniques of genetic analysis. The research of Wilson and the many others who followed came along at precisely the right time to resoundingly confirm the early work of Stringer.

Stringer and McKie mention in their introduction above that our species "rose like a phoenix from a crisis which threatened its very survival," and propose later on in the book the occurrence of a population bottleneck sometime about 100 to 150Ka. The possibility of such a bottleneck has also drawn criticism from defenders of the orthodoxy, yet again the genetic evidence is what has come to the forefront to support the proposal.

The genetic evidence in question was not at first concerned with the DNA of the cell nuclei, found in every cell of the body and which is responsible for control of the growing embryo and inheritance of physical traits, but DNA contained the mitochondria of these same cells. These small structures within animal cells act like metabolic power-packs, enabling the biochemical reactions which provide the cell with energy. That these structures contain their own DNA, entirely different from nuclear DNA, is something of a curiosity, and has led to speculation that very early on in evolution, mitochondria might have been a separate organism which developed a symbiotic relationship with primitive single-celled life forms to enable the evolution of the first true single-celled animals. Whatever their evolutionary story, the mitochondria and their independently organized DNA strands have provided an important key for the understanding of hominid evolution. Two specific characteristics of mtDNA (mitochondrial DNA) figure importantly: firstly, mtDNA is transmitted only through the female lineage, since the mitochondria of sperm reside in the cell's extranuclear protoplasm, and do not enter the egg at fertilization. Thus mtDNA provides a powerful tool for tracing genealogies in animals, and reconstructing recent evolutionary trees. Secondly, mtDNA has a relatively high

and constant rate of random mutation which is conveniently analyzed, thus constituting a "molecular clock" providing genetic markers for accurately tracing migration and fissioning in human societies. A recent paper by Rebecca L. Cann, an early associate of Allan C. Wilson, explains more fully the peculiarities of mtDNA which result in its being such a powerful tool for the study of evolution. Concerning the bottleneck hypothesis resulting from mtDNA studies she recounts:

> When I began my study of mtDNA in the late 1970s with Dr. Allan C. Wilson, one of his postdoctoral fellows, Dr. Wesley Brown, was writing up his work on a study of 21 human mtDNAs. Dr. Brown had discovered that using restriction fragment length polymorphisms (RFLPs), humans as a species looked 'different' to other mammals. He found that in comparison to two chimpanzees, or two gorillas, or two orang-utans, or two gibbons, or even two pocket gophers, humans had only one-half to one-fifth of the intraspecific variability seen in our closest primate relatives and other genetically well-characterized mammals. In 1980, Brown proposed that the level of variability sampled in his study was consistent with the derivation of the human mitochondrial sequence from a single female about 200,000 years ago. This was the origin of the bottle-neck hypothesis and mitochondrial 'Eve'. (18)

The mitochondrial "Eve" hypothesis naturally made big headlines, was featured on the cover of such magazines as Time and Newsweek, and also quite naturally was journalistically exaggerated out of all proportion to the original claims. A concerted attack by the multiregionalist "old guard" also helped to make the new idea sound a bit absurd, both to the public, and to scientists in other fields not yet acquainted with the genetic evidence. All the criticisms have been adequately countered however, and the findings confirmed by newer and more complete studies, including studies on the nuclear DNA. Rebecca Cann was careful to explain, in the above quoted paper, the intended

interpretation of the hypothesis concerning the possible number of individuals existing at the time of the proposed bottleneck. Since mtDNA is passed on only through the female lineage, the existence of a mitochondrial "Eve" does not imply that our nuclear DNA is also descended from a single individual, nor that at one point the human lineage was reduced to a single, or mere handful of individuals (the "Biblical Eve" scenario!) Recent estimates of the number of individuals existing at the time of the bottleneck, including that of Chris Stringer, puts the number at perhaps ten thousand. (19) It may be argued that a population of ten thousand individuals is not what one could call a genetic bottleneck, yet the sum of the genetic evidence indicates that "there were at least 100,000 adult archaic forebears of our Africa ancestors about 200,000 years ago." (20) Thus a decrease to 10,000 individuals is certainly a "population crash" indicative of important events in the early evolution of modern man.

As for the date of the lifetime of "mitochondrial Eve," there have been various estimates between the extremes of about 60 to 400Ka based on several different methods of mtDNA analysis. Some best estimates put the life of "mitochondrial Eve" at about 130 to 140Ka, "the date of origin of modern humans." (21) The uncertainties in these several estimates may be narrowed by considering data from other fields of study, and from a view of the overall evolutionary scenario which emerges upon consideration of all the information at our disposal, including my own hypotheses of the influence of psychedelics on the overall process. Using all these sources, a reasonably constrained sequence of events with fairly accurate dates becomes possible.

In looking at the combined evidence from new interpretations of the "stones and bones," (Chris Stringer's findings), the genetic evidence, (now far more convincing than just a few years ago), and other pieces of the puzzle, Stringer and other workers have come to the conclusion that there must have been some kind of unusual event, some catalyst, some kind of "trigger" which set in motion the very rapid rise of human culture and civilization which began a mere few moments ago on an evolutionary scale. The strong evidence for a population bottleneck, during which time individuals existed who were our sole ancestors, and

the ensuing rapid migration and rapid rise of human culture in every corner of the earth, has led these workers to ask a central and important question for which they have not yet formulated an answer. Stringer and McKie write:

> It was one of the critical events in mankind's convoluted route to evolutionary success. The nature of the trigger of this great social upheaval is still hotly debated, but remains a mystery at the heart of our 'progress' as a species. Was it a biological, mental or social event that sent our species rushing pell-mell towards world domination? Was it the advent of symbolic language, the appearance of the nuclear family as the basic element of human social structure, or a fundamental change in the workings of the brain? Whatever the nature of the change, it has a lot to answer for. It transformed us from minor bit players in a zoological soap opera into evolutionary superstars, with all the attendant dangers of vanity, hubris and indifference to the fate of others that such an analogy carries with lt. (22)

Reading this paragraph in African Exodus, I realized I had been for several years working on ideas which constituted the very answer sought by this recent revolution in thinking about human evolution. It was, as I have said in chapter 2, "Models and Theories," a falling into place of pieces of a puzzle which justified so much earlier "wild speculation," a realization that practically by accident I had found a key that many others were actively searching for which would enable the opening of a door to an important future in understanding.

Rebecca Cann asks,

> We often wonder if language played a part of the process, and that our ancestors all had some new mutations which allowed them to spread, at the expense of the other indigenous peoples. [Results of genetic research] suggest the spread of our ancestors was rapid, with little mixing. (23)

Although language certainly played a part in the process, as I have already discussed, the identity of the trigger, the origin of the population bottleneck, the reason behind man's migration to the ends of the earth, the factor enabling the rapid rise of culture independently in all these regions, the factor behind the ability of the new hominids to out-compete all former races of archaic man, the secret of the birth of the human race, may all be intimately related to one and the same phenomenon: the advent of psychedelic use by a regionally isolated group of proto-humans somewhere in Africa. Such use might then have spread with the spread of the descendants of this core group of individuals, mimicking a population bottleneck in that psychedelic use and the advantages it provided were closely guarded secrets not evident or available to competing "tribes." As I stated previously, if a member of a competing "tribe" were to use the new medicine, it would only serve to isolate him from his own group. Psychedelic use could then have been at once the reason for an apparent but not necessarily absolute bottleneck, and also the trigger, the key which enabled this original group to expand and prosper by virtue of the cognitive advantages provided by the cumulative effects of psychedelic use. These advantages, I remind the reader, concern a new and powerful ability to suspend a mode of existence entirely governed by habit routine. The advanced ape that was our predecessor necessarily had, as I have shown, the most complete, one might say irrevocable dependence on habit routine of any animal yet evolved, a dependence entirely precluding the use of the most advanced nervous system ever evolved for creative purposes.

But what of that other facilitating factor I mentioned before, the one that would allow psychedelic use to become important and not just an infrequent and disorienting event for single individuals who might then expulsed from their group? Some environmental or social situation must have resulted in the frequent use of psychedelics by a significant proportion of the core group, and psychedelic use must then have become part and parcel of the social structure of the group. There are several possibilities. Here another body of research information on climate change becomes important, for during the proposed period between

100Ka and 200Ka, drastic climatic changes were occurring on a time scale certain to disrupt all life on the planet, especially those advanced forms of life so dependent on social complexity and a diversified diet.

In view of the best estimates for the time slot for the population bottleneck and mitochondrial Eve (about 133Ka), (24) a particular period of climatic history stands out: the Eemian interglacial period. During the Eemain, warm, wet, and tropical conditions extended much further north than at present. The fossil evidence shows that hippopotamuses browsed along the banks of the Thames and the Rhine, while lions and elephants roamed the forests of southern England. Until recently, the Eemian interglacial period was thought to have been a stable climatic period lasting from about 130Ka to 114Ka, when the beginning of the last ice age commenced. Climatic information has been obtained from such methods as analysis of ocean sediment cores, pollen cores from terrestrial sources, and ice cores drilled in such locations as Antarctica and Greenland. A recent ice core analysis from Greenland however, has given us a radically new view of the Eemain climatic era, indicating that it was not a period of stability but rather one of wild climatic oscillations: (25)

> The early part of the Eemian was dominated by several oscillations between warm and cool stages. The temperature dropped by as much as 10 degrees, sometimes within as short a time as ten to thirty years. Some cold spells lasted a few decades, while others lasted several hundred years. After 8000 years of fluctuating conditions, the climate settled into a period of stable warmth lasting some 2000 years. This warm period ended abruptly...when the temperature in Greenland dropped about 14 ˚C within ten years. (26)

Such a period as the early Eemain seems to provide exactly the kind of opportunities for the disruption and crisis conditions for groups of human predecessors that would lead to the discovery of psychedelic use. Several times there must have been abrupt changes in habitability of various regions, with changes in flora and fauna and

resulting dietary pressures, food shortages, the encroachment of and conflict with neighboring tribes, the possible occurrence of new diseases and a resulting search for medicinal remedies promoting population movements, in essence, frequent turmoil. If modern chimpanzees have the need to roam far and wide to procure their necessary diet including "fungi, rotten wood, insects, bark, shoots," we may safely assume that proto-man had similar if not even greater exigencies. If uprooted from a home ground, or if rapid climate change forced him to experiment with new foods, an opportunity for the discovery of psychedelic plants becomes important.

In the case of edible fungi today for example, it is well known that many, if not the majority of cases of poisoning result when individuals or groups, newly arrived in an area, see and consume a mushroom which they had always safely consumed in their previous home region. Many mushrooms look nearly identical, and some fungi species are known to be safe in one region, yet toxic in another. A changing climate might well alter a fungal species, changing its visible characteristics or production of metabolites. Some recent work has shown that fungi tend to proliferate at far greater rates in a tropical, CO2 rich climate, as must have existed during the Eemian. (27) In these facts we see a possible, if not probable mechanism whereby a group of our ancestors might have discovered the use of a psychedelic mushroom or other plant, in which the discovery involved the use of that plant by the entire group, and for an extended period of time. The likelihood of widespread existence of unfamiliar and unusual species of alkaloid-containing plants is, of course, much higher in the tropical and humid, and fluctuating conditions of the Eemian, rather than during the dry, cold, and barren ice age conditions which preceded it. And the dates of the climatic disruptions of the early Eemian that might have led to such a discovery match nicely the mtDNA evidence of a population bottleneck.

The Eemian might well have been the period of mankind's first important exposure to psychedelic drugs, for by 90Ka we see the appearance of sophisticated bone harpoons and knives in what is now Zaire, a level of technology that was not seen in Europe until 50 thousand years later. (28) But we should not expect that the initial psychedelic exposure would have led to rapid cultural change as we would today

define it. Evidence from studies of "primitive" yet ecologically stable and wise tribal societies indicates that psychedelic use and the associated rise of shamanism does not automatically propel a society towards building automobiles and atom bombs, but rather, preferentially enables another kind of creativity involving stability and equilibrium. Some of the oldest of tribal societies, those that have been discovered in New Guinea, or in the backwaters of the Amazon basin, or the vast tundra of the Siberian wilderness, all have a long tradition of psychedelically influenced shamanism, and have remained stable for many thousands of years. If we should look at such a society and call it "primitive," their practices being seen as "backward" and "ignorant," how much more so may such a stable and ecological society view the all-too-obvious happenings and extrapolations of Twentieth Century "Civilization"? Our view today of what constitutes "progress" and "civilized living" has practically nothing in common with the views of hundreds, even thousands of societies that have come before, and lasted far longer than our recent experiment in "progress". With a little luck, the remnants of an isolated tribe or two may well survive us.

A psychedelically-enlightened society does not at all produce rampant technological change, just for the sake of change. They do not fly to the moon just because it is there, or to impressand propagandize tribal members with their supposed superiority over a rival tribe in some cold war scenario. A psychedelically-enabled society does, however, make rapid advances of a creative nature in response to real challenges such as climate change, the necessity to emigrate to new regions, the avoidance of disease and a search for new medicines (chimpanzees and even elephants have been shown to intentionally search out and consume effective medicinals as required). But in periods of climatic and resource-stability the psychedelically-enabled society also exhibits an ecological stability: it has the power and intelligence to make creative changes as it pleases, and chooses consciously to remain in equilibrium with nature. What could be more illustrative of wisdom than this? In times of stability, psychedelically-enabled tribes produce myth, art, they use their creative powers to elaborate tradition, the hallmark of culture; they do not spend their time in petty schemes to conquer nature, or

exploit reality, or develop "backward" regions. Perhaps the long term lesson that is taught by the psychedelic experience is that the human animal, having evolved slowly over millions of years, is ill-equipped to handle sudden large advances in technology, which have historically resulted very reliably in mass production of weapons, ecological destruction, genocide, waste, and the collapse of civilizations. Surely there is a better use for creativity than this.

The point here is to give a better view of what a psychedelically enabled tribe, at the advent of the human race, might do with its powers of creativity. If our original African ancestors began the use of psychedelic agents as the first step toward an organized shamanism, only our modern illusions of what constitutes "progress" would predict that such a society, if truly a society of man, would rapidly invent and amass technology. A broader view would predict that what would be amassed by the true Homo sapiens would be techniques of living exhibiting a consciously designed harmony and ecology, leading to long-lasting modes of tribal life changing only slowly with time. Psychedelically enlightened tribes would optimally remain stable for millennia. To restate: Creativity in such a group would involve the creation and preservation of myth and ritual, the gradual perfection of a style of living, the elaboration of tradition, not a headlong rush into exploitation of "resources" and a supposed domination of nature.

Thus our originally psychedelically-enlightened ancestors, the first humans, would have spread slowly and surely from their original home, perhaps in East Africa, and carried with them such traditions of stability and longevity. Only severe challenges to their survival and continuation would result in their use of the creative power to make radical changes in their technology and lifestyle. Before long even a slow migration would have brought descendants of the original core group into the Middle East, as evidenced by fossils of modern humans in Israel dated at 100Ka. (29) We must remember that climatic changes after the end of the Eemian, although following a general tendency toward the next ice age, continued to include occasional but abrupt reversals as is shown by the recent Greenland ice core studies. Migration was likely therefore to have been a

sporadic happening, as certain habitats and food sources changed. Considering these tribes' penchant for stability, intentional migration, just for the sake of migration, was unlikely. The spread of our ancestors would therefore have been slow and occasional, initiated by the occasional climatic upheavals and other environmental challenges such as volcanic eruption, changing food supplies, occurrence and avoidance of diseases, and perhaps the search for new medicines and psychedelic plants. We know from anthropological studies how important are the recommendations of the shamans for decisions taken by tribal elders, and it is thus possible that shamans also greatly influenced decisions of our early ancestors concerning their movements. The shamans' use and search for psychedelic plants may well have initiated some early migrations.

It is necessary to understand the above described tendencies that would naturally follow our original psychedelic enlightenment to see why modern culture as we know it did not get underway for over 60 thousand years. Tradition and stability reigned for many thousands of years while a slow migration brought human ancestors to Europe, Asia, and finally the Americas. But the flowering of modern culture did not really get underway until 40 thousand years ago, when art and body ornamentation, sophisticated bone tools, built hearths and structured living spaces, open site "religious" burials, storage pits and social storage, quarries, the long distance exchange of raw materials, long term occupation of harsh environments, and signs of complex forward planning made a wide appearance as evidenced in the archaeological record. (30) This apparently sudden appearance of the roots of the modern age, in which the beginnings of modern technology can be seen, is the phenomenon that has challenged anthropologists the most. If anatomically and cognitively modern humans began their specieshood in Africa 130Ka, why did it take so long for the modern trend to get underway? And importantly, what was the catalyst which precipitated this event so suddenly? Like all history, the answers to such questions, even if they could be known, must necessarily be very complex, a story that can be told in a multitude of ways that might seem contradictory. Consider the myriad ways the story of the eradication of Native American populations can be told.

But some scholars have proposed that the sudden

flowering of the modern age beginning about 40Ka might actually have been more gradual, and sporadic. Such ideas fit in with the above observations on the likely characteristics of psychedelically-enlightened societies. The appearance of the previously-mentioned bone harpoons in Zaire, and other scattered evidence may well indicate that local tribes made advances in technology in fits and starts, in response to novel challenges, and then returned to long periods of stability. The appearance of cave art seems today from modern discoveries to be rather abrupt, yet the quality of such art would indicate a long tradition of artistic endeavor, certainly the artists of the Lascaux and Cosquer caves were no amateurs, thousands of years of tradition no doubt led up to their remarkable artistic abilities. New discoveries of even more ancient sites are bound to indicate that the first "artists" did not suddenly appear around 40 thousand years ago, but that artistic expression was a slowly maturing phenomenon of very long duration indeed, going back to the Eemian perhaps.

The psychedelic model of evolution of culture therefore agrees that some recent interpretations of evidence indicating a "sudden flowering" of culture beginning about 40Ka is too drastic. Alison Brooks, an archeologist who with John Yellen made the important finds in Zaire, states:

> A closer scrutiny of the archeological record leads one to inquire, Just how abrupt was the behavioral transition in Europe? I believe that the gulf between the Middle Paleolithic and the Upper Paleolithic has been artificially widened by de-emphasizing the very real evidence of cultural complexity in the former and overstressing the achievement of early modern humans, who, in Europe, did not achieve all of the behaviors usually cited as part of the Upper Paleolithic "revolution" until the very end of the Pleistocene [near 10,000 years ago]. (31)

One final surmise about the trigger events that may have continued to push Early Man along the road to modern civilization will bring this chapter to a close. If, according to my theory, there was a gradual evolution of

culture during the 70 thousand years between the Eemian and the period in which the beginnings of modern culture are deemed to have begun 40 thousand years ago, then we might look for the rapid, yet sporadic and geographically independent advances in culture and technology to coincide with known instances of rapid climatic change, with instances of severe volcanic activity or other known or to-be-discovered radical environmental influences during the period. It will certainly be interesting to compare further detailed analyses of the new Greenland ice cores to known and future archeological discoveries in an attempt to correlate cultural change with environmental disruption. Perhaps there will never be enough evidence to write history about such pre-historic times, but intriguing clues and parallel developments may well appear that will at least allow the writing of a probable scenario.

The question of how geographically isolated groups of modern men all developed astounding cultural and technological advances, and how at least two dozen different regional societies of men experienced along with such changes a dramatic increase in population, has been a puzzle for many archaeologists, linguists, anthropologists, and other workers. In the words of Chris Stringer and Robin McKie,

> It is an extraordinary catalogue of achievements that seem to have come about virtually from nowhere - though obviously they did have a source. The question is: what was it? Did we bring the seeds of this mental revolution with us when we began our African Exodus, though its effects were so subtle they took another 50,000 years to accumulate before snowballing into a cultural and technological avalanche that now threatens to engulf Homo sapiens? Or did that final change occur later, and was it therefore more profound, and much speedier in its effects? (32)

I believe the answer is neither of these, or rather a combination of the two: The seeds of the revolution were indeed carried by Homo sapiens from his birthplace in Africa, but they were seeds which needed periodic

stimulation to grow vigorously. As I have argued, psychedelic wisdom does not of itself propel societies to produce a "technological avalanche" nor should we believe that "technological avalanches" are inherently good. Psychedelic wisdom rather leads to ecology, stability, and longevity. But when novel and severe challenges present themselves to psychedelically-enabled societies, they are able to react intelligently and with foresight and complex long-range planning. This is perhaps the most important difference between the true Homo sapiens his animal forebears.

Thus the periodic and now well-established abrupt climatic upheavals of the post-Eemian world became the catalyst which successively and cumulatively forced tribes of men living in many isolated areas of the globe to use their God-like powers of creativity to advance technology in the interests of survival. An ice age was approaching, with fits and starts, and global climatic change was frequent and severe. If the cognitive seeds existed, dormant in the sense of not automatically producing technological change at a rate which we moderns believe essential to our species, and these seeds existed in all the societies of men around the globe, the fact of climatic change being a global phenomenon would explain how these seeds flowered, or were forced to grow independently in all these regions.

During the post-Eemian period, changes in the earth's orbit were responsible for the climatic disruption and slow onset of a new ice age. But such orbital changes have sometimes been hypothesized as the catalyst for increased volcanic activity as well. Whatever the cause, at least one extremely severe volcanic eruption occurred during the period leading up to that famous starting date for the beginning of modern technology, and in line with my proposals, may have been a major event pushing tribal societies around the world toward radical changes in the effort to survive. Stringer and McKie tell of the eruption:

> The Earth was gripped by continuing climatic mayhem as changes in its orbit began inexorably to push down the world's thermostat. Then to add to these woes, about 74,000 years ago, Mount Toba on the island of Sumatra exploded in the largest volcanic eruption of the past 450 million years. The blast

> was 4,000 times more powerful than that of Mount St Helens and would have sent more than 1,000 cubic kilometres of dust and ash into the atmosphere, plunging the earth into years-long volcanic winters. Summer temperatures could have dropped by as much as twelve degrees centigrade, while forests shrank, deserts spread, and in eastern Asia, a prolonged winter monsoon would have swept clouds of dust from inland deserts round the globe... Having evolved in warm Savannah sun we nearly perished, huddled in cold dismal misery as volcanic plumes straddled the earth. (33)

Examination of some recent charts of sea-levels and estimated prevailing temperatures reveals that this event seems to have brought on the most severe period of the last ice age. The post-Eemian climate between 115Ka to 75Ka is now known to be more changeable, the Greenland ice core data showing several abrupt reversals, yet the same data show that after a significant warming period peaking about 75Ka to 80Ka, a severe decline then led into the very coldest period of the ice age. The whole of the post-Eemian climatic turmoil may well have been the partner to those original African seeds of modern culture which required such periodic stimulation to grow. The volcanic eruption might have been one of the most important instances driving societies to improvise and find technological solutions in order to survive, the aftermath of the Mount Toba event would have disrupted flora and fauna world-wide, it would have caused food shortages, driven intentional and planned migration in search of resources, brought about wide experimentation with new foods and medicinal plants, and perhaps even led to the appearance of new or altered species of psychedelic plants such as the fungi which might have proliferated in the wake of widespread forest death and an abundance of decaying vegetation. Psilocybe cyanescens for example, usually a fairly rare species, thrives in decaying woody debris and in colder climes. It is also one of the more powerful Psilocybe species.

It is certainly a difficult task to sift and weigh all these factors in the attempt to propose a concise scenario for psychedelic influence on early man. Two or more

seemingly contradictory scenarios might well have happened simultaneously in different regions, or consecutively. The idea of psychedelic evolution is still too new, and much more work will have to take place with these new hypotheses in mind, trying to prove and disprove the many resulting implications before we can decide on a likely scenario. As I have said, this task is more than just the construction of a temporary model, it is an attempt to discover actual history and subject to real error.

References

1. The Forbidden Game, A Social History of Drugs, 1975, Hodder and Stoughton Limited, U.K. p230. (back)

2. Machiavellian Intelligence, Richard W. Byrne and Andrew Whiten, editors, Clarendon Press, Oxford University Press, 1988. (back)

3. ibid., chapter 20, "Tools and the evolution of human intelligence," Thomas Wynn, p 283. (back)

4. ibid., Alison Jolly, pp373-4. (back)

5. See for example the paper by Daniel C. Dennett, "The intentional stance in theory and practice" for an appreciation of the "levels of intentionality" necessary and implicit in social interaction, ibid., chapter 14, pp180-202. (back)

6. See for example a question responded to by Andrew Weil at the first Tucson conference on consciousness: Toward a Science of Consciousness, Hameroff, Kaszniak, and Scott, editors, The M.I.T. Press, 1996, p687. (back)

7. The Thinking Ape, Richard Byrne, Oxford University Press 1995, p178. (back)

8. ibid., p142. (back)

9. Katherine Milton, "Foraging behavior and the evolution of primate intelligence", in Machiavellian Intelligence, ibid., pp285-305. (back)

10. See for example African Exodus, Chris Stringer & Robin McKie, Jonathan Cape, London 1996, p92-93 (back)

11. Self-Made Man, Jonathan Kingdon, John Wiley & Sons 1993, p97. (back)

12. Steven Pinker, "Facts about human language relevant to its evolution" in Origins of the Human Brain, Jean-Pierre Changeux and Jean Chavaillon, editors, A Fyssen Foundation Symposium, Clarendon Press, Oxford, ch17. (back)

13. ibid., p271. (back)

14. The Origin of Modern Humans, op. cit., p173. (back)

15. The Multiregional Hypothesis posits that an early migration by Homo erectus from the African heartland to the Near East, Europe, Asia, Australia, was followed by a long period of regional and parallel development, with some intermixing between regions, to produce Homo sapiens quasi-independently in the various regions. Under this scenario, racial differences, long thought to be far more significant than has recently been shown to be the case by genetic analyisis, were supposedly evolved during this at least million-year period. (back)

16. The first "Out-of-Africa" migration being that of H. erectus 1.5 to 2 Ma. (back)

17. African Exodus, Chris Stringer and Robin McKie, Jonathan Cape, London 1996, from the Preface. (back)

18. "Mitochondrial DNA and Human Evolution" in Origins of the Human Brain, Jean-Pierre Changeux and Jean Chavillon, editors, Fyssen Foundation Symposium, Clarendon Press, Oxford, 1995, p 128. (back)

19. African Exodus, op. cit., p150 (back)

20. Ibid., p 150 (back)

21. The Origin of Modern Humans, Roger Lewin, Scientific American Library 1993, p99. (back)

22. African Exodus, op. cit., pp 5-6 (back)

23. Ibid., p134. (back)

24. see The Origin of Modern Humans, op. cit., p99. (back)

25. "Chill Warnings from Greenland," New Scientist, 28 August, 1993, pp29-33. (back)

26. Ibid., p31. (back)

27. "Sneezing while the Earth warms," New Scientist, 24 August, 1996, p5. (back)

28. African Exodus, op. cit, p5. (back)

29. see African Exodus, op. cit, various index entries under "Qafzeh, Israel." (back)

30. see the chart in In Search of the Neanderthals, Christopher Stringer and Clive Gamble, Thames and Hudson, 1993, p198. (back)

31. Quoted in Lewin, The Origin of Modern Humans, op. cit., p128 (back)

32. African Exodus, op. cit., p186-187 (back)

33. African Exodus, op. cit., p153. Stringer and McKie give the reference for the eruption as M. Rampino and S. Self, 1993, "Climate-volcanism feedback and the Toba eruption of ca. 74,000 years ago", Quatenary Research, 40: 269-80.

(back)

Chapter 8 | Table of Contents

Send e-mail to The Psychedelic Library: psd_lib@druglibrary.org

The Psychedelic Library | Books Menu Page