

BIOLOGICAL ANOMALIES: HUMANS I

Compiled by:

William R. Corliss



A CATALOG OF BIOLOGICAL ANOMALIES

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**BIOLOGICAL
ANOMALIES:
HUMANS I**

***A CATALOG OF
BIOLOGICAL ANOMALIES***

Compiled by:

William R. Corliss

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LIST OF PROJECT PUBLICATIONS

- CATALOGS:** Lightning, Auroras, Nocturnal Lights (category GL)
 Tornados, Dark Days, Anomalous Precipitation (category GW)
 Earthquakes, Tides, Unidentified Sounds (categories GH, GQ, GS)
 Rare Halos, Mirages, Anomalous Rainbows (category GE)
- The Moon and the Planets (categories AE, AH, AJ, AL, AM, AN, AP, AR, AU, AV)
 The Sun and Solar System Debris (categories AA, AB, AC, AE, AS, AX, AY, AZ)
 Stars, Galaxies, Cosmos (categories AO, AQ, AT, AW)
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 Incredible Life: A Handbook of Biological Mysteries
 The Unfathomed Mind: A Handbook of Unusual Mental Phenomena
- SOURCEBOOKS:** Strange Phenomena, vols. G1 and G2
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 Strange Universe, vols. A1 and A2
 Strange Planet, vols. E1 and E2
 Strange Life, vol. B1
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PREFACE

After more than twenty years of scouring the scientific and semiscientific literature for anomalies, my major conclusion is that this is a most fruitful activity. In fact, organized science should have been compiling such information over the past 200 years. It is surprising that a Catalog of Anomalies does not already exist to guide scientific thinking and research. It is at least as important to realize what is anomalous as it is to recognize the well-explained facts of nature. With this outlook, here is the twelfth volume of such a Catalog. It is largely the product of one person's library research, carried forward entirely through the sale of these Catalogs, Handbooks, Sourcebooks, and related books on anomalies.

Under the aegis of the Sourcebook Project, I have already published 28 volumes, totalling roughly 10,000 pages of source material on scientific anomalies. (See page iv for the list of titles.) As of this moment, these 28 volumes represent only about 40% of my data base. New material is being added at the rate of about 1,200 new items per year, about 500 of which come from the current scientific literature. These acquisition rates could easily be multiplied several-fold simply by spending more time in libraries. Even after twenty years, only the English-language scientific journals have received my serious attention. The journals in other languages, government reports, conference papers, publications of scientific research facilities, untold thousands of books, and an absolutely immense reservoir of newspapers remain almost untouched. Every library foray uncovers new scientific anomalies; the world's libraries are bulging with them.

Given this rough assessment of the magnitude of the anomaly literature, one can understand why the Catalog of Anomalies will require at least 30 volumes, many of them larger than the one you now hold. I visualize a shelf of these 30 volumes, with master indexes, to be only the initial step in providing scientists with ready access to what, in my opinion is not well-explained. The underlining of "my" is important because anomalousness is often in the eye of the beholder. It depends upon how well one is satisfied with explanations based upon currently popular theories. In the Catalog of Anomalies, the data rule; all theories and hypotheses are deemed tentative. The history of science demonstrates that this is a wise policy.

Will the Catalog of Anomalies revolutionize science? Probably not---at least not right away. Quite often the initial reaction to the volumes already published has been disbelief and even disdain. The data must be in error; the data are mainly testimonial; the data are too old; the purported anomaly was really explained long ago. Germs of truth reside in all these complaints. Some science and some observations are certainly bad. Also, the baseline of well-established theories, against which anomalousness is measured, is always shifting. But for every anomaly that can be legitimately demolished, a trip to the library will replace it with ten more from impeccable sources. In sum, Nature is very anomalous or, equivalently, Nature is not yet well-understood. Much remains to be done.

William R. Corliss

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March 1, 1992.

PREFACE

"ROUND ABOUT THE ACCREDITED AND ORDERLY FACTS OF EVERY SCIENCE THERE EVER FLOATS A SORT OF DUST-CLOUD OF EXCEPTIONAL OBSERVATIONS, OF OCCURRENCES MINUTE AND IRREGULAR AND SELDOM MET WITH, WHICH IT ALWAYS PROVES MORE EASY TO IGNORE THAN TO ATTEND TO ANYONE WILL RENOVATE HIS SCIENCE WHO WILL STEADILY LOOK AFTER THE IRREGULAR PHENOMENA. AND WHEN THE SCIENCE IS RENEWED, ITS NEW FORMULAS OFTEN HAVE MORE OF THE VOICE OF THE EXCEPTIONS IN THEM THAN OF WHAT WERE SUPPOSED TO BE THE RULES."

William James

HOW THE CATALOG IS ORGANIZED

Purpose of the Catalog

The Catalog of Anomalies is designed to collect and categorize all phenomena that cannot be explained readily by prevailing scientific theories. Following its definition, each Catalog anomaly is rated in terms of: (1) its substantiating data; and (2) the seriousness of the challenge the anomaly poses to mainstream scientific theories. Next, all examples of the anomaly discovered so far are recorded, some of the more interesting ones in more detail. Finally, all examined references are listed. Thus, the Catalog is a descriptive guide as well as a compendium of examples with supporting references. Scientific researchers thus have a substantial foundation for beginning further studies of these intriguing phenomena. This is the basic purpose of the Catalog: the collection and consolidation of the unknown and poorly explained in order to facilitate future research and explanation.

General Plan of the Catalog

It was tempting to organize this Catalog alphabetically, making it an "encyclopedia of anomalies". But many of the phenomena have obscure names or, even worse, no names at all. Under these circumstances, access to the data base would be difficult. Therefore, a system of classification was designed based upon readily recognized classes of phenomena and the means the observer uses to detect them. The universe of anomalies is first divided into nine general classes of scientific endeavor, as illustrated in the diagram on the following page. Few people would have difficulty classifying a phenomenon as biological, astronomical, geological, etc. The second, third, and fourth levels of classification are also based upon generally recognized attributes. The similarity of this kind of categorization to that employed in natural-history field guides is quite intentional. Like bird identification, phenomenon classification soon becomes second nature. In fact, many of the phenomena described in this Catalog are accessible to anyone with normal senses and, especially in astronomy, a little optical help.

Most catalogs employ numbering systems, and this one is no exception. Rather than use a purely numerical system, the first three levels of classification are designated by letters. The triplets of letters selected have some mnemonic value. Thus, a BHA anomaly is easily recognized as belonging to the biology class (B), involving humans (H), and concerning external appearance and morphology (A). The number added to the triplet of letters marks the fourth classification level, so that BHA5 denotes the phenomenon of apparent human physical degeneration with the passage of time, as indicated in the diagram on the next page. Every type of anomaly has such a unique alphanumeric code. All cross references and indexes are based on this system. Catalog additions and revisions are made easier with this approach.

The Catalog codes may seem cumbersome at first, but their mnemonic value to the compiler has been considerable. The codes are simple, yet they are flexible enough to encompass the several thousand types of anomalies identified so far in diverse scientific disciplines.

A glance through this volume will reveal that each entry for an anomaly type bears an X-number, and each reference an R-number. BHA5-X2 therefore specifies the second entry for human physical degeneration with time. BHA5-R1 is the first reference in this phenomenon's bibliography.

| <u>First-order classification</u> | <u>Second-order classification</u> | <u>Third-order classification</u> | <u>Fourth-order classification</u> |
|-----------------------------------|------------------------------------|--------------------------------------|------------------------------------|
| A Astronomy | A Arthropods | A Appearance & Morphology | 1 Asymmetry |
| B Biology | B Birds | B Behavior | 2 Appearance of Beauty |
| C Chemistry & Physics | C Biochemistry | C Chemistry & Physics | 3 Physique & Month-of-Birth |
| E Earth Sciences | F Fish | E Bones & Artifacts | 4 Poor Aquatic Design |
| G Geophysics | G Genetics | F Bodily Functions | 5 Physical Degeneration |
| L Logic & Math | H Humans | G Genetics | ⋮ |
| M Archeology | I Animals without Skeletons | H Health | ⋮ |
| P Psychology | L Microorganisms | I Internal Structure | Other BHA Entries |
| X Unclassified | M Mammals | O Organs | ⋮ |
| | P Plants & Fungi | T Talents & Faculties | ⋮ |
| | R Reptiles & Amphibians | U Unrecognized Species | ⋮ |
| | X Life Processes | X Interactions with Other Life | ⋮ |
| | | Z Interactions with Other Entities | 56 Human Vibrations |

Bold-face subjects are covered in this volume

Catalog Coding Scheme

How Data and Anomalies Are Evaluated

Each anomaly type is rated twice on four-level scales for data "validity" and "anomalousness", as defined below. These evaluations represent only the opinion of the compiler and must be considered only rough guides.

Data Evaluation Scale

- 1 Many high-quality observations. Almost certainly a real phenomenon.
- 2 Several good observations or one or two high-quality observations. Probably real.
- 3 Only a few observations, some of doubtful quality. Phenomenon questionable.
- 4 Unacceptable, poor-quality data. Such entries are included only for purposes of comparison and amplification.

Anomaly Evaluation Scale

- 1 Anomaly cannot be explained by modifications of present laws. Revolutionary.
- 2 Can probably be explained through relatively minor modifications of present scientific laws.
- 3 Can probably be explained using currently popular theories. Primarily of curiosity value.
- 4 Well-explained. Included only for purposes of comparison and amplification.

Referring to the evaluation scales above, it should be remarked that anomalies that rate "1" on both scales are very rare. Such anomalies, however, are the most important because of their potential for forcing scientific revolutions.

Anomaly Examples

Examples of anomaly types and the entries discussing them are designated by the letter X in the body of the Catalog. Except in the cases of extremely common phenomena, such as ball lightning, all of the examples discovered so far are entered. If the example is of the "event" type, time and place are recorded if they are available. Such data are the basis of the Time-of-Event and Place-of-Event Indexes, which could in principle lead to the discovery of obscure cause-and-effect relationships. When library research has unearthed a great many examples of a specific anomaly, only the more interesting and instructive are treated in detail. In all examples and entries, direct quotations from eye-witnesses and scientific experts are employed to convey accurately the characteristics and significance of the phenomenon.

The References and Sources

Each anomaly type and the examples of it are buttressed by all references that have been collected and examined. Since some references deal with several examples, each reference includes the X-numbers of the examples mentioned. When a reference covers more than one type of anomaly, it is repeated in each anomaly bibliography. Actually, there is little repetition of this sort in the Catalog.

Perusal of the Source Index will demonstrate that the great majority of the references employed comes from the scientific literature. Heavily represented in this volume of the Catalog are such journals as: Nature, Science, and Human Biology. Some less technical publications are also used fairly frequently, such as Science News and the New Scientist. All of the serials just mentioned are generally very reliable, although one must always be wary when dealing with anomalous phenomena. In addition to these often-referenced publications, a wide spectrum of other journals dealing with biology and have been found useful here. In contrast to the preceding Catalog volumes, books, both scientific and popular, have played an important role here.

The sources consulted date from the beginning of organized science some 200 years ago. The great bulk of the references, however, comes from the past 80 years. In biology especially, the explosive growth of the data base is remarkable. Indeed, advances are being made so rapidly in natural history and biology that some things printed in the volume will be outdated before the books leave the bindery.

The Indexes

Most Catalog volumes conclude with five separate indexes. At first glance this may seem to be too much of a good thing, but in the context of a science-wide endeavor each index helps tie the whole together. It is quite apparent, though, that most biological phenomena are not of the "event" type. Therefore, the Time-of-Event and Place-of-Event Indexes in the Series-B volumes are very small compared to those in the Series-G and Series-A volumes.

The Source Index shows immediately the dependence of this Catalog upon the scientific literature rather than newspapers and other popular publications. Its real purpose, though, is the rapid checking of newly acquired references to determine whether they have already been caught in the fishing net of the library-research aspect of the Catalog effort. The Source Index is doubly valuable because many footnotes and bibliographies in the scientific literature omit article titles and, sometimes, even authors! The researcher also comes across vague references to such-and-such an article by so-and-so back in 1950 in Nature. In such cases, the rather ponderous Source and First-Author Indexes can help pin down references lacking in specifics.

The five indexes use the Catalog codes described above rather than page numbers. The codes are permanent whereas page numbers would change as volumes are revised. The mnemonic value of the Catalog codes is evident here, too, because the approximate nature of each index entry is readily apparent, while page numbers provide only location.

Supporting Publications of the Sourcebook Project

The Catalog volumes currently being published are actually distillations of huge quantities of source material. The Sourcebook Project has already published 28 volumes of such material, as detailed on p. iv. Phase I of the Sourcebook Project resulted in ten looseleaf notebooks called "sourcebooks". To meet the demands of libraries, Phase II supplanted the sourcebooks with a series of six "handbooks", which are casebound, much larger, and more comprehensive than the sourcebooks. Phase III, now in progress, is the cataloging phase. This consists of systematizing the data base, which now comprises some 35,000 articles, and the publication of the "catalogs".

Catalog Addenda and Revisions

Over 1200 new reports of anomalies are collected each year from current and older scientific journals. New anomaly types and additional examples of types already cataloged are accumulating rapidly. When sufficient new material has been assembled, Catalog volumes will be revised and expanded.

The Sourcebook Project welcomes reports of scientific anomalies not already registered in extant Catalog volumes. Reports from scientific journals are preferred, but everything is grist for the anomaly mill! Credit will be given to submit-
ters in new and revised Catalog volumes. If the reports are from current literature they may be mentioned in Science Frontiers, the Project's newsletter. Send data to: Sourcebook Project, P.O. Box 107, Glen Arm, MD 21057.

BH INTRODUCTION: Volume I

With this, the twelfth volume of the Catalog of Anomalies, we begin a series on biology, including what is popularly termed "natural history." Biology is the most complex subject addressed so far and certainly the most anomalous. Our early estimate is that a total of eight volumes will be required to do justice to the incredible complexity of the phenomenon we call "life." The first three volumes are reserved for human biological anomalies; the fourth volume for the other mammals; the fifth for birds and reptiles; and so on. Even with eight volumes, we are cataloging only the most obvious and most easily researched mysteries of life. In all likelihood, we will overlook some significant biological anomalies; some of which may not even be recognized as anomalies---even by the biologists themselves.

The first volume on human biological anomalies looks at what we might call the "external attributes" of human beings: (1) their appearance to the outside viewer; (2) their anomalous modes of behavior; and (3) their unusual talents and faculties. (Note that the Series-P catalog volumes are reserved for anomalous human mental and information-processing phenomena.) The second "human" volume focuses on internal structure, organs, and chemistry; the third, on human evolution as inferred from fossils and genetics and the interfaces between humans and other forms of life.

It will be quickly seen that all Catalog volumes traffic in heresy on one hand and simple curiosities and trivia on the other. Some phenomena recorded here strike at the core hypothesis of biology, evolution; others can be shrugged off as merely minor "unexplaineds." But such is the nature of the phenomena on the fringes of any science. Our eclectic approach may discomfort some who are used to the conventional presentation of biology.

Finally, biological anomalies cannot be divorced completely from the mysteries we have already cataloged in astronomy, geology, and geophysics. The stratigraphic record, for example, figures prominently in both biology and geology. The subject of mass extinctions via asteroid impact involves astronomy as well as geology and biology. Do the sun and the moon affect human behavior, say, through subtle modifications of weather and the geomagnetic field? Was the origin of life dependent upon the influx of extraterrestrial chemical building blocks in carbonaceous chondrites? Biological anomalies are inexorably linked to some of the phenomena cataloged in preceding volumes.

Key to Categories

| | |
|-----|------------------------------------|
| BHA | EXTERNAL APPEARANCE AND MORPHOLOGY |
| BHB | ANOMALOUS HUMAN BEHAVIOR |
| BHT | UNUSUAL SENSES AND FACULTIES |

BHA EXTERNAL APPEARANCE AND MORPHOLOGY

Key to Phenomena

BHA0 Introduction

GENERAL ATTRIBUTES

- BHA1** Human Asymmetry
- BHA2** The Appearance of Beauty in the Human Lineage
- BHA3** General Physique Correlated with Month of Birth
- BHA4** Human Body Badly Designed for Swimming
- BHA5** The Apparent Physical Degeneration of Humans
- BHA6** Human Physical Degeneration and Genius
- BHA7** Variability of External Appearance
- BHA8** Discordances in the Appearances of Identical Twins
- BHA9** Mirror-Image Twins
- BHA10** The Apparent Primitive Character of Some Features of the Human Body
- BHA11** Human and Orang-Utan Physiological Similarities
- BHA12** Significant Morphological Differences between Humans and the Great Apes
- BHA13** Sports, Monsters, Terata

PHYSICAL STATURE

BHA14 Two Separate Populations of Pygmies

WEIGHT

BHA15 Birth Weight Varies with Month of Birth

SEX

- BHA16** Human Sexual Dimorphism
- BHA17** Sex-Ratio Variations
- BHA18** Gradations between Male and Female

PIGMENTATION

- BHA19** The Sacral Spot
- BHA20** Pigmentation Peculiarity on Upper Arms
- BHA21** Spotted or Piebald People

LUMINOSITY

- BHA22** Visible Radiation Emitted by the Human Body
- BHA23** Unidentified, Problematical Radiation Emitted by the Human Body
- BHA24** The Supposed Human Aura
- BHA25** Kirlian Photography of the Postulated Human Aura

HAIR

- BHA26 Excessively Hairy Humans
- BHA27 Sudden Loss of Hair and (Sometimes) Regrowth
- BHA28 Baldness among Musicians
- BHA29 Human Hairlessness
- BHA30 Curious Human Hair Patterns
- BHA31 Sudden Blanching of the Hair
- BHA32 Sudden Color Changes in Human Hair
- BHA33 Hair Color Correlated with Eminence
- BHA34 Hair Color Correlated with Strength and Vitality
- BHA35 Remarkable Persistence of Hair Growth after Death
- BHA36 Voluntary Erection of Body Hair

EYES

- BHA37 Night-Shining in Human Eyes
- BHA38 Eye Color Correlated with Athletic Capability

EARS

- BHA39 Inherited Ear Pits
- BHA40 Supernumerary Ears and So-Called Gill-Slits

NOSES

- BHA41 Nostril Orientation and Musculature

TEETH

- BHA42 Differences and Similarities between Human and Primate Teeth
- BHA43 Racial Dental Differences
- BHA44 Historical Shrinkage of Human Teeth
- BHA45 Extra Dentitions

HORNS

- BHA46 Human Horns

HANDS AND FEET

- BHA47 Unusual, Inherited Characteristics of Feet
- BHA48 Progressive Loss of the Little Toe
- BHA49 Webbed Hands and Feet
- BHA50 Alleged Primitive Character of Human Hands and Feet

BREASTS AND BUTTOCKS

- BHA51 Large Female Breasts and Buttocks
- BHA52 The Unusual Location of Human Breasts

TAILS

- BHA53 Human Tails

EMBRYO

- BHA54 Concordance of Human Embryo Growth and Evolutionary Developments

ODORS

- BHA55 Anomalous Human Odors

*VIBRATIONS***BHA56 Natural Human Vibrations****BHA0 Introduction**

Our first impressions of another human being usually involve elements of "external appearance and morphology", the subjects of this first chapter on human biological anomalies. We are aware first of stature, weight, skin pigmentation, hair color, and gender. After these elements are registered, our attention is attracted by the person's eyes, teeth, nose, hands, and so on. While these elements of appearance are readily observed; others, such as human vibrations and electromagnetic radiations, require scientific instrumentation.

The anomalies of appearance and morphology are many in number, as the chapter contents (listed above) demonstrate. Some of these are bizarre and startling, such as mirror-image twins and human tails and horns. Some are difficult for the casual observer to detect, such as human asymmetry and the supposed human aura. In assessing the degree of anomalousness for each phenomenon, we find that some, though most peculiar indeed, such as those human horns, are little more than curiosities. More profound from a scientific standpoint is the apparent retention of primitive characteristics by humans when compared to the apes. As always in the Catalog of Anomalies, there are wild swings in anomalousness from trivialities to questions that challenge the foundations of biology.

*GENERAL ATTRIBUTES***BHA1 Human Asymmetry**

Description. The bilateral asymmetry of the external human form, particularly the facial features.

Data Evaluation. The asymmetry of human facial features has been well-advertised through the frequent publication of composite photographs of left-left and right-right halves of faces. Although only one reference is employed here, the phenomenon at hand is common knowledge. Rating: 1.

Anomaly Evaluation. Superficially, the phenomenon harbors nothing profound. However, as A.C. Neville points out in X2, below, the DNA coding is identical on both sides of the body's midline. Why should the genetic code be interpreted differently on opposite sides of the body? This is not a trivial question.

Rating: 2.

Possible Explanations. One can always dismiss human asymmetry by saying that conditions are simply different on opposite sides of the body, and that growth and development will be, too.

Similar and Related Phenomena. The asymmetry of identical twins (BHA8); the strong asymmetry of many animals, such as coiled mollusks (BIA) and the flatfish, which begin life tolerably symmetrical and then metamorphose into a state of greater asymmetry (BFA); the growth of snowflakes (C).

Entries

X1. General observations. Contrary to expectations and casual observations, humans are markedly asymmetric. This bias is seen most clearly in the human face and skull. When a photo of a face is halved vertically, and the halves are made into mirror images in the photo lab, the composite left-left and right-right faces are usually startlingly different from the original face. This simple experiment demonstrates that human faces at least are not bilaterally symmetric. In actuality, this asymmetry extends from head to toe.

It must also be remarked that the human brain is asymmetric in its functioning. Also, our internal organs are not always located symmetrically. The heart, for example, is certainly not on the body's centerline and in rare cases may be reversed. It is also interesting to note that Siamese twins are usually mirror images of one another rather than exact copies. (R1)

X2. What is anomalous about human asymmetry? The significance of animal asymmetry---for all animals are asymmetric, not just humans---has been explained by A.C. Neville.

Consideration of animal asymmetry reveals some challenging unsolved problems in developmental biology. How can an animal build a bilaterally symmetrical body using asymmetrical components (e.g. L-amino acids, D-sugars, right-handed alpha-helix)? In the organic world, bilaterally symmetrical crystals form spontaneously with the expenditure of the

minimum amount of energy. Since the building units of organisms are asymmetrical (molecules, organelles, cells, etc.), it has been argued that the achievement of bilateral symmetry in a whole organism must involve higher energy expenditure. For instance, in the replication of two-stranded DNA (giving right-left symmetry of base pairing), two enzymes seem to be required (ligase and replicase) instead of one. Hence at this molecular level, bilateral symmetry is expensive in energy terms.

The problem occurs in reverse. Given a bilaterally symmetrical animal, how can it evolve to give rise to an asymmetrical form? DNA codes for proteins which control an organism's shape and metabolism. Since the DNA code occurs identically in every somatic cell of the body (i.e. not counting sex cells), how can it be interpreted differently on the two sides of the midline, in a non-erratic manner?

This problem becomes even more challenging when the question of bias is considered. Not only must we postulate differential interpretation of the genetic code on the two sides of the body, but we have to suggest that the code 'knows', often with great accuracy, what to build on a specific side of the body. (A trivial explanation of bias could be that there is a difference in mortality rate between left and right individuals of a species. However, extensive experiments with huge numbers of the snail Limnaea peregra did not support this explanation.) (R1)

Reference

- R1. Neville, Anthony Charles; "Symmetry and Asymmetry Problems in Animals," in The Encyclopaedia of Ignorance, Ronald Duncan and Miranda Weston-Smith, eds., New York, 1977, p. 331. (X1, X2)

BHA2 The Appearance of Beauty in the Human Lineage

Description. The sudden, mysterious appearance of beauty in the human face and form, as exemplified by modern man and his direct predecessor, Cro-Magnon man, as contrasted to Neanderthal man, who is generally considered to have been a coarse, brutish infrahuman.

Data Evaluation. Of course, beauty is a subjective value, so the statements above actually represent opinions rather than facts, even though most modern literature is consistent with these opinions. The only real facts we have are the bones of the Neanderthals and Cro-Magnons and ourselves, the direct descendants of Cro-Magnon man. Unquestionably, something did happen several tens of thousands of years ago, for skulls like our own began replacing the big-browed, coarse-featured skulls of the Neanderthals. In our subjective view, humankind suddenly became more beautiful! More objectively, thousands of skeletons say that an evolutionary saltation occurred. Rating: 1.

Anomaly Evaluation. This "beauty" phenomenon is not entirely a frivolous entry in this Catalog. The saltation was real, call it the sudden appearance of beauty if you will; but quite suddenly modern man (the more beautiful one) replaced Neanderthal man. Any evolutionary saltation is considered anomalous in this Catalog because we do not understand why the glitch or saltation was so large and sudden, or why it led to the introduction of such an increase in intelligence, the advent of esthetic values, morality, religiousness, and, yes, the capacity to appreciate beauty, even in ourselves. We shall return again and again to this phenomenon of apparent biological improvement of various life forms. It just so happens that an obscure article in a defunct magazine has caused us to recognize the mystery of biological evolution so early in a long series of volumes on biological anomalies. As for evaluating the anomalousness of this phenomenon in the present context, employing mainstream evolutionary thought as a baseline, we have only to ask how evolutionists can explain the survival value of beauty and/or the ability to define and appreciate beauty. Of course, we are having a little premature fun with the theory of evolution here, but the fact remains there seems to be more to modern man than the ability to exterminate the Neanderthals. Rating: 1.

Possible Explanations. Humanity's beauty, intelligence, etc., and its capacity for appreciating its own attributes, are only the consequence of chance, favorable mutations. On the other hand, creationists would say that God made man ("modern" man, that is) in His image!

Similar and Related Phenomena. Human evolution as seen in the fossil record (BHE); the human recognition of beauty in art, music, science, nature, etc. (BHB14).

Entries

X1. General observations. Obviously the title of this phenomenon is anthropomorphic and self-serving. The basic reference was penned in 1916, when the philosophical and political environments were different. Although the fundamental observable is "beauty", the real phenomenon and its entrained anomaly is the unexplained displacement of Neanderthal man by modern man or Homo sapiens. Not surprisingly, the more beautiful of the two was and is modern man, as expressed by an anonymous writer in Current Opinion.

During the long interval from Aurignacian to Magdalenian times, that is, about twenty-five thousand years ago, a striking progress took place (from the standpoint of beauty) in the configuration of the European countenance. This is exemplified in the head of the so-called Cro-Magnon type of knowing man---Homo sapiens, as the authorities say. Neanderthal man, whose coarse features have been made so familiar in the literature of this subject, seems to have succumbed to the Cro-Magnon type. The latter was armed for offense, apparently, with a bow and arrow, against which the hapless Neanderthals had no means of contending. The subjugation of Neanderthal man and his extinction seem to have promoted the evolution of a lovelier human countenance. The Cro-Magnon type of face was common in Europe, comparatively, about twenty-five thousand years ago. Before that, say forty thousand years ago, faces were conspicuously Neanderthal in salient lines. Whether the Neanderthals were exterminated entirely or whether they were driven out is not known. The encounter was certainly between a very superior people, both physically and mentally, and a very inferior and somewhat degen-

erate people that had already been reduced physically by the severe climatic conditions of the fourth glaciation of the old world. The Neanderthals were dispossessed of all their dwelling places by this new and more beautiful race. (R1)

Of course, the anthropologists of 1916 and today can only surmise about the mental and physical inferiority of the Neanderthals. It should not be forgotten that the cranial capacity of the average Neanderthal exceeded that of modern man! (BHE) Perhaps we do not really appreciate Neanderthal man's real capabilities. After all, we have only his bones.

Of additional interest in this article in Current Opinion was the unequivocal statement that Homo sapiens evolved in Asia. Such a position in contrary to today's mainstream thinking, in which Africa is considered the home of modern man. We shall return to this subject in much more detail when the fossil evidence is examined. (BHE)

The source cited for the facts and opinions expressed above was the book Men of the old Stone Age, by H.F. Osborne, a well-known figure in 1916. According to lengthy quotations in the article at hand, Osborne saw the sudden appearance of beauty in Cro-Magnon man as the natural complement of the simultaneous appearance in Cro-Magnon man of superior intelligence, an esthetic sense, and religiousness. The appearance of these characteristics, he said, "is one of the greatest mysteries of psychology and of history," (R1)

Reference

- R1. "Mysterious Appearance of Beauty in the Prehistoric European Countenance," Current Opinion, 60:265, 1916. (X1)

BHA3 General Physique Correlated with Month of Birth

Description. The tendency of those born from February through October to be taller and heavier than those born during the other half of the year.

Data Evaluation. Two studies, each involving tens of thousands of individuals, from northern and southern hemispheres, record the same phenomenon. However, such a remarkable result should be confirmed by much more data worldwide.

Rating: 2.

Anomaly Evaluation. Since the phenomenon is correlated with month of birth in both northern and southern hemispheres, the effect is not one of season (meteorological factors) but rather calendric (astronomical). Such a phenomenon is manifestly heretical, for the position of the earth in its orbit around the sun results in no known forces that would affect human physique! Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. Intelligence correlated with season-of-birth (BHB35); eminence or success correlated with time-of-birth (BHB27); and many other behavioral phenomena correlated with solar activity, the moon, the planets, weather, etc. See the BHB "Key to Phenomena" and the Subject Index.

Entries

X1. The study of C.A. Mills. Mills collected data on the heights and weights of over 45,000 freshmen enrolling at certain American colleges. From these statistics he concluded:

Height and weight of college freshmen, both males and females, are greater in those conceived during the warmer half year (May to October inclusive) than with those conceived in winter cold (November to April inclusive). (R1)

As if to compensate, it was also found that the likelihood of college matriculation was considerably higher for those conceived during the winter months.

The larger men were born in February [summer in the southern hemisphere], and the smaller ones in June [which is winter down under]; the heaviest ones were born in December, although the difference in weight was relatively less important than the difference in height. (R2)

If one converts time-of-conception to time-of-birth, Fitt's conclusions tend to agree with those of Mills, if the correlate is month-of-birth rather than season. In other words, the phenomenon seems to be astronomical in origin rather than meteorological!

References

X2. Fitt's research. In his book The Cosmic Clocks, M. Gauquelin quoted the results of an investigation by the British demographer Fitt. Fitt's data came from the records of 21,000 New Zealand recruits.

- R1. Mills, C.A.; "Mental and Physical Development as Influenced by Season of Conception," Human Biology, 13: 378, 1941. (X1)
- R2. Gauquelin, Michel; "Season of Birth," The Cosmic Clocks, Chicago, 1967, p. 179. (X2)

BHA4 Human Body Badly Designed for Swimming

Description. Human physical features, such as low buoyancy as compared to other animals, that have apparently deprived humans of the nearly universal innate ability to swim and survive in the water.

Data Evaluation. Several elements of bad body design, as applied to aquatic operations, have been noted in the scientific literature. (See X1 below.) There is, however, little literature on this subject. Given the existence of "good" human design features for aquatic activities, more study is obviously necessary to see which predominates. Rating: 2.

Anomaly Evaluation. While mainstream science does not claim that humans are well-designed for swimming, it does seem incongruous that humans, almost alone in the animal world, should not have the innate ability to swim in their repertoire, particularly in view of the apparent recent evolution of humans and other primates. To add to the problem, humans do possess several physical attributes that seem to betoken a recent aquatic past. See below. Rating: 3.

Possible Explanations. The stock answer to this phenomenon is that humans and most apes have no pressing need to swim and have therefore lost the innate ability to do so.

Similar and Related Phenomena. Some human features thought by some to be favorable to aquatic operations are: loss of body hair, as in the case of most marine mammals (BHA29); possession of subcutaneous fat, again like most of the marine mammals (BHI); possession of some swimming and diving reflexes similar to those of some marine mammals (BHT21). See also the Subject Indexes in the BH Catalog volumes under "Aquatic ape hypothesis."

Entries

X1. General observations. Most animals swim well naturally and are able to survive in the water much longer than most humans and apes. Biologists speculate that humans lost or never had this innate ability to swim. Illustrative of this is the fact that the construction of the human body seems to be poorly designed for aquatic operations. Some specific elements of "bad design" have been enumerated by J. Wind.

Among these are (a) buoyancy having been reduced slightly due to a smaller lung air/body weight ratio, less air trapped in the body covering hairs and reduction in gastrointestinal gas, (b) the caudally directed nasal entrance cranially to which there is the heavy neurocranium, (c) the low position of the laryngeal entrance, (d) the ineffective propulsion by the human innate crawling and walking movements, and (e) the well developed cerebrum be-

ing present cranially to the airway entrance, being sensitive for anoxia and hypothermia, and causing behaviour adding to drowning risks. (R1)

Why humans and some apes (the proboscis monkey being one exception) should have lost this valuable innate ability is difficult-to-account-for, given the importance of water transportation and the popularity of water sports. This phenomenon also bears forcefully upon the so-called "aquatic ape" hypothesis, in which humans are claimed to have evolved from a watery mode of existence. (WRC)

Reference

R1. Wind, Jan; "Human Drowning: Phylogenetic Origin," Journal of Human Evolution, 5:349, 1976. (X1)

BHA5 The Apparent Physical Degeneration of Humans

Description. The apparent decline in human strength and resistance to disease over the last several tens of thousands of years.

Background. It is worthwhile remarking here that the possible degeneracy of man fits in well with Christian thinking. The Christian expectation is that, after man's fall from grace and expulsion from the Garden of Eden (presumably a very healthy place), the lot of humans can only change for the worse until the return of Christ. In contrast, the scientific and humanist expectation is that rational man and his science will take humanity on an upward course. Thus, the question of degeneracy has philosophical overtones.

Data Evaluation. Large collections of ancient human skeletons and artifacts and historical medical records could, in principle, lead to a careful scientific assessment of the subject phenomenon. To our knowledge, no such comprehensive study exists. Instead, we have so far only a single reference to human degeneracy, and this is based on limited scientific study. Rating: 3.

Anomaly Evaluation. Aside from its general aversion to religious interpretations of phenomena, today's science does not seem to have taken a firm stand on the implications of human degeneracy. Actually, scientific expectations, when divorced from philosophical imperatives, could be consistent with the observations presented below in X1. For, with the rise of civilization, human physical strength was no longer a great necessity; and the concentration of large masses of people in cities, plus changes in diet, could well have increased the incidence of some diseases. The phenomenon of degeneracy, therefore, does not really seem to be anomalous. Rating: 4.

Possible Explanations. See above discussion. It is also possible that the phenomenon of degeneracy may be illusory. More study is required here.

Similar and Related Phenomena. Other primates are, pound for pound, much stronger than humans. Possibly pertinent is the observation that modern mammals are smaller and less robust than those living during the Pleistocene. Could there be a general degeneracy in life? Such topics are grist for the final volume in the Biology series of Catalogs.

Entries

X1. General observations. In order to determine whether humans have degenerated in physique and health down the millennia, one must appeal to the archeological and anthropological record, as established by human artifacts and bones. A.C. Custance has made some general observations in this regard.

In the matter of physical strength some of the tools of primitive man would appear to us to be quite unmanageable. Presumably the people who made them did not find them so. And no one can look at the monolithic structures of antiquity without marvelling at the masses of stone they seemed to be able to throw

around at will.

In all these things man seems to be a less remarkable creature today than he was in earlier times. And this applies to the diseases from which he suffered, at least those diseases which could leave evidence of their presence in his bones. Ales Hrdlicka made a special study of this question and comments in connection with the earlier remains as follows:

"There is no trace in the adults of any destructive constitutional disease. There are marks of fractures, some traces of arthritis of the vertebrae, and in two cases (Lachappelle and the Rhodesian Skull) much less

of teeth and dental caries. The teeth of the remaining specimens are often more or less worn, but as a rule free from disease, and there is, aside from the above mentioned two specimens, but little disease of the alveolar processes.

"It appears, therefore, that on the whole, early man was remarkably free from disease that would leave any evidence on his bones and teeth."

Then he turns to later human remains and observes, "Such diseases as syphilis, rachitis, tuberculosis, cancer (of the bone at least), hydrocephalus. etc., were unknown or rare in these..." Subsequently he shows the gradual increase of other diseases of bone and teeth, and speaking of the much later remains of early man he concludes:

"As we proceed towards men of today, particularly in the white race, pathological conditions of the bone become more common."

In a similar vein George A. Dorsey points to the evidence of degen-

eration in the human body as it now is.

"There are more than mere structural variations in our food canal: there are signs of degeneracy---in teeth, in jaws and throat, and in the large intestine. Changed diet does it. To digest raw food our ancestors had to chew it. They had strong jaws, heavy muscles, sound teeth properly aligned, big throats, and a colon that could digest husks of grain and skins of fruit and vegetables."

Of course, civilization may account for some of these evidences of degeneracy. But civilization is attributed by evolutionists to man's superiority, and other animals not having evolved sufficiently to have produced it. In this case evolution must be blamed ultimately, at least in part, for the degenerate state of its highest achievement. (R1)

Reference

- R1. Custance, Arthur C.; "The Fall Was Down," Doorway Paper No. 40, 1967, p. 33. (X1)

BHA6 Human Physical Degeneration and Genius

Description. The correlation of physical degeneracy with genius.

Data Evaluation. The only literature we have found bearing on this supposed phenomenon is nearly a century old---perhaps the phenomenon itself offends modern sensitivities. In any case, we have found some unsupported speculation plus a modicum of statistical data. Factual support for the phenomenon is rather weak Rating: 3.

Anomaly Evaluation. We have found no sign that modern science recognizes any connection between human physical degeneracy and the incidence of genius. Given today's philosophical and political climates, we assume that most scientists would be repelled by the thought of linking the two parameters. The phenomenon, therefore, displays significant anomalousness. Rating: 2.

Possible Explanations. None offered, unless one considers the "theory of compensation" mentioned in X1, below, to be operative; but this as a general character-

istic of the universe would be even more anomalous than the phenomenon under discussion.

Similar and Related Phenomena. Intelligence correlated with season-of-birth (BHB35) and birth order (BHB36). Genius is also associated with epilepsy and some mental diseases. See the Handbook The Unfathomed Mind and the Series-P volumes in the Catalog of Anomalies.

Entries

X1. Lombroso's theory. In the late 1800s, the scientist Lombroso proclaimed that human genius is a form of physical and psychological degeneration. To pursue this theme in more depth, we quote from a translation of M.G. Valbert's critique of Lombroso, which appeared originally in Revue des Deux Mondes.

sagacity which, loving the real and the possible, sacrifices to them all chimeras, the rhythm of a will always regulated and always even, the obedience of a powerful imagination, that consents to let itself be ruled by a sovereign and impassible reason.

'These are degenerates, I tell you!' cries M. Lombroso from Turin, 'and you may be certain that many of them have protruding ears, an asymmetric visual field, and the handwriting of an epileptic or a lunatic!' (R1)

The last of his [Lombroso's] discoveries is perhaps the most alarming, and he speaks of it with relish. It is with true enjoyment that he endeavors to persuade us that if alcoholics, criminals, cretins, and deaf mutes are degenerate, the great men are their cousins german, that genius is a sort of degenerative psychosis, belonging to the family of the epilepsies...

Unfortunately the quotation above is short on specifics and certainly not scientific evidence. However, we shall return again to human genius and its correlates, especially in connection with order of birth and season of birth. (BHB36 and BHB36) In addition, the following entry bears upon this subject of genius and degeneracy.

Lombroso believes that, after all, his theory has its consoling side; there comes to its aid the system of compensations, which has decreed that every advantage that is acquired shall have its drawback and that every gain shall be accompanied by a loss. 'The reptiles,' says Lombroso, 'have more functions than we, the monkeys have a greater number of muscles and an entire organ---the tail---that we lack. Only by losing these advantages have we gained our intellectual superiority.'

.....

X2. H. Ellis's study of genius and height. If all men of genius were short and physically defective, we would be tempted to support Lombroso's thesis in X1. But the psychologist H. Ellis collected the heights of 280 recognized men of genius and concluded as follows:

But let us talk now only of the real genius...whether he paints or builds, whether he is sculptor or poet, whether he composes symphonies, epics, or dramas, whether he guides the destinies of a great people or leads armies in the field; we admire, equally with the extent of his thought and the grandeur of his conceptions, the justice of his view, the close connection of all parts of his work, the harmonious complexity of his designs and the simplicity and wisdom of his processes, the deep

It is clear that the belief in the small size of great men was not absolutely groundless. There is an abnormally large proportion of small 'great men.' It is mediocrity alone that genius seems to abhor. While among the ordinary population the vast majority of 68 percent was of middle height, among men of genius, so far as the present investigation goes, they are only 22 per cent, the tall being 41 per cent, instead of 16, and the short 37, instead of 16.

The final result is, therefore, not

that persons of extraordinary mental ability tend either to be taller or shorter than the average population, but rather that they tend to exhibit an unusual tendency to variation. Even in physical structure, men of genius present a characteristic which on other grounds we may take to be fundamental in them; they are manifestations of the variational tendency, of a physical and psychic variational diathesis. (R2)

Ellis also remarked that the tall men of genius were generally also superior physical specimens---hardly degenerate! The small geniuses, though, did seem to support Lombroso's degeneracy theory (X1). We quote Ellis again.

There are certainly at least two types of short men of genius: the slight, frail, but fairly symmetrical type (approaching what is called the true dwarf), and the type of stunted giant (a type also to be found among dwarfs proper). The formal are fair-

ly symmetrical, but fragile; generally with little physical vigor or health, all their energy being concentrated in their brain. Kant was of this type. The stunted giants are usually quite vigorous, but lacking in symmetry. Far from being delicately diminutive persons, they suggest tall persons who have been cut short below; in such the brain and viscera seem to flourish at the expense of the limbs, and while abnormal, they often have the good fortune to be robust both in mind and body. Lord Chesterfield was a man of this type. (R2)

References

- R1. "Are Men of Genius Degenerates?" Scientific American Supplement, 44: 18054, 1897. (X1)
- R2. "Stature of Men of Genius," Scientific American Supplement, 44:18274, 1897. (X2)

BHA7 Variability of External Appearance

Description. The great variability of Homo sapiens in skin color, hair color, facial features, tooth structure, stature, body form, and other similar features. Generally, these characteristics help determine the race of a group of humans.

Data Evaluation. Many racial differences are immediately obvious in a large, cosmopolitan city; they are common knowledge. The full extent of these variations, however, is difficult for a single person to ascertain on a global basis. Happily, racial differences are of great popular and scientific interest. Consequently, much pertinent data may be found in any library as well as the scientific literature. Rating: 1.

Anomaly Evaluation. Anthropologists usually assume that modern man, Homo sapiens, began as a single, homogeneous population, and that racial differences emerged as this population expanded and invaded all continents. Environmental pressures and interbreeding with other hominids, such as Neanderthal man, are thought to be sufficient to account for all two dozen or so recognized racial groups. While this may ultimately turn out to be the case, the fact is that scientists are not absolutely sure where humanity originated, the migration routes taken, and just what contacts were made with other hominid stocks. As for the environmentally induced racial features, there is much surmise. Dark skin, for example, is thought to have evolved as a defense against the tropical sun, even though many tropical races today are light-skinned! Additionally, no mechanism

by which sunlight or any other environmental force can change human appearance has been suggested. Rather, the standard evolutionary formula of random mutation plus natural selection is deemed sufficient, even though modern humans have existed for only about 30,000 years---hardly long enough, it would seem, to accumulate the many observed racial differences. All in all, it is difficult to account for human racial differences. Rating: 1.

Possible Explanations. None offered beyond the preceding discussion.

Similar and Related Phenomena. Racial differences in skeletal structure (BHE) and blood composition (BHC). Archeological and anthropological evidence for the diffusion of the human races. See the Handbook Ancient Man and the Series-M volumes in the Catalog of Anomalies.

Entries

X1. General observations. The variability of the external appearance of Homo sapiens is framed largely in terms of "racial differences". Some of these are merely curious in character, but many others seriously complicate the explanation of the origin of the races. By way of general introduction, we adduce some comments by L. Casson et al.

Homo sapiens is the youngest of all primate species. We are also the most variable, the richest by far in variety. There are human populations so tall on the average that six-footers are common and populations so short that five-footers are rare. There are dark-skinned peoples and light-skinned peoples and every shade in between. There are peoples with long trunks and short legs and peoples with short trunks and long legs; fuzzy-haired peoples and straight-haired peoples, big-toothed peoples and small-toothed peoples. Modern-looking sapiens first appeared in the fossil record some 40,000 years ago, the blink of an eye in the 3.3-billion-year history of life on this planet. Yet today anthropologists are able to distinguish at least two dozen or more human populations sufficiently different from each other in certain hereditary traits to qualify as distinct local races of that upstart species, Homo sapiens.

How the living races of man came to be what they are and live where they live remains shrouded in mystery. This history of the races is a vast, intricate jigsaw puzzle which no one has yet put together, at least not to the satisfaction of anyone else engaged in the enterprise

of trying. (R5)

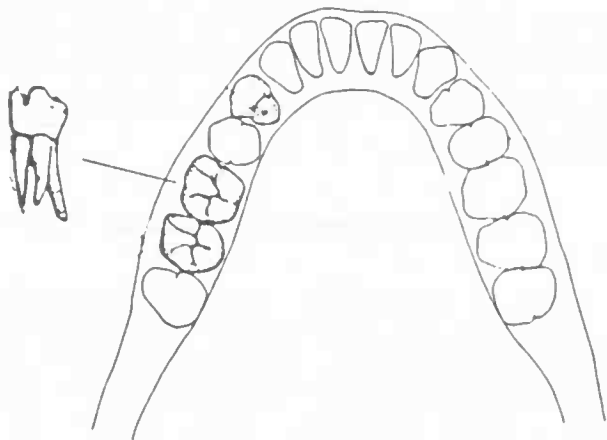
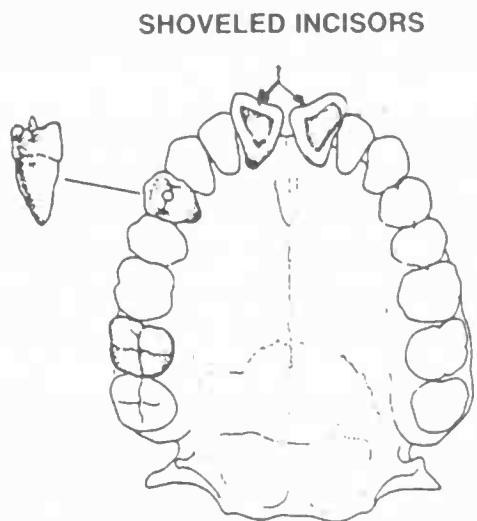
Casson et al wrote the above in 1977. Even now, years later, the origin of the races and their many differences remains puzzling. It is true that in recent years the African origin of humans, perhaps from a single "Eve", has attracted much support. But even the African origin has three major variants, as delineated in X3. Moreover, some anthropologists favor an Asian origin for humanity.

X2. A few specific, rather fascinating racial differences. It is popular to split the races by skin color: white, black, yellow, red, brown, etc. But, as Casson et al pointed out in X1, there are at least two dozen easily distinguishable races. Many have tried to explain the color differences in terms of insolation, the need of the body to generate vitamin D, and so on. Some of these explanations are quite reasonable, but there are many other differences that severely tax the ingenuity of the anthropologists. Some of the more interesting "other differences" are listed below. One must admit that it is hard to think how some of them increase survivability and how some very similar races ended up so far apart geographically.

1. The two distinct dwarf-sized races of primitive hunters live over 6,000 miles apart in the Congo (the Pygmies) and Southeast Asia (the Negritos) (R5)

2. The hair cross sections of the white race are oval; the yellow race, round; the black race, flat. (R9)

3. The so-called Sinodonts (northern Asians and native Americans) possess incisor teeth with strong shoveling (scooping out on one or both surfaces), whereas other people do not. In addition, the Sinodonts have different numbers of roots on the upper first pre-molars and lower first molars. (R8)



Upper and lower Sinodont jaws, showing unusual shoveling of incisors, single-rooted upper first molars, and triple-rooted lower first molars. (X2)

4. Big-nosed peoples are generally to be found in high, cool regions, as exemplified by many modern Europeans, Ethiopians, and the North American Indians. (R5, R7)

5. The Melanesians of the southwest Pacific appear Negroid but are so far from Africa that a common origin is unlikely. (R5)

6. The Mongoloid peoples possess not

only the well-recognized slitted eyes with epicanthic eye folds but also (more curiously) dry, crumbly ear wax, rather than the sticky ear wax of other races. (R5)

7. The children of the Australian aborigines are sometimes blond-haired until puberty. Whence the blond genes? (R5)

8. The Japanese Ainu lack the epicanthic eyefold, have considerable body hair, and are light-skinned---all of which are anomalous in a surrounding sea of Mongoloid peoples. (R5)

9. The Mandan Indians of North America are often fair in hair and complexion (R4), as are some New Guinea natives (R3), and some Central American Indians (R2). Further, one sees tales of a now-extinct red race of Madagascar. (R1)

X3. How the races might have evolved after the origin of *Homo sapiens* in Africa. C.B. Stringer has delineated three possibilities.

1. A multiregional model states that the various human races evolved, over long periods of time, in the areas we see them today, perhaps through admixture with Neanderthals and other hominids.

2. The so-called out-of-Africa model proposes that undifferentiated *Homo sapiens* spread out from Africa, developing different racial characteristics without any significant admixture with other hominids.

3. A gene-flow or hybridization model that traces modern humans back through a complex web of ancient lineages, with different genetic contributions coming from different geographical regions. (R7)

No consensus exists as to which model is best. In fact, we probably do not have sufficient data to choose among the three. And, of course, an Asian origin of modern man is favored by a minority of anthropologists. In all cases, as in all evolutionary theory, the actual mechanisms by which the changes are accomplished remain vague or unstated. (WRC)

X4. Human variability is limited. Even considering the wide spectrum of variability in external appearance presented by the world's races, there is definitely a limit to human racial differences. We may have dwarfs only 2 feet tall, but we shall never measure one less than a foot tall. In fact, all animal species seem to have these built-in limits. The deliberate breeding of animals and plants to accentuate certain traits has demonstrated that, although remarkable changes may be attained (dogs, pigeons, plums, etc.), one can only go so far. (R10, R11)

That such limits do exist is important in biological theory, since it tends to show that breeding alone within a species does not create new species. Something extra seems to be required, be it long-term isolation of a population, environmental pressure, or something still unrecognized.

References

- R1. "The Red Race of Madagascar," Science, 5:266, 1897. (X2)
 R2. Fairchild, H.L.; "White Indians of

- Darien," Science, 60:235, 1924. (X2)
 R3. "A New Tribe of Light-Skinned Natives in New Guinea," Science, 85:sup 16, March 6, 1937. (X2)
 R4. Newman, Marshall T.; "The Blond Mandan: A Critical Review of an Old Problem," Southwestern Journal of Anthropology, 6:255, 1950. (X2)
 R5. Casson, Lionel, et al; "How Did Human Races Originate?" Mysteries of the Past, New York, 1977, p. 211. (X1, X2)
 R6. Strickling, James E., Jr.; "The Origin of the Races of Homo Sapiens: A Case of Rapid Divergent Nonevolution," Origins---Today's Science, Tomorrow's Myth, New York, 1986, p. 72. (X2)
 R7. Stringer, Christopher B.; "The Emergence of Modern Humans," Scientific American, 263:98, December 1990. (X2, X3)
 R8. Fagan, Brian M.; "Northeast Asians," The Journey from Eden, New York, 1990, p. 196. (X2)
 R9. Weiss, Rick; "Fuzzy Science," Science News, 139:168, 1991. (X2)
 R10. Denton, Michael; "The Typological Perception of Nature," Evolution: A Theory in Crisis, London, 1985, p. 103. (X4)
 R11. Fix, William R.; "The Synthetic Theory," The Bone Peddlers, New York, 1984, p.... 184. (X4)

BHA8 Discordances in the Appearances of Identical Twins

Description. The observation of appreciable differences in the external appearances of identical twins.

Data Evaluation. Identical twins have been a favorite research subject in recent years. Several large-scale study projects have resulted in the publication of many scientific papers and even a few full-length books. Only a few of these are referenced below. Rating: 1.

Anomaly Evaluation. That identical twins have very similar external appearances (facial features, stature, eye color, etc.) is not surprising; they are thought to have come from the same mold. When examined in detail, however, discordances crop up, mostly of a minor nature. It had long been assumed that these small

differences were the consequences of different environments and social conditioning or "nurture" as opposed to "nature". Twin studies, however, indicate that discordances are probably more likely due to different conditions and events occurring in the womb. In other words, identical twins are concordant because of their genes and discordant because of prenatal genetic alterations and in utero differences. Since one of the cornerstones of humanistic thinking is that individuals can be molded by the environment and conditioning to enact desired social agenda, the results of twin research are disappointing. Since a mainstream paradigm is challenged here, we have an important anomaly in the sense that twin discordances tend to prove that "nature" almost completely dominates "nurture".
Rating: 1.

Possible Explanations. Early expectations that nurture plays a major role in social development were premature.

Similar and Related Phenomena. Mirror-image twins (BHA9); behavioral similarities of identical twins reared apart (BHB2).

Entries

X0. Spooky concordances between identical twins. Past studies of identical twins separated at birth have documented remarkable similarities between them, despite the fact that they were reared under radically different circumstances. Their physical appearances, habits, vocations, health histories, and other factors are often eerily the same.

Consider a pair, located by psychology professor Thomas Bouchard, the "Jim twins." Jim Lewis and Jim Springer, separated as infants and reunited 39 years later, had first wives named Linda, second wives named Betty, drove Chevrolets, and each had put a white seat around a tree in his yard. (R1)

Although the Jim twins did look much alike, the "spooky" similarities mentioned in the quotation are really concordances in behavior, which are examined more thoroughly in BHB2. The point being made in this introduction is that the behavioral concordances between identical twins can be remarkable indeed, even though they were reared apart. Some investigators have even wondered if they are linked psychically! On the other hand, the physical concordances, particularly external appearances, while also remarkable, are generally not considered anomalous because we expect identical twins to resemble each other very closely. But suppose that they do not?

X1. Discordances among identical twins. Externally and internally, identical twins can differ markedly. They can, for instance, differ appreciably in size, intellect, and behavior. In fact, identical twins can diverge even in the womb, where one may receive more oxygen and nutrients than the other. One twin may be assailed in utero by viruses, drugs, or bacteria, while the other escapes. Even more drastic is the possibility that one twin may pick up an extra chromosome soon after the original egg has split. Also, mutations may doom one twin to Down's syndrome or some other genetic affliction, while the other is unscathed. Identical twins may even be of opposite sex! Such twins would of course be genetically different, but they are still monozygotic (from the same egg). Blood tests will show them to be identical. (R4)

In studies of identical twins, the subjects are compared employing a long list of factors, such as eye color, nose shape, blood type, etc. Even the "most identical" of identical twins will be discordant in some comparisons. They may even be discordant on as many as 20% of the comparisons. (R2)

X2. A typical pair of identical twins exhibiting discordances.

The most puzzling case...involved two Japanese-born women reared by separate families in California. Though the twins looked almost in-

distinguishable, a few key markers, like the shape of their ears and face, were just different enough to get researchers wondering. Examinations and interviews revealed that both twins shared split nails on the same toes; both had had miscarriages; both suffered from a similar intestinal ailment. Yet one twin wore glasses and the other did not; one had a phobia of flying and the other did not; and one was reserved and traditional, the other more outgoing. It was not until the blood tests were completed that the answer was known: the twins were indeed identical. (R3)

X3. The significance of discordances. The remarkable similarities or concordances of identical twins, as outlined in X1, have strongly supported the school of thought that nature dominates nurture; that is, the environment does not shape individuals as much their genetic

inheritance. It used to be thought that the small differences that do exist between identical twins separated at birth were surely due to nurture, not nature. But, faced with all the differences that can accrue in utero, it now seems that the role of nurture in shaping individuals is much smaller, possibly negligible. (R4)

References

- R1. Powledge, Tabitha M.; "The Importance of Being Twins," Psychology Today, 17:21, July 1983. (X2)
- R2. Cassill, Kay; "Science Takes a Look," Twins: Nature's Amazing Mystery, New York, 1984, p. 44. (X1)
- R3. Rosen, Clare Mead; "The Eerie World of Reunited Twins," Discover, 8:36, September 1987. (X2)
- R4. Horgan, John; "Double Trouble," Scientific American, 263:25, December 1990. (X0, X3)

BHA9 Mirror-Image Twins

Description. The mirror-imaging of asymmetric characteristics of some twins; i.e., hair whorls, handedness, etc. The phenomenon extends to psychological and pathological factors as well. However, significantly, many twins are not mirror-image twins.

Data Evaluation. The only reference at hand is one of the popular books on twins. No scientific studies of mirror-image twins have been collected so far. Nevertheless, the phenomenon is undoubtedly real. Rating: 2.

Anomaly Evaluation. It is not known how human asymmetry originates in view of the fact that the genetic codes for manufacturing proteins are identical on each side of the body. The situation becomes even more puzzling in mirror-image twins. The crucial question is why some twins are mirror-images of each other while others are not. What genetic factor (or other influence) controls this? Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. Human asymmetry (BHA1); reversed internal organs (BHI); behavioral similarities among identical twins (BHB2); discordances in the appearances of identical twins (BHA8).

Entries

X1. General observations. As pointed out in BHA1, humans are asymmetrical in both external appearance and the internal placement of organs. The way in which this asymmetry comes about is puzzling, since the genetic code used in constructing the left side of the body is identical to that used for the right side.

The enigma of human asymmetry is accentuated by the existence of mirror-image twins. K. Cassill describes this phenomenon in her book Twins: Nature's Amazing Mystery.

When you look in a mirror, you see a reflection of yourself in reverse. A ring on one hand will appear to be on the other; a mole on your left side will look to be on your right side. Nature accomplishes such a reversal in some sets of twins. These are known as reverse asymmetrical, or more commonly mirror-image, twins. This reversed asymmetry generally manifests itself in clockwise and counterclockwise swirls of the hair, in right-handedness and left-handedness and so forth. In extreme cases, there will be a displacement of internal organs in one twin. In such an instance, one twin will have his heart on the right side and the other will have his on the left. (R1)

Mirror-image twins are almost always monozygotic (from a single egg). The mirror-imaging is thought to begin when the embryo splits after it has begun to develop right- and left-handedness. Perhaps the most significant fact is that not all twins are mirror images of each other. Some unappreciated element is active during the development of the fetus that initiates the mirror-image phenomenon. (R1)

S.I.V. (situs inversus viscerum). The popular presentation of Cassill above is amplified in a more technical way by H.H. Newman in his 1940 study of mirror imaging (or "roughly" s.i.v.) in humans and other animals. Part of his Summary follows:

11. S.i.v. is almost the rule in later-

ally conjoined human twins, is much commoner in the right component, in the smaller component and in the less normal component of such twins.

12. Minor expressions of mirror-imaging, such as those in hair whorl, ear form, palm and sole prints, dental irregularities, etc., are much commoner in conjoined human twins than in separate one-egg twins. Such minor degrees of mirror imaging are correlated with s.i.v.

13. Mirror imaging in handedness, hair whorl, and palm patterns in separate one-egg twins are real and not to be explained away because two-egg twins and singly born individuals also exhibit pseudo-mirror-imaging with respect to these characters.

14. Minor expressions of mirror imaging are regarded as having the same general cause or causes as s.i.v. All reversals of asymmetry are probably due to growth-depressing agents and are therefore environmental.

15. This conclusion, based upon much new evidence, tends partially to discredit the present writer's earlier view that mirror imaging is due to a "third factor" neither strictly genetic nor environmental."

16. This conclusion helps to simplify those methods of twin research that are directed toward determining the exact shares of genetic and environmental factors in determining variance in human characters. (R2)

References

- R1. Cassill, Kay; "Science Takes a Look," Twins: Nature's Amazing Mystery, New York, 1984, p. 45. (X1)
- R2. Newman, H.H.; "The Question of Mirror Imaging in Human One-Egg Twins," Human Biology, 12:21, 1940. (X1)

BHA10 The Apparent Primitive Character of Some Features of the Human Body

Description. The appearance in humans of several physical features that seem to be more juvenile or primitive than the same features in other primates. This condition is labelled "neoteny".

Data Evaluation. The biological literature contains many treatments of neoteny. We record below only three general references; but one of these, R3, contains an impressive bibliography. Rating: 1.

Anomaly Evaluation. In biological and popular thinking, humans are placed at the apex of evolution. Yet, the phenomenon at hand, neoteny, implies that human ascendancy originates in the retention of many juvenile, unspecialized features, as well as a long, retarded growth process from womb to adulthood. It is at least incongruous that a sharp evolutionary advance should be built upon the retardation of development rather than its acceleration! But this situation is really overshadowed by our nearly complete ignorance as to just how this claimed retardation of development is accomplished biologically, and how these retardation mechanisms are triggered selectively. Then, too, the phenomenon of neoteny is unplumbed; what would be the effects of still further retardation of human features already held back, or in the restraining of other human features so far unaffected? Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. Differentiation of the human races (BHA7); the genetic distance between humans and the other primates (BHG); human tails (BHA53); supposed primitive character of human hands and feet (BHA50); human sexual behavior (BHB19); general aspects of neoteny and recapitulation (BX). Also see the Subject Index under "Aquatic ape hypothesis."

Entries

X0. Introduction. Many external aspects of the human body differ from those of the apes; for example, our flat face contrasts strikingly with the prominent muzzles of adult apes. Yet, many of these differences between adult humans and apes become less pronounced as one retraces body development backward to juveniles and into the embryos. These observations have led to two equivalent generalizations: (1) Apes are further evolved than humans; and (2) Many human features are retarded in their development and more primitive in character than the same features in apes. The first generalization simply notes that apes are generally more specialized than humans; i.e., their prehensile feet. The second generalization, however, suggests that there exists a specific biological process that retards the development of some human features,

keeping them "primitive" or "juvenile". This apparent retardation in the development of biological features is termed "neoteny".

Neoteny is observed in many forms of life as well as the primates. Salient examples are the salamanders that retain their juvenile external gills into adulthood. The reality of neoteny and its significance have enlivened the pages of biological journals for decades. While we shall touch on the meaning of neoteny and its anomalousness in X3, the primary goal here is the presentation of data. These data are usually found in list format and in the enumerations of specific physical features.

X1. A.H. Schultz claims that apes are more evolved than man. 1925. Schultz

focused on the more highly specialized features of apes. His ideas were "startlingly opposed to current notions"!

In his review of the many resemblances between man and the apes. Dr. Schultz has made use of features that develop before birth and during growth to adult stature. One of the outstanding examples of greater physical specialization in the lower animals is the disappearance of the thumb in certain species of monkeys, which goes along with the much-noticed lengthening of the arms in the direction of special application for climbing. All that is left of the thumb in these monkeys is a mere stump or rudiment, though occasionally a specimen appears in which a longer thumb is evident.



Baby chimps have near-human profiles, whereas the jaws of the adults jut out strongly. (X1)

Even in the matter of getting rid of a tail, certain of the apes have out-evolved man, says Dr. Schultz, for they have less of a rudimentary tail than man himself. And during the time before birth, man's tail is well-developed externally, reaching a length nearly one-fifth that of his body. Sometimes the external tail in man persists after birth. (See BHA53.) A record case of this kind is cited by Prof. Schultz, who shows a picture of a twelve-year-old boy from Indo-China with a tail nine inches long.

In the position of the eyes also the monkeys have gone farther from the primitive animal state than man has. In the lower animals the eyes are far apart, being indeed in many forms on quite opposite sides of the head. In the pre-natal development of both man and monkeys the eyes start far apart, and become relatively closer together as growth proceeds. But in man they remain noticeably farther apart than they do in many of the simians. In the development of the outer ear, however, man occupies an intermediate position; for while the ear of the chimpanzee is enormous compared with that of man, the gorilla's ear is just about of human size, and the ear of the orang is considerably smaller. (R1)

X2. L. Bolk's "fetalization" theory. The 1920s. Bolk was a Dutch anatomist who drew up a list of over twenty physical features that humans have in common with juvenile apes, but not adult apes. S.J. Gould discussed six on Bolk's list in his book Ever Since Darwin (R2) and listed 25 "retarded characters" in his more technical Ontogeny and Phylogeny (R3). From Gould's two titles, we provide an abbreviated listing:

1. Humans possess a rounded, bulbous cranium in adulthood. The embryos of apes and monkeys do, too, but their brains grow more slowly than the rest of their bodies so that, in the adult, the cranial vault is relatively lower and smaller. Gould suggests that the human brain achieves its relatively large size by retaining the rapid fetal growth rate.

2. The adult human face retains the

flat profile that both humans and apes possess in the juvenile stage. For example the shape of a young chimpanzee's face is very human-like, but in adulthood a muzzle is prominent. Humans also retain the small jaws and teeth and weak brow ridges of the juvenile stage.

3. In the embryos of humans, other primates, and many other mammals, the foramen magnum, the hole in the bottom of the skull from which the spinal cord emerges, points downward. The position of this hole is unchanged in the human adult, but points backward in other animals. This means that when humans stand upright, we can look forward since our skull is directly on top of our backbone. In the other animals, the migration of the foramen magnum is such that a four-footed life is favored. Thus, the retention of this juvenile (embryonic) geometry is consistent with our celebrated, supposedly very advantageous posture.

4. In the human infant the skull sutures are not closed, and the skull is not fully calcified. Appreciable postnatal expansion of the brain is possible. The skulls of other animals are essentially complete at the time of birth.

5. The vaginal canal in human females points forward, allowing face-to-face copulation. In most other mammals the canal also points forward in the embryo but migrates backward in the adult.

6. Most primates possess an opposable big toe that permits the grasping of branches, etc. In the embryo, however, all primate feet begin as human-like feet. Humans retain this juvenile (more primitive) feature, which turns out to be compatible with bipedalism---a supposedly desirable trait!

7. The human infant is dependent on adults for a much longer period of time than the other mammals. Further, the time to reach adulthood is also much longer. Interestingly enough, the human life span is also greater.

This list could be trebled easily, but the point has been adequately made that humans may be what they are because of the retardation in some aspects of development rather than acceleration.

Is it possible that humans dominate the earth not so much because of innovative characteristics but rather because of selected retarded development?

X3. Speculations about the significance of neoteny and additional observations.

1. L. Bolk himself wrote, "You will note that a number of what we might call pithecoid features dwell within us in latent condition, waiting only for the falling away of the retarding forces to become active again." Gould enjoys this quotation and develops it further:

What a tenuous position for the crown of creation! An ape arrested in its development, holding the spark of divinity only through a chemical brake placed upon its glandular development. (R2)

2. Despite the physiological and intellectual gaps between humans and apes, their genetic differences are very small. (See BHG.) This observation and the lessons of neoteny make one wonder how much the diversity of life depends upon the mutation of the genes and how much upon the release and retardation of "innate factors". But of course these "innate factors" must have originated somehow! (WRC)

3. A strange relationship exists between neoteny and recapitulation. Recapitulation, as codified in the biogenetic law, states that ontogeny recapitulates phylogeny; that is, animals repeat the adult stages of their ancestors during embryonic and postnatal growth. Gould avers that recapitulation is not generally true (despite some recent books). He argues that, if it were generally true, features or characteristics would have to be accelerated not retarded during the evolutionary process. In fact, neoteny was originally embraced as a notion opposing recapitulation. (R2)

4. Humans seem to be more retarded in development than the other primates in several respects, but all primates seem to be retarded relative to the other mammals. Therefore, neoteny, as an evolutionary mechanism, also applies to apes and monkeys to a lesser degree. In fact, the apes are more retarded than

the monkeys. (R2)

5. The "aquatic ape" theory is mentioned here and there in this volume. It should be remarked that many of the human characteristics ascribed to neoteny are taken by some as proofs of recent human evolution in a water environment. (See the Index under Aquatic ape. WRC)

6. L. Bolk, in the late 1920s, extended his theory of neoteny to the differentiation of the human races. (R3) (See also BHA7.)

7. In all the foregoing discussion of neoteny, little is said about how the retardation of the development of certain features is actually accomplished, whether by hormones or other mechanisms. And beyond the question of mechanism are the "why" questions: Why

were certain retarding forces released in the apes so that they could become more specialized and better adapted to their environments? Were environmental forces responsible? Why were these forces checked for humans, who were supposedly developing in similar environments? (WRC)

References

- R1. "Apes More Evolved Than Man, Says Washington Scientist," Science News Letter, 6:5, July 4, 1925. (X1)
 R2. Gould, Stephen Jay; "The Child As Man's Real Father," Ever Since Darwin, New York, 1977, p.63, (X2, X3)
 R3. Gould, Stephen Jay; "Retardation and Neoteny in Human Evolution," Ontogeny and Phylogeny, Cambridge, 1977, p. 352. (X2, X3)

BHA11 Human and Orang-Utan Physiological Similarities

Description. Physiological characteristics of humans that are similar to those of the orang-utans of Southeast Asia, but not shared with the African apes (gorillas and chimpanzees).

Data Evaluation. We have a single scientific paper on the subject. It lists and discusses 15 morphological and behavioral characters shared by humans and orang-utans but not the gorillas and chimpanzees. Additional information and, particularly, critiques are desirable here. Rating: 2.

Anomaly Evaluation. Mammalogists are almost unanimous in placing humans closer to the African apes in the evolutionary scheme of things than the orang-utans. Additionally, an African origin of humans is widely accepted; and this is consistent with a closer relation to the African apes. These two strongly held mainstream positions confer a high level of anomalousness upon physiological similarities between humans and orangs, particularly since the orangs are now confined to Southeast Asia. The similarities also challenge the validity of DNA comparisons which are consistent with the mainstream positions. Rating: 1.

Possible Explanations. DNA comparisons are better measures of evolutionary relationships than physiological characteristics. A few biologists would deny this statement.

Similar and Related Phenomena. DNA analysis and its implications for human evolution (BHG); fossil evidence relating to the place(s) of human origin (BHE) and our evolutionary links to the other primates (BHE).

Entries

X1. General morphological observations. J.H. Schwartz, swimming against mainstream pronouncements that humans (Homo) originated in Africa and are most closely related to the African apes (Gorilla and Pan) has assembled a list of 15 morphological characters that are shared only by humans and orang-utans (Pongo) but not with any other primates.

1. The possession of low-cusped cheek teeth
2. Thick molar enamel
3. The upper molars lack cingula
4. Lower molar M₃ smaller than M₂
5. Single incisive foramen palatally
6. Foramen lacerum
7. Scapula short, vertical vertebral border, small superior fossa
8. Proximal humerus/distal radius delayed ossification
9. Ischial callosities are unkeratinized and rare
10. Can grow the longest hair
11. The mammary glands are widely separated
12. Exhibit the longest gestation periods (both about 270 days)
13. Female genitals lack tumescence
14. Females lack oestrous cycle, so that copulation is not confined to the peak of the menstrual cycle
15. Exhibit the longest copulation bouts.

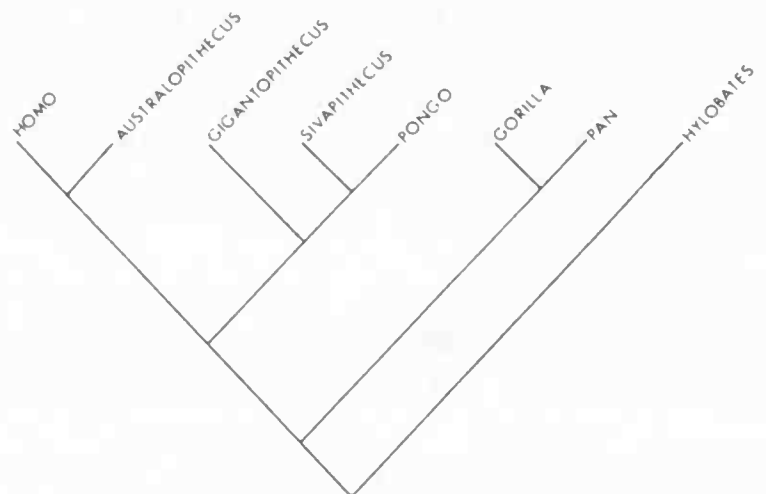
In summary, Schwartz states: "Review of morphology reveals that when Homo shares a unique feature with another primate it is most frequently with the orang-utan." (R1)

Not all anthropologists share Schwartz's opinions or concur with his 15 points. To illustrate, on point 14, E. Morgan cites observations that female orang-utans are not "permanently receptive," and that many copulations are no more than rapes. (R2)

X2. Non-morphological comparisons. Since a very close relationship between humans and the African apes seems indicated by DNA analysis (1.1% mismatch as compared to 2.4% mismatch with the orang-utan), Schwartz takes pains to argue that these comparisons do not necessarily support the theory that humans and African apes (gorilla and

chimpanzee) are closely related. Basically he says that we do not really know what comparisons of DNA mean, whereas morphological comparisons are less ambiguous. See BHG for more on this. (R1)

X3. Implications of Schwartz's study. The heretical nature of Schwartz's data is best seen in the accompanying cladogram. Cladograms are based upon shared, unique features. Therefore, Schwartz places humans, orang-utans, and the fossil Sivapithecus in a single clade. The implication is that, from the standpoint of evolution, humans are more closely related to the orang-utans than the African apes (gorillas and chimpanzees). As Schwartz remarks in his Abstract, this relationship is "contrary to current opinion." (R1)



This cladogram depicts Schwartz's proposed close relationship of humans and orang-utans. (X3)

Note that cladograms are supposed to be constructed independently of mainstream evolutionary expectations. Once completed, however, conclusions about evolutionary history are often drawn from them. (WRC)

References

- R1. Schwartz, Jeffrey H.; "The Evolutionary Relationships of Man and Orang-Utans," Nature, 308:501, 1984. (X1)

R2. Morgan, Elaine; "Sex in Transition,"
The Scars of Evolution, London,
 1990, p. 152. (X1)

BHA12 Significant Morphological Differences between Humans and the Great Apes

Description. Morphological differences between humans and apes that are so large that a close evolutionary relationship is doubtful.

Data Evaluation. Even the casual observer notes many superficial differences in the appearances of humans and apes. The biologist sees more fundamental differences in less obvious anatomical features, such as the structure of the pelvis. The quantity and quality of the data available are not in question, it is whether they are sufficient to cast doubt on well-established evolutionary family trees. The significance of the data, then, is a subjective call and a matter of controversy. When the data are not clear-cut a low rating is in order. Rating: 3.

Anomaly Evaluation. That humans and apes are close on the evolutionary tree is a major tenet of modern science. Any data undermining this belief are highly anomalous. Rating: 1.

Possible Explanations. The mainstream view is the correct one, and all of the differences between humans and apes cited below are minor. The data are insufficient to open up an evolutionary chasm between humans and apes.

Similar and Related Phenomena. Human-ape differences that support the concept of neoteny (BHA10); fossil evidence pertaining to human evolution (BHE); comparisons of human DNA with that of other primates (BHG).

Entries

X1. Human-ape morphological differences introduced in connection with neoteny. In BHA10, selections from a list of 25 differences between humans and apes were presented as evidence of neoteny. Neoteny does not deny a close evolutionary link between humans and the great apes; it asserts only that in humans some features maintain their juvenile character, while in apes the same features change significantly in adulthood. Most of the physiological characteristics supporting neoteny can also be employed to make a case that humans may not have evolved directly from the apes, or even have had a re-

cent common ancestor. Rather, according to some, humans arose from other, smaller mammals.

We now add two more human-ape differences that seem to contradict a close human-ape evolutionary connection.

X2. The unique human pelvis. In 1934, G.S. Miller, Jr., from the U.S. National Museum, pressed the argument that humans are not as closely related to the apes as generally asserted. His reasoning had its foundation in three uniquely human structural features: (1) the posi-

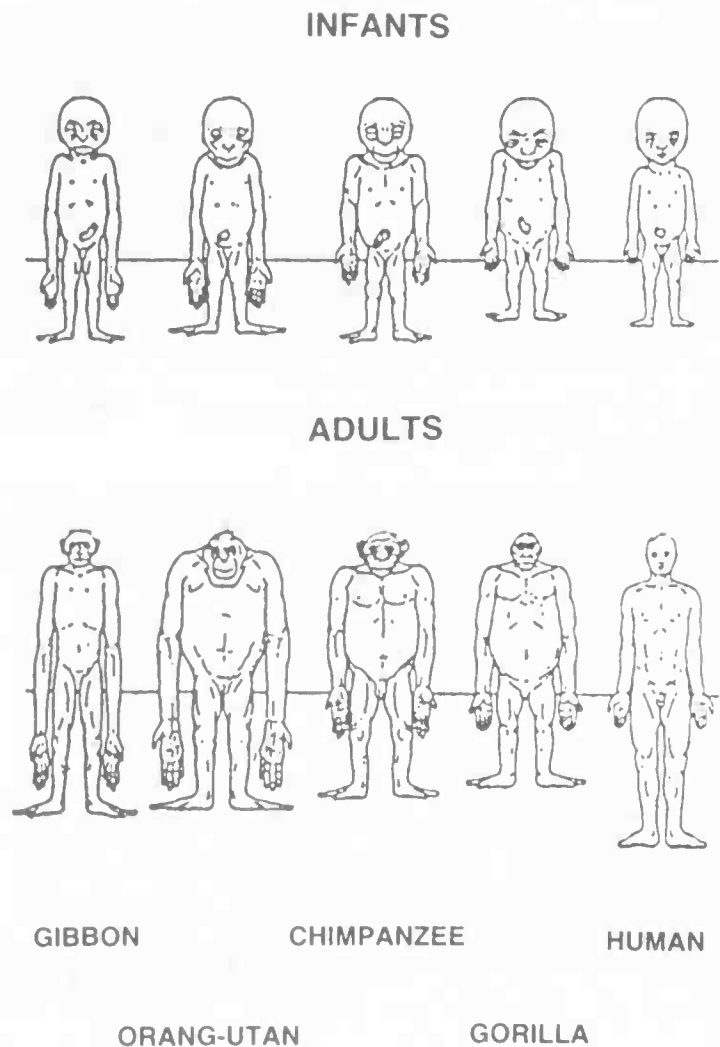
tion of the hole in the bottom of the human skull (the foramen magnum); (2) the unopposable human big toe; and (3) the human pelvis. Items (1) and (2) are also part of the neoteny discussion in BHA10-X2, but the third character deserves more discussion here. The following quotation is based upon Miller's work.

Another bone, or group of bones, necessary for establishing the correct zoological status of any supposedly human fossil, according to Mr. Miller, is the pelvis. This is the irregular ring of bone at the base of the trunk, attached to the spine and in turn serving as attachment-point for the legs and as partial support for the vital organs in the abdomen. In upright-walking man, the legs are extended in the same direction as the spine itself, instead of being at right angles to it as in the ancestral quadruped pattern; and it is to give efficient leverage to the leg muscles in this new and 'unnatural' position that the pelvis has had to become profoundly modified. Furthermore, since it now has to bear all of the body weight instead of only half of it, as in the quadrupeds, it must be solidly constructed. In the apes and monkeys it is narrower and not so rigidly built, because these animals are not primarily leg-walkers. Even the least aboreal of them goes on all fours more than he does on his hind legs. For these and other reasons, there is a great difference between the pelvis bone structure of man and the apes, which no anatomist could escape noticing. (R1)

X3. The proportions of the adult human body compared to those of the apes.

In 1926, the great American primatologist [A.M. Schultz] made some very interesting discoveries in this field. They concern the different relations between head, trunk, and members during the growth of man

and several apes, from the foetus stage right through until maturity. The changes in body proportion are clearly illustrated in the diagram beside. Professor Max Westenhofer claimed that if we don't hold any preformed opinion, this diagram is sufficient proof to make us abandon all ideas of a simian ancestry to man. (R2)



Morphologies of several apes and humans compared. (X3)

References

- R1. Thone, Frank; "No Great Ape Was Your Ancestor," Science News Letter, 25:310, 1934. (X2)
- R2. de Sarre, Francois; "Initial Bipedalism: An Inquiry into Zoological Evidence," Bipedia, 1:3, September 1988. (X3)

BHA13 Sports, Monsters, Terata

Description. Grossly deformed humans, such as Siamese twins and individuals with two heads, three legs, etc.

Data Evaluation. The medical literature is full of descriptions of curious deformities and repellent monstrosities. The single reference cited below contains no fewer than 163 pages of major and minor terata, accompanied by gruesome illustrations. Rating: 1.

Anomaly Evaluation. Sports and monstrosities are common in the animal world. In the main, they have little biological significance. They are simply evidence that something has gone wrong in the process that begins at conception and ends with birth. Defective sperm, disease during pregnancy, the use of drugs; all manner of forces can lead to sports and monstrosities. In this Catalog, sports and monstrosities are regarded as biological errors rather than biological anomalies, because no biological laws are challenged. Rating: 4.

Reference

R1. Gould, George M., and Pyle, Walter L.; "Major Terata," Anomalies and Curiosities of Medicine, New York, 1896.

PHYSICAL STATURE

BHA14 Two Separate Populations of Pygmies

Description. The geographical and genetic separation of African Pygmies and Asian Negritos.

Data Evaluation. An encyclopedia article presently forms the basis for the Catalog entry. More information is required. Rating: 3.

Anomaly Evaluation. The question at hand is why two very similar populations of Pygmies should have evolved from separate African and Asian stocks. This is apparently a case of parallel or convergent evolution. However, since the African Pygmies and Asia Negritos are of the same species, the anomaly is not as profound as it is when the taxonomic gaps are much larger. Nevertheless, we do not understand even this unimpressive example of parallel evolution. Did both populations evolve through what must have been long series of random mutations, ending up at nearly the same type of human, even though the starting points were different? It is difficult to blame the environments, since they are tropical in both cases. Humans of normal size thrive along side the Pygmies and Negritos, so natural selection for small stature would not seem to be important. Parallel evolution occurs so frequently in biology, and it is considered a first-

class anomaly in this Catalog. It must be recognized, though, that mainstream biologists do consider random mutation plus natural selection to be an adequate explanation. Rating: 1.

Possible Explanations. Random mutation plus natural selection have led, by sheer coincidence, to two very similar Pygmy populations.

Similar and Related Phenomena. See the Subject Indexes of the Series-B catalogs under Parallel evolution and Mimicry.

Entries

X0. Background. Anthropologists define Pygmies as members of any human group whose males average less than 150 centimeters (59 inches) in height. Although an especially tall Pygmy may be taller than a very short "normal" person, there are two groups of humans that can fairly be labelled "Pygmies": the Pygmies of Africa and the Negritos of Asia.

Pygmy babies are of normal size at birth, but they do not undergo the adolescent "growth spurt" seen in other human groups. Not only are Pygmies shorter than normal, but for their size their legs are unusually short and their arms long. Pygmy stature does not appear to be due to a shortage of growth hormones, nor is their diet deficient. (R2)

X1. Probable separate evolution of the African Pygmies and Asian Negritos. The Pygmies of Africa are presently concentrated in the tropical rain forests of Central Africa between latitudes 5° North and 5° South. The Asian (or Australoid) Negritos are found in Indonesia, India, Malaysia, the Philippines, and some of the islands of Southeast Asia.

The important facts to be noticed here are: (1) The two Pygmy populations are presently widely separated; and (2) It has been determined that they are also genetically unrelated. (R2) In other words, the African Pygmies and Negritos probably evolved separately.

X2. Apparent nonexistence of Pygmies in the fossil record. W. Ley muses about the seeming absence of fossil skeletons in his book Exotic Zoology. (R1) He could not point to a single fossil Pygmy.

Ley's book was published in 1966, so this gap in the fossil record may now be filled; but we have seen nothing further. Without fossils we cannot determine when Pygmies originated and just how they are related to modern humans of normal stature.

References

- R1. Ley, Willy; "The Little People," Exotic Zoology, New York, 1966, p. 90. (X2)
- R2. "Evolution, Human," Encyclopedia Britannica, 18:975, 1985. (X1)

WEIGHT

BHA15 Birth Weight Varies with Month of Birth

Description. The peaking of birth weights in the month of May in the Northern Hemisphere and in December in the Southern Hemisphere.

Data Evaluation. Only two references have been collected here. One of these is a scientific report; the other is an item from a popular book. Rating: 3.

Anomaly Evaluation. The birth-weight phenomenon is "explained" in X1 in terms of an annual hormone cycle. This leads to the obvious questions: Why is there an annual cycle in hormones? Is this a weather or seasonal phenomenon, or does it involve some unrecognized astronomical effect? If the latter were the case, the birth-weight phenomenon would be very anomalous indeed. However, we do not at present know enough about the phenomenon to assign an anomaly rating.

Possible Explanations. An annual hormone cycle linked to some weather or astronomical effect.

Similar and Related Phenomena. Many phenomena in this volume may be linked to seasonal, weather, and/or astronomical effects. Consult the Subject Index.

Entries

X1. General observations. In noting that more children are born in May and June than November and December, L. Watson refuses to accept the usual explanation linking this phenomenon to increased procreativity during the summer vacation months. More may be involved:

But there seems to be a more fundamental biological principle involved. because children born during May are, on the average, about two hundred grams heavier than those born in any other month. The difference is caused by an annual rhythm in the production of hormones involved in pregnancy. We still have a breeding season. (R1)

X2. Data from the Southern Hemisphere. Southern Hemisphere data are almost exactly 180° out of phase with those from the Northern Hemisphere, as discovered by A.B. Fitt in his study of New Zealand men:

(1) An analysis was made of the height and weight measurements of

over 21,000 men of the New Zealand army draft for World War II.

(2) The tallest men were those born in February (summer) and the shortest those born in June (winter). There was an average difference of about one-third of an inch between them.

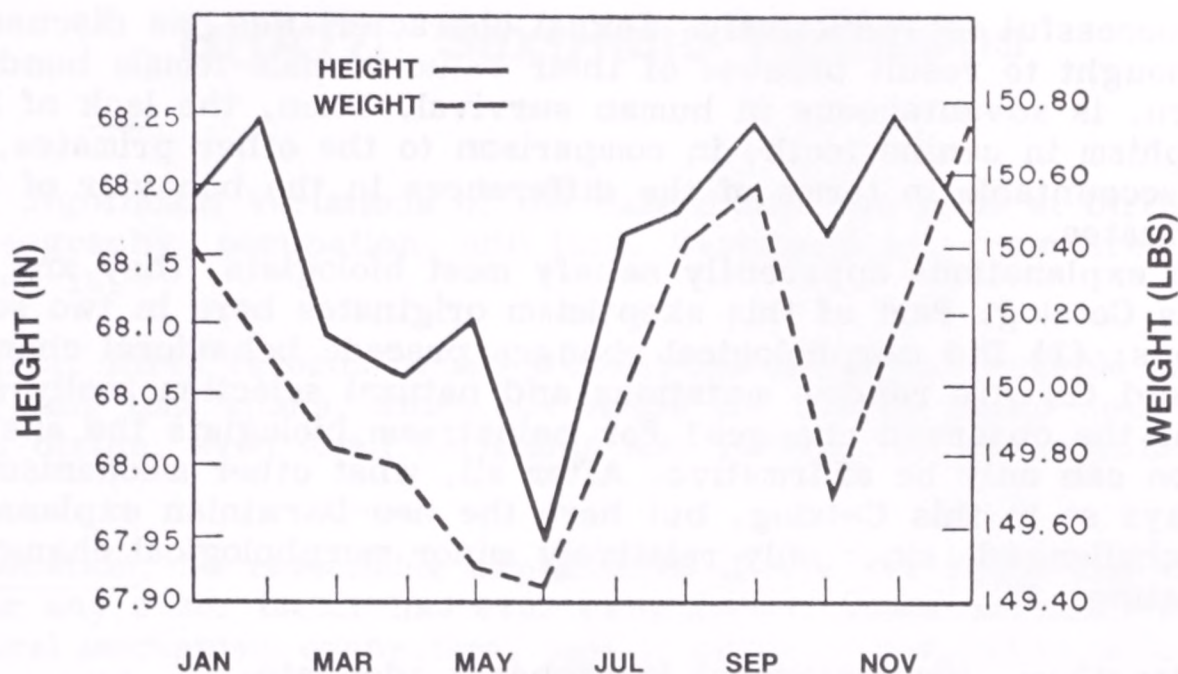
(3) The heaviest men were those of December birth and the lightest those born in June. There was an average difference of about one and one-third pounds between these weight levels.

(4) The main differences in height were significant and those in the weights had a lower level of significance. (R2)

Even though the differences seem too small to be anomalous, the large size of the sample make them significant. (WRC)

References

R1. Watson, Lyall; "Man and the Cosmos," Supernature, Garden City,



Heights and weights of New Zealand recruits versus month-of-birth. (X2)

1973, p. 46. (X1)

R2. Fitt, A.B.; "The Heights and Weights of Men According to the Month of Birth," Human Biology, 27:138, 1955. (X2)

SEX

BHA16 Human Sexual Dimorphism

Description. Differences in the external appearance of males and females.

Background. Sexual dimorphism is common in the animal world. The Catalog of Anomalies is always skeptical of facile explanations; and these are frequent in the explanation of sexual dimorphism. However, our policy here is to notice only those cases of sexual dimorphism that seem especially anomalous or that are extreme or bizarre. For example, it is worth recording examples where the females are much larger than the males.

Data Evaluation. Human sexual dimorphism is obvious to all sighted observers.
Rating: 1.

Anomaly Evaluation. The greater average size and strength of the human male is explained in evolutionary terms as the consequence of the larger, stronger males

being more successful reproductively. Sexual characteristics, as discussed below in X1, are thought to result because of their value in male-female bonding, which, in turn, is advantageous in human survival. Then, the lack of human sexual dimorphism in canine teeth, in comparison to the other primates, is believed to be accountable in terms of the differences in the behavior of humans and other primates.

While such explanations apparently satisfy most biologists, they are often challenged in this Catalog. Part of this skepticism originates here in two seemingly naive questions: (1) Did morphological changes precede behavioral changes or vice versa? and (2) Are random mutations and natural selection really sufficient to account for the observed changes? For mainstream biologists the answer to the latter question can only be affirmative. After all, what other mechanism is there? It is not always so in this Catalog, but here the neo-Darwinian explanation seems only weakly challenged, since only relatively minor morphological changes are involved. Rating: 3.

Possible Explanations. Neo-Darwinism is probably adequate.

Similar and Related Phenomena. Sexual dimorphism is so frequent that listing here is inappropriate. See the Subject Indexes of the other Series-B Catalogs.

Entries

X1. General observations. Although human sexual dimorphism is not as extreme as it is in some other species, particularly some fish, it is atypical among the primates and therefore deserving of notice in this Catalog.

In addition to the obvious male-female differences in body size, robustness, facial hair, etc., humans are unusual for the male's conspicuous penis and the female's permanently enlarged mammae. C.O. Lovejoy asserts that such sexual dimorphism differs radically from that in other monogamous species, in which the pair bond is continually tested and strengthened through mutual displays.

In man, however, marked epigamic dimorphism is achieved by elaboration of parasexual characters in both males and females rather than the males alone. Their display value is clearly cross-sexual and not intra-sexual as in other primates. It should be stressed that these epigamic characters are highly variable

and can thus be viewed as a mechanism for establishing and displaying individual sexual uniqueness, and that such uniqueness would play a major role in the maintenance of pair bonds. (R1)

Humans also differ from the other primates in that there is little sexual dimorphism associated with the size of the canine teeth. This reduction in sexual dimorphism is striking even in the fossil record. Lovejoy states that this signifies an entirely different pattern of behavior for humans early in their evolution. The other male primates employ their large canines for bluffing, threatening, and fighting. Men were and are different. (R1)

Reference

- R1. Lovejoy, C. Owen; "The Origin of Man," Science, 211:341, 1981. (X1)

BHA17 Sex-Ratio Variations

Description. Significant variations of the male/female sex ratio at birth with such factors as geography, occupation, and time. Variations are considered significant if they exceed 1%.

Data Evaluation. Birth records in many countries are highly reliable and readily available for long time spans. Since sex ratios are usually based upon many thousands of births, even small variations may be scientifically significant.

Rating: 1.

Anomaly Evaluation. No reasonable explanation of how sex ratios can vary with geography or any other factor has ever been found. There seems to be no recognized biological mechanism connecting, say, a person's occupation with the sex of his or her children. However, this ignorance does not necessarily signify a highly anomalous phenomenon. It may, for example, only imply hormonal or other biochemical variations induced by the environment---things that do not threaten any important biological laws. Such is "assumed" here. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. The sex ratios of other animals vary with species; for cats, it is 107; for sheep, only 98! (R8)

Entries

X1. Sex ratio and geography. In a survey of human variability, K.F. Dyer singled out three features: (1) variations of the sex ratio in various parts of the world; (2) the frequencies of multiple births; and (3) the numbers of births among older women. The first of these is cataloged here; the other two may be found in BHF, in another volume of the Catalog.

The first of these variations is the human sex-ratio at birth, which normally varies between 104 and 107 (male births per hundred female births). This can be confirmed from data in the United Nations Demographic Yearbook for 1959 and 1965, particularly from those countries in which the registration of births is said to be relatively complete. There are statistics of birth from 80 different populations for the decade 1949-1958 and 50 of them fall within the range 104-107. Many of those with values outside this range over the decade 1949-58, such as Iceland, West Berlin, and Panama, have a relatively low total number of births and random error can explain the deviation. When calculated over a long-

er period of time (1949-64), a larger number of values fall within the range 104-107. There are still a number of exceptions, however, and Table 1 shows the sex-ratio at birth in those cases that fall significantly below 104 and significantly above 107 respectively. (R4)

Excerpts from Dyer's Table 1

| | |
|------------|--------|
| Montserrat | 94.34 |
| St. Lucia | 98.77 |
| St. Kitts | 100.06 |
| Antigua | 100.13 |
| Hong Kong | 108.04 |
| Gambia | 110.18 |
| Aden | 120.31 |

It is interesting that the first four are all islands in the Caribbean.

X2. Sex ratio and occupation. The "fine structure" of sex-ratio variation is also fascinating. Can one's occupation make a difference? We quote W.F. Biddle, who was responding to the article in the New Scientist mentioned in X1:

Some years ago, a number of us noticed at various large research establishments where we had worked, that the scientists appeared to have daughters. At one establishment we compiled the following table:

| | Qualified scien- tists & engineers | Non-scientific staff |
|----------|---------------------------------------|-------------------------|
| Families | 41 | 47 |
| Boys | 28 | 55 |
| Girls | 42 | 42 |
| Ratio | 1.5 | 0.76 |

Statistical analysis shows that the difference between the samples is significant at the 0.05 level, that is, the difference is fairly certainly real ---although I would like to see the experiment repeated with more rigorous controls---including a test to see if there is any difference between scientists and engineers. On the other hand I believe that even higher ratios existed at some of the other establishments, and there were almost certainly more single-sexed families, particularly of girls, than would be found by pure chance. (R5)

Sex ratios of children of military pilots.
A more rigorous analysis was made of pilots of high-performance aircraft by R.C. Snyder. As above, a lop-sided ratio favoring female births was found, but only under certain rather bizarre conditions.

Data were obtained on 236 married pilots representing the total fighter pilot population at three different military airbases. One hundred and eleven of these individuals fathered 222 children. 113 males and 109 females. The data of birth for each child formed a basis for the assumed date of conception for each offspring, and the flight records for each father were examined for the period from 3-0 months prior to assumed conception.

It was found that there was a statistically significant preponderance of female offspring born when the fathers flew fighter-type aircraft prior to conception ($.01 > p > .001$). Of 91 children conceived and born under such conditions, 59 were females, while only 35 were males. This results in a sex ratio of only

59.3, compared to an expected ratio of 105.37. It was also found that the relationship of parity (birth order) to sex ratio agreed with the expected when the fathers flew transport types of aircraft or did not fly prior to conception, but that a significant reversal of this relationship occurred when father flew fighters prior to conception of each child.

This study gives statistical support to the hypothesis that the secondary sex ratio is significantly altered toward a preponderance of female offspring when the fathers have participated in high-stress, fighter-type flying prior to conception. (R9)

X3. Sex ratio and war. Popular belief has it that more male children than usual are born during and immediately after devastating wars. The basis for this assertion seems to be studies carried out for World War I. A brief synopsis follows.

It is well known that the [sex] ratio is susceptible to large social disturbances, and in the years immediately after the war of 1914-1918 there was a considerable rise in the sex ratio of all the belligerent countries. No completely satisfactory reasons for this rise have been advanced. In England and Wales the sex ratio which had varied between 1032 and 1049 during the 60 years 1859-1918, rose in 1919 to 1060 and remained above the prewar level during the next two years with values of 1052 and 1051. A high sex ratio has also been recorded during the present war; the ratios, 1939-42, were 1050, 1058, 1054 and 1061. The last value is the highest ever recorded since the introduction of registration in 1838. (R1)

There is no argument over the data, but some researchers maintain that the claimed phenomenon was not seen in other countries, and that it is not particularly significant where it did occur. For example, R.J. Myers says:

In summary, there is no evidence of any appreciable increase in masculinity of births in the United States and Canada during the Second World

War....From a statistical viewpoint there was a possibly significant higher sex ratio at birth during the war years than during peacetime, but the absolute amount of the increase was so small relatively as to be considered negligible from the layman's viewpoint. Even in the First World War the relatively large increase in certain European countries, as measured by statistical tools, was not sizable enough to support the common belief that there is a great increase in masculinity of births during wartime. (R2; R3)

X4. Sex ratio and season of birth.

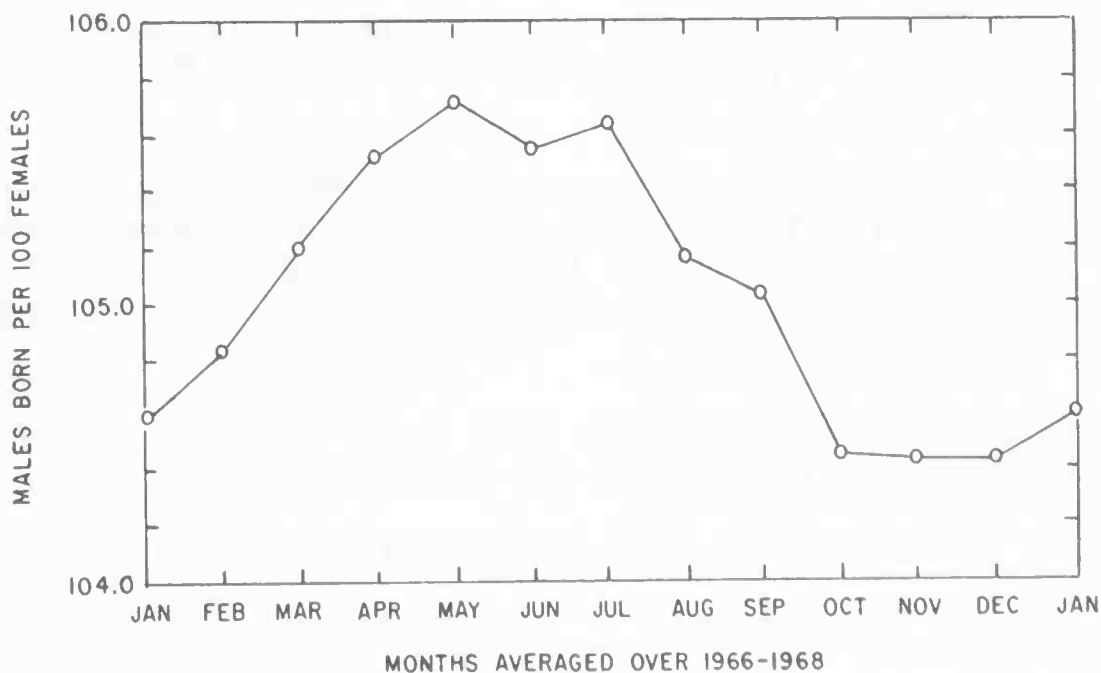
The latest available statistics on birth rates in the United States reveal that a curious annual variation in the sex ratio appears to be becoming more marked. The variation was first noted in 1953, when Dr. H.M. Slatis---using data going back to 1948---showed that the ratio of males to females among the newborn of May and June was greater than the male-to-female ratio of November-December. For the country as a whole, Slatis noted a shift of about half of one per cent between the two periods; the phenomenon was most marked in large cities, less so in medium sized towns, and almost ab-

sent in rural areas. The new data, from Vital Statistics of the United States shows that Slatis' shift has increased to about one and a half per cent. (R7)

Note that even within this aspect of the phenomenon there exists a "cultural" variation.

X5. Sex ratios and natural selection. In a letter to New Scientist responding to K.F. Dyer's article (X1), M. May asks: "How does the doctrine of natural selection explain the establishment of sex ratios for different species?" He then muses:

Now, the advantages of a suitable sex ratio are conferred not on individuals, but on populations as a whole. The overall ratio is the result of many pairs of individuals producing offspring at widely different ratios, and no particular combination of male/female offspring would appear to create a selective advantage for that combination, or for the individuals which make it up. Remember also that this concerns the sex ratio at birth, survival of the fittest will account for the surviving sex ratio. Furthermore, even if the sex ratio of a particular family---which is the result of a chance male/female



Sex ratio of infants born in the United States versus month-of-birth. (X4)

parental combination---were to be advantageous, what possible genetic feedback can cause this to be reflected in later generations? (R6)

We have not found any answers to May's questions.

References

- R1. Martin, W.J.; "Sex Ratio during the War," Lancet, 807, 1943. (X3)
- R2. Myers, R.J.; "Effect of the War on the Sex Ratio at Birth," American Sociological Review, 12:40, 1947. (X3)
- R3. Myers, R.J.; "War and Postwar Experience in Regard to the Sex Ratio at Birth in Various Countries," Human Biology, 21:257, 1949. (X3)
- R4. Dyer, Kenneth F.; "Hidden Variability in Man," New Scientist, 44:72, 1969. (X1)
- R5. Biddle, W.F.; "Variability in Man," New Scientist, 44:368, 1969. (X2)
- R6. May, M.; "Variability in Man," New Scientist. 44:368, 1969. (X5)
- R7. "Early Summer Favours the Birth of a Boy," New Scientist, 45:448, 1970. (X4)
- R8. Taylor, Gordon Rattray; "The One and the Many," The Great Evolution Mystery, Philadelphia, 1983, p. 198.
- R9. Snyder, Richard C.; "The Sex Ratio of Offspring of Pilots of High Performance Military Aircraft," Human Biology, 33:1, 1961. (X2)

BHA18 Gradations between Male and Female

Description. The external appearance of gradations between masculinity and femininity, usually most obvious in the genitalia. Dissection and genetic research reveal that these gradations extend to internal organs and the chromosomes. Although the phenomenon is classified under "external appearance", the anomaly is genetic in character. The dogma being challenged is that which asserts that maleness is determined solely by the Y chromosome, in other words, maleness is an all-or-nothing character.

Data Evaluation. The external gradations in masculinity and femininity are matters of common knowledge; they are also amply documented in the scientific literature. Rating: 1.

Anomaly Evaluation. Since this phenomenon contradicts the dogma that sex is completely determined by the Y chromosome, it must be considered moderately anomalous. The rating is tempered a bit by the observation that some scientists recognize the incorrectness of the dogma and are attempting to modify it. Rating: 3.

Possible Explanations. Chromosomes other than the Y chromosome, as well as extrachromosomal factors are involved in the determination of sex.

Similar and Related Phenomena. See the chapter on human genetics (BHG) for related phenomena.

Entries

X1. The existence of observable gradations between male and female. Various degrees of masculinity and femininity are common and well-recognized by everyone. Most of these in-between individuals, however, are fully functional as either males or females. More ambiguous are those classified as hermaphrodites.

This anomaly in most cases consists of a malformation of the external genitalia. A prolonged clitoris, prolapsed ovaries, grossness of figure, and hirsute appearance have been accountable for many supposed instances of hermaphrodites. On the other hand, a cleft scrotum, an ill-developed penis, perhaps hypospadias or epispadias, rotundity of the mammae, and feminine contour have also provoked accounts of similar instances. Some cases have been proved by dissection to have been true hermaphrodites, portions or even entire genitalia of both sexes having been found.

Numerous accounts, many mystical, but always interesting, are given of these curious persons. They have been accredited with having performed the functions of both father and mother, notwithstanding the statements of some of the best authorities that they are always sterile. Observation has shown that the sexual appetite diminishes in proportion to the imperfections in the genitalia, and certainly many of these persons are sexually indifferent. (R1)

G.M. Gould and W.L. Pyle follow the above overview with several graphic examples confirming the existence of many gradations of masculinity and femininity. Although these authors call hermaphroditism anomalous, it becomes a Catalogable anomaly only if it contradicts an established biological paradigm.

X2. A paradigm challenged. Most of us learned in biology class that males have XY chromosomes; females, XX chromosomes, with the Y chromosome being the sole determinant of maleness. Modern genetic research has blurred this long-

taught paradigm. U. Mittwoch explains how this situation arose.

We have long known that most men have XY chromosomes, and most women are XX. But about one in a thousand men have three sex chromosomes, XXY, while a smaller proportion of women have only a single X chromosome. This suggests that the presence of a Y chromosome is associated with male sex and its absence with female sex. But how does the Y chromosome function to turn an embryo into a male? Many researchers now believe that the Y chromosome carries a single dominant male-determining gene, whose presence or absence alone determines the sex of an individual. The available evidence, however, makes it unlikely that this concept is correct. (R2)

Mittwoch then elaborates:

(1) There are exceptions to the rule that maleness requires a Y chromosome. Roughly one male in 20,000 has two X chromosomes and no Y at all. Although about two-thirds of these XX males do carry on their X chromosomes some DNA sequences normally found on the Y chromosomes, the other one-third do not. The origin of these latter XX males remains enigmatic.

(2) In those rare males who possess a Y chromosome plus more than one X chromosome, masculinity diminishes with the number of Xs. For example, men with four Xs and one Y have severely underdeveloped genitalia. "So the current dogma of the dominance of the Y chromosome is not entirely supported by the available evidence."

(3) True hermaphrodites have both ovarian and testicular tissue and, as previously mentioned, ambiguous genitalia. It is curious that in these hermaphrodites the ovaries are generally found on the left side and the testes on the right. In other words, hermaphroditism is asymmetrical. (R2) This observation, although not especially pertinent, does show how complicated the matter is.

Obviously, much remains to be clarified here, but the Y-chromosome paradigm is definitely undermined.

References

- R1. Gould, George M., and Pyle, Walter L.; "Hermaphroditism," Anomalies and Curiosities of Medicine, New York, 1896, p. 206. (X1)
- R2. Mittwoch, Ursula; "One Gene May Not Make a Man," New Scientist, p. 40, November 10, 1990. (X2)

PIGMENTATION

BHA19 The Sacral Spot

Description. The appearance in some races of a distinctive bluish or purplish spot in the sacral region of the back during infancy. The Japanese, the Eskimos, the Mayas, and probably other peoples show this spot.

Data Evaluation. Only one scientific reference is at hand. Our information on this subject is incomplete. Rating: 3.

Anomaly Evaluation. The primary conundrum here concerns the origin of the sacral spot in the Mayas. (Of course, one wonders why it occurs at all, since its survival value would seem nil.) Since the Mayas are apparently surrounded by a sea of peoples without sacral spots, it may be that the Mayans have a different origin---perhaps a random contact with an ancient Japanese vessel blown off course. This would contradict the paradigm that all New World Indians immigrated across the Bering Strait. If a early, separate Japanese contact did not occur, we may have a case of convergent evolution, a rather common yet hard-to-explain biological phenomenon. Our rating is based on the first possibility. Rating: 1.

Possible Explanations. See above discussion.

Similar and Related Phenomena. Anomalous ancient contacts with the New World (Series-M catalogs); convergent evolution (Series-B catalogs, check the Subject Indexes).

Entries

X1. General observations. In 1901, F. Starr learned from a Mexican parish priest that all pure-blooded Mayas supposedly possessed a blue or purple spot on their backs in the sacral region; i.e., directly above the anal fold. Recalling that Japanese and Eskimo infants also displayed such sacral spots, he de-

cided to examine some Mayan children.

In the town of Palenque, Chiapas, I examined all the little babies of the town---not a heavy labor, as the town was small. The people here call themselves Mayas, but claim to be closely related to the Chols. Probab-

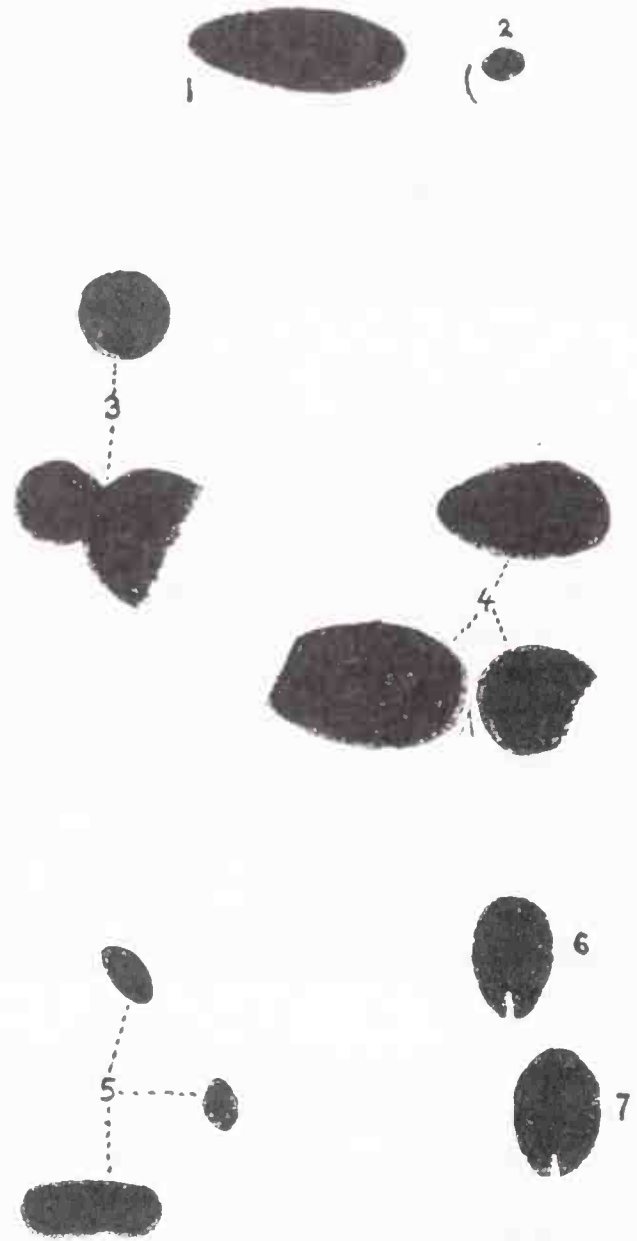
ly the population is a mixture of the two peoples, who are closely related in language, and probably in blood. To my surprise, I found the spot in every one of the seven babies of pure Indian blood. It seems, however, to be far more evanescent among the Mayas than among the Japanese and other populations, being rarely found in individuals of more than ten months of age. Three babies, less than ten months in age, but of mestizo (mixed-blood) parentage, showed no trace of the spot. The spot is variable in size, shape and position, but it is always in the sacral region; in color it is blue or a bluish purple; it gradually disappears and two or three of the cases seem to show an original single spot broken up into separate blotches which lose distinctness. (R1)

Starr also inquired into the presence of sacral spots among the Aztecs and found that these Indians never displayed them. (R1)

Apparently, only the Mayas, of all the New World Indians that are believed to have migrated across the Bering land bridge, have the sacral spot.

Reference

R1. Starr, Frederick; "The Sacral Spot in Maya Indians," Science, 17:432, 1903. (X1)



Seven examples of sacral spots found on Mayan children. (X1)

BHA20 Pigmentation Peculiarity on Upper Arms

Description. A curious, sharp, linear change in the skin pigmentation of the upper arm of some blacks. In a small sample, some 17% of the individuals examined displayed this phenomenon. The pigmentation change is usually symmetrical and bilateral, rarely unilateral.

Data Evaluation. Our files contain only one report, but this is from a doctor at a respected medical institution. More data are certainly desirable. Rating: 2.

Anomaly Evaluation. Since the phenomenon does not seem to be the consequence

of disease or heredity, its biological purpose is unclear. Of course, a trait need not have to have "purpose" or survival value. Random mutations can, in principle, cause changes of neutral value that persist. In any case, the phenomenon is a curious, puzzling one; although we must classify it as barely anomalous. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Spotted people (BHA21).

Entries

X1. General observations. Pigmentation anomalies are many and varied. Some are inherited; others are due to some of the multitude of skin diseases. Since the phenomenon described below does not fall in either of these classes and, in addition, is relatively widespread, it is worthy of an entry in the Catalog of Anomalies. Very likely, though, there are similar pigmentation anomalies just as worthy of recording. (The specialized medical journals have not yet been investigated.)

During the routine examination of Negroes in the Johns Hopkins Hospital, Baltimore, Maryland, we have recently observed a peculiarity of pigmentation common to a significant proportion of the patients. At a point on the antero-lateral surface of the upper arm the darker color of the outer aspect of the extremity abuts on the less heavily pigmented flexor surface. In the subjects referred to, this change is not a gradual fading of the dark pigment as the eye passes medianward over the flexor surface, but the transition is an abrupt one, producing a very definite linear appearance. Usually the margin between the darker dorso-lateral and the lighter antero-median surfaces begins to be obvious a little

below the greater tubercle of the humerus and follows the lateral edge of the belly of the biceps muscle distally, disappearing again just below the middle of the humerus; it averages about ten centimeters in length. The mark is usually bilateral and more or less symmetrical in the two arms, but is occasionally present on one arm and absent on the other.

A total of two hundred Negroes of both sexes, aged eleven to seventy-four years, in the hospital wards for adult patients, were examined for the presence of the line. It was sharp and distinct bilaterally in thirty-five patients, or 17.5 per cent; in another 2 per cent, it was present unilaterally. (R1)

Only a single patient had noted the phenomenon in relatives, so it appears unlikely that this peculiarity is inherited.

Reference

- R1. Fitcher, Palmer Howard; "A Peculiarity of Pigmentation of the Upper Arm of Negroes," Science, 88:570, 1938. (X1)

BHA21 Spotted or Piebald People

Description. The rare appearance of large white spots on the skins of individuals of both the white and black races. The spots range from an inch across to large patches a foot or more in size. Often the spots are bilaterally symmetrical. Spot sizes and number may vary during a person's lifetime. Spottedness does not seem to derive from disease; rather, there are instances where spottedness persists in families, indicating it is hereditary.

Data Evaluation. Several cases of spottedness are in the older literature. Actually, very little seems to be known about the incidence of the phenomenon. For example, we do not know if it occurs in other races. Rating: 2.

Anomaly Evaluation. Minor variations continually occur within species in the form of extra fingers, white streaks in the hair, etc. Pigmentation anomalies, along with other minor physical variations, are usually blamed on minor genetic variations. They do not seem to challenge any important biological laws. Of course, it is assumed that pigmentation is created and maintained entirely by the genes! Rating: 4.

Possible Explanations. Inherited spottedness derives from minor genetic variations.

Similar and Related Phenomena. The sacral spot (BHA19); other pigmentation anomalies (BHA20).

Entries

X1. A family of spotted whites. Unlikely as it may seem, some individuals and even whole families are spotted.

In an American university is a member of an old-time American family now living in the Northwest and scattered over at least four states, which for three succeeding generations exhibits an unusual marking of the skin. I have examined and photographed piebald members of each of these three generations. My informant tells me of a piebald cousin of his father whom he well remembers, thus affording knowledge of piebaldism in four succeeding generations.

I shall not take time to describe the exact markings of the skin of the three persons shown in the accompanying illustrations [not reproduced here]; however, there are some important facts that should be noted. The light areas, or spots, are strikingly bilateral, with considerable symmetry; they occur with marked consistency at the more important joints of the body---as ankles, knees, hips, wrists, elbows, and shoulders. There is also a ten-

dency to a median dorsal light line. This light dorsal area is the opposite of what Castle reports in his family of spotted negroes. He found a dark dorsal area. (R6)

Castle's report is R5. The fact that several generations of whole families are afflicted indicates an inherited trait.

X2. Spotted blacks. In addition to the family of spotted blacks referenced above, several individual cases of spotted blacks have been remarked. We now summarize two of these.

The first refers to a black man from Delaware.

He is covered over with white spots (as white as the fairest white man) from the size of a dollar to several inches, and even feet in length and breadth. There is a white ring round each of his eyes, and also white round his mouth, one half of one of his arms is white. His predominant color is black, only about a

third being white. (R2)

The second instance is interesting because of the changing patterns. The report was from Alabama and concerned a negro

...about forty-five years old, [who] was at twelve, copper color all over; at twenty, spotted like a leopard; and is now undergoing a second change, the black spots increasing in size and number. The parts of his skin which are white, are very white, clear and smooth. The hair and features show that he is an unmixed African. He is stout, and has always been healthy, except a rheumatism, which is of late origin. (R3)

X3. Expanding white spots on a mulatto. The following, somewhat different case was described before the British Association by a medical doctor.

...the author related an instance in which he had observed a gradual disappearance of the cutaneous pigment in a Mulatto aged 43. Minute white spots first appeared on the man's back, and by coalescing gradually formed large white patches. These constantly extending, in the course of six years the whole of the trunk

became perfectly white, spots of the original colour remaining only on the extremities. The face retained its dark hue, and an irregular margin encircling the neck formed the limit of the upward advance of the white colour. Isolated spots of white had appeared, however, on the forehead and at the angles of the jaw. The white skin was perfectly healthy in appearance and not to be distinguished from that of a European. (R4)

The man was judged perfectly healthy.

References

- R1. "A Spotted Negro," Scientific American, 3:46, 1847. (X2)
- R2. "A Piebald Negro," Scientific American, 5:74, 1849. (X2)
- R3. "A Spotted Negro Man," Scientific American, 10:96, 1854. (X2)
- R4. Foster, Balthazar W.; "On a Peculiar Change of Colour in a Mulatto," Report of the British Association, 1866, p. 91. (X3)
- R5. Simpson, Q.L., and Castle, W.E.; "A Family of Spotted Negroes," American Naturalist, 47:50, 1913. (X1)
- R6. Jenks, Albert Ernest; "A Piebald Family of White Americans," American Anthropologist, 16:221, 1914. (X1)

LUMINOSITY

BHA22 Visible Radiation Emitted by the Human Body

Description. The emission of visible light by the human body or parts thereof. Usually, but not always, this light is not accompanied by heat. Various hues are observed; the light is usually weak---more like a glow---although sometimes the surroundings are illuminated. In most cases, the light is temporary, lasting but a few minutes. In the case of infected wounds, it is a steady, permanent emission.

Data Evaluation. Almost all of the data supporting these phenomena are very old. Further, some come from suspect sources. To some extent, these factors are

counterbalanced by the abundance and internal consistency of the accounts.
Rating: 3.

Anomaly Evaluation. The only scientifically acceptable explanation of these remarkable luminous phenomena relies upon the presence of luminous bacteria on the body, in wounds and sores, and in sweat and urine. Where such can be demonstrated, no anomaly exists. But when healthy individuals exhibit glowing spots (X1, X3), or when eyes seem to emit light (not reflected light), science is at a loss for a mechanism. Likewise, the aura-like phenomena frequently associated with mediums and mystics (X7, X8) are not recognized as legitimate phenomena by mainstream science. For these reasons, all human luminous phenomena not yielding to the bacteria explanation, must be classified as highly anomalous, even though the supporting data are soft. Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. The purported human aura (BHA24); Kirlian photography (BHA25); spontaneous human combustion (BHC); night-shining human eyes (actually a reflection phenomenon) (BHA37); the so-called "psychic" lights (Series-P catalogs).

Entries

X1. A luminous toe. The following incident was first reported in a newspaper and then reprinted in two popular science publications in 1869. Although of questionable provenance, it is interesting and not unlike many other reports in this category. We might term it a typically Fortean report.

A lady correspondent wrote to the Boston Transcript that 'upon retiring to rest, the gas being out and the room quite dark, the writer's attention was directed to her foot, which was illuminated by light, which, upon examination, was found to be phosphorescent, and proceeded from the upper side of the fourth toe of the right foot. Upon rubbing it with the hand the light increased and followed up the foot, the fumes filling the room with a disagreeable odor. This lasted some time. When the foot was immersed in a basin of water, hoping to quench the light, but to no purpose, for it continued beneath the surface of the water, the fumes rising above. The foot was taken out and rubbed dry, but the light still remained. A second immersion of the foot followed, and soap applied, with the same result. No more experiments were tried, and after a time it gradually faded and disappeared. The time occupied by the phenomenon was about three

quarters of an hour. The lady's husband substantiated the above facts, as he also witnessed them.' (R3, R4)

This luminous toe may have some connection with an even more unlikely phenomenon, spontaneous human combustion (BHC). Also, as elaborated upon in X4, infected portions of the body may harbor luminous bacteria.

X2. Luminous eyes! In 1911, the English Mechanic printed a letter from an individual (who identified himself only as H.C.A.) to the effect that human eyes may emit visible light.

I was much interested in the paragraph in a recent issue re luminous rays from human beings. It reminded me of a curious experience of my own some years ago when residing in Melbourne, Australia. I woke from sleep, on a perfectly dark night, and perceived a deep crimson colour in the bedroom. I looked to the window, but there was no light coming in thence. I next took steps to discover whether the light was being emitted by my own eyeballs by spreading out the fingers of my right hand and moving them before my face; and on doing so came to the conclusion that the light was pro-

ceeding from my eyeballs. (R5)

This purported phenomenon, if real, is different from those rare reports of human night-shining human eyes (BHA37), which are due to reflected rather than emitted light.

Despite their bizarreness, luminous eyes have been remarked by others, although not recently. C.L. Esser recorded the case of Michaelis:

...who, many years before his death, during the interval between day and night, and during the night itself, observed irradiations of light issuing from his eyes; sometimes so strong that he could read the smallest print. (R1)

X3. The luminous woman of Pirano. In this famous, well-investigated case, intermittent light proceeded from the breast of a sleeping woman, Anna Monaro, who lived in Pirano, Italy. Dr. C. Protti, of Venice, observed the phenomenon and reported his findings in La Reforma Medica (R11).

The usual time of the light's appearance was during the early part of the night, never in the daytime, or when Monaro was only lightly asleep; it lasted never longer than three to four seconds, it always appeared in the region of the heart, it varied in color from green to red. Monaro herself was unaware of the light and it left no trace of odor, heat or color. (R7)

The London Times (May 5, 1934) printed Protti's theory that Monaro's fasting and religious zeal had increased the sulphides in her blood, which were then rendered luminous by the ultraviolet radiation from the blood. (R9) Protti's "explanation" makes one wonder about the reliability of his investigation.

X4. Luminous patches probably related to disease. I. Sanderson observed an individual with glowing patches of skin while cruising the mangrove swamps on the Caribbean side of Nicaragua.

At the back of this clearing was a

small shack. As we rounded the bend we saw a fairly bright greenish-blue light emerge from this shack and advance to the creek to coincide with our passing. Even our gallant and extremely rugged 'Captain' was rather startled, for said light was in the form of a person's torso!

To make a very long story as short as possible, I will only explain that this was a local citizen of, apparently, almost pure African origin, wearing only a wide leather belt, and a pair of ragged khaki pants. His upper half was magnificently proportioned but all over it were mottlings (as in hound-dogs) of brightly 'lit' glowing luminescence. By very pure coincidence, our Captain happened to have known the man years before and we struck up a conversation after we tied up at his so-called dock.

The glowing patches on his body, which really lit up the afterdeck, proved on examination with a flashlight to be huge, soft swellings. They glowed from inside---a sight more bizarre than I would ever have wished to see. (R8)

When Sanderson's article appeared in the journal Pursuit (his creation), a reader who was also a medical doctor wrote in recounting a similar case:

Many years ago, late one evening in September, a deep-sea fisherman came into my office. He had been living with two companions in a shack across Merritt Island, on the Banana River [Florida]. Every day he came home soaked with salt water.

He did not complain of being ill nor suffering in any way, except that he could not sleep at night. Likewise, his condition, he said, annoyed his roommates.

'Put out your office lights', he said; 'it is growing dark'. Then he removed his coat and shirt.

I saw a large, glowing tumor on his shoulder. The glow it emitted was almost as bright as the light of a candle. I found the mass slightly spongy. It had become infected with phosphorescent sea animalculae, which frequent the waters of the Indian and Banana Rivers in our autumn months. (R8)

Later the tumor was found to be cancerous, and the man died from it. This case does, however, suggest that perfectly nonanomalous conditions can cause human luminescence.

X5. Luminous sweat and urine. Bacteria are ubiquitous within and without the human body. Since some are luminous, it is not particularly surprising to come across reports of shining sweat and urine, as related by U. Dahlgren:

Some few of the luminous bacteria are capable of existing on living tissues, or they may even be pathogenic and cause disease. Numerous cases have been reported in which the urine of animals and men has been seen to shine as emitted from the bladder, or after being allowed to stand for a short time after.

.....

So also has human sweat been seen to shine. Many cases have been reported: in particular, an Italian woman was reported by Bartholin, and a Bavarian peasant by Hermsstadt, to be luminous when they perspired freely. In the latter case luminosity was accompanied by a peculiar smell. The odor was very pronounced in a case reported by Henkel, where it resembled old sauerkraut.

.....

The luminous bacteria sometimes enter into a closer association with living animals. In man they may infect and grow in a wound so that it glows strongly in the dark. Such an infection is not pathogenic, however, and it is said by the military surgeons that such wounds heal better than others. (R6; R1)

X6. Luminous phenomena of the dead and dying. Given the omnipresence of bacteria, some of them luminous (X5), the observation of luminous corpses is almost expected. Indeed, a discussion of them appeared in the Philosophical Magazine as early as 1838. (R2) In general, we cannot consider glowing cadavers anomalous, but we have found one

exception.

J. Michell and R.J.M. Rickard, in their book Phenomena mention the case of a child who died of acute indigestion:

As neighbors prepared the shroud they noticed the body surrounded by a blue glow and radiating heat. The body appeared to be on fire; efforts to extinguish the luminescence failed, but eventually it faded away. On their moving the body, the sheet below it was found to be scorched. (R9)

Michell and Rickard immediately made the association with spontaneous human combustion (BHC), just as we did with the luminous toe of X1.

Shifting now to dying individuals, the psychical literature abounds in reports of lights and luminous clouds leaving or moving around the bodies of dying people. Later in the Catalog of Anomalies, in the Series-P volumes, we shall take up this subject again. Here, though, we are interested only in luminous phenomena observed close to the body. C.S. Alvarado has collected many of such accounts from the medical literature of the Nineteenth Century. One of these accounts was from a person, H. Marsh, who was attending a dying woman:

After she settled [in] for the night I lay down beside her, and it was then that this luminous appearance suddenly commenced. Her maid was sitting up beside the bed, and I whispered to her to shade the light, as it would awaken Louisa [the patient]. She told me the light was perfectly shaded...The maid...informed me she had seen that light before...After watching it myself half an hour, I got up and saw that the candle was in a position from which this peculiar light could not have come, nor indeed, was it like that sort of light; it was more silvery, like the reflection of moonlight on water. I watched it for more than an hour, when it disappeared. It gave the face the look of being painted white and highly glazed, but it danced about...Her sister came into the room and saw it also. The evening before L.A. died I saw the light again, but it was fainter and lasted but about twenty minutes. The state of the patient was that of

extreme exhaustion...Her breath had a very peculiar smell, which made me suppose that there might be some decomposition going forward. (R10)

X7. Luminosity of mediums. Here, we go even farther into parapsychological territory, and we must take care.

In his long survey of human luminous phenomena, C.S. Alvarado collected many references to mediums who manifested luminosity. For example, during one seance, the reknowned medium D.D. Home's hands became luminous, and two observers saw jets of flame proceeding from his head! Similar phenomena were seen about the body of E. Palladino, another famous medium. (R10)

Of course, such manifestations are rejected by mainstream science. But, for the sake of completeness, we must catalog them, even though the data are of suspect character.

X8. The luminous phenomena of mystics. As in X7, entire books have been written on the subject (Physical Phenomena of Mysticism, 1952). The faces of saints have often been reported to be luminous. (R10) There are even stories of holy priests who lit up whole chapels with the light that streamed from them. (R9) However frequent these kinds of observations have been in the history of religion, we know of no modern scientific study of them.

References

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- R2. Cooper, Daniel, and Cooper, Robert; "On the Luminosity of the Human Subject after Death, with Remarks and Details of Experiments Made with a View of Determining the Nature of the Fuel," Philosophical Magazine, 3:12:420, 1838. (X6)
- R3. "A Luminous Toe," Scientific American, 21:171, 1869. (X1)
- R4. "A Luminous Toe," English Mechanic, 10:24, 1869. (X1)
- R5. "Luminous Rays from Human Beings," English Mechanic, 94:45, 1911. (X2)
- R6. Dahlgren, Ulrich; "The Production of Light by Animals," Franklin Institute, Journal, 180:513, 1915. (X5)
- R7. "The Luminous Woman of Pirano," Scientific American, 152:323, 1935. (X3)
- R8. Sanderson, Ivan T.; "Luminous People and Others," Pursuit, 6:66, 1973. (X4)
- R9. Michell, John, and Rickard, Robert J.M.; "Human Glow-Worms," Phenomena: A Book of Wonders, New York, 1977, p. 24. (X3, X6, X8)
- R10. Alvarado, Carlos S.; "Observations of Luminous Phenomena around the Human Body," American Society for Psychical Research, Journal, 54:38, 1987. (X7, X8)
- R11. Protti, Giocondo; "Accertamenti e Considerazioni Eseguite a Pirano sulla Considetta 'Donna Luminosa'," La Riforma Medica, no. 22, p. 841, no date, but circa 1934. Cr. L. Gearhart. (X3)

BHA23 Unidentified, Problematical Radiation Emitted by the Human Body

Description. Invisible radiations emitted by the human body and parts thereof. Such radiations were detected, in the older experiments, by phosphors of one kind or another.

Background. With the discovery of X-rays, in 1895, and the penetrating radiations from radioactive materials, in 1896, scientists of the period searched diligently for additional forms and sources of radiations invisible to the eye. Overenthusiasm and the desire for fame led to erroneous and sometimes fantastic claims. Most of these claims were promptly and legitimately disposed of through the normal workings of the scientific community. Yet, the anomalist is always beholden to examine such procedures carefully to make sure that some curious, miscellaneous, yet viable phenomena were not junked prematurely. Interestingly enough, many of the new-found radiations of the early 1900s seemed to emanate from the human body. And why not? The discovery of radioactivity had revealed a whole new layer of complexity in matter and, by extension, life itself.

Data Evaluation. The data employed here are mostly old and, since they were rarely replicated, suspect. Rating: 3.

Anomaly Evaluation. Mainstream science does not recognize any significant radiations emitted by the human body, except for the normal infrared radiation of a body at 98.6°F, or thereabouts. Of course, the very tiny amounts of natural radioisotopes located in the human body do emit a few gamma rays and nuclear particles. Any other radiations are strongly anomalous. Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. Visible luminosity of the human body (BHA22); the supposed human aura (BHA24); the Kirlian effect (BHA25).

Entries

X1. N-rays. The history of the N-rays is one of the most engaging and, in personal terms, tragic stories in science. The N-rays themselves are covered in depth in the Series-P Catalogs. Basically, N-rays are a type of penetrating radiation that could be detected by a phosphorescent screen. At this point, a short paragraph by M. Gardner sets the historical background.

In 1903 Prosper Blondlot, a reputable French physicist at the University of Nancy, detected what he called "N" (for Nancy) rays. Scores of papers describing the curious properties of N rays appeared in French journals and the French Academy actually awarded Blondlot a prize for his discovery. The coup de grace was deftly executed by Ameri-

can physicist Robert W. Wood (best known to laymen as the author of How to Tell the Birds from the Flowers) when he called upon Blondlot at his laboratory. While Blondlot was observing and describing an N-ray spectrum, Wood slyly removed an essential prism from the apparatus. This had no effect on what poor Blondlot fancied he was seeing! (R5)

Gardner states that Blondlot was unquestionably sincere, and that his "observations must have been "self-induced visual hallucinations". Blondlot eventually went mad.

If Blondlot hallucinated, so did many other scientists around the world. Some of these researchers claimed to have detected N-rays and other radiations emanating from the human body. Like

Blondlot, these scientists were also sure that they were recording important scientific results. Even though N-rays are now considered only aberrant science, it is instructive to review them and similarly rejected observations of human radiations. There is always the chance that some data were dismissed too quickly.

The N-ray work of Charpentier will serve here, as described in Scientific American in 1904.

In continuing his researches upon the rays which are given off from living organisms, and especially the human body, M. Aug. Charpentier brings out some remarkable facts. He seems to have proved that the brain and nerve centers not only give off N-rays, but also a new form of radiation which is peculiar to them. The N-rays will pass through an aluminum screen, while the new rays will not. In a paper read before the Academe des Sciences he mentions his new researches.

The emission of N-rays by living organisms is not confined to the human body. Different animals, such as the rabbit and frog, will produce them, and no doubt the inferior animals as well. Here, as before, it is the muscles and nerves which form the principal source, and the emission of rays is stronger as these are in a state of greater activity. The frog, in spite of its small size, is a good subject, and shows that the effect is not due to an increase of temperature. This can also be proved for warm-blooded animals by heating the phosphorescent test-screen to 40 degrees C. or more (when it becomes more luminous) and its phosphorescence increases as before when placed near the muscles, nerves or nervous centers, even in a state of rest, and the effect is still stronger when these are in a state of activity. The rays act upon all forms of phosphorescence. The N-rays from the sun were found to increase the brightness of the glow-worm. M. Charpentier finds that phosphorescent bacteria have their brilliancy increased when placed near the heart, muscles, and nervous centers, in about the same way as sulphide of calcium. (R2, R7)

Such observations sound bizarre to us

today, but it should be remembered that they were made by reputable scientists all over the world. What were they seeing, if anything?

The "second" type of radiation mentioned by Charpentier consisted of "I-rays". These are described in X2. The reader will also find additional background on the N-rays there, because N- and I-rays were detected by the same apparatus with the same subjects.

X2. I-rays.

M. di Brazza, a student at Liege, who sent an account of Becquerel's work on radio-activity to the Secolo XX, for January 1903, now describes the I-rays as discovered by himself when repeating the N-ray experiments of M. Blondlot and of Professor Charpentier. Charpentier succeeded in demonstrating that the human body emits N-rays. He found that the phosphorescence of certain substances is increased when they are brought close to a nerve or contracting muscle, i.e. muscular work is accompanied by a marked emission of N-rays. By means of a simple apparatus, a lead tube 7 cm. long (lead was chosen because it was opaque to the human rays, and accordingly lessens diffusion), closed at the end by a sheet of paper, or bit of silk covered by phosphorescent calcium sulphate, it is possible to observe the different nervous centres of the cerebral cortex. Thus by placing it in apposition with Broca's centre (the centre of articulate speech) while the patient is talking, variations are produced in the luminosity of the phosphorescent calcium sulphate. In another experiment, Charpentier saw the phosphorescent substance shine all down the line of its application to the spinal cord. Charpentier concluded that the emission of rays goes pari passu with activity of function, whence we should be in possession of a new method of studying nervous and muscular activity. Di Brazza claims to have demonstrated what Charpentier only surmised, i.e., that "the brain is the seat of active radiation. The I (Italy) rays differ from the N in that they can pass through most substances, and are not bent nor

refracted. Di Brazza observes them directly and indirectly, in direct observation he applies a phosphorescing screen treated with platino-cyanide of Ba, or other phosphorescent substances, to the patient's head. The screen is faintly illuminated by a radiographic tube (tubofocus) enclosed in a wooden box. When the subject concentrates his will, curious oscillations appear in the luminosity of the screen in relation with the patient's psychical activity. When his attention is not concentrated, the light does not flicker. The rays are not emitted equally from all parts of the head. They are nil at the forehead and upper part of Broca's centre, increase at the temples and eyes, and reach their maximum behind the ears. (R1)

Presumably, the I-rays met the same fate as the N-rays; i.e., relegation to science's trash heap. Nevertheless, researchers continued to find other anomalous radiations emitted by the human body, as related in X3-X5.

X3. V-rays. In 1909, the English Mechanic recounted for its readers the experiments of Major Darget, during which he claimed to have detected a new kind of human radiation apparently localized in the brain. Darget's results resemble somewhat the purported human aura (BHA24) and the Kirlian effect (BHA25). The Editor of the English Mechanic prefaced the discussion of the so-called "V-rays" with: "Strange though it may appear to our readers, these experiments would seem likely to lead to a method of immediately observing the processes going on in other people's minds."

His [Darget's] researches on what he thinks to be fluids given out by living beings were commenced as far back as thirty years ago. It was not, however, before 1894 that, very much to the surprise of other persons engaged in similar studies, he succeeded in producing on photographic plates an impression due to the vital fluidium. These effects were obtained in the dark-room on plates immersed in the developing bath and submitted to the action of the fingers, kept either in contact

with the plate or at some distance.

The impression thus obtained was quite well defined, forming, as it were, a radiation starting from the finger-tips. Those photographs would have been accurately like those obtained with light-rays, but for their being frequently coloured a red, green, or yellow hue, according to the subject and the actual state of his health.

While according to those early experiments the "vital" fluid would thus seem to act like some special kind of light. Darget soon inferred from certain instances that this radiation must be of a rather different nature, being analogous in its behaviour to that of radium, Crookes bulbs, X-rays, or radio-activity.

.....

Darget, as above stated, ascribes these interesting phenomena to a vital fluidium, calling those rays "vital" rays or rays of life. He is inclined to think that the various parts of the body give out those rays to variable degrees of intensity, and some further experiments, the results of which will shortly be made public, go to confirm this hypothesis.

This new radiation would thus constitute some agent inherent in living bodies, being, as it were, their immediate exterioration. These "rays of life" are variable according to the individual---that is, his character as well as his actual state of mind and health, thus being intimately connected with the very source of life. (R3)

Obviously, one could not get a research grant for such work today, but Darget's research does tell us much about the intense scientific quest for invisible radiation that followed the discovery of X-rays. Additionally, one must ask again whether Darget actually demonstrated the existence of some still-unrecognized phenomenon. It is difficult to relegate all the experiments on human radiation reported in this section to illusion.

X4. Lethal human radiation. In 1932, Professor O. Rahn, an eminent Cornell bacteriologist, announced at a meeting of the American Association for the Ad-

vancement of Science that he had discovered that the human body emitted a form of radiation that was lethal to yeast cells. This radiation issued from human blood, finger tips, the eyes, and the ends of noses! Human cancers, too, emitted this radiation, but the blood of cancer patients (contrary to the blood of healthy persons) did not. An item in Science News Letter elaborated.

Prof. Rahn's experiments show that the blood and saliva produce the radiation, but that with different people the rays emitted vary greatly. Some people have the power of producing effective radiations and others do not, while it varies with the same person under different conditions.

It was also demonstrated that the human body as a whole sends out rays.

The exact nature of the radiation is not yet determined but it may be some variety of ultraviolet rays, the invisible radiations of wavelengths shorter than visible light. This seems probable because the human rays are effective, as are ultraviolet rays, after being passed through quartz. (R4)

No further information on this "lethal radiation" has been found so far. Was it, like the N-rays, assumed to be an illusion of the researcher and therefore forgotten? Probably the answer lies buried in the immense file of unexamined medical literature. It is certainly not an accepted phenomenon today.

X5. Mitogenetic radiation. The main entry on this once-controversial subject is in Section BL, under the heading of cellular phenomena. Mitogenetic radiation (or was) thought to be a type of electromagnetic radiation emitted when the cells of any organism divided. For several decades, establishment science has considered mitogenetic radiation to be a closed subject---that is, it had been thoroughly debunked. Recent research, however, has not been entirely negative. Several investigators now claim to have detected ultraviolet light accompanying cell division. (See BL.) (R6)

References

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- R3. "Rays of Life," English Mechanic, 89:609, 1909. (X3)
- R4. "Deadly Radiations Produced from Living Human Body," Science News Letter, 22:3, 1932. (X4)
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- R6. Shirley, Vestel B.; "Mitogenetic Radiation: Pathology or Biology?" Physics Today, 43:130, October 1990. (X5)
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BHA24 The Supposed Human Aura

Description. The existence of a luminous fringe around the human body, generally described as egg-shaped. The color and shape of this fringe is said to vary with the health and emotional state of the subject.

Data Evaluation. Aura observations seem to come from two sources: (1) Individuals who claim to have psychic powers; (2) Individuals who believe that they

have discovered an important scientific phenomenon, but who are actually only misinterpreting well-recognized physical and psychological phenomena. In general, the scientific community has invested little effort in investigating claims for auras. The extant literature is weak. Rating: 3.

Anomaly Evaluation. Since there is no recognized physical or biological mechanism capable of generating a fringe of light around the human body, human auras are highly anomalous. Rating: 1.

Possible Explanations. A few people may possess unusual eye structure and/or optical processing systems that provide the illusion of auras. Imagination and self-deception may play roles, too.

Similar and Related Phenomena. Kirlian photography (BHA25); unidentified radiations emitted by the human body (BHA23).

Entries

X0. Background. Any discussion of the supposed human aura must be prefaced by recognition of the fact that the human body emits infrared radiation characteristic of the body's temperature. Special photographic film and high-tech imaging devices can produce pictures of the human body as it appears in the infrared part of the electromagnetic spectrum. Since some parts of the body are warmer than others, the infrared picture is, in effect, colored. Such infrared pictures can be taken in a room devoid of visible light.

The normal human eye, however, cannot detect an infrared-emitting human in a completely dark room. It is not impossible, though, that some rare human eyes might be slightly sensitive to infrared radiation, and thus produce infrared images. So far, human infrared capability has not been demonstrated scientifically.

In any event, the infrared image of a human body does not resemble the classical aura, for it does not extend beyond the body proper, nor does it possess the fantastic properties claimed for the aura by psychics. (See X1.)

X1. The aura of the psychics. People who assert that they can see a human aura describe it as a smooth egg-shaped fringe that is wider at the head than at the feet. They say that a person's personality and health can be ascertained from the form and color of this luminous envelope or "surround".

The aura is an ancient parapsychological concept. Further, it is not lim-

ited to humans but is associated with all life forms. S. Ostrander and L. Schroeder described the classical aura in their book Psychic Discoveries behind the Iron Curtain.

The concept of a human aura, a radiating luminous cloud surrounding the body, goes back centuries. Pictures from early Egypt, India, Greece, Rome, showed holy figures in a luminous surround long before artists in the Christian era began to paint saints with halos. This convention may actually have been based on observations of clairvoyants who could reportedly see the radiance surrounding saints. The famous psychic, Mrs. Eileen Garrett, reports in her book Awareness, "I've always seen every plant, animal, and person encircled by a misty surround." According to people's moods, the surround changes colors and consistency, she says.

Clairvoyants are quick to point out, however, that the aura is actually a misnomer; they believe the human body is interpenetrated by another body of energy and it is the luminescence from this second body radiating outward that they see as the aura. We look, they say, something like an eclipse of the sun by the moon, the luminous astral body being completely concealed by the physical body. (R3)

The question at hand is whether science can confirm what the psychics claim to see.

X2. W. Kilner's experiments. Perhaps the first methodical investigation of the human aura was carried out by W. Kilner of St. Thomas' Hospital, London. In 1911, he claimed that by looking through screens of colored glass he could see a fringe about 6 inches wide about most human bodies. This aura, said Kilner, changed color and shape according to the health of the subject. In fact, he employed the aura in his medical diagnoses. Kilner's book The Human Atmosphere (London, 1911) is a classic of its genre.

Kilner's research, however, had detractors. H.D.J. White wrote the following about Kilner and his perception of auras:

Early in 1915 I visited Dr Kilner for a demonstration of his method for viewing "the human aura". He started by opposing hands with fingers outstretched when what he called "lines of force" were supposed to be seen running across the gap between the tips of the fingers of one hand to those of the other. The phenomenon is easily seen against a dark background. As a psychologist I knew it well; it is caused by a positive after-image. As the eyes pass across the dark from one light object to another light object neural lag gives the appearance of faint light.

.....

I proceeded to tell Dr Kilner of my objection to his interpretation of the phenomenon and invited him to look without dye-screens at my open hand against a dark background. He would not look long enough for the effect to develop but turned his head away. After my third attempt I realized he was not intending to look. I immediately inferred that the great scientific discovery which he claimed gave him a self-regard of such satisfactory importance as to induce him to reject and shun anything which might throw doubt on it. He was not a charlatan for he genuinely believed he was pioneering a new method of diagnosis based on his own discovery of new scientific phenomena. (R2)

In White's opinion, given his experience with Kilner, the human aura is in the eye of the beholder and has no objective existence.

X3. O. Bagnall's experiment. In his book Supernature, L. Watson related how O. Bagnall built upon Kilner's research.

Following up Kilner's work, the Cambridge biologist Oscar Bagnall has tried to describe the aura in physical terms. He claims that it can most easily be seen after "sensitizing" the eyes by looking for some time through a solution of the coal-tar dye dicyanine or pinacyanol. To make this easier, he has designed goggles with hollow lenses that can be filled with the dye dissolved in triethanolamine. Bagnall reports that the aura cannot be dispersed by a current of air but that it is attracted by a magnet held close to the skin and that, like the electrical field around a charged conductor, it extends farthest from a projection such as a finger or the tip of the nose. He describes the aura as being composed of a hazy outer layer and a brighter inner layer, in which there seem to be striations running out at right angles from the skin. Bagnall and other aura watchers say that every once in a while a much brighter ray "reaches out from the aura like a searchlight" and extends several feet from the body before vanishing again. (R4)

No independent confirmation of Bagnall's observations have been found to date.

X4. R.W. Loftin's experiment. In 1990, R.W. Loftin, a professor of philosophy at the University of North Florida, reported on a simple experiment he devised to determine whether a psychic, who professed to seeing auras, could actually do so.

Placing the psychic in a light-tight room, Loftin asked her to determine the number of individuals in the room by counting their auras. The number of people introduced, excluding the psychic and Loftin, was either one or two, as determined by flipping a coin. The psychic could not do better than expected by chance.

Nevertheless, Loftin considered that the psychic was sincere (like Kilner in X2) in that she truly believed that she

saw auras around people. Even in the face of the negative outcome of his experiment, Loftin concluded his paper with this paragraph:

The possibility remains that auras are not internally generated but that some people see them because they have a different visual apparatus. If this is the case, those who see them are quite sincere, but auras become much less interesting because this would clearly remove them from the area of the paranormal and place them in the category of visual defects. (R5)

X5. D.F. Fraser-Harris' experiments. G. Dean recently pointed out another series of scientific experiments on the human aura. (R6) He referred to a paper by D.F. Fraser-Harris (R7), who concluded:

...Auras have no objective, external, independent existence, but are essentially the results in consciousness of those states of the retina known to physiological psychologists as negative after-images. On this view the aura is neither an illusion nor a hallucination, but rather a subjective sensation or unshared per-

ception corresponding not to the presence of an external object but to a more or less transitory physiological condition of the retina of the per-
cipient. (R7)

References

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- R2. White, H.D. Jennings; "'Auras' Explained," New Scientist, 43:443, 1969. (X2)
- R3. Ostrander, Sheila, and Schroeder, Lynn; "Kirlian Photography---Pictures of the Aura?" Psychic Discoveries behind the Iron Curtain, Englewood Cliffs, 1970, p. 186. (X1)
- R4. Watson, Lyall; "Mind over Matter," Supernature, Garden City, 1973, p. 141. (X3)
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- R7. Fraser-Harris, D.F.; "A Psycho-Physiological Explanation of the So-Called Human Aura," British Journal of Medical Psychology, 12:174, 1932. (X5)

BHA25 Kirlian Photography of the Postulated Human Aura

Description. The apparent revealing of the postulated human aura through the application of high frequency electrical fields. This technique for delineating or enhancing the human aura makes use of the so-called Kirlian effect.

Data Evaluation. Several objective studies of the Kirlian effect are available in the mainstream scientific literature. Much more can be found in psychic and New Age publications, but in these the scientific quality of the work is questionable. Nevertheless, the amount of scientifically acceptable work is appreciable. Our rating is based it alone. Rating: 1.

Anomaly Evaluation. The phenomenon in question here is not the Kirlian effect it-

self; this is well-established scientifically. What is at issue is whether the Kirlian effect reveals any anomalous radiation being emitted by the human body, especially the postulated human aura. None of the carefully controlled, objective studies of the Kirlian effect applied to human beings reveals any anomalous radiation proceeding from the human body. The Kirlian images of the human body all seem well-explained in terms of corona discharge and variations in the electrical characteristics of the human skin (mainly its moisture). In short, Kirlian photography does not seem to confirm the existence of the human aura or any other anomalous radiation. Rating: 4.

Possible Explanations. None required.

Similar and Related Phenomena. Radiation from the human body (BHA22, BHA23, BHA24).

Entries

X0. Background. S. Ostrander and L. Schroeder, L. Watson, and others have related how in 1939, S. Kirlian accidentally discovered the effect that bears his name. In the Kirlian effect, photos of curious fringes about human fingers, leaves, and virtually any biological materials can be produced through the application of high frequency electricity. Over the years, Kirlian and his wife developed so-called Kirlian photography to the point where it became something of a scientific fad in Russia and, among psychics everywhere, proof positive that a human aura exists.

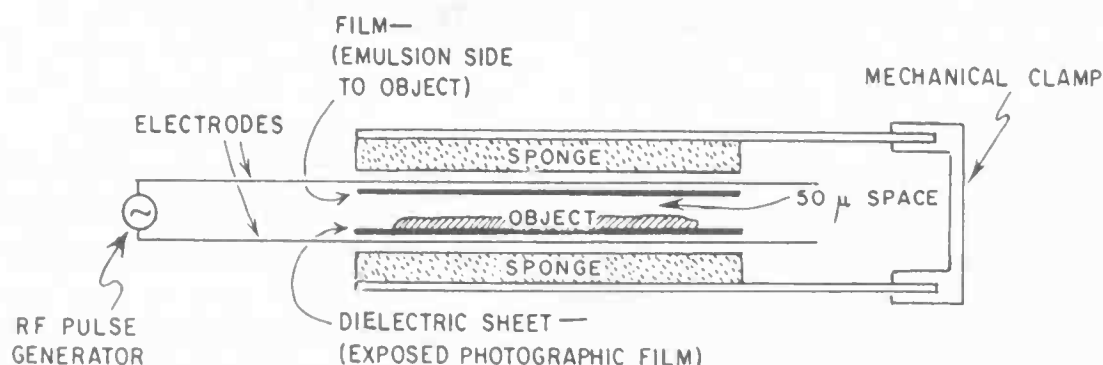
Kirlian photographs, with their highly variable, colorful effects, are believed by many to indicate a subject's emotions, state of health, and other biological and psychic characteristics. In short, Kirlian photographs have many of the properties of the vaunted human aura, and are interpreted by some as enhancements of this aura. In other words, the human aura, visible normally only to psychics, is made visi-

ble to all through the application of electrical currents!

Unfortunately, it seems that inanimate objects, such as keys and bolts, also have Kirlian auras. This fact suggests caution in accepting the claims of those proponents of Kirlian photography who see manifestations of vital forces in the eerie photos of hands and leaves.

The Kirlian technique. Kirlian methods vary, but they all involve the application of electrical potential, L.J. Shawver has described a simple Kirlian set up.

In the simplest Kirlian device, the object to be photographed is placed on film between two metal plates to which voltage is applied. For taking pictures of a portion of the human body only one electrode (metal plate) is needed since the body acts as a ground. In other cases, a transparent electrode is used, and the film is placed outside the apparatus in a



In Kirlian photography, the object is placed between two electrodes. (X0)

camera. Often a Tesla coil is used with the device; it is plugged into an electrical outlet and in turn rigged to the metal plates. The Tesla coil multiplies the voltage and the frequency of the electric field. If the current is of high frequency, it travels over the surface of objects rather than through them and is thus safer to work with. The exposure time depends on the film speed and the strength of the discharge current. When the current is turned on, in a darkened room, rays of light are readily seen issuing from the object's edges. The light is recorded by the film. (R2)

Shawver points out that radiation-field photography was investigated long before Kirlian's work. The earlier researchers considered that they were only dealing with corona discharges--an obvious conclusion for a physicist. It was Kirlian who injected the possibility that the photos thus obtained might reveal biological phenomena as well.

X1. The Kirlian experiments. Kirlian and his wife, like the psychics who followed them, read much into the photographs that they took. We excerpt here some paragraphs from Psychic Discoveries behind the Iron Curtain, by S. Ostrander and L. Schroeder.

But the photographs only showed static images. Soon the Kirlians had developed a special optical instrument so they could directly observe the phenomenon in motion. Kirlian held his hand under the lens and switched on the current. And then, a fantastic world of the unseen opened before the husband and wife team.

The hand itself looked like the Milky Way in a starry sky. Against a background of blue and gold, something was taking place in the hand that looked like a fireworks display. Multicolored flares lit up, then sparks, twinkles, flashes. Some lights glowed steadily like Roman candles, others flashed out then dimmed. Still others sparkled at intervals. In parts of his hands there were little dim clouds. Certain glittering flares meandered along sparkling labyrinths like spaceships travel-

ing to other galaxies.

.....

The investigators examined every conceivable substance under their high-frequency microscope---leather, metal, wood, leaves, paper, coins, rubber. The pattern of luminescence was different for every item, but living things had totally different structural details than nonliving things. A metal coin, for instance, showed only a completely even glow all around the edges. But a living leaf was made up of millions of sparkling lights that glowed and glittered like jewels. The flares along its edges were individual and different. (R1)

Although couched in rather subjective terms, it is easily verified that Kirlian photographs are both spectacular and impressive. Ostrander and Schroeder also make the key point that living and nonliving materials seem to yield qualitatively different Kirlian photos. This does not necessarily mean that the photos reveal a "life force"; rather, the differences could be due to differences in structure and chemical makeup of the object or subject.

X2. The Moss experiments. Other experimenters have inquired into the medical and therapeutic ramifications of Kirlian photography.

Thelma Moss, at the University of California at Los Angeles, utilised the single electrode technique and 1-10 kHz pulses to study the effects of drugs and alcohol on the energy emission from finger pads. She has found some remarkable colour (white, blue, red, orange, yellow) and energy intensity effects....She has also reported effects associated with damaging leaves of plants and the changes associated with their treatment by a healer (laying on of hands).... Unfortunately, in these studies no precautions were taken to control either finger cleanliness or finger pressure on the film. (R4)

In the above quotation from an article by W.A. Tiller in the New Scientist, we see two significant aspects of Kirlian

photography: (1) its frequent close association with parapsychology and New Age concepts; and (2) the frequent lack of adequate experimental controls---at least in the eyes of many conservative scientists.

---a very unmysterious finding. Since a subject's health and emotional state may affect skin moisture, there is even a rational explanation for some of the more sensational claims of Kirlian enthusiasts.

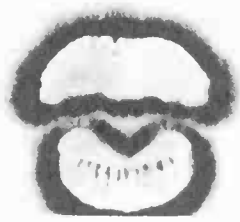
X3. The experiments of Pehek et al. That Kirlian photography is real and possesses a scientific rationale is underscored by reports in mainstream scientific journals. For example, in 1976, Pehek et al discussed in Science their extensive study of Kirlian phenomena. Their conclusions are much less sensational than those of the Kirlians and Moss (X1 and X2 above).

X4. The experiments of Watkins and Bickel. Two physicists, A.J. Watkins and W.S. Bickel, at the University of Arizona, are even more conservative in their interpretation of Kirlian photography. They conclude:

Photographic images obtained by the Kirlian technique are principally a record of corona activity during an exposure interval. Most of the variations in the images of the corona of a living subject who is in contact with the photographic film can be accounted for by the presence of moisture on or within the subject's surface. During exposure, moisture is transferred from the subject to the emulsion surface of the photographic film and causes an alteration of the electric charge pattern on the film, hence the electric field at the surface of the subject. As a result, large variations in the density of corona images, corona streamer trajectories, and image coloration can be brought about. (R5)

There is no evidence as yet that any feature character or property of the aura pattern is related to the physiological, psychological, or psychic condition of the sample. Although the aura surely depends on some physical properties of the system---i.e., the conductivity of the sample (sweaty fingers, perspiring hands), force exerted on the sample---it also depends on many other complicated effects. There is no doubt that some psychological and physiological conditions do manifest themselves in external signals: lie-detectors can work, heat sensors can detect tumors, shaking hands represent nervousness or illness, and so on. However, the Kirlian technique has not been shown to be a direct or meaningful link to these conditions. In fact, while most Kirlian investigators acknowledge the effects of physical parameters, they make no attempt to standardize their research by controlling the parameters, nor do they appear to be concerned with the significance of changing parameters. Indeed, for the most part, the parameters within their research are only

In other words, these scientists see no evidence that the postulated human aura really exists. Corona discharge modulated by moisture is considered the primary basis for the Kirlian effect



Three Kirlian photographs. From left to right: a leaf, human lips, a diamond ring. (Adapted from R6, X4)

vaguely reported if at all, making replication studies by other researchers impossible. (R6)

Nowhere in the tightly controlled experiments with the Kirlian effect has anyone found any connection between the Kirlian "auras" and the aura seen by psychics.

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R1. Ostrander, Sheila, and Schroeder, Lynn; "Kirlian Photography---Pictures of the Aura?" Psychic Discoveries behind the Iron Curtain, Engle-

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 R2. Shawver, Lisa J.; "Science Focuses on a 'Light of Life'," Science News, 104:202, 1973. (X1)
 R3. Watson, Lyall; "Mind over Matter," Supernature, Garden City, 1973, p. 141. (X1)
 R4. Tiller, William A.; "Are Psychoenergetic Pictures Possible?" New Scientist, 62:160, 1974. (X2)
 R5. Pehek, John O.; "Image Modulation in Corona Discharge Photography," Science, 194:263, 1976. (X3)
 R6. Watkins, Arleen J., and Bickel, William S.; "A Study of the Kirlian Effect," Skeptical Inquirer, 10:244, 1986. (X4)

HAIR

BHA26 Excessively Hairy Humans

Description. Individuals, families, and larger groups of people who display heavy quantities of hair over much more body area than normal. Usually, only the head, pubic area, and arm pits have heavy growths of hair. In this Catalog entry, we collect accounts of people bearing thick hair over most of the body and over areas not normally covered.

Data Evaluation. Both the popular and scientific literatures contain many descriptions of people with excessive hair. Rating: 1.

Anomaly Evaluation. The Catalog entries below reveal three curious aspects of excessive hairiness: (1) It is frequently inherited; (2) It is sometimes correlated with dental abnormalities and other physiological phenomena; and (3) It seems to represent a post-natal retention and additional growth of fetal hair (the lanugo). The most likely explanation of excessive hairiness is that it is simply a minor genetic defect or developmental abnormality. One would then classify it as one of the "minor terata". This is not really an explanation, rather it is an assertion that no major biological paradigms seem to be at risk. In other words, excessive hairiness has mostly curiosity value. Rating: 4.

Possible Explanations. Genetic and developmental abnormalities.

Similar and Related Phenomena. Sports, monstrosities, terata (BHA13); primitive characteristics of the human body (neoteny) (BHA10).

Entries

X1. A hairy child. Many individuals are afflicted with excessive hair. Often, it is restricted to the face, leading to the so-called lion-faced or dog-faced men. A few people have possessed manes of heavy hair running down their backs. Other areas of the body may be similarly bedecked. Most interesting are those individuals that are nearly completely covered with heavy growths of hair. The example we use here is a child named Kra-o, who was touted in the late 1800s as a "missing link".

The picture is that of a girl, six years of age, covered from head to foot with soft, silky hair. Upon first sight little Kra-o, as the child is named, would appear to be the "missing link" between the ape and man, but a closer examination of this peculiar being will prove that this diagnosis is faulty in all respects. We have simply an excellent type of hypertrichopherosis (superabundance of hair), cases of which have been known in this and previous centuries. Kro-a, who is being exhibited in London at present, is quite an intelligent child, and has acquired enough knowledge of the English language within a few months to be able to make herself understood; and this is an ample proof that, although her outward appearance is that of an animal, she has a bright mind and considerable intelligence. A correspondent of the Institution Ethnologique, Mr. H. Kaulitz Jarlow, writes as follows to the editor of the Illustrite Zeitung:

"Kra-o is about six years old; she is of the same size as other children of her age, but of a finer build; thick, jet black hair covers her head and reaches down to the backbone, and forms a perfect mane on the shoulders; the eyebrows are wide, glossy, and silky, and the eyes are of a deep black with open pupils, and the iris is missing entirely, as in the gorilla; the resemblance to the face of the latter is very great and astonishing; the nose is flat, and has wide nostrils inclined diagonally toward the cheek bones; the cheeks hang down and are baggy, and in them Kra-o stores her food and carries it about with her in the



A hairy child from Borneo. (X1)

same manner as her cousins of the ape tribe.

Her head, like the human type more than any other part of her body, and the intelligent eyes, the agreeably rounded mouth with the full lips, which can smile very pleasantly when Kra-o plays and talks, do not at all correspond with the ape-like body of the child. Kra-o is of a brownish-yellow color, and the hair extends from the crown of her head to the soles of her feet. She is generally very jolly, loves to play, and is more thankful than most children if persons take the trouble to amuse her. If she is molested and teased, her wild nature shows itself; she throws herself on the ground, screams, strikes the person, and finds great pleasure in tearing out some of her superabundance of hair." (R8)

Two points of importance in the foregoing paragraphs are: (1) Kra-o's hair is very soft and silky, like the lanugo (fetal hair); and (2) Kra-o, though intelligent, possesses physical abnormalities as well as some traits which might well be termed atavistic.

X2. Hairy families. Excessive hair seems to be genetically transmitted in many cases. S.W. Williston, writing in *Science*, described one of the several hairy families that have appeared and, in addition, provides some more background on abnormal hair growth.

The abnormal growth of hair, that has been not rarely observed since antiquity in individuals of different races of mankind, presents various points of interest other than anthropological ones. As Professor Mason has stated (*Science*, ix. No. 205), its recently recognized cause is the persistence of the prenatal downy hair, 'lanugo' as it is called, and its rich growth through life; or rather, to speak more accurately, the non-development of the hair-follicles to adapt them to the growth of normal hair. This persistence of the embryonal covering is most strikingly shown, as a normal condition, in the ostrich (*Ratitae*), *Apteryx*, and penguin, where the hair follicles, or, what is anatomically the same, the feather-follicles, produce through life the soft downy plumage of the chick only. This loss of the foetal hair, which takes place with the general exfoliation of the cuticle during the first year of life, is not characteristic of man, but occurs in many other, though not all, mammals. Wiedersheim (*Vergl. anat.*, 31) sees in this lanugo, and its abnormal development in the 'hair men,' a probable evidence of an abundant covering of hair at some early period of man's ancestry.

The extent to which this abnormal growth of the downy hair may reach will be better appreciated from the picture, here given [not reproduced], of Teftichew (or Testichew), the elder Russian 'dog man,' than can be from any description. The 'animal' or dog-like appearance in this case is more striking than in any other of which I have seen illustrations, though the Amras family of the sixteenth century presented a very similar aspect. In this family, the father, son, and daughter were all covered, according to the paintings and descriptions now extant, over the entire body with long hair, with the

exception of a space below the eyes.

In the notable case of Julia Pastrana of Mexico, a most repulsive-looking person in her picture, the hair of the head, forehead, and face was coarse like ordinary hair, and her cheeks and nose were nearly



Julia Pastrana. (X2)

bare. She died in 1860, in giving birth to a son, who early showed similar hairiness on head and face. The prenatal hair is not necessarily soft and downy. Pathological conditions will cause it in places to be coarse, like that of an adult, and some cases are known where the large part of the body has remained through life covered with a thick coat of strong hair, due, in reality, to an enormously large mother's mark. A similar condition is found in the coarser and more bushy growth of the beard from long-continued neuralgia or nerve irritation.

Yet another point of interest is the undoubted tendency to heredity which these abnormal cases show. Thrice has the anomaly been known to be developed in the second generation; and once, the Birman family, in the third generation. (R10)

X3. Hairy tribes? It would be most interesting if excessive hairiness could be demonstrated in groups larger than the family unit. Unfortunately, there are no reliable reports of such situa-

tions. The only allusion has been found in the Annual Register for 1832. Here, in the description of the discoveries of the American expedition of 1820-1821 to the Rocky Mountains, we find the following:

After crossing the mountains, they passed 386 different Indian tribes, some perfectly white, some entirely covered with hair, who were among the most singular, and so wild that the company were compelled to run them down with horses. (R1)

No elaboration has ever been found.

X4. General observations. Excessive hairiness possesses additional dimensions in the form of physical defects that often accompany the condition. In particular, hairiness is related to both the lack of and the redundancy of teeth. For example, two individuals possessing excessive hair, Andrian and Fedor Jef-tichjkw [sic] had severe dental deficiencies.

It is remarkable that both Andrian and Fedor are almost toothless, the former possessing only five teeth, one in the upper jaw and four in the lower, while the child has but four teeth, all in the lower jaw. These four teeth are, in both cases, incisors. To the right of Andrian's one upper tooth there still remains the mark of another which has disappeared. That beyond these six teeth the man never had any others is evident to any one who feels the gum with the finger. (R5)

Other people with excessive hair have had similar dental deficiencies.

On the other hand, Julia Pastrana, mentioned in X2, possessed redundant teeth that caused her mouth to project, giving her a gorilla-like appearance. (R5)

Further on this theme, Darwin remarked upon the correlation between hairlessness in dogs and deficiencies in teeth. He even connected the reduced bristles of domesticated boars with their diminished tusks! (R5)

References

- R1. "American Expedition of Discovery," Annual Register, 1832, p. 444. (X3)
- R2. Nature, 4:454, 1871. (X2)
- R3. "Hairy Men," English Mechanic, 18:234, 1873. (X1)
- R4. "Hairy Men," Scientific American, 29:407, 1873. (X1)
- R5. "A Freak of Nature," Popular Science Monthly, 4:448, 1874. (X4)
- R6. "A Hairy-Faced Family," Scientific American, 32:119, 1875. (X2)
- R7. Harrison, J. Park; "'Krao,' the So-Called Missing Link," Report of the British Association, 1883, p.. 575. (X1)
- R8. "A Hairy Child," Scientific American, 48:247, 1883. (X1)
- R9. Mason, O.T.; "A Hairy Human Family," Science, 9:16, 1887. (X2, X4)
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- R13. Gould, George M., and Pyle, Walter L.; "Minor Terata," Anomalies and Curiosities of Medicine, New York, 1896, p. 228. (X1)
- R14. "A Lion-Faced Boy," Scientific American Supplement, 42:17412, 1896. (X1)
- R15. "Boy with Hairy Coat Studied in Kharkov," Science News Letter, 27:147, 1935. (X1, X4)
- R16. "A Modern Jo-Jo," Scientific American, 152:274, 1935. (X1, X4)
- R17. Dobbins, Ron; "Hairier Humanoids," Fate, 33:46, September 1980. (X3)

BHA27 Sudden Loss of Hair and (Sometimes) Regrowth

Description. The loss of all or most body hair over a period of a few days. On occasion, regrowth occurs. Excluded here are cases where hair is lost due to disease and chemical treatments.

Data Evaluation. Only two accounts, both over a century old, have been recovered from the scientific literature searched so far. Rating: 3.

Anomaly Evaluation. The case histories cataloged below indicate that fright and worry seem to correlate with the extensive loss of hair. Even though the precise biological processes involved and the mechanism by which the mind sets them in motion are unknown, no important laws of biology seem at risk here. It is apparent, though, that mind-body relationships are largely uncharted. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. Sudden hair blanching (BHA31).

Entries

X1. Sudden loss of hair. An old case history.

The case is as follows: Daniel McCarthy, the son of a farmer resident near Kinsale, aged 12 years, in perfect health, was seized at night with a sudden fit of screaming, which alarmed the entire family. He stated the cause of his terror to have been, that he dreamed two men were dragging him from the house to murder him. On the next day the hair began to fall off in great quantities, and before a fortnight he was completely bald, and not a hair remained on his eyebrows or eyelashes. He continues in this state still, though seven years have elapsed, and enjoys perfect health. (R1)

X2. Sudden hair loss and regrowth. Another old case history that originally appeared in the Lancet of May 4, 1867.

A man of nervous temperament began business as a draper in 1859. At that time he was twenty-seven years of age, in good health, though not very robust, unmarried, and had the usual quantity of (dark) hair, whiskers, and beard. For two years he was in a state of perpetual worry and anxiety of mind, and his diet was very irregular. Then his hair be-

gan to come off. He declares that it literally fell off, so that when he raised his head from his pillow in the morning, the hair left on the pillow formed a kind of cast of that part of his head which rested on it. In a month's time he had not a single visible hair on any part of his body---no eyebrows, no eyelashes; even the short hairs of his arms and legs had gone; but on the scalp there could be seen, in a good light, patches of very fine, short down. This was in 1861. Medical treatment proved of no avail, and he was finally advised to do nothing. So long as his anxiety continued, the hair refused to grow, but by the latter part of 1865 his business became established, and, coincidentally, his hair reappeared; and when Mr. Churton, of Erith, reported on the case, he had a moderately good quantity of hair on the head, very slight whiskers, rather better eyebrows, and the eyelashes pretty good. (R2)

References

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- R2. Tuke, Daniel H.; "How Feelings Affect the Hair," Popular Science Monthly, 2:158, 1872. (X2)

BHA28 Baldness among Musicians

Description. The correlation of degrees of baldness among musicians with the types of instruments they play. For example, the brasses lead to what has been called "fanfare baldness"!

Data Evaluation. A single notice of this curious phenomenon is in our collection. The report, in fact, has a tongue-in-cheek flavor. If it did not come from a serious, sober journal (the English Mechanic), it would be easy to dismiss the phenomenon completely. Certainly, we need to know much more. Rating: 3.

Anomaly Evaluation. Scientists have apparently never found any physical or physiological means by which the sound of a musician's instrument can affect the quantity of his (or her) hair. Most likely, no one has pursued the phenomenon at all. If the effect is a real one, it is more-than-curious because of our total ignorance of the mechanism involved. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. The sudden loss of hair (BHA27); the sudden blanching of hair (BHA31).

Entries

X1. General observations. The writer of the following paragraphs assumes prematurely that the degree of baldness and the acoustic environments of specific musical instruments are somehow connected. Nevertheless, the associations made are fascinating to any anomalist.

Musicians, it appears, are bald in the proportion of 11 per cent; but among instrumentalists the influence of musical vibrations make themselves felt in two opposite directions, according to the class of instrument.

Thus, while string instruments prevent and arrest the falling off of the hair, the brass instruments exercise the most deadly influence upon the scalp. The piano and the violin, especially the former, have an undeniably preservative effect. All male pianists, says M. de Parville, have an Ysaye-like head of hair. The violoncello, the harp, and the double base all partake of the beneficial effects of the piano; the oboe is in-

ferior to the double base, while the clarinet and the flute have but a very slender effect, and towards one's fiftieth year the hair begins to thin perceptibly.

On the other hand, the effect of the brass is deplorable. The coronet and the horn despoil the most hirsute man of his locks with surprising speed and certainty.

The trombone, however, is the most deleterious of all, for in five or six years the player has lost at least 60 per cent. of his hair. This disagreeable result is known as "Fanfare baldness," because the evil particularly punishes regimental musicians. (R1)

Reference

- R1. "Stringed Instruments and Baldness," English Mechanic, 96:545, 1913. (X1)

BHA29 Human Hairlessness

Description. The rather obvious lack of hair on the human body when compared with most other mammals.

Data Evaluation. The relative hairlessness of the human body is common knowledge. Many books and papers on human biology and evolution remark upon this condition. Rating: 1.

Anomaly Evaluation. The anomalousness of human hairlessness is difficult to assess. On the basis of hair follicles per unit area, humans differ little from some of the primates. In this context, human nakedness is more apparent than real. It is really the shortness and fineness of human hair that must be explained---at least in the eyes of many biologists and anthropologists. They suspect that relative human hairlessness is the consequence of an evolutionary scenario that divides humans from the other primates. Several such scenarios are summarized in X2, below; but none is generally accepted. Our rating is based on this expectation that our relative nakedness has profound implications, even though we cannot read Nature's signs for certain. Rating: 2.

Possible Explanations. See X2.

Similar and Related Phenomena. Neoteny and "primitive" human traits (BHA10); excessively hairy humans (BHA26); human hair patterns (BHA30).

Entries

X1. General observations. Specific documentation is not required to convince the reader that humans are much less hairy than most other mammals. Only a visit to the zoo is necessary. It is a relative affair, however, because humans do have hair over much of their bodies. In fact, humans have as many hair follicles per square centimeter as chimpanzees. (R4) Most human hair, though, is short, sparse, and obscure; and we certainly look more "naked" than chimpanzees! Then, too, many mammals have even less hair than we do; whales, mole rats, armadillos, etc. Even so, most biologists feel obliged to explain why humans rate the description "naked apes". In other words, there exists the conviction that something significant happened during human evolution that led to hair reduction.

Virtually all biologists assume that humans evolved from more heavily furred ancestors, although a few anthropologists contend that we are really so hairy that a special explanation is not required. (R4) Thus, there is some ambivalence as to whether an anomaly really exists here.

X2. Possible explanations of human hairlessness. Even Darwin wrestled with the question of man's relative hairlessness. His explanation and the many others that followed are worth a short digression.

The defective gene theory. W.S. Olson asserted that our loss of body hair can only be ascribed to a mutation involving a defective gene, which swept through the human population before the various races evolved (since they are all relatively hairless). He stated further:

Unless there were some compelling advantage in not having body hair, it would be very unlikely for the defective gene to propagate rapidly throughout a population. The fact that it did, and that all nonbearers of the gene were eliminated completely, requires an explanation. (R2)

Obviously, this is not an explanation, but rather a formulation of the problem in genetic terms.

The body-cooling explanation.

It is most often proposed that the

evolution of human hairlessness was somehow associated with temperature regulation in a tropical environment. This basic concept has several permutations. Campbell proposed that hairlessness may be an adaptation for rapid heat loss made necessary because of man's unusual diurnal hunting regime. Morris also advocated the hypothesis that hairlessness prevented overheating during hunting chases. He thought that such hairlessness was necessary because hunting chases were activities for which early man was otherwise poorly adapted physically. (R3)

Two objections to this hypothesis are: (1) Other tropical mammals engaged in long, hot chases (as both predator and prey) get along fine with heavily furred bodies; and (2) Human males, who presumably did the hunting, have more body hair than the females left behind. If the "cooling" theory is correct this sexual dimorphism should be reversed.

It is also worth noting that the human skin, with its abundance of sweat glands, is an excellent heat exchanger.

W.S. Olson carried the "cooling" theory further by claiming that the advantages of the hairless, heat-exchanging, human skin could have evolved only in conjunction with the development of human intelligence, acquisition of artificial clothing for cold periods, and the knowledge of how to use fire. In this sense, hairlessness and intelligence go hand in hand!

B. Glass also links human hairlessness to the use of clothing and the increasing artificiality of our environment.

Humans have retained hair on the head, which is still useful for protection from the sun, wind, and rain. Glass believed that male baldness, however, is a different phenomenon from general human hairlessness. It is, he thought, probably only a genetic trait that has become common because of the great extension of human life.

He mused further:

Evolutionists suppose that the relative hairlessness of these mammals [other primates] arose from a change in selection pressure, and it is reasonable to suppose the same is true of the human species. What was this change in selection pressure? One

may postulate a positive advantage in being hairless, a disadvantage in hairiness; or one may postulate that hairiness simply became inconsequential to man. The first hypothesis does not seem very probable, because the human species, evolving in East Africa or wherever else, was in the company of other primates who did not become hairless, to judge from their modern descendents. Although the matter must of course remain without conclusive proof, it seems far more reasonable to suppose that man very early in his separate existence as a species (or genus) began wearing clothing (in the form of skins) and later using fire to warm himself. Thus he changed his environment sufficiently to make hairiness an inconsequential feature, except on the more exposed parts of his anatomy. (R5)

The defense-against-parasites theory.

This theory is based on the assumption that it is easier to rid a nearly hairless body of parasites. Superficially, the idea has merit, but even Darwin rejected it:

Whether this evil is of sufficient magnitude to have led to the denudation of his body through natural selection may be doubted, since none of the many quadrupeds inhabiting the Tropics have, as far as I know, acquired any specialized means of relief. (Quoted in R4)

The "clothing" explanation. It is very reasonable to postulate that with the advent of clothing, thick coats of hair were no longer necessary to human survival, and, like unneeded organs, the human pelt just wasted away over the eons. Since we do not really understand the biological mechanism involved in the loss of hairiness in response to the application of artificial clothing, this is really a scenario rather than an explanation.

Two counts can be registered against the "clothing" proposition: (1) People occupying the colder climes, where the use of clothing is most important, have retained more body hair than the peoples of the tropics, where little clothing is worn (R2); and (2) Many other mammals have lost more body hair than humans, implying that some factor other

than the advent of clothing may be involved.

The "sexual selection" theory. Darwin subscribed to this theory. The nearly hairless human body with its striking patches of pubic hair stimulated this theory. Sexual dimorphism works to the advantage of this theory, since it is the females, who are supposedly trying to entice the males, who are the less hairy. Actually, one could ask why the males lost any hair at all, if the attraction was all in one direction. A ramification of this view is the assertion that sex is more fun with hairless bodies than with furred bodies. (R4) Unfortunately, we have no testimony from furred mammals!

D. Dewar objects to the sexual attraction theory on the basis that long, dense hair is a valuable attribute to human primates. The young cling to their mothers' hair much of the time, especially during flight. As human hair became shorter and shorter---the consequence of presumed small, additive, mutations---infant mortality would soar, cancelling out and advantages supposed for added sexual attraction. (R1)

Is human hairlessness consistent with neoteny? As discussed in BHA10, some human features can be interpreted in terms of the retention of juvenile traits or neoteny. Most of the human body is covered with thin, very fine hair that superficially resembles the lanugo or fetal hair. Even though the lanugo is almost always lost before birth, some biologists have wondered whether there may be some connection between it and our postnatal hair inventory.

E. Morgan objects to this idea as follows:

It is manifestly contrary to the whole theory of neoteny that a human fetus should first acquire the coat of hair once appropriate to an adult primate and then subsequently abandon it... There are many examples of creatures retaining juvenile or fetal characteristics. There are no examples

of creatures regaining such characteristics after they have been lost by the normal process of growth and maturation. (R4)

The "aquatic ape" theory. E. Morgan, a strong proponent of the aquatic ape hypothesis rejected the neoteny explanation in the preceding paragraph; she also denies that humans lost their hair because they became overheated while hunting in the tropics. Rather, she claims, man lost most of his hair because he went through an aquatic phase:

He lost it for the same reason as the whale and the dolphin and the manatee: because if any fairly large aquatic mammal needs to keep warm in the water, it is better served by a layer of fat on the inside of its skin than by a layer of hair on the outside of it. (R4)

The fact that man is unique among the primates in possessing a layer of subcutaneous fat makes the aquatic ape theory seem more plausible. Even so, the theory has not been well-accepted in mainstream science. Also, one is now required to explain how the human layer of fat was acquired.

References

- R1. Dewar, Douglas; "Some Transformations Postulated by the Doctrine of Evolution," The Transformist Illusion, Murfreesboro, 1957, p. 236. (X2)
- R2. Brace, C. Loring, et al; "What Ever Happened to Hairy Man?" Science, 153:362, 1966. (X1, X2)
- R3. Kushlan, James A.; "The Evolution of Hairlessness in Man," American Naturalist, 116:727, 1980. (X1, X2)
- R4. Morgan, Elaine; "The Emergence of Man," The Aquatic Ape, New York, 1982, p. 13. (X2)
- R5. Glass, Bentley; "Evolution of Hairlessness in Man," Science, 152:294, 1966. (X2)

BHA30 Curious Human Hair Patterns

Description. Human hair arranged in puzzling patterns and locations.

Data Evaluation. Very little solid, scientific information on hair patterning has shown up in the literature surveyed. Enthusiasts of the aquatic-ape school refer frequently to hair flow-patterns, but they speak mainly in generalities. Rating: 3.

Anomaly Evaluation. Human sacral and dorsal hair whorls (X2-X4), curious though they may be, do not seem to point to any major biological mystery. Of course, we would like to know why they exist at all, and why they favor some peoples more than others; but for the time being they are classified with the minor biological idiosyncrasies. The apparent overall flow pattern of human body hair (X1) would normally be similarly classified, except for the claim that it supports the aquatic-ape theory. This raises the anomalousness of hair patterning in general. Rating: 2.

Possible Explanations. Human hair patterns were acquired through a previous aquatic stage in our development.

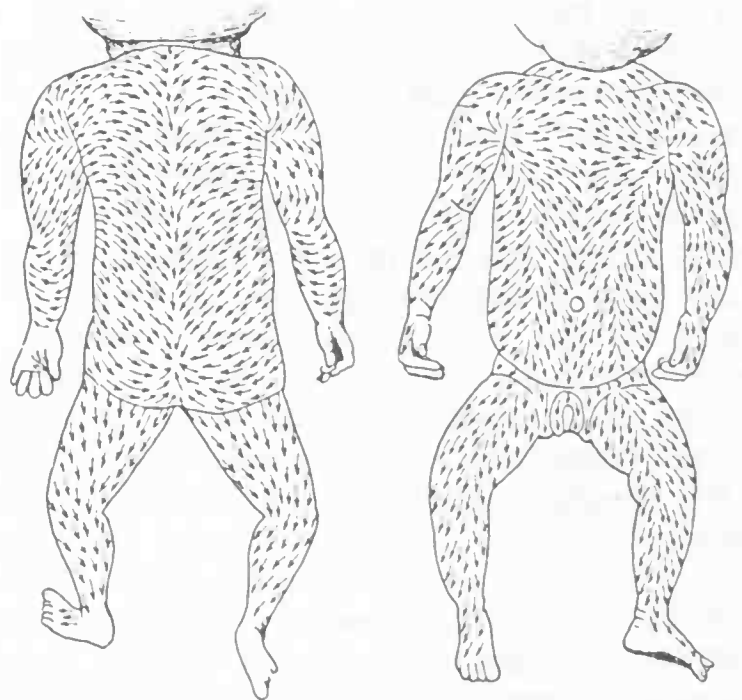
Similar and Related Phenomena. The sacral spot (BHA19); excessive human hairiness (BHA26)

Entries

X1. "Flow" patterns in human hair. The hair on the human body is not randomly arranged. Proponents of the aquatic ape hypothesis see in human hair patterns an argument for an aquatic past for the human race. A. Hardy elaborated as follows:

Whilst discussing hair it is interesting to point out that what are called the "hair tracts"---the directions in which the hairs lie on different parts of the body---are different in Man from those of the apes; particularly to be noted are the hairs on the back, which are all pointing in lines to meet diagonally towards the mid-line, exactly as the streams of water would pass around the body and meet, when it is swimming forward like a frog. Such an arrangement of hair, offering less resistance, may have been a first step in aquatic adaptation before its loss. (R3)

That human hair "flow patterns" or "streams" differ significantly from those of the apes was also recognized by W. Kidd in 1902. Kidd divided the human hair streams into three groups: (1) those inherited from ape-like ancestors;



Hair tracts on a human foetus. (X1)

(2) those affected by human morphological changes during evolution (as exemplified by the human head); and (3) those acquired by habit or use (as in the use of clothing). (R7)

X2. Dorsal hair whorls. Superimposed upon the general arrangement of body hair described in X1 are curious whorls of hair. Certainly they have no connection with the aquatic ape theory. Their origin and distribution among the peoples of the world are puzzling. The first type of whorl occurs in the mid-dorsal region in some races.

The occurrence of hair whorls in the mid-dorsal region of man has been recorded in a high percentage of Australian aborigines, in a few Hawaiian fetuses of mixed ancestry, and in one European. Osman-Hill has observed the same anomaly in Veddahs.

During a spleen survey of native children in the village of Buna, in northern Papua, the dorsal hair whorl was observed in six out of eighteen children examined. In all cases the whorl was anti-clockwise in direction and centered over vertebral spines D4, D5, D7, D10 (each once), and D6 (twice).

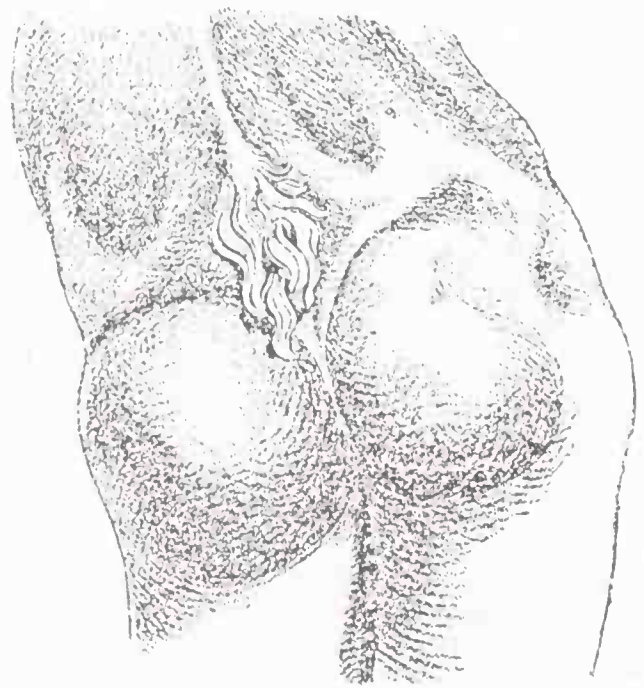
The significance of this type of hair tract arrangement is obscure; its occurrence in this group of Papuan villagers extends its known range. (R2)

Note that the position of this hair whorl varies along the spine. It may be associated somehow with the sacral hair whorls and tufts, which are lower down. See X3.

X3. Sacral hair whorls and tufts. Some remarkable examples of sacral hair formations were described in Popular Science Monthly in a long treatise on tail-like formations in humans.

The embryonal processes and normal conditions of formation thus briefly sketched are sufficient in general to permit most of the cases of so-called tail-formations in men, which occur with tolerable frequency, to be recognized as easily explainable irregularities of natural growth. The case deviating least from the normal condition concerns only the skin covering, and exhibits itself in an excessive hairiness of the sacral and coccygeal region (trichosis sacralis). We have seen above that this spot in the embryo regularly bears a hair-twirl, which is not rarely prolonged into a

hairy pencil or taitlet. We can hardly consider it an important variation if this hairy taitlet is exceptionally not absorbed, but endures and grows stronger after birth. In the so-called hairy men we evidently have persons in whom, according to all appearance, the wool-hair of the foetus has grown to a far greater extent, or at least possesses the same properties of alignment and direction. The chief physician of the Greek army, Dr. Bernhard Ornstein, having observed several cases of extraordinarily abundant hairiness in the sacral region



Back view of the "Silenus with the Infant Bacchus," in the Louvre. (X1)

among Grecian recruits, has given continued attention to this phenomenon, and has determined some very remarkable cases of it. The most striking of these cases was that of the twenty-eight-year-old recruit Demeter Karus, of the eparchy of Corinth. The whole sacral region appears to be covered with a thick, dark-brown hairy growth, about three inches in length, which spreads over on to either side. The hairs lie more smoothly on the border of the skin covering the sacrum, while in the middle they curl out into two strong tufts. The man is about five feet two inches high, and his yellowish-brown skin shows elsewhere on his whole body less than the usual hairiness. The recruit said that he was born with this unusual hair on his back, and that he had

even in youth suffered on account of it from the curiosity of the people in his native village. He said also that the growth had once been so strong that he had braided the hair into queues and tied it in front, but that since then he preferred to cut it from time to time. (R1)

The anonymous author of the above paragraph also asserted that sacral hairiness is not at all rare in Greece and the islands of the Aegean Sea. Even the ancient Greeks appreciated the trait, for in the Louvre one finds a statue of the Bacchus child with prominent sacral hair. (See sketch.)

X4. Mirror-image hair whorls. A final curiosity concerns the mirror-image twins mentioned in BHA9. The reversed asymmetry of these individuals is manifested in clockwise and anticlockwise hair whorls along with opposite handedness and other features. (R6)

The existence of this phenomenon in Japanese identical twins is denied in a study by T. Komai and G. Fukuoka:

There is no conclusive evidence that the sinistral whorl is commoner among twins than among single-born individuals, nor is there any reliable difference between different types of twins. Thus, no relation is found between twinning and the reversed direction of the head whorl. (R8)

X5. Hairy pinna. An unusual location for heavy growths of hair is the human ear. Among the Australian aborigines, however, remarkably hairy ears are common. In 1965, A.A. Abble and P.D.P. Rao summarized their survey as follows:

Hairy pinna is described in 37 of 189 adult full-Aboriginal males giving an overall incidence of 19.6%, but with much regional variation. This condition seems to be independent of secondary hair development elsewhere on the body. Hairy pinna is much commoner in men over the age of 40 years and penetrance may increase with age. Other findings are not at variance with the hypothesis of Y-linked inheritance of this trait,

but we can offer no genealogical evidence of any value either way. (R9)



(Top) These ear tufts are common in male Australian aborigines past middle age. (Bottom) Markedly hairy pinna from an Australian aborigine. (X5)

References

- R1. "Tail-Like Formations in Men," Popular Science Monthly, 40:347, 1892. (X3)
- R2. Fenner, Frank; "Mid-Dorsal Hair Whorls in Papuan Children," Nature, 152:538, 1943. (X2)
- R3. Hardy, Alister; "Was Man More Aquatic in the Past?" New Scientist, 7:642, 1960. (X1)
- R4. Morgan, Elaine; "Loss of Body Hair," The Aquatic Ape, New York,

- 1982, p. 30. (X1)
- R5. Watson, Lyall; "The Water People," Science Digest, 90:44, May 1982. (X1)
- R6. Cassil, Kay; "Science Takes a Look," Twins: Nature's Amazing Mystery, New York, 1984, p. 45. (X4)
- R7. Kidd, Walter; "A Chart of the Human Hair Streams, Showing Their Lineage and History," Scientific American Supplement, 54:22928, 1902. (X1)
- R8. Komai, Taku, and Fukuoka, Goro; "A Note on the Problem of Mirror-Imaging in Human Twins," Human Biology, 6:24, 1934. (X4)
- R9. Abble, A.A., and Rao, P.D. Prasad; "Hairy Pinna in Australian Aborigines," Human Biology, 37:162, 1965. (X5)

BHA31 Sudden Blanching of the Hair

Description. The sudden whitening of the human hair. The blanching may occur in the space of a few hours. Stimuli include fright, injury, mental illness, disease, and general stress and grief. All of the scalp and other facial hair may be involved, although blanched spots are also common. Reversal and recoloration of the hair have also been observed.

Data Evaluation. Considerable discussion of the phenomenon can be found in the pre-1930 literature; some of this, though, is of questionable scientific value. There is little question that the phenomenon is real, but it has not attracted the attention of modern science. Rating: 2.

Anomaly Evaluation. Two unexplained aspects of the anomaly are: (1) the unknown mechanism by which colored hair can be whitened suddenly and, in some instances, recolored; and (2) the unknown means by which mental and physiological states control the blanching mechanism. In short, we have a complex, bizarre phenomenon about which we know next to nothing. The psychosomatic mechanism in particular is mysterious. Rating: 2.

Possible Explanations. Human hair above the skin is not inert but, in analogy with the pigment cells of fish and other color-changing organisms, can change color under limited circumstances. This is a suggestion rather than an explanation.

Similar and Related Phenomena. Color changes of human hair (BHA32); blanching of hair in other mammals (BMA) and of feathers in birds (BBA); hereditary gray forelocks (not cataloged).

Entries

X1. General observations. That human hair can turn white overnight has long been a popular belief. Lord Byron recognized this in the opening lines of "The Prisoner of Chillon":

My hair is grey, but not with years,
Nor grew it white

In a single night,
As men's have done with sudden fears.

There is scientific as well as poetic substance to this phenomenon. A.F. Savill and C. Warren, in their unpoetic textbook The Hair and Scalp begin their discussion of the subject with:

Sudden blanching of the hair has been reported by so many competent observers that the existence of the phenomenon is probable. Ephraim, reviewing the literature since 1800 for cases of sudden or rapid whitening of the hair, collected twenty-six cases thought to be caused by excitement, fright, or mental strain; seven cases observed by neurologists, and five reported by ophthalmologists. (R10)

We catalog below cases apparently due to specific causes and follow with additional examples that portray unusual features of the phenomenon.

X2. Sudden blanching due to fright. The classical case oft-recorded is that of Marie Antoinette awaiting the guillotine, but that may be apocryphal. We employ one presented by Savill and Warren (R10):

A man aged fifty-two, whose truthfulness I cannot doubt, told me that at the age of thirty-six his hair turned grey in a single night. His history was that he was motor-cycling in a thick fog on a dark night. Towards midnight he fell into a canal and spent a long time trying to reach the bank. Exhausted, he collapsed. When he regained consciousness he was told by the police that he had been picked up insensible at 6 a.m. His hair had turned grey that night. (R10)

X3. Partial blanching resulting from injury.

A man, in consequence of an injury, had haemorrhage over the greater part of the left hemisphere of the brain. During the next two days the hairs of his beard and moustache on the opposite side, the right, were observed to become paler and paler, until they were almost white at the time of his death on the third day. This change extended up to the middle line and there ceased. A very curious fact is that the pale region was separated from the normal brown, by a very narrow darker zone, almost black in the middle line. (R6)

Here, the blanching seems completely independent of the emotions of the subject and, in addition, involved a darkening of adjacent hair.

X4. Blanching due to the stress of gambling. The story is that of a California miner, 1849-vintage, reaching San Francisco with his earnings of two year's hard work and betting it all on the draw of a single card (the seven) in a gambling den:

The cards are slowly told with the precision of high-wrought excitement. The seven spot wins. The spell is broken---reaction takes place. The winner exclaimed with a deep drawn sigh, 'I will never gamble again,' and was carried from the room in a deep swoon, from which he did not fully recover until the next morning, and then to know that the equivalent surrendered for his gain was the color of his hair, now changed to a perfect white. (R1)

X5. Spot-blanching associated with a tic. On occasion, blanching may occur in a very limited region. In reference to a discussion how some nervous conditions are likewise restricted to small areas, D.H. Tuke mentioned a case of blanching associated with a nervous tic.

In connection with a succeeding remark, that the eyebrows are a clinical region in brow-ague, herpes, and leprosy, the case already referred to, of a woman who suffered in the night from a severe attack of tic, and found in the morning that the inner half of one eyebrow and the corresponding portion of the eyelashes were perfectly white, may be mentioned. (R3)

X6. Hair-blanching and insanity. As strange as sudden hair whitening is, it is even more remarkable that the original color is sometimes restored. This can happen in attacks of insanity. A.F. Savill and C. Warren elaborate:

The hair has become white during

attacks of mental insanity, remained so for a few days or hours, then restored its natural color. Dr. Clave Shaw wrote that it was not uncommon to see symmetrical white bands on tracts of hair develop during insanity and the usual color restored during convalescence. (R10)

Another case of individual hairs with alternating bands of white and normal color was reported in Scientific American in 1867. (R2)

X7. Extremely rapid whitening of the hair. The classical case of high speed blanching occurred during the Sepoy Rebellion, in India, in 1859. One of the rebels, from the Bengal army, was captured. The story goes as follows:

The prisoner seemed for the first time to be conscious of his danger when, deprived of his uniform and completely nude, he saw himself surrounded by soldiers. He then began to tremble violently, terror and despair were depicted on his face, and, though he responded to the questions addressed to him, he seemed actually stupefied by fear. Then, under our very eyes and in the space of scarcely a half hour, his hair, which we had seen was a brilliant black, turned gray uniformly over his whole head. A sergeant who had made him prisoner cried out, "He is turning gray," and so called our attention to this singular phenomenon, which we, as well as many others, were then able to follow in all its phases. The discoloration of the hair took place gradually, but it became complete and general in the short space of time already mentioned. (R5)

X8. Spotty blanching. Often the hair will turn white only in specific regions.

A soldier, aged 23 years, was in a trench in Argonne which was blown up by a mine. He was projected into the air and fell, and was covered by a mass of earth, from which he succeeded in extricating himself. The detonation was such that he immediately became deaf. This was attributed to double haemorrhagic labyrinth-

itis by M. Cousteaud, who subsequently examined him. The deflagration of the powder produced superficial burns of the face, and there were several bruises on the head, which were greatest on the left side. He was taken to the English hospital at Arc-en-Barrois, where on the following day he noticed, to his surprise, tufts of white hair on the left side of the head. These formed four "islets" in the left frontoparieto-occipital region separated from one another by normal hairs. The loss of color was complete from the roots to the ends of the hairs and the longest hairs were just as white as the shortest. There was not a brown hair amidst them. The grey hairs were solidly implanted and could be pulled out only by strong traction. The bulbar swelling of the hairs was equally decolorized. After the accident the patient suffered from incessant twitching of the left eyelid. The rest of the head was dark brown and there was not a white hair in the beard or moustache. (R8)

The soldier mentioned above had a tic just like the woman in X5, except that here the blanched spots were multiple and larger.

Another case of spotty whitening was reported in Scientific American in 1921. In that period, phrenology was popular, and it is not surprising to find hair blanching related to certain "organs" or "bumps" on the head!

The writer has studied and investigated phrenology for the past twenty-five years and knows of a case of a woman residing here [Livermore, CA] whose hair fell out over the organ of Conjugality (conjugal love) on each side of her head while her husband was in a hospital undergoing a capital operation, and then the hair grew again, but came out white, and has been white there ever since. (R9)

For unenlightened readers, the organ of conjugality can be found about two inches back horizontally from the meatus of the ear.

X9. Reversals of blanching. Alternate blanching and recovery of hair color

were mentioned as sometimes accompanying insanity. (X6) Two other examples unassociated with insanity have been advanced by D.H. Tuke.

Mr. Paget, in his 'Lectures on Nutrition,' has recorded the case of a lady with dark-brown hair, subject to nervous headache, who always finds, the morning afterward, patches of her hair white, as if powdered with starch. In a few days it regains its color. (R3)

Tuke's second case concerns the regaining of normal hair color in a woman in her seventies, naturally gray at this age, who with her husband had moved from England to the States. The "invigorating atmosphere of freedom" had so improved their lives that the old woman "had cut a new set of teeth, and her poll was covered with a full crop of dark-brown hair"! (R3)

Of course, the character of the latter report raises a warning flag.

X10. Possible explanations of sudden blanching. In their book The Hair and the Scalp, A.F. Savill and C. Warren speculate about the causes of sudden whitening of the hair.

Many explanations of sudden and rapid blanching of the hair have been advanced. Some maintain that the altered circulation allows the loosening of the cells and thus air enters the spaces between the cells of the cortex, that these reflect the light and cause the hair to appear white, although there may still be pigment present. This may be true in a few cases, just as was found in the white portions of ringed hair [see X6] and in Case 3 described on page 29. Jackson stated that the change of colour is due to air bubbles rendering the cortex opaque, and so hiding the pigment. He added: "This is proved by placing one of the affected hairs in hot water, ether or turpentine, when the air bubbles will be driven out and the hair will resume its natural colour."

.....

It seems a reasonable theory that

with sudden and profound emotion there may occur constriction of the vessels supplying the hair papillae, and that when these cells are deprived of their normal nutriment their function of pigment formation must be in abeyance.

With prolonged depressing emotion the changes in the circulation resemble those produced by disease and by age; the slow decrease of pigment formation and alteration of the cortex cells in such conditions is readily understood. A more scientific explanation has been provided by the observation that Simmonds' disease (often associated with greyness) may follow sudden shock. It is probable that this effect is due to interference with the hypothalamic pituitary relationship. The hair has for too long been regarded as a dead object from the time it reaches the level of the skin. May not the medulla be a channel along which the hair shaft can receive nourishment and pigment? Its structure, with its loose cells and definite cavities, lends itself to this function. In the event of sudden deprivation of circulation in the papilla, the medulla may absorb the fluid pigment from the cortex and may convey no further supply from below; this would account for rapid greying of the appearance of the hair. Future research will determine whether this occurs more rapidly in hairs which have a medulla than in those which have none. Other arguments against the hypothesis of the hair being regarded as a dead object are: (1) Cut and singed hair ends behave as if they still had life; (2) repigmentation of white hair has been watched in alopecia areata and similar cases; and (3) the appearance and diameter of the hair varies with health and with constitutional disease. (R10)

References

- R1. "Curious Effects of Excitement," Scientific American, 7:91, 1851. (X4)
- R2. "Blanching of the Hair," Scientific American, 17:40, 1867. (X6)
- R3. Tuke, Daniel H.; "How the Feelings Affect the Hair," Popular Science

- Monthly, 2:158, 1872. (X5, X9)
- R4. Gould, George M., and Pyle, Walter L.; "Anomalies of the Color of the Hair," Anomalies and Curiosities of Medicine, New York, 1896, p. 235.
- R5. "Can the Hair Turn White from Fright?" Scientific American Supplement, 44:18016, 1897. (X7)
- R6. Gowers, W.R.; "Sudden Blanching of Human Hair," Knowledge, 24:231, 1901. (X3)
- R7. "Does the Hair Grow Grey in a Few Hours?" English Mechanic, 100:229, 1914. (X7)
- R8. "The Sudden Turning Grey of the Hair," Scientific American Supplement, 80:288, 1915. (X8)
- R9. Still, Elmer G.; "'His Hair Turned White Overnight'," Scientific American, 125:45, 1921. (X9)
- R10. Savill, Agnes F., and Warren, Clara; "Grey Hair," The Hair and the Scalp, Baltimore, 1962, p. 28. (X1, X2, X6, X10)
- R11. "Sudden Blanching of the Hair," Scientific American Supplement, 76:19, 1913. (X1)

BHA32 Sudden Color Changes in Human Hair

Definition. Sudden changes in human hair color. Excluded here are sudden blanching (covered in BHA31) and the slow color changes, including graying, that accompany aging.

Data Evaluation. The data consist solely of brief, very old, second- and third-hand accounts of cases. The data-situation is less than satisfactory. Rating: 3.

Anomaly Evaluation. A person's hair color often changes slowly and naturally with age; blonds may darken, redheads may become browner, etc. The emphasis on suddenness in the definition restricts the field to psychosomatic and physiological conditions that cause color changes in just a few days. It is not known whether the processes causing long-term and short-term color changes are the same. Neither is it known, say, how insanity can trigger hair-color changes and then reverse them hours later. New hair pigments have to be synthesized, somehow conveyed to the hairs, and then the entire process reversed. Detailed scenarios have not been found. No important biological paradigms are at risk here, but considerable ignorance exists. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. The sudden blanching of hair (BHA31).

Entries

X1. General observations. To find discussions of sudden color changes of human hair, we have to go back nearly a century; the subject is obviously not one of great import to modern science. First, we quote the comments and brief case histories recorded by G.M. Gould

and W.L. Pyle.

Anomalous Color Changes of the Hair. The hair is liable to undergo certain changes of color connected with some modification of that part of the bulb secreting its coloring-matter. Alibert,

quoted by Rayer, gives us a report of the case of a young lady who, after a severe fever which followed a very difficult labor, lost a fine head of hair during a discharge of a viscid fluid, which inundated the head in every part. He tells us, further, that the hair grew again of a deep black color after the recovery of the patient. [The original color of the woman's hair was blond.] The same writer tells of the case of James B., born with brown hair, who, having lost it all during the course of a sickness, had it replaced with a crop of the brightest red. White and gray hair has also, under peculiar circumstances, been replaced by hair of the same color as the individual had in youth. We are even assured by Bruley that in 1798 the white hair of a woman sixty years of age changed to black a few days before her death. The bulbs in this case were found of great size, and appeared gorged with a substance from which the hair derived its color. The white hairs that remained, on the contrary, grew from shriveled bulbs much smaller than those producing the black. The patient died of phthisis.

A very singular case, published early in the century, was that of a woman whose hair, naturally fair, assumed a tawny red color as often as she was affected with a certain fever, and returned to its natural hue as soon as the symptoms abated. (R5)

Additional references to old cases of color changes are to be found in D.W. Prentiss' survey, itself dating from 1890. There is apparently some redundancy in these accounts.

Alibert and Beizel relate cases of women with blond hair which all came out after severe fever, and when new hair grew it was black. Alibert also relates the case of a young man who lost brown hair during illness, and that which replaced it with red. In the case of an epileptic girl of idiotic type, with alternating phases of stupidity and excitement, during the stage of stupidity the hair was blond, during excitement it was red. This change of color took place in two or three days, the change always beginning at the ends of the hairs. (R3, R4)

Unfortunately, we have not come across more recent and more detailed accounts of this phenomenon.

X2. Hair color changes and insanity. Our single example here closely resembles, and may be the same as, that of the epileptic girl reported above in X1.

Dr. C. Reinhardt reports a case of periodical changes in the hair of an epileptic idiot. During the period of excitement hair changed its color from yellow to red and black; during the condition of stupor the hair resumed its usual condition. (R1)

X3. Hair-color changes associated with the chemical environment. Obviously excluded here are cases of intentional dyeing of the hair.

Cases of changes in the color of the hair other than to gray are not uncommon. Workers in cobalt-mines and indigo-works sometimes have their hair turned blue, and workers in copper green, by deposition of coloring material upon it. This, however, is only superficial coloring, and can be washed off. Prentiss records a case of a patient to whom muriate of pilocarpine was administered hypodermically whose hair was changed from light blonde to nearly jet-black, and his eyes from light blue to dark blue. These changes were due to increase of normal pigment. Hauptmann relates a case of a body exhumed twenty years after burial, the hair on which had changed from dark brown to red. (R2)

References

- R1. "Trophic Changes in the Hair of the Insane," Journal of Nervous and Mental Disease, 2:299, 1884. (X2)
- R2. "Changes in the Color of the Hair," Popular Science Monthly, 27:138, 1885. (X3)
- R3. Prentiss, D.W.; "Changes in Color of Hair and Feathers," Scientific American Supplement, 30:12452, 1890. (X1)
- R4. Prentiss, D.W.; "Changes in Color

of Hair and Feathers," Science, 16: 183, 1890. (X1)

- R5. Gould, George M., and Pyle, Walter L.; "Anomalies of the Color of the Hair," Anomalies and Curiosities of Medicine, New York, 1896, p. 235. (X1)

BHA33 Hair Color Correlated with Eminence

Description. The correlation of human hair color with eminence, as measured by appearance in portrait galleries and biographies.

Data Evaluation. Not only are the general measures of eminence employed here (portrait galleries and biographies) suspect, but the specific galleries and biographies used are restricted to a very narrow portion of the planet (mainly the British Empire and America). The rest of the world was excluded and, since the rest of the world is less than fair-haired, the data collected so far have little biological significance. Rating: 4.

Anomaly Evaluation. If hair color could be associated with eminence on a world-wide basis, down all of history, we might be able to conclude that the factors contributing to eminence (presumably intelligence, energy, ruthlessness, etc.) favored certain groups of people. Such a conclusion would be contrary to the widely held axiom that all peoples, on the average, possess comparable abilities. Rating: 1.

Possible Explanations. None required.

Similar and Related Phenomena. The correlation of hair color and physical strength (BHA34).

Entries

X1. Testimony of portraits. One measure of eminence in society might be found in portrait galleries. However shaky the assumptions behind this statement, portraits provide the first datum for our inquiry.

Mr. Havelock Ellis has made a census of the National Portrait Gallery, which contains portraits of so many persons of eminence, with a view to finding out whether the dark men or the light men have done the most for the Empire. Arranging the individuals in the order of their "decreasing fairness," he finds that the

political reformers and agitators are the fairest of the lot in complexion. These gentlemen in the "index of pigmentation" figure as 233. The sailors are 150, the men of sciences 121, the soldiers 113, the artists 111, the poets 107, members of the Royal family 107, lawyers 107, and created peers and their sons 102. The brunettes are statesmen 89, men and women of letters 85, hereditary aristocrats 82, divines 58, men of low birth 50, explorers 33, and actors actresses 33. In this table an index of more than 100 means that the fair element predominates over the dark

in that group. An index of less than 100 means that the dark element predominates. The list includes persons of both sexes.

.....

The fair man, Mr. Ellis thinks, tends to be bold, energetic, restless, and domineering, not because he is fair, but because he belongs to an aboriginal fair stock of people who possess these qualities. The dark man tends to be resigned and religious and imitative, yet highly intelligent, not because he is dark, but because he belongs to a dark stock possessing these characteristics. (R1)

Of course, this "study" is flawed because it is restricted primarily to individuals associated with the British Empire. Much of the planet, where darker races predominate, is ignored

X2. Testimony of biographies. Another crude measure of eminence can be found in biographies. One assumes that biographies are restricted to eminent people.

Seeing the predominance of blue and gray and bluish-gray eyes among persons of distinction, as determined

in the discussion of physiognomy as related to genius in the February issue, 1911, of this magazine, it might have seemed just to expect that the hair color of eminent men would be fair. In reality, however, the case is otherwise. The hair-color of celebrated personages, in so far as the result of our investigation may justify us in speaking, has usually been dark. (R2)

Following this paragraph are long lists of individuals who, from their biographies, can be classified by hair color. Most listed possessed black or brown hair, with a few flaxen- and reddish-haired people at the end. Yellow-headed personages are notable by their absence! As in X1, the data are restricted to a small segment of the planet; the British Empire and America in this case.

The conclusion based upon biographies is opposite that derived from portraits.

References

- R1. "Blondes and Brunettes," English Mechanic, 73:537, 1901. (X1)
 R2. Kassel, Charles; "Genius and Hair Color," Popular Science Monthly, 81:284, 1912. (X2)

BHA34 Hair Color Correlated with Strength and Vitality

Description. The correlation of human hair color with strength, vitality, and general species fitness.

Data Evaluation. As in BHA33, the data are old, vague, questionable, and speculative. Rating: 4.

Anomaly Evaluation. The evaluation here essentially parallels that in BHA33. Rating: 1.

Possible Explanations. None Required.

Similar and Related Phenomena. The correlation of hair color with eminence (BHA33); the correlation of evolutionary fitness with pigmentation in mammals (BMA).

Entries

X1. General observations. Included among the vague generalities in the following quotation are a few pertinent facts. Bear in mind, too, that these paragraphs were written a century ago.

It is not improbable, says Appleton's Popular Science Monthly, that there is in brunetteness, in the dark hair and eyes, some indication of vital superiority. If this were so, it would serve as a partial explanation for the social phenomenon which we have been at so much pains to describe. If in the same social community there was a slight vital advantage in brunetteness, we should expect to find that type slowly aggregating to the cities; for it requires energy and courage, physical as well as mental, not only to break the ties of home and migrate, but also to maintain oneself afterwards under the stress of urban life. Selection would thus be doubly operative. It would determine the character both of the urban immigrants and, to coin a phrase, of the urban persistents as well. The idea is worth developing a bit.

Eminent authority stands sponsor for the theorem that pigmentation in the lower animals is an important factor in the great struggle for survival. (R1)

We omit here assertions that, among other mammals, dark pigmentation is a decided advantage in survival. See BMA.

Applying these considerations to man, evidence is not entirely wanting to support De Candolle's (1887) thesis that "pigmentation is an index of

force." Disease often produces a change in the direction of blondness, as Dr. Beddoe has observed; asserting, as he does, that this trait in general is due to a defect of secretion. The case of the negro, cited by Ogle, whose depigmentation was accompanied by a loss of the sense of smell, is a pertinent one. The phenomenon of light-haired childhood and grey-haired senility, points to the same conclusion. A million soldiers observed during our Civil War afforded data for Baxter's assertion that the brunette type, on the whole, opposed a greater resistance to disease, and offered more hope of recovery from injuries in the field. Dr. Beddoe finds in Bristol that the dark-haired children are more tenacious of life, and asserts a distinct superiority of the brunette type in the severe competitions induced by urban life. It is not for us to settle the matter here and now. The solution belongs to the physiologist. As statisticians it behoves us to note facts, leaving choice of explanations to others more competent to judge. It must be said in conclusion, however, that present tendencies certainly point in the direction of some relation between pigmentation and general physiological and mental vigor. (R1)

Reference

- R1. "Are Brunettes Stronger Than Blondes?" English Mechanic, 67: 192, 1898. (X1)

BHA35 Remarkable Persistence of Hair Growth after Death

Description. The continued growth of hair long after death. Growth periods of a year or more seem likely.

Data Evaluation. Although this phenomenon is really in the category of common knowledge, we have found very little about it in our literature survey. Especially, there are no scientific descriptions and evaluations. Nevertheless, there seems to be no doubt that the phenomenon exists. Rating: 2.

Anomaly Evaluation. The discovery of hair growths of 12 inches and more on exhumed bodies implies that hair growth continues after death for periods in excess of a year---assuming unchanged hair-growth rates. It is at least curious that some body cells continue to function so long after the supplies of energy and raw materials have been almost completely choked off. How and from what were such masses of hair synthesized? Rating: 3.

Possible Explanations. Some body functions continue longer than supposed.

Similar and Related Phenomena. Postmortem nail growth.

Entries

X1. General observations. In their opus Anomalies and Curiosities of Medicine, G.M. Gould and W.L. Pyle devote a paragraph to this curious phenomenon.

The hair and beard may grow after death, and even change color. Bartholinus recalls a case of a man who had short, black hair and beard at the time of interment, but who, some time after death, was found to possess long and yellowish hair. Aristotle discusses postmortem growth of the hair, and Garmanus cites an instance in which the beard and hair were cut several times from the cadaver. We occasionally see evidence of this in the dissecting-rooms. Caldwell mentions a body buried four years, the hair from which protruded at the points where the joints of the coffin had given away. The hair of the head measured 18 inches, that of the beard eight inches, and that on the breast from four to six inches. Roess of Washington mentions an instance in which after burial the hair turned from dark brown to red, and also cites a case in a Washington cemetery of a girl, twelve or thirteen years old, who when exhumed was found to have a new growth of hair all over her body. (R2)

Gould and Pyle add that the nails may also grow as much as several inches after death.

X2. Another old example. In the referenced item from the English Mechanic, following a recounting of the Caldwell case mentioned in X1, there is an additional example of extreme persistence in postmortem hair growth.

In 1847, a similar circumstance occurred in Mercer county, Pa. In digging a grave, the workmen came upon the skeleton of a man that had been buried for ten years. The hair was as firm as during life, and had grown to a length of eleven or twelve inches. (R1)

References

- R1. "Growth of the Human Hair after Death," English Mechanic, 26:35, 1877. (X1, X2)
- R2. Gould, George M., and Pyle, Walter L.; "Postmortem Anomalies," Anomalies and Curiosities of Medicine, New York, 1896, p. 523. (X1)

BHA36 Voluntary Erection of Body Hair

Description. The rare ability to voluntarily erect selected body hair.

Data Evaluation. Only one case has been uncovered, although this was investigated professionally. It is not known how widespread this phenomenon is.

Rating: 3.

Anomaly Evaluation. Many mammals can voluntarily and involuntarily erect body hair and spines. As for humans, it is said in popular parlance that "It made my hair stand on end." We have nothing to add about this apparently involuntary human talent. Based on these general observations, a human hair-raising capability is not really anomalous. The voluntary control of it, however, particularly when restricted to the arms, does seem remarkable. Rating: 3.

Possible Explanations. Probably the human hair-raising capability is relict; that is, it is left over from a period during human evolution when it was useful.

Similar and Related Phenomena. Hair erection in mammals.

Entries

X1. Erectile arm hair. The popular belief is that the hair of the head stands on end when a person is frightened. It is odd then that the following case of voluntary hair erection involves only the arms.

rifying experience. He just raises the hair, so far as he knows, in much the same way that he works his muscles. He found he could do it when he was a ten-year-old boy. (R1)

Dr. Donald B. Lindsley, of Bradley Home and Brown University, showed before the meeting of the American Psychological Association a motion picture film of a man who can raise the hair on his arms whenever he wants to. More than that, he can step from a hot shower into a cold draft and yet keep the gooseflesh from coming up on his skin.

Dr. Lindsley pointed out that during the erection of his arm hair, the man's pupils dilated, his heart and breathing sped up, and even his brain waves changed.

He doesn't scare himself to bring on the hair-raising. He doesn't even picture in his mind a painful or ter-

Reference

- R1. "Studies Man Who Can Make His Own Hair Stand on End," Science News Letter, 38:211, 1940. (X1)

EYES

BHA37 Night-Shining in Human Eyes

Description. The reflection of light from human eyes at night after the fashion of dogs, cats, and other animals. According to one observer, this light is an eerie orange color.

Data Evaluation. Specific instances of this phenomenon are very rare in the scientific literature. The nature and dimensions of the phenomenon are poorly known. Rating: 3.

Anomaly Evaluation. Although it is often said that human eyes do not reflect light at night, it turns out that this is a rare phenomenon rather than an anomalous one. Further, a reasonable explanation exists for its existence as well as its relative rarity in humans. Rating: 4.

Possible Explanations. See X3 below.

Similar and Related Phenomena. Human luminosity (BHA22); structure, functions, and evolution of the human eye (BHO).

Entries

X1. General observations. Night-shining in animal eyes (actually "light-reflecting") has been observed by nearly everyone. It is widely held that human eyes do not have this reflecting capability. However, reports surface from time to time to the contrary. (R2, R3)

Of particular interest are the observations of spelunker E.A. Glennie.

Spelaeologists have perhaps rather exceptional opportunities for observing 'night shining' in human eyes. I have seen it on three occasions with different individuals, and once was accused of exhibiting the phenomenon myself.

On all occasions the observer was below the object and the illuminant was the concentrated beam of a focused electric torch. The glow from the eyes is a most uncanny tawny orange, causing exclamations of horror.

Once only have I seen night-shining by a human outside a cave. An Indian woman, who was bending low down, looked back from that position at the headlights of my car ---a momentary gleam from her eyes, which ceased as she stood up and

faced the light. Hence the incidence of the light on the eyes on this occasion was similar to that on the previous occasions in caves. It is possible that the normal individual only exhibits the phenomenon when, with dilated pupils, he is caught by a concentrated beam of light coming from this rather unusual direction. (R3)

X2. Shining in the eyes of albinos. It is not certain that the following observations should be classified as examples of "night-shining", but they are certainly pertinent as well as curious.

Many appearances of light have been observed in the eyes of human beings. Treviranus mentions, that G.T. L. Sachs, and his sister, both belonging to albinos, had phosphorescent eyes. Late in the evening there appeared in them a lively yellowish brightness, which darted forth in fiery coruscations or globules, from the interior of the eyes. The balls rolled hither and thither, and frequently ejected rays, at least an

inch in length. In these two relatives the light was liveliest and strongest after their birth, and during infancy; in their more advanced years the light was strongest when they were in deep meditation.

.....

In a boy, who belonged to the Albino variety, I observed a similar case, though not accompanied with irradiation. In this boy, who suffered so much from the dread of light that he never ventured abroad except at twilight, I frequently observed the same fiery eyes, yet they were very different, both in the strength and colour of their light, from the luminous eyes of animals which I had observed. (R1)

In the first paragraph above, it is implied that the eyes actually emitted light, which would be much more anomalous than simple reflection of incident light. (See BHA22.)

X3. An explanation of night-shining eyes?

The explanation of "night-shining eyes" is well known. The retina and choroid act as a mirror. In the emmetropic eye the light reflected from the fundus emerges in a parallel beam; hence none of it can enter an observer's eye unless this is placed in the comparatively narrow beam of light---the principle of the ophthalmoscope. In highly hypermetropic eyes

the emergent beams are widely divergent, and therefore an observer's eye can see a reflex from the pupil over a considerable area. (R4)

J.H. Parsons, the author of the foregoing paragraph, added two important points: (1) Night-shining in human eyes is rare because the observed eye must be highly hypermetropic, the incident light very bright, and the observer situated just right; and (2) Most lower mammals possess a special reflecting membrane, the tapetum, which may be provided with crystals, leading to iridescence and various colors of reflected light.

Generally speaking, Parsons' explanation seems adequate. The only question that comes to mind is whether it can account for the strange orange light reflected from human eyes, as described in X1.

References

- R1. Esser, Charles Ludwig; "On the Luminousness Observed in the Eyes of Human Beings, and also in Those of Cats, Dogs, Horses, and Sheep," Edinburgh New Philosophical Journal, 2:164, 1826. (X2)
- R2. "Shining in Human Eyes," Nature, 145:737, 1940. (X1)
- R3. Glennie, E.A.; "Night-Shining Eyes," Nature, 146:366, 1940. (X1)
- R4. Parsons, J. Hubert; "Night-Shining Eyes," Nature, 146:366, 1940. (X3)
- R5. "Night-Shining Eyes," Nature, 145:506, 1940. (X1)

BHA38 Eye Color Correlated with Athletic Capability

Description. The statistical correlation of human eye color with demonstrated athletic abilities and physiological parameters that are valuable to athletic performance.

Data Evaluation. Two rather limited statistical studies have been found in the scientific literature. The lack in depth of these researches weakens any conclusions derived from them. Rating: 3.

Anomaly Evaluation. People with dark eyes apparently edge out light-eyed people in baseball and reaction time---but just barely. This observation is actually consistent with the fact that dark-eyed peoples make up the great bulk of the planet's population; that is, they have been more successful biologically! We don't understand why this should be correlated with eye color. On the other hand, a modern paradigm states that all races are equal in capability. Only in this sense do we have an anomaly; and not much of one at that! Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Correlation of hair color with various physiological attributes (BHA33 and BHA34).

Entries

X0. Cross reference. Correlations of hair color, including passing references to eye color, with various human attributes are covered in BHA33 and BHA34.

X1. Eye color correlated with reaction time.

Summary. Response latencies to a visual stimulus were determined for 44 male and 82 female Caucasians. Those with dark eyes had significantly shorter simple (one stimulus) reaction times. Complex (one to four stimuli) reaction times showed a similar but nonsignificant trend...Darker iris pigmentation apparently correlates with shorter reaction times but more strongly on practiced tasks and on those which do not involve accuracy. (R1)

X2. Eye color correlated with baseball batting statistics.

Summary. 139 professional baseball players who appeared on Topps bubble gum cards (copyright 1987) were subjects. The players, whose printed eye colors could be identified from their photographs, were sorted into three categories of 45 dark-eyed white players, 27 light-eyed white

players, and 67 black players. The statistics on the backs of the cards were dependent measures and included: Games, At Bat, Runs, Hits, Second Base, Third Base, Home Runs, Runs Batted In, Stolen Bases, SLG, Bunts, Strike Outs, and Batting Average. (R2)

Analysis of the statistics for dark- and light-eyed white players showed no significant advantage for either for any of the parameters. On the other hand, when black players were compared with both categories of white players, the former had more triples, more stolen bases, and better batting averages. Since black players almost invariably have dark eyes, it would seem that dark-eyed players are generally better baseball players. The referenced paper did not express this last conclusion, however. (WRC)

References

- R1. Tedford, W.H. et al; "Human Eye Color and Reaction Time," Perceptual and Motor Skills, 47:503, 1978. (X1)
 R2. Beer, John, and Beer, Joe; "Relationship of Eye Color to Professional Baseball Players' Batting Statistics Given on Bubble Gum Cards," Perceptual and Motor Skills, 69:632, 1989. (X2)

EARS

BHA39 Inherited Ear Pits

Description. The existence of inheritable pits in the ears that closely resemble healed, artificially produced holes for earrings.

Data Evaluation. The data are very limited, being restricted to only two European families. We do not know how common this phenomenon is, or whether it exists in other parts of the globe. Rating: 3.

Anomaly Evaluation. The automatic reaction of modern biologists is to treat these curious pits as random defects and certainly not as manifestations of Lamarckism. However, one purpose of this Catalog is to collect such data to see if, taken together, they might force reassessment of favored biological paradigms. By themselves, though, the ear pits are merely curiosities. Rating: 3.

Possible Explanations. Random blemishes that happen to be inheritable.

Similar and Related Phenomena. Data with Lamarckian overtones are found in throughout the Series-B Catalogs, Consult the Subject Indexes under Lamarckism.

EntriesX1. General observations.

Pits in the ears which sometimes simulate holes pierced for ear-rings are shown to be inherited in man by H.W. Edwards and C.E. Keeler (J. Hered., 31:507-510, 1941). These pits on both lateral and median surfaces of the lobe of the ear do not usually form a channel through the ear, but appear similar to old, healed, ear-ring puncture marks. The character is inherited in two families as an irregular dominant, with indications of other factors which modify the expression. (R1)

The preceding announcement appeared in Nature in 1941. Science News Letter expanded a bit upon the discovery, adding a cautionary note lest unwary readers be influenced by the Lamarckian overtones.

A naive explanation would be that these natural "piercings" are inherited from a long line of ancestors who have had their ears pierced for earrings. A more exact explanation is that they are hereditary all right, but are not due to any artificial treatment of ancestors. (R2)

In other words, the pits are merely random defects in ear structure that happen to be inheritable. Should such fascinating tidbits be dismissed preemptorily?

References

- R1. "Inheritance of Pits in the Ears," Nature, 147:679, 1941. (X1)
 R2. "Natural Ear-Ring Holes Found in Two Families," Science News Letter, 39:99, 1941. (X1)

BHA40 Supernumerary Ears and So-Called Gill-Slits

Description. The occasional appearance on human necks, just below the ears, of orifices (branchial fistulae) and ear-like structures (auricles).

Note on Terminology. The embryos of vertebrates all display structures popularly called "gill-slits". Although these structures do become gills in fish, they develop into other structures in other species. In fact, they are not slits at all in the embryo, but rather "folds". The word "branchial", too, is misleading because it means "gill-like", and no gills are involved, except in the fish.

Data Evaluation. The data base here is very narrow; only two sources were used in preparing this Catalog entry. Rating: 3.

Anomaly Evaluation. In this Catalog, we usually omit minor terata (deformities). Branchial fistulae and auricles, however, are closely associated with human embryology, particularly the destiny of the so-called gill slits of the vertebrate embryo. Of course, supernumerary ears and milk-exuding orifices in the neck are almost bizarre enough to qualify as catalogable curiosities, but the biological stakes are higher than this. Biologists cannot yet explain in detail how human genes (and any other heredity-determining factors) convert embryonic gill slits into the human external ear and nearby diverse structures, while fish genes transform the same structures into true gills. The details of embryonic development represent a major biological mystery. The branchial fistulae and auricles cataloged here are indicators that something has gone awry in the transformation process. Such minor terata may, therefore, provide clues to what is really going on as embryos develop. In this view, the branchial fistulae and auricles are not so much anomalies as expressions of lingering biological mysteries. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. All embryology, biological metamorphosis, and development.

Entries

X0. Background. The so-called gill slits in vertebrate embryos have been the subject of much biological controversy over the years. A key player in the early debates was the German naturalist E.H. Haeckel. He employed the gill slits, along with other facets of the vertebrate embryo, to support his Biogenetic Law, which states that "Ontogeny recapitulates phylogeny." The implications of the gill slits in the human embryo were that humans evolved from aquatic animals and that the human embryo went through a "fish" phase.

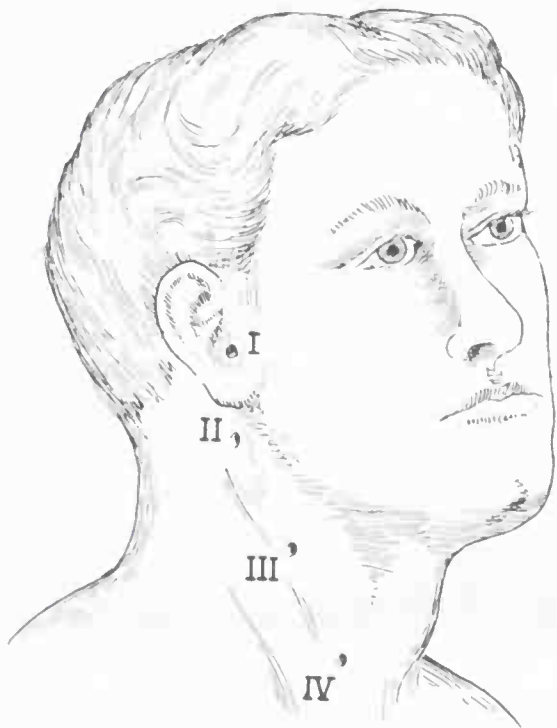
Haeckel's views have been largely discarded today, although some popular works still repeat the Biogenetic Law. It has been established that, while the gills in a fish embryo indeed do go on to become gills, the gill-like structures in the human embryo actually develop

into the external ear, neck, and other body features.

X1. Traces of gill slits? As explained in X0, the so-called gill slits never become gills in the mammalian embryo, but instead develop into the ear, neck, etc. Sometimes these transformations go awry, and an individual will end up with curious "fistulae" along the sides of the neck as outlined below.

The neck of the mammalian embryo is furnished with four similar slit-like orifices, communicating with the pharynx as in the dog-fish, and though they never support gills they are furnished with a small swelling or tubercle, representing the oper-

culum. In the human embryo four branchial slits present themselves. The first of these represents the spiracle of the shark, and becomes the tympano-eustachian passage subservient to the sense of hearing. The small tubercles surmounting it coalesce, and gradually give rise to the pinna or external ear. In cases



The four common locations of branchial fistulae. (X1)

of normal development the posterior gill-slits disappear; but it is by no means uncommon to find on the sides of the neck of a child, along the anterior border of the sterno-mastoid muscle, small openings of the skin capable of admitting a thin probe. These congenital fistulae, especially when they exist in the upper part of the neck, communicate with the pharynx. This in some cases may be demonstrated by allowing the child to swallow milk, when drops of the milk will find their way through the fistula and appear on the neck. (R1)

In such cases, one is tempted to think that not all of the gill-making instructions necessary for fish were completely suppressed in the human embryo; however, it is more likely that the instructions for ear- and neck-making were garbled.

X2. Auricles. Auricles are fleshy structures that on rare occasions appear along the side of the neck at roughly the same locations of the fistulae of X1. Some auricles closely resemble the real external ears (or pinna) located above them.

Sometimes we find in the situations frequented by these fistulae, instead of openings, small rounded white patches of skin, natural cicatrice, indicating the points of obliteration of the [embryonic gill] clefts. It is by no means infrequent to find the cutaneous orifice of a persistent branchial slit surmounted by a cutaneous tag, which often contains a small nodule of yellow elastic cartilage resembling that found in the pinna. These projecting pieces of skin often occur unassociated with fistulae, and are most common in two situations in the neck at the spots marked III and IV. As a rule they are symmetrical; usually they are short, often looking like mere pim-



A supernumerary auricle in the neck. (X2)

ples on the side of the neck. In some cases they attain a length of two or three centimetres. A very large one is represented in [the figure] as it grew from the side of a girl's neck. These fistulae and cervical auricles, or ears, as they are now called, usually affect many members of a family. The mother may possess cervical auricles, and one child have a cervical fistula, whilst a third may have fistulae and auricles combined. (R1)

G.M. Gould and W.L. Pyle provided additional background on the auricles.

They are often associated with some form of defective audition---harelip, ocular disturbance, club-feet, congenital hernia, etc. These supernumerary members vary from one to five in number and are sometimes hereditary. Reverdin describes a man having a supernumerary nipple on the right side of his chest, of whose five children three had preauricular

appendages. (R2)

References

- R1. "Traces of Gills in the Throat of Man," Knowledge, 13:149, 1890. (X1, X2)
- R2. Gould, George M., and Pyle, Walter L.; "Anomalies of the Ears," Anomalies and Curiosities of Medicine, New York, 1892, p. 261. (X2)

NOSES

BHA41 Nostril Orientation and Musculature

Description. The downward orientation of human nostrils, which are additionally equipped with musculature and "wings", resembling a nostril-sealing mechanism. Other primates do not possess these features.

Data Evaluation. The geometry and musculature of the human nose are common knowledge. Rating: 1.

Anomaly Evaluation. The remarkable differences between human noses and those of most other primates, especially the apes, deserves a special explanation. Of course, one does not expect all primate noses to be carbon copies of one another, but human noses do stand out and, furthermore, seem designed for some special, unrecognized purpose. Explanation of the human nose in terms of the aquatic-ape hypothesis is especially heretical to mainstream science. Rating: 2.

Possible Explanations. Humans went through an aquatic or semi-aquatic phase during their evolution. In this context, the human nostril muscles might be considered to be vestigial, like those that allow some of us to wiggle our ears. Vestigial muscles are commonly thought to originally have had some adaptive value in human evolutionary history.

Similar and Related Phenomena. The human nose as an organ (BHO); see Subject Index under Aquatic-ape theory.

Entries

X1. General observations. The human nose is remarkable when compared with those of other primates. First, it is relatively large, and, second, the nos-

trils point downwards rather than outwards. Only the semi-aquatic proboscis monkey has a nose with like characteristics. In addition, humans possess

wings around their nostril openings equipped with muscles. No other primates sport these muscles. E. Morgan, a champion of the aquatic ape theory, suggests that the unusual structure of the human nose is no fluke but rather possesses evolutionary significance. She notes that, along with its musculature, the nose is buttressed by cartilage that seems to have some purpose; that is, it was not evolved capriciously. (R1, R2)

X2. Theories about the human nose.

Some biologists have ventured that the human nose evolved to give resonance to speech, or even to warm the air before it entered the lungs. But most apes are quite noisy (e.g., howler monkeys) without large noses; and no one has suggested that humans evolved in a climate where the ambient air required warming before breathing.

The most intriguing interpretation of the human nose is that it developed when humans led a more aquatic exist-

tence---i.e., the aquatic ape theory. To illustrate, when the head is erect, the downward position of the nostrils helps prevent water from entering the nose. The nostril muscles may have been an evolutionary step in the direction of a sealing mechanism for swimming and diving, as present today in seals and some marine mammals. Everyone knows, of course, that present-day human nostril muscles actually can only flare the nostrils, an action seemingly contrary to sealing the nose. However, the nostril muscles of seals are used only for opening the nasal passages, which are sealed shut when the nostril muscles are relaxed! (R1)

References

- R1. Morgan, Elaine; "Swimming and Diving," The Aquatic Ape, New York, 1982, p. 76. (X1, X2)
 R2. Watson, Lyall; "The Water People," Science Digest, 90:44, May 1982. (X1)

TEETH

BHA42 Differences and Similarities between Human and Primate Teeth

Description. Differences and similarities of human and primate teeth in such matters as arrangements, relative sizes of canines and molars, enamel thicknesses, dental formulas, and dimensions.

Data Evaluation. Teeth are not only important to the external appearance of a primate but also to the unravelling of its evolution. Consequently, teeth have been frequent subjects of scientific study by biologists and anthropologists. A great deal has been written on this subject. Rating: 1.

Anomaly Evaluation. There is no denying that human and ape teeth are similar in many ways, and that a close evolutionary relationship is thereby indicated. This is a mainstream conclusion, and no anomaly derives. Yet, intriguing differences do exist, and these differences are more pronounced in the second dentition (permanent teeth) than in the so-called milk teeth. This observation supports the contention that juvenile characteristics are retained in humans, while the

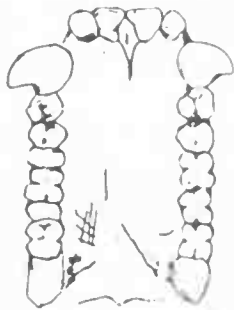
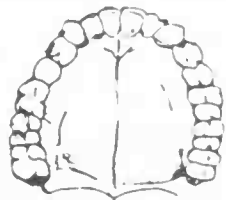
apes go on (in the second dentition) to develop large canines, thin enamels, and the dental geometry that gives them their "canine profile". The idea that humans are unevolved apes is still controversial and mildly anomalous in terms of modern biological and anthropological thinking. In addition, the affinity between humans and orangs in the matter of enamel thickness is also contrary to mainstream thinking. Rating: 3.

Possible Explanations. Neoteny prevailed in human evolution.

Similar and Related Phenomena. Neoteny in humans (BHA10); human-orang affinities (BHA11); morphological differences between humans and apes (BHA12).

Entries

X1. Position and arrangement of permanent teeth. Human permanent teeth are arranged in a rough semicircle, whereas in the other primates the geometry is rectangular. Also, human permanent teeth are set vertically in the jaw, as opposed to the inclined teeth observed in other primates. The inclined teeth in the apes produces the obvious "canine profile".



(Top) Human jaw.
(Bottom) Ape jaw.

Both human and apes have two dentitions: the milk teeth and the permanent teeth. The human-ape differences mentioned above are most noticeable in the second dentition or permanent teeth. In the first dentition, the differences are much smaller. (R4, R6) (See X5 below as well as the discussion of neoteny in BHA10.)

X2. Molar dominance over canine teeth. The evolution of humans has been characterized by reduction in the size of the canine teeth relative to the molars. In other primates, the canines still dominate. (R2)

X3. Enamel thickness. Human teeth are covered with a thick layer of enamel, while in all other apes, except the orang-utan, the layer is thin. (R7) (See BHA11 for other human-orang affinities.)

X4. Dental formulas.

One of the most important similarities between man and apes is in the dental formula. With the exception of the marmosets, the dental formula for the more "primitive" New World monkeys (and also for some of the lemurs) is:

$$\frac{2.1.3.3}{2.1.3.3}$$

That is, each side of the upper jaw and lower jaw has two incisors, one canine, three premolars, and three molars. In the Old World monkeys, the dental formula is:

$$\frac{2.1.2.3}{2.1.2.3}$$

and it is no coincidence that this is the same formula for both apes and man,

Thus, the identity of human and ape

dental formulas is taken as "proof" of a close evolutionary relationship. The identity or homology is certainly highly suggestive, but in this Catalog morphological similarities are not considered proof. (WRC)

X5. Human-ape affinities stronger in first dentition. M.C. Mahaney and P.W. Sciulli have studied the buccolingual diameters of both dentitions in six hominoid species. They concluded that, on this basis, humans and apes were even more closely related than commonly assumed. However, a second conclusion is more provocative:

A particularly interesting result of these analyses is that both distances and principal coordinates based on measures of the deciduous dentitions indicate closer relationships between the species studied than do those based upon the succedaneous dentition. This closer correspondence between hominoid juveniles is supportive of the suggested conservative nature of the deciduous dentitions of the "higher" primates. (R5)

This closer juvenile similarity of humans and apes was mentioned in connec-

tion with neoteny. (BHA10)

References

- R1. Greenwell, J. Richard; "Tiptoeing beyond Darwin," Skeptical Inquirer, 4:42, Spring 1980. (X4)
- R2. Lovejoy, C. Owen; "The Origin of Man," Science, 211:341, 1981. (X2)
- R3. Cheek, Dennis W.; "The Creationist and Neo-Darwinian Views Concerning the Origin of the Order Primates Compared and Contrasted: A Preliminary Analysis," Creation Research Society Quarterly, 18:93, 1981. (X1)
- R4. Morgan, Elaine; "Appendix 2," The Aquatic Ape, New York, 1982, p.149. (X1)
- R5. Mahaney, Michael C., and Sciulli, Paul W.; "Hominid-Pongid Affinities: A Multivariate Analysis of Hominoid Odontometrics," Current Anthropology, 24:382, 1983. (X5)
- R6. de Sarre, Francois; "Initial Bipedism: An Inquiry into the Zoological Evidence," Bipedia, 1:3, September 1988. (X1)
- R7. Lowenstein, Jerold, and Zihlman, Adrienne; "The Invisible Ape," New Scientist, p. 56, December 3, 1988. (X3)

BHA43 Racial Dental Differences

Description. Notable differences in the numbers and shapes of teeth among the human races.

Data Evaluation. The focus of anthropological investigations into human dentition has been the upper lateral incisors, where marked racial differences prevail. Research papers are plentiful here, but very little has been found on other racial variations. Rating: 2.

Anomaly Evaluation. The older scientific studies of the apparent slow, evolutionary loss of the upper lateral human incisors would be interpreted today as distinctly racist in tone, because in those days the shrinkage and loss of these teeth was equated with evolutionary "progress." The "higher" races supposedly had a higher fraction of their populations with lost or reduced incisors! Today, such an interpretation is politically incorrect! In actuality, since the same trend is seen among the other primates (apes, monkeys, etc.), the evolutionary signifi-

cance of the phenomenon, if any, is rather obscure. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Other externally observed racial differences (BHA7-X2 and BHA44); the diffusion of the various races around the globe (Series-M catalogs).

Entries

X1. Evolutionary Loss of the Upper Lateral Incisors. We introduce the subject with a quotation from A.H. Schultz:

In the normal permanent dentition of man the medial incisors are larger than the lateral ones in the upper jaw, but smaller than the lateral incisors in the lower jaw. This is clearly indicated by the few figures in the following table which are based upon the data from very extensive series.

| <u>Incisor</u> | <u>Breadth (mm)</u> | <u>Thickness (mm)</u> |
|----------------|---------------------|-----------------------|
| Upper medial | 6.5-10.6 | 6.2-8.3 |
| Upper lateral | 5.0-8.3 | 5.0-7.8 |
| Lower medial | 3.5-6.5 | 4.9-7.7 |
| Lower lateral | 4.2-7.2 | 5.3-7.6 |

As has been shown by Rosenberg, Ross, Bluntschli, and others, there appears to exist an evolutionary trend to reduce the dentition of man in connection with a shortening of the jaws. This process of reduction affects the dental row not indiscriminately at any place, but only at the opposite ends, the last molars [the wisdom teeth] and the incisors. It is very significant that this trend toward the elimination of teeth is not evident in all the incisors but that it is restricted to the smaller incisors in each jaw. These, as shown above, are the upper lateral and the lower medial incisors. In these particular teeth one can observe all the different degrees of reduction, leading to extreme cases to mere small pegs or even to the complete lack of one or both incisors. Rose, in very large series totaling almost 15,000 cases, found marked degeneration or complete absence of lateral upper incisors in Scandinavians in 6 per cent, in Central Europeans in 2 to 4 per

cent, in Greeks in 1.4 per cent, but in several colored races in only about 1 per cent of the cases examined. The lack of these incisors occurs somewhat more frequently in women than in men and very much more frequently in the permanent than in the deciduous dentition.

.....

Among some primitive human races the lack of these incisors seems to be exceedingly rare if, indeed, it

does occur at all. Schwarz, for instance, failed to find a single case among 667 skulls from New Caledonia and the New Hebrides, Campbell did not see it in large series of Australian aboriginals, and Shaw looked for it in vain among the Bantu races of South Africa. (R3)

Missing teeth among the Celts. An extreme case of racial dental differences seems to occur among those of Celtic extraction, according to a letter in the New Scientist:

As you are probably aware, the genuine Celts are of medium stature, with a particularly typical somewhat triangle shape of head among them, and an oval head among the women.

Almost all Celts have, in fact, one or two teeth missing in the upper jaw, these being the outer incisors. This hereditary characteristic can be traced back in some families for many hundreds of years. (R1)

A genetic interpretation of the phenomenon. M.F.A. Montagu is now quoted:

The genetic nature of the tendency towards the elimination of the maxillary lateral teeth in man is now, I believe, adequately demonstrated. This tendency is to some extent already perceived in anthropoids in whom these teeth are occasionally found in a vestigial condition. Bearing in mind the fact that anthropoids in whom these teeth are not vestigial, complete absence of diastemata in both jaws is also occasionally seen, it should not be very difficult to conceive of the manner in which the tendency for such conditions may have been carried over to the Hominidae in association with jaws which are characterized by a marked tendency towards reduction...The significance of the variability of the upper lateral incisor teeth in man may be interpreted in the following two propositions: (1) The variability of the upper lateral incisor teeth in man reflects a tendency which was probably already present in the ancestral stock of both the Hominidae and the Great Apes, and (2) This tendency finds expression in the various groups of mankind in different degrees, depending upon such a complex of factors as genetic structure,

degree of orthognathism, and the chance occurrence of conditions favoring a genetic tendency common to the group. (R5)

Unfortunately, this quotation does not help too much!

X2. Shoveled teeth among northern Asians and native Americans. See BHA7-X2 for details. (R2)

References

- R1. Mardon, Jasper; "Missing Teeth among the Celts," New Scientist, 8: 677, 1960. (X1)
- R2. Fagan, Brian M.; "Northeast Asians," The Journey from Eden, New York, 1990, p. 196. (X2)
- R3. Schulz, Adolph H.; "The Hereditary Tendency to Eliminate the Upper Lateral Incisors," Human Biology, 4:34, 1932. (X1)
- R4. Schultz, Adolph H.; "Inherited Reductions in the Dentition of Man," Human Biology, 6:631, 1934. (X1)
- R5. Montagu, M.F. Ashley; "The Significance of the Variability of the Upper Lateral Incisor Teeth in Man," Human Biology, 12:335, 1940. (X1)

BHA44 Historical Shrinkage of Human Teeth

Description. The substantial reduction in the sizes of human teeth over the past 100,000 years.

Data Evaluation. Our files contain a single summary of scientific study of modern and fossil teeth. More data would be helpful. Rating: 3.

Anomaly Evaluation. A size reduction of 45%, as reported below, is large enough to demand explanation; but the literature offers none. We presume that any explanation would involve such factors as historical changes in diet. This would lead to a low anomaly rating. But if the steady shrinkage of human teeth represents a general degeneracy of humanity, the biological significance of the phenomenon is high. At this point, no one knows! Rating: 2.

Possible Explanations. Dietary changes; general, long-term degeneracy of humans and other species.

Similar and Related Phenomena. Degeneration in humans (BHA5).

Entries

X1. General observations. Anthropologists L. Brace et al estimate that the size of human teeth has shrunk as much as 45% in the past 100,000 years. Using modern and prehistoric teeth, they measured tooth area rather than height because the latter is usually reduced by wear.

The anthropologists found a definite decrease in the size of the human tooth. The area of the third molar fell from an average 260 square millimetres to less than 200 square millimetres. The average area of the incisor fell from 144 square millimetres to a little more than 80 square millimetres. Since the beginning of the

last glaciation, about 100 000 years ago, the size of human teeth decreased by 1 per cent every 2000 years and continued to do so until the end of the late Pleistocene age 10 000 years ago. From the end of the Pleistocene age to the present day, the rate at which human teeth shrank doubled to 2 per cent every 2000 years. (R1)

Reference

R1. "Teeth Are Shrinking," New Scientist, p. 33, November 26, 1987. (X1)

BHA45 Extra Dentitions

Description. The appearance, usually among the aged, of third sets of teeth.

Data Evaluation. Many instances of this phenomenon appear in the older, specialized literature; but no one seems to have studied third dentitions in any depth. We do not know their frequency, age distribution, condition of the third set of teeth, health, etc. Rating: 3.

Anomaly Evaluation. It is not possible to tell if third dentitions are merely terata (sports or flukes) or an ongoing evolutionary development. Since people live much longer today and many lose some or all of their teeth, a third dentition would seem advantageous to the species. Of course, we cannot know if evolution is coming to our rescue or not. Beyond such surmising, we have no idea how third dentitions are triggered and what their real significance is. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Loss and regrowth of hair (BHA27).

Entries

X1. General observations. G.M. Gould and W.L. Pyle, in 1896, amassed many cases of third dentitions; that is, a third sets of teeth appearing in humans, usually of advanced age. Actually, one case of six dentitions was reported! A few excerpts from Gould and Pyle are reproduced below:

There is an account of a country laborer who lost all his teeth by the time he arrived at his sixtieth year of age, but about a half year afterward a new set made their appearance...There is a record of a physician of the name of Slave who retained all his second teeth until the age of eighty, when they fell out; after five years another set appeared,

which he retained until his death at one hundred...The Philosophical Transactions of London contain accounts of dentition at seventy-five and eighty-one. (R1)

The cases reported are many and, although they are quite old, there seems no reason to doubt such straightforward observations.

Reference

- R1. Gould, George M., and Pyle, Walter L.; "Minor Terata," Anomalies and Curiosities of Medicine, New York, 1896, p. 243. (X1)

HORNS

BHA46 Human Horns

Description. Horn-like structures growing from the human head and, frequently, other parts of the body. Superficially, human horns resemble those of some of the other mammals, but they do not always develop at the same sites nor are they usually hereditary.

Data Evaluation. Although little has been found in the recent literature, previous centuries saw frequent mention of human horns. The phenomenon apparently has not been studied scientifically in any depth. Rating: 2.

Anomaly Evaluation. Human horns have been labelled "anomalous outgrowths from the skin". As such, they are no more "anomalous", as defined in this Catalog, than warts or external cysts. Generally speaking, they are really "minor terata". Three aspects of human horns remain puzzling, though: "(1) They are more common in women; (2) They afflict some groups (a West African tribe in particular) with unusually high frequency; and (3) Some appearances of horns do seem to be hereditary. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Excessive human hair, especially its growth in unusual locations (BHA26).

Entries

X1. General observations. Human horns have a particular fascination because of their modern association with the Devil and, in earlier times, as symbols of wisdom and power. From the medical standpoint, there are so many cases of human horns on record that G.M. Gould and W.L. Pyle require five pages to do them justice in their compilation Anomalies and Curiosities of Medicine. We rely upon them here for an overview:

Human horns are anomalous outgrowths from the skin and are far more frequent than ordinarily supposed...Home, Cooper, and Treves have collected examples of horns, and there is one 11 inches long and 2½ in circumference in a London museum. Lozes collected reports of 71 cases of horns,---37 in females, 31 in males, and three in infants. Of this number, 15 were on the head, eight on the face, 18 on the lower extremities, eight on the trunk, and three on the glans penis. Wilson collected reports of 90 cases,---44 females, 39 males, the sex not being mentioned in the remainder. Of these 48 were on the head, four on the face, four on the nose, 11 on the thigh, three on the leg and foot, six on the back, five on the glans penis, and nine on the trunk. Lebert's collection numbered 109 cases of cutaneous horns. The greater frequency among females is admitted by all authors. Old age is a predisposing cause. (R4)

From this quotation, we conclude that horns are indeed fairly common, and that they are certainly not confined to the head. Indeed, they seem to grow about anywhere. There is, then, no basis for thinking that human horns have any evolutionary significance; they are simply minor terata.

X2. Alexander and Moses. P. Sieveking has reviewed some of the amusing history of human horns.

Alexander the Great is depicted with horns on his coinage. According to Josephus, the High Priest of Jerusalem showed Alexander the prophecy in the Book of Daniel which promised

him dominion of the East. The prophecy referred to Alexander as the 'two-horned king'. He appears in the Koran as Dhul Karnain, 'the two-horned'. Moses was also 'two-horned', and in Arabian legend, 'El Hidr, the ever-young prophet' befriended both Moses and Alexander 'at the meeting place of the two seas'. St. Jerome and the early Church Fathers made a poetic identification of Alexander's horns with those of Moses. Michelangelo's famous sculpture of Moses sports a pair of horns. (R6)

Actually, there does not seem to be any firm evidence that either Alexander or Moses really had horns. Like the halo, the horns were probably only symbolic. In fact, Sieveking remarks that Moses' supposed horns probably arose in a mistranslation from the Hebrew.

X3. Francois Trouille: a famous case. P. Sieveking attributes the following quotation to Fabricius:

He [Trouille] was of middle stature, a full body, bald, except in the hinder parts of his head, which had a few



A horned man, Francois Trouille. (X3)

hairs upon it; his temper was morose, and his demeanour altogether rustic; he was born in a little village called Mezieres, and bred up in the woods amongst the charcoal men. About the seventh year of his age, he began to have a swelling in his forehead; so that about the seventeenth year of his age, he had a horn there as big as a man's finger end, which afterwards did admit of that growth and increase, that when he came to be thirty-five years old, this horn had both the bigness and resemblance of a ram's horn. It grew upon the midst of his forehead, and then bended backward as far as the coronal suture, where the other end of it did sometimes so stick in the skin, that, to avoid much pain, he was constrained to cut off some part of the end of it. (R6)

X4. A woman with horns. The following report is typical of the genre.

The New York Observer of the 12th inst., contains a letter from its correspondent at Larnaca, in the Island of Cyprus (Turkish dominions), describing a most remarkable lusus naturae recently discovered there. It is nothing less than a woman with horns growing out of her head! She has one large horn on the side of her head of the size and consistency of an ordinary ram's horn, besides three or four cornicles on other parts of the head. (R1)

X5. The African "horned" men. In the 1800s, reports came out of Africa regarding a tribe of "horned" men. For example, in 1876, a communication from Captain J.S. Hay described the "malformation in the males of a tribe of people he had visited in the district of Akem, in West Africa." Hay believed that this malformation was peculiar to this particular tribe. He continued with:

The malformation in question is confined to the male sex, and consists in a protuberance or enlargement of the cheek bones under the eyes, which takes the form of horns on each side of the nose. This malformation begins in childhood, but is not,

as far as I am aware, hereditary. It presents no appearance of being a diseased structure, nor is it a raised cicatrice after the fashion adopted by



Congenital "horns" that appear on the males of a West African tribe. (X5)

many African tribes. On the contrary, I have seen children with this peculiarity of structure whose parents were doing their utmost (though ineffectually) to stop it by medicines and applications. (R2; R3)

G.M. Gould and W.L. Pyle devote a paragraph to the phenomenon, stating that the "horns" were: "congenital, followed no history of traumatism, caused little inconvenience, and were unassociated with disturbance of the sense of smell." (R4)

X6. Horns on a girl's neck. The only modern recognition of human horns was found in a Science News Letter of 1955. A nine-year-old girl was described who had horns on the sides of her neck. In this instance, heredity did seem to be a factor:

Five generations of this child's family, Dr. Lindgren said, were born with similar horns. The youngster's mother had them, as did eight other family members, all of them female except two. (R6)

References

- R1. "A Woman with Horns," Scientific American, 10:323, 1864. (X4)
- R2. "Horned Men in Africa," English Mechanic, 24:9, 1876. (X5)
- R3. "A Horned African Family," Anthropological Institute, Journal, 10:459, 1881. (X5)
- R4. Gould, George M., and Pyle, Walter L.; "Minor Terata," Anomalies and Curiosities of Medicine, New York, 1896, p. 222. (X5)
- R5. "Horns in Girl's Neck from Embryo Gills," Science News Letter, 68:231, 1955. (X6)
- R6. Sieveking, Paul; "Human Horns," Fortean Times, no. 43, p. 36, Spring 1985. (X1-X3)

*HANDS AND FEET***BHA47 Unusual, Inherited Characteristics of Feet**

Description. Inheritable deformities or exaggerated characteristics of human feet that are acquired through injuries or other external physical influences.

Data Evaluation. The scientific literature on this subject is notably sparse. Only a few isolated items, many of them over a century old, have come to light.

Rating: 3.

Anomaly Evaluation. Those inheritable deformities that can definitely be assigned to genetic mutations are not anomalous, although some are quite remarkable. Deformities or exaggerated characteristics that seem to be the consequence of external forces, such as injury or heavy use, strike at the heart of modern evolutionary theory. Rating: 1.

Possible Explanations. Acquired characteristics can, in some instances, be transmitted to progeny---a major heresy, if proven.

Similar and Related Phenomena. See the Subject Indexes in the Series B Catalogs under: Acquired characteristics and Lamarckism.

Entries

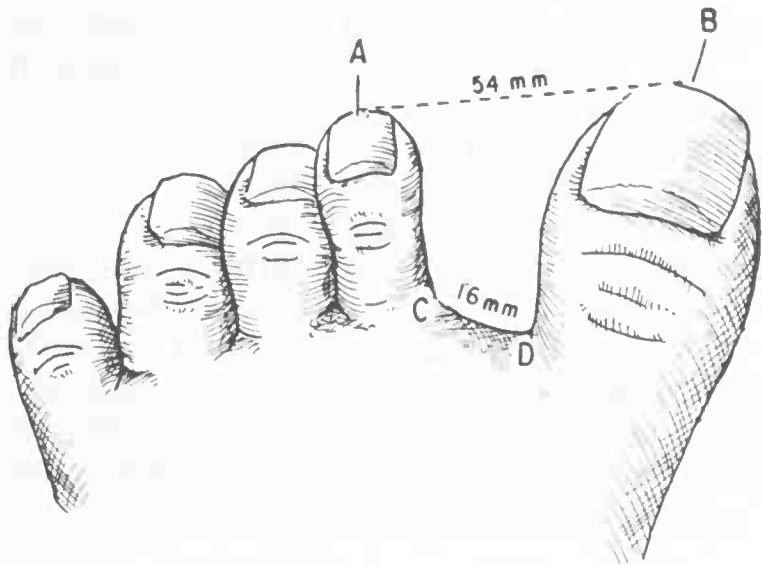
X1. Nearly prehensile feet. Artisans of India and Southeast Asia utilize their feet in their work to a degree remarkable to Westerners. While their feet are not prehensile like those of apes and monkeys, they are employed to hold and manipulate the objects of their labor. In the following paragraphs, M.F. Regnault relates how this is done and speculates upon the origin of this capability.

In considering this property of the lower limb, it is well to distinguish between the parts that relate, first, to the articulation of the hip, which, being very loose, permits the Indian to squat in such a position that his foot shall not be very far from his hands, so as to make all four participate in the work and permit the whole lower limb to engage in wide movements. The position is very dif-

ferent from that of our tailors or of the Arabs. It brings the knees to a level with the chest. The man is supported on his ischia and his feet; and he keeps in this position for whole hours, while we can maintain it only for a few minutes. It is their way of resting, and we can see them by groups squatting in this manner, and smoking. In the second place, the articulation of the instep and the medio-tarsal permit wide lateral movements of the foot, as in the examples of the shoemaker, joiner, comb-maker, and turner; and on the toes which are particularly flexible, as with the butcher cutting meat and the child climbing trees

The great toe is capable of considerable lateral movements from the second toe, so that the Indian can easily pick up articles from the ground with his foot, and even exert some force sidewise.

But great as is their skill, there is no movement of opposition between the great toe and the other toes, as there is in the monkey. The great



The distance between the first and second toes of some Asians is unusually great. (X1)

toe has very extended movements of adduction and abduction, and of elevation and depression, but all is limited. The property is frequent among savages and half-civilized peoples. Broca pointed out in 1869 the part of the foot which could be made to serve. Morice has remarked that the great toe of the Annamites could be used by them in picking up small

objects; and he saw a boatman take his hand from the helm and steer very correctly with his foot, while he rolled his cigarette.

.....

It does not follow, however, that this faculty is common to all peoples that go barefooted, or even to all savages. There are at the museum castings of three feet of negroes in which nothing like it appears; an American Indian foot from the lower Amazon...also normal; two feet of young Bushmen, normal likewise; and thirteen feet of Fuegian men and women, normal...I have not observed it in any European or in any white child. The habit of walking barefoot may produce a slight divergence of the great toe, but not at the base. The function of prehensibility must therefore be considerably developed for such a divergence to exist. Still, heredity appears to have a part in it; for we do not observe it except among peoples who have exercised the function from a remote antiquity. (R2; R1)

The crucial question asks whether this degree of prehensibility represents the inheritance of a characteristic that was acquired through long use (biological feedback) or whether it is simply a case of natural selection. Today, the great majority of scientists would opt for the latter.

X2. The ostrich people. Presumably the consequence of an unfavorable mutation, many members of one African tribe, the Vanyai or Vadoma, display "ostrich" feet---bird-like feet with only two huge toes. As one might expect, some wild stories about this tribe have found their way to the newspapers. We quote below a few paragraphs distributed by the Copley News Service in 1969.

Remarkable evidence of the existence of a strange tribe of two-toed people who can run like the wind on a staple diet of honey, corn and mushrooms, has been obtained by a few European travelers who independently ventured into the wild, tsetse-infested region of the steaming Zambezi Valley on the remote northwes-

tern borders of Rhodesia.

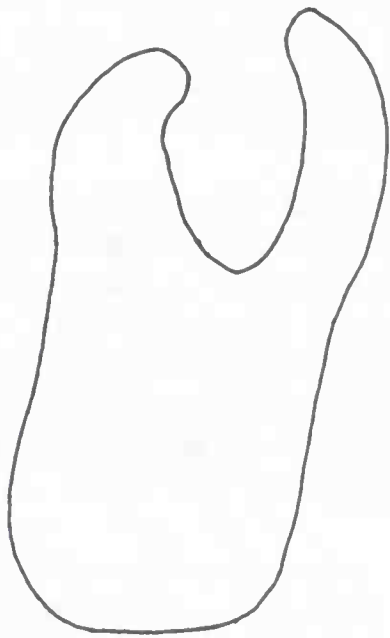
G. Olsson, an engineer, tells how he surprised a group of 50 or 60 Vanyai, who fled from him at a fantastic speed.

The men were about six feet tall, very shy and reticent. The first group I saw were up a tree. As soon as I got near them in the small clearing they were down and off.

.....

Olsson, the borehole engineer, disagrees with the claim that toes are removed from babies. "Their toes are definitely not chopped off or affected by any disease," he says.

"Their bone structure is quite different from the normal because their feet split high up on the instep and splay out in two big toes like an ostrich foot." (R4)



Outline of the "ostrich feet" of the Vanyai. (X2)

It is not known how many newspapers carried this syndicated item, but one can understand how it might be rejected because of its racist overtones as well as scientific unlikelihood. The "ostrich people" story, however, is a true one. Authentic color photographs of the Vanyai have appeared, and their deformed feet have been ascribed to a genetic defect. (R5) The two huge splayed toes are evidently not enough of an impediment to survival to cause elimination of the defective gene.

X3. Possible inheritance of a physical injury. Physical injuries should have no effect on the genome according to prevailing biological theory. Therefore, they cannot be passed on to progeny. But contradictory evidence exists, as in this 1884 report by I.P. Bishop in the journal Science.

Well-authenticated instances of the inheritance of a physical injury are so rare, that I wish to put upon record one which has recently fallen under my observation. A gentleman, when a boy about seven years of age, had the second toe of the right foot deformed by wearing a tight boot. The first and third toes were crowded together, forcing the second one under and backwards, and causing a curvature of the second joint, which, in time, became permanent. The joint, being somewhat elevated above those of the other toes, received the pressure of the shoe, and always after was more or less troublesome in consequence. The gentleman was twice married. By his first wife he had six children, the second of which was a daughter; the rest, sons. The daughter inherited the crooked toe; but the feet of all the sons were normal. The deformity appeared, however, in the son of one of these,---the brother next younger than the sister,---affecting the same foot and toe as on the grandfather. By his second wife the gentleman had only one child, a son, who also inherited the peculiarity; but in this instance it was the second toe of the left foot, instead of the right, that was affected. (R3)

References

- R1. Tremlett, Charles F.; "The Great Toe of the Annamese," Anthropological Institute, Journal, 9:460, 1880. (X1)
- R2. Regnault, M.F.; "The Prehensile Foot of East Indians," Popular Science Monthly, 41:489, 1892. (X1)
- R3. Bishop, Irving P.; "Inheritance of Physical Injuries," Science, 3:144, 1884. (X3)
- R4. Nicholas, George; "Extraordinary News of Unusual People," San Francisco Chronicle, September 21, 1969. (X2)

R5. Hoyle, Fred; "The Gospel According to Darwin," The Intelligent Universe, New York, 1984, p. 34. (X2)

BHA48 Progressive Loss of the Little Toe

Description. The progressive atrophy of the human little toe.

Data Evaluation. The only information on this subject found so far asserts that the human little toe has been atrophying---losing a phalanx. No additional statistics, measurements, of historical data are at hand. Rating: 3.

Anomaly Evaluation. Since a slightly smaller little toe would not seem to confer additional survival value, the mainstream explanation of little-toe atrophy relies upon linking the atrophy genetically to some unidentified change that does have survival value. Not only is this argument vague but it is difficult to apply to all the atrophies noticed in the natural world. An alternative explanation---atrophy through disuse---is heretical, since there is no known mechanism by which disuse can be converted into genetic changes. Neither of the potential explanations is at all satisfactory. Rating: 1.

Possible Explanations. Disuse can modify the genome or other mode of transmitting characteristics to offspring.

Similar and Related Phenomena. Vestigial organs (BHO, BMO, BBO, etc.)

Entries

X1. General observations. Exploring the "inadequacies" of evolution, H.D. Johnson has wondered about the apparent atrophy of the little toe of humans:

Another phenomenon in evolution which underlines the inadequacy of present hypotheses is what might be called "progressive inheritable atrophy". A highly developed organ such as the eye would be expected to be far more often the site of a useless mutation than of one able to improve function. A sport having a bizarre and damaging modification of the eye would soon be eliminated from most species, though perhaps not so from the mole, which has little use for sight.

.....

Again, why is man gradually

losing a phalanx from his little toe? What possible advantage can the possessor of the smaller number of little bones have over his longer toed rival for survival? Of course, the usual answer given is that the feature favoured must have happened to be linked to another which did have value to the species. If this were really the explanation, it would be quite remarkable how regularly disuse of a structure by a species is followed by its gradual atrophy. (R1)

Reference

R1. Johnson, H. Daintree; "Evolution's Inadequacies," New Scientist, 48:567, 1970. (X1)

BHA49 Webbed Hands and Feet

Description. The existence of webbing between the fingers and toes.

Data Evaluation. The available data are old (1926) and limited to a small sample. In addition, the amount of webbing reported is hardly impressive. Some amount of webbing between fingers and toes is to be expected, with some individuals possessing more or less than others. Rating: 4.

Anomaly Evaluation. If a high proportion of the human populace had significant webbing between the toes and/or fingers, those advocating the aquatic-ape hypothesis could be legitimately encouraged. Since the aquatic-ape hypothesis is far from mainstream science, such evidence would be highly anomalous. Rating: 1.

Possible Explanations. None required.

Similar and Related Phenomena. The normal variations in human body parameters, such as length of the digits, size of ear lobes, etc.

Entries

X1. General observations. E. Morgan, in defending the aquatic-ape theory, has employed some interesting facts about webbing in human hands and feet.

Several people have asked me why, if man has had a long enough evolution in the water to produce such characters as loss of hair and [the addition of] subcutaneous fat, he has not also got webbed hands and feet. Regarding the development of hands, I am sure that selection would not favor such mutations, for his separated fingers would be of greater value in finding and dealing with marine food. But regarding the feet, the truth is that some people have their toes webbed but they do not like to talk about it! In 1926, Basler examined 1,000 schoolchildren

and found that 9 percent of boys and 6.6 percent of girls had webbing between the second and third toes; and in some the webbing may extend between them all. (R1, R2)

In another section of her book, E. Morgan asserts that webbed hands, though rare, do occur in humans. Her Plate 4 shows vividly just such an instance.

References

- R1. Morgan, Elaine; "Appendix 2," The Aquatic Ape, New York, 1982, p. 146. (X1)
- R2. Watson, Lyall; "The Water People," Science Digest, 90:44, May 1982. (X1)

BHA50 Alleged Primitive Character of Human Hands and Feet

Description. Characteristics of human hands and feet, such as the five-fingered hand and plantigrade foot, that may be interpreted as being primitive when compared to corresponding features of other vertebrates.

Data Evaluation. A few facts and interpretations by a single author, who is an acknowledged proponent of "initial bipedalism". More facts and rebuttals are needed here. Rating: 3.

Anomaly Evaluation. If many aspects of human hands and feet are indeed primitive, as asserted below, one can make a case for both "initial bipedalism" and for apes being more highly evolved than humans. The latter view is conceded by some biologists who see neoteny in the human appearance. "Initial bipedalism", however, is a radical notion unsupported by most scientists. Data supporting initial bipedalism, therefore, are anomalous. Rating: 2.

Possible Explanations. For some reason, humans are what they are because they have retained many primitive traits when compared to other vertebrates; i.e., neoteny was an important factor in the evolution of humans.

Similar and Related Phenomena. Neoteny and the general primitive nature of the human body (BHA10).

Entries

X1. General observations. In the following paragraphs, F. de Sarre considers human hands and feet and how their structures, both in the embryo and in the adult, may display very primitive features. Opinions vary on this matter, and it should be pointed out early that de Sarre is a proponent of the aquatic-ape theory as well as "initial bipedalism"; that is, the theory that the general construction of bipedal humans represents original prototype of all vertebrates! Heretical though this view may be, de Sarre marshals some interesting facts about human hands and feet.

The hand, in Man, is an extremity which normally is used for touching and clasping objects, whereas in the other mammals, it is also used to support the body weight and to provide a means of locomotion: in fact, these are often its main functions. Apes have kept hands which are anatomically very similar to those of Man, and which they use also for getting about in a quadrupedal position.

Many herbivores now only walk on their fingers (on one finger, as in the case of the horse), after the formation of a hoof which grew out of the remaining nail(s).

We can affirm that the human hand has remained the most primitive of all with its 5 fingers, and we can also state that it has never been used to provide a means of locomotion. Just as the upright position was acquired at the very moment of the emergence from the water by the pre-hominid, the archaic shape of form of the human hand goes back to this same ancient stage of the phylogenesis of the vertebrates. Consequently, the human hand has served as a starting point for numerous evolutive transformations, right through the hoof of the herbivores, for example...

The human foot, used exclusively to provide a means of movement, the whole of which (as a plantigrade foot) is in contact with the ground, comes directly from the lower natatory paddle of the marine animalcule which

was the ancestor of all vertebrates: this explains its form in the human embryo at the age of 30 days.

Around 2 weeks later, the foot has the aspect of a hand, in that the middle toe is the longest, and the future big toe is short, but this has nothing to do with the "posterior hand" of the ape, as it is sometimes claimed... We see that the foot is palmed: it is the same kind of foot which characterized the archaic pre-hominid before he left the water, some 600 million years ago. In the very first earthly bipeds, the adapting to walking on firm ground consequently modulated the architecture of the foot, with a big toe as we know it, and the sole, which is formed by the angles made by the bones of the tarse, of the metatarses and of the phalanxes.

When he walks, and especially when he runs, Man's body weight is primarily on the big toe: the staggering development of the latter is one of the peculiarities of the human

foot. This is obviously connected with the bipedal gait. On the contrary, the evolution of the foot in the tree-dwelling primates is oriented towards a prehensile structure, where the big toe becomes opposable to the other toes, which inevitably causes a reduction in size, and even, in the long term, the complete disappearance of the latter. And so, in all logic, the evolution of Man's foot has never passed through a similar stage to that which characterizes tree-dwelling apes or monkeys. Man's aptitude is flat-footed bipedal walking, and he has been like this since the very beginning of his lineage. (R1)

Reference

- R1. de Sarre, Francois; "Man as an Ancestral Vertebrate," Bipedia, 4:19, March 1990. (X1)

BREASTS AND BUTTOCKS

BHA51 Large Female Breasts and Buttocks

Description. The very large breasts and buttocks of human females relative to the other primates.

Data Evaluation. In addition to this phenomenon coming under the heading of common observation, its uniqueness has also attracted the attentions of anthropologists who have tried to explain it in evolutionary terms. Rating: 1.

Anomaly Evaluation. In most cases where animals have developed special external features seemingly designed to attract the opposite sex, it is the males who have received the gaudy feathers and large antlers. With the subject phenomenon, the roles have been reversed. The usual explanation is that these female attributes encourage monogamy and the male investment of considerable time and energy in raising his offspring. This sounds reasonable, but is it simplistic? In any event, it is still necessary to account for the simultaneous development of the human male's fascination with these exaggerated female attributes. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. None identified so far.

Entries

X1. General observations. Relative to the apes, human females, on the average, possess much larger breasts and buttocks. Furthermore, these anatomical features appear early in life and are permanent. Anthropologists have been hard put to explain why human females alone should be so adorned. J.G.H. Cant develops one solution below.

Human females are unique in the concentration of fat deposits in breasts and buttocks. Although breasts develop in some primates during first pregnancy, human females are further distinguished by breast development during puberty, usually several years before pregnancy.



Bushwoman nursing her infant. Note the large breasts and buttocks. (R1, X1)

Humans have been interested in breasts and buttocks, in one way or another, for a long time, as illustra-

ted by the so-called Venus figurines of Upper Paleolithic Europe. More recently attempts have been made to explain the evolution of these unusual anatomical features. Here I present an integrated hypothesis, proposing that breasts and buttocks evolved to signal the female's nutritional state to males, in the context of facilitating female choice of mate. High male parental investment is critical to this point of view. I reach the conclusion that humans stand out against a general background of sexual selection wherein many animals exhibit male ornaments to attract females.

.....

I believe that fatty breasts provide an "honest" signal of maternal fitness, because there should be a positive correlation between overall fat levels and quantity of milk and/or the mother's readiness for bearing and investing in subsequent offspring. (R2)

During his explanation of large human female breasts and buttocks, Cant wonders how evolution also produced, in a parallel fashion, the innate male fascination with female breasts and buttocks!

References

- R1. Gould, George M., and Pyle, Walter L.; "Minor Terata," Anomalies and Curiosities of Medicine, New York, 1896, p. 297.
- R2. Cant, John G.H.; "Hypothesis for the Evolution of Human Breasts and Buttocks," American Naturalist, 117: 199, 1981. (X2)

BHA52 The Unusual Location of Human Breasts

Description. The location of human breasts on the chest in the same positions as those of some aquatic mammals.

Data Evaluation. The data are superficial and incomplete. We have seen no thorough survey of breast position for mammals. The claimed evolutionary connection with the sirenians (and perhaps elephants) would be undermined if other similar examples could be found. Also weakening the aquatic-ape interpretation of the phenomenon is the observation that many aquatic mammals do not have breasts in the same positions as humans and sirenians. Rating: 3.

Anomaly Evaluation. While the location of human breasts is manifestly unusual, it becomes anomalous if it is taken as support for the aquatic-ape theory, which is summarily dismissed by the scientific community. Rating: 2.

Possible Explanations. The human-sirenian connection is coincidental.

Similar and Related Phenomena. Both human females and males may possess supernumerary breasts in curious locations. In females, these extra breasts are sometimes functional, even when located on the thigh! (R1)

Entries

X1. General observations. In humans and apes, the breasts are located on the chest on a level with the armpits. As pointed out in BHA51, the breasts of human females develop earlier and are much larger than those of the female apes. There is one class of mammals, however, in which the females have large breasts in the same position as human females---the sirenians (the manatees and dugongs). Interestingly enough, these aquatic mammals seem to be the source of many of the old sightings of mermaids!

E. Morgan introduced this human-sirenian comparison in her book The Aquatic Ape as potential evidence that humans have had an aquatic phase in

their evolutionary history. (R1)

Morgan also devotes an appendix of her book to the elephant and its characteristics that seem to indicate an aquatic heritage for this mammal, too. (See BMA.) For some reason, Morgan did not point out that the breasts of the female elephant are in positions similar to those in the sirenians and humans. (WRC)

Reference

- R1. Morgan, Elaine; "Loss of Body Hair," The Aquatic Apes, New York, 1982, p. 33. (X1)

TAILS

BHA53 Human Tails

Description. The rare presence of tails or, more accurately, appendages resembling tails on humans. These tails are usually smooth and fleshy and just a few inches long. Only in the rarest of cases are they capable of movement or contain vertebrae.

Data Evaluation. The fascination of human tails has led to a substantial literature, most of which is rather old. The phenomeon, though, is well-recognized, and modern cases are on record. Rating: 1.

Anomaly Evaluation. The anomalousness of human tails depends, first of all, upon whether these appendages are really tails and not just unusual growths or terata. Since most of the purported tails examined look like tails, occur where tails are expected, and contain muscles; we conclude that a tail was intended. This settled, we ask if human tails are contrary to the theory of evolution. Since evolution affirms that we are descended from tailed ancestors, the occasional appearance of a crude tail (or atavism) really tends to confirm the validity of evolution. Thus far, human tails would be rated as merely curious, definitely not anomalous.

Human tails, however, do have a more profound implication. They suggest that some humans still carry tail-making genes that are somehow repressed by unknown mechanisms. Pursuing this theme further, one can speculate that we retain genes for many other "lost" morphological features and talents. If tails sometimes slip past repressive forces, why not other characteristics developed during billions of years of evolution? The vision of recent human evolution called forth by human tails is, therefore, one of selected release of bottled up potentials rather than the blind, random search for innovations suggested by Darwinism. This viewpoint is consistent with the role of neoteny in human development. How the repressed characteristics originated is another question. This interpretation of human tails definitely runs counter to mainstream thinking. Rating: 2.

Possible Explanations. See the preceding discussion.

Similar and Related Phenomena. The role of neoteny in human development (BHA10); vestigial organs (BHO); other possibly atavistic organs, such as webbed digits (BHA49) and human horns (BHA46).

Entries

X0. Background. Yes, humans do on rare occasions exhibit tails or, to be more objective, fleshy protuberances on their rears just where one would expect tails to be. Are these protuberances any more meaningful than a sixth finger or the (supposedly vestigial) human appendix? Human tails could be biologically significant if: (1) They either supported or undermined the theory of evolution; (2) They demonstrated a close or distant relationship with the great apes; and/or (3) They imply that hu-

mans still carry the genes or other factors that have the instructions for making tails, but which have somehow been suppressed.

The number of tales about tails is large. We have selected just those that best demonstrate the basic phenomenon and those which discuss the biological meaning (if any) of these tails.

X1. Tales of questionable authenticity. We have collected considerable material of doubtful scientific value concerning

obscure tailed tribes and peoples of remote times and places that were reported to have sported tails. (R1-R4, R17) In the interest of brevity and considering the "soft" nature of these data, we opt for a summary of some of these stories by G.M. Gould and W.L. Pyle.

The prolongation of the coccyx sometimes takes the shape of a caudal extremity in man. Broca and others claim that the sacrum and the coccyx represent the normal tail of man, but examples are not infrequent in which there has been a fleshy or bony tail appended to the coccygeal region. Traditions of tailed men are old and widespread, and tailed races were supposed to reside in almost every country. There was at one time an ancient belief that all Cornishmen had tails, and certain men of Kent were said to have been afflicted with tails in retribution for their insults to Thomas a Becket. Struys, a Dutch traveler in Formosa in the seventeenth century, described a wild man caught and tied for execution who had a tail more than a foot long, which was covered with red hair like that of a cow.

The Niam Niams of Central Africa are reported to have tails smooth and hairy from two to ten inches long. Hubsch of Constantinople remarks that both men and women of this tribe have tails. Carpus, or Berengarius Carpensis, as he is called, in one of his Commentaries said that there were some people in Hibernia with long tails, but whether they were fleshy or cartilaginous could not be known, as the people could not be approached. Certain supposed tailed races which have been described by sea-captains and voyagers are really only examples of people who wear artificial appendages about their waists, such as palm-leaves and hair. A certain Wesleyan missionary, George Brown, in 1876 spoke of a formal breeding of a tailed race in Kali, off the coast of New Britain. Tailless children were slain at once, as they would be exposed to public ridicule. The tailed men of Borneo are people afflicted with hereditary malformation analogous to sexdigitism. A tailed race of princes have ruled Rajoopootana, and are fond of their ancestral mark. There are fabulous

stories told of canoes in the East Indies which have holes in their benches made for the tails of the rowers. At one time in the East the presence of tails was taken as a sign of brute force.

There was reported from Caracas the discovery of a tribe of Indians in Paraguay who were provided with tails. The narrative reads somewhat after this manner: One day a number of workmen belonging to Tacura Tuyn while engaged in cutting grass had their mules attacked by some Guayacuyan Indians. The workmen pursued the Indians but only succeeded in capturing a boy of eight. He was taken to the house of Senor Francisco Galeochoa, at Posedas, and was there discovered to have a tail ten inches long. On interrogation the boy stated that he had a brother who had a tail as long as his own, and that all the tribe had tails. (R9)

X2. General observations. Despite the apochryphal character of the above tales, many bona fide cases of human tails---certainly hundreds of them---are to be found in the medical literature.

Human tails are generally only a few inches long, seldom more than 4 inches in length. They are mostly conical in shape, rarely cylindrical. The ends often curl, and the entire tail may be twisted like that of the pig. Some tails are hairy, being compared to a cow's tail; sometimes they are quite smooth. Although some human tails contain muscles and nerves, most are fleshy and incapable of voluntary movement. Vertebrae and cartilage are almost never found.

Human tails seem to be found mainly on males, and less frequently on members of the white race, although we have seen only a general comment to this effect. (R8)

The human embryo (and those of all mammals) exhibits a substantial tail at one stage of its development. In fact, the embryonic tail contains vertebrae, which post-natal tails almost never do. (R15)

X3. A typical soft or vertebraeless tail. One of the most comprehensive dis-

cussions of human tails appeared in Popular Science Monthly in 1892. We quote the anonymous author's treatment of "soft" tails.

A third class is composed of the "soft tails," which depend freely from the sacral and coccygeal region and are the most frequent. They have sometimes the form of a swine's

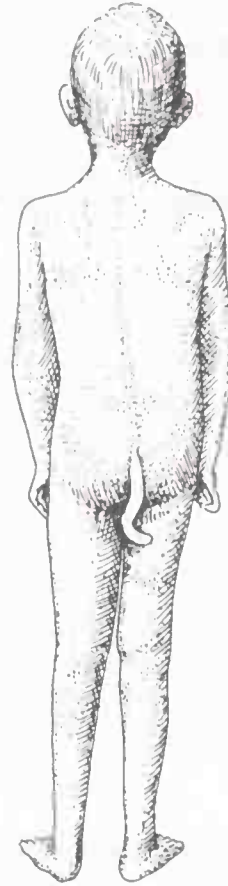


Amputated tail from an eight-week-old boy. Length: 3 inches. (X3)

tail drawn out to a point; sometimes that of a thicker fleshy appendage only slightly rolled at the end. Such soft tails, which belong to the largest of their kind and are both naked and hairy, have been observed and described, among others by Blancart, Koenig, Elsholtz, Schenk, von Grafenberg, and Greve. The last author sent a tail three inches long (see figure), which he had amputated from a boy eight weeks old, to Prof. Virchow for a more thorough examination, and he found that it was not a simple case of skin formation, but that there lay within the inner cell-texture of the skin a fatty bundle penetrated by large vessels. (R8)

Such tails were considered to be atavistic by the anonymous author.

X4. An exceptionally long soft tail. The accompanying sketch shows a 12-year-old Moi boy from Thailand. He bears a soft tail almost a foot in length. It is soft and smooth and is without bones. The long, cylindrical shape is unusual. (R7)



A Moi boy with a nine-inch tail. (X4)

X5. Offset soft tails. Most human tails are located centrally in the sacral region and appear superficially much like true tails. However, the existence of offset tails suggests that soft tails, as a class, may be merely malformations or growths of some sort without any biological affinity to the coccyx. The following example comes from Louisville, Kentucky, as reported in Science in 1884.

We found a female negro-child, eight weeks old, normally formed in all respects, except that slightly to the left of the median line, and about an inch above the lower end of the spinal column, is a fleshy pedunculated protuberance about two and one-half inches long. At the base it measures one and one-quarter inches in circumference. A quarter of an inch from the base, it is somewhat larger, and from that it tapers gradually to a small blunt point. It closely resembles a pig's tail in shape, but shows no signs of bone or cartilage. There seems to be a slight mole-like protuberance at the point of attachment. The appendage has grown in length about a quarter of an inch since the birth of the child. (R5)

A similar tail was described by F. Ledley in 1982. This tail was located 1.5 centimeters to the right of the body's midline. (R15)

X6. A soft tail capable of motion. In 1901, R. Harrison, Johns Hopkins Hospital, described a tail he removed from a boy aged 6 months. The tail was 4 centimeters long at birth but had grown to 7 centimeters by the time of excision. It contained striped muscle and "moved under various emotional states." (R10) This is the only case we have come across where a human tail actually moves in response to muscular action. Of course, the motions may have been involuntary.

X7. Tails containing vertebrae. Most writers on human tails take pains to deny that tails actually containing vertebrae are known. In truth, a few such cases are recorded in the older literature.

Real vertebral tails, in which the vertebra-containing part of the embryonal tail remains without being grown over and the coccyx preserves its original straighter direction, have been, if we may trust the older anatomists and physicians, only very rarely observed. Surgeon-General Ornstein, a few years ago, carefully studied such a case in Athens in a Greek from Livadia, twenty-six years of age. There was in this case a conical tail, free only at the tip, about two inches long, within which three vertebrae might be felt by pressing on it. It did not, however, hang perpendicularly down, but the coccyx was slightly, though less than in normal cases, bent inward. Notwithstanding its apparent firmness, this little movable tail was not distinguishable by the color of its skin from its surroundings. It was hairless, although the sacral region was very hirsute. The free part was not half as long as the whole. While only three shrunken vertebral fragments could be felt in this case, free tails of like character have been described by several of the older authors in which the normal number

of vertebrae appears to have been exceeded by four. Dr. Thirk, of Broussa, in 1820, described the fat-tail of a Kurd, twenty-two years old, which formed a thick lump and contained four surplus vertebrae. Thomas Bartholinus, also, told in the seventeenth century of a tailed boy who had more than the regular number of vertebrae in the coccyx. Such cases represent true atavistic formations, but have never been verified with as much exactness as is desirable....(R8)

X8. The human embryonic tail. There is no debate over the human embryonic tail. Not only is it present in all normal embryos, but at 4 weeks is considerably longer than the developing legs. At the sixth week, the tail may have as many as 12 vertebrae. After this, the tail begins to regress. The vertebrae shrink and fuse to become the coccyx, which is attached to the end of the spine. (R8, R15)

The coccyx does not seem to be associated in any way with the soft human tails. The existence of offset tails underscores this point. Those very rare tails that do contain vertebrae are more puzzling. If they truly occur, and the data sources do not inspire confidence, they could be just malformations or terata. (WRC)

X9. Tails and the human-ape relationship. Humans, gorillas, orangs, chimps, and gibbons all lack tails. Does this tailless condition imply a close evolutionary relationship among this select group of primates? Most scientists would reply affirmatively and explain in terms of the evolution of the so-called orthograde posture of these primates.

The orthograde group of Primates is represented today by the gibbon, orang, chimpanzee, gorilla, and man; in all of them the muscles of the spine, and of the thorax and abdomen, and all the spinal and other nerve reflexes which regulate the action of muscles, have been transformed to suit the orthograde posture; in all of them the external tail has disappeared and the basal or pel-

vic vertebrae of the tail have been reduced to a coccygeal form. (R10)

The quotation above obviously sees evolutionary unity in taillessness. A somewhat different view has been espoused by D. Dewar.

It may be noted that the os coccyx is situated lower and is longer in man than in the anthropoid apes, being composed of four vertebrae in the former and three in the latter. Thus, if man descended from an anthropoid ape, his os coccyx has increased in size. These differences correspond to profound differences between the organization of man and that of the anthropoid apes. In man the absence of a tail is essential to his erect posture; in the apes were the coccyx not very short and situated higher than in man, the process of giving birth to the young would as Vialleton points out, be greatly impeded. 'To regard,' he writes, 'the absence of a tail as a character common to man and the anthropoids is to disregard the differences of structure that are hidden behind this apparent resemblance, and to fail to appreciate the different condition to which the anatomy of each type responds. (R13)

Taillessness, then, may have developed independently in man and apes for different reasons.

In this context, it would be interesting to know whether the tailless apes, like humans, on rare occasions also sport the kinds of tails described above. (WRC)

X10. The possible evolutionary significance of an occasional tail. The rare occurrence of tail-like appendages in humans is taken by many as proof that humans descended from animals that possessed tails normally. However, the examples of human tails provided above cast doubt on the assertion that they are really tails---most might be terata; that is, abnormal growths that happen to favor the sacral region. But assuming for the moment that human tails are really echos of distant ancestors, they imply that humans still possess genes for manufacturing tails, but that they

are now suppressed save in rare cases. Human tails, in this view, are atavistic ---throwbacks. Have we been carrying suppressed tail genes for millions of years? D.T. Gish, a creationist, does not buy this interpretation.

Presumably, then, we would also be carrying along in our human genetic apparatus other genes that are responsible for all other characteristics seen in our monkey-like ancestors but not seen in man. Following this thinking to its logical conclusion, the human genetic apparatus should still be carrying every gene ever possessed by any of our ancestors, even the genes that make a worm a worm, if indeed a worm was the ancestor of vertebrates. (R16)

It is true that humans and other life forms do seem to carry excess genetic baggage in the form of useless or "non-sense" DNA. No one really knows the purpose, if any, of excess DNA. The appearance in man of worm-like characters seems most unlikely, but Gish does make an interesting point. (WRC)

References

- R1. "Men with Tails," Zoologist, 7:2618, 1849. (X1)
- R2. "Men with Tails," Scientific American, 5:19, 1849. (X1)
- R3. "Man and Monkey," Scientific American, 10:80, 1854. (X1)
- R4. "Men Reported to Have Tails," Eclectic Magazine, 10:506, 1869, (X1)
- R5. Eaton, H.W.; "A Tailed Child," Science, 3:673, 1884. (X5)
- R6. "On the Human Tail," Journal of Science, 22:416, 1885, (X10)
- R7. "Caudal Appendage in Man," Scientific American, 60:295, 1889. (X2)
- R8. "Tail-Like Formations in Men," Popular Science Monthly, 40:347, 1892. (X3, X7, X8)
- R9. Gould, George M., and Pyle, Walter L.; "Human Tails," Anomalies and Curiosities of Medicine, New York, 1896, p. 277. (X1)
- R10. "Human Tails," Nature, 106:845, 1921. (X6, X9)
- R11. Keen, W.W.; "More Human Tails," Science, 65:448, 1927.
- R12. "A Seven-Inch Human Tail," Science, 68:sup xiv, November 16, 1928.

- (X3)
- R13. Dewar, Douglas; "The Development of the Animal Embryo," The Trans-formist Illusion, Murfreesboro, 1957, p. 199. (X9)
- R14. Shute, Evan; "The Human Tail," Flaws in the Theory of Evolution, Philadelphia, 1961, p. 39.
- R15. Gould, Stephen Jay; "Fascinating Tails," Discover, 3:40, September 1982. (X5)
- R16. Gish, Duane T.; "Evolution and the Human Tail," ICR Impact Series No.117, March 1983. (X10) ICR = Institute for Creation Research.
- R17. Goss, Michael; "Tales of Men with Tails," Fate, 40:32, February 1987. (X1)
- R18. "Seven-Inch Tail on Baby," Science News Letter, 14:307, 1928. (X3)

EMBRYO

BHA54 Concordance of Human Embryo Growth and Evolutionary Developments

Description. A concordance between the development of the human embryo (embryo-fetus size vs. embryo development time) and evolutionary events in the fossil record.

Data Evaluation. The concordance at hand is mainly the work of a single individual. So far, no evaluations or discussions of the work have appeared. The data employed for human embryonic developments are doubtless of high quality. The dating of the fossil record and the times at which certain evolutionary developments occurred are less certain. In addition, the study was done for human embryos only. Rating: 2.

Anomaly Evaluation. Even though the Biogenetic Law has been used for decades as a "proof" of the theory of evolution, it seems to be in scientific limbo at present. Some biologists doubt its validity and significance; others think it has value and has been discarded with insufficient reason. If the Biogenetic Law had been firmly denied by the scientific community, the concordance under discussion, which tends to support it, would be highly anomalous. But, with the Biogenetic Law being in limbo, the challenge of the concordance to biological thinking is lessened. Rating: 3.

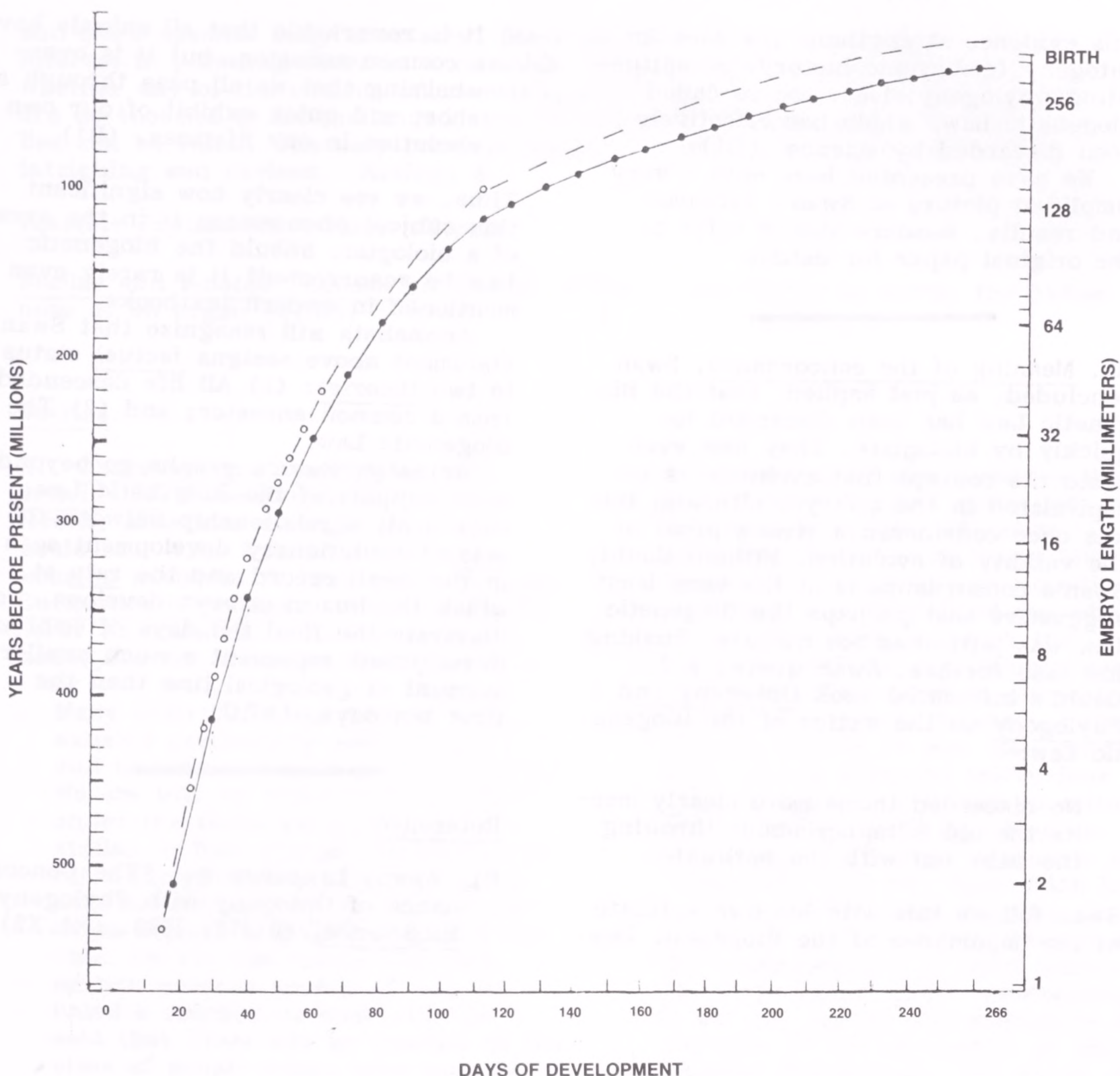
Possible Explanations. The concordance could be coincidental; it may not hold for other species. The Biogenetic Law is valid after all.

Similar and Related Phenomena. See Subject Indexes in the other Series-B Catalogs under Biogenetic Law.

Entries

X1. Graphs comparing ontogeny and phylogeny. A remarkable comparison of human embryonic development with evo-

lutionary developments seen in the fossil record has been put forward in graphical form by L.W. Swan.



Swan's plots of embryo growth (solid circles) and evolutionary developments (open circles). See text for details. (R1, X1)

The first graph (represented by solid circles in the figure) plots human embryonic and fetal growth, as measured by crown-rump length, against the number of days of embryonic development. This graph is straightforward, but note that embryonic-and-fetal growth is plotted on an exponential scale.

The second graph (open circles) requires more explanation. It is based on evolutionary events seen in the fossil record, such as the first appearance of ear ossicles in mammals skulls some 210 million years ago. Swan provides details

on other evolutionary innovations, assigning each a time-of-appearance in the fossil record. These innovations or developments also appear during the development of the human embryo and fetus. The ear ossicles, for example, appear at day 63. This figure plus the 210-million-year age of the first ear ossicles in the fossil record permit the construction of a second graph, which consists of geological time plotted against the day of embryonic development. Swan's second graph concords well with the first graph. The implication, clearly stated by Swan, is that

this evidence strengthens the case for ontogeny (embryonic history) recapitulating phylogeny; i.e., the so-called Biogenetic Law, which has effectively been discarded by science. (R1)

We have presented here only a very simplified picture of Swan's rationale and results. Readers should refer to the original paper for details.

X2. Meaning of the concordance. Swan concluded, as just implied, that the Biogenetic Law has been discarded too quickly by biologists. They now even avoid the concept that evolution is recapitulated in the embryo, although this was once considered a strong proof of the validity of evolution. Without doubt, Swan's concordance is at the very least suggestive that perhaps the Biogenetic Law was jettisoned too quickly. Pushing his case further, Swan quoted S.J. Gould's influential book Ontogeny and Phylogeny on the matter of the Biogenetic Law:

No discarded theme more clearly merits the old metaphor about throwing the baby out with the bathwater.

Swan follows this with his own estimate of the importance of the Biogenetic Law:

It is remarkable that all animals have a common ancestor, but it is overwhelming that we all pass through a short and quick exhibit of our own evolution in our lifetimes. (R1)

Thus, we see clearly how significant this subject phenomenon is in the eyes of a biologist. Should the Biogenetic Law be resurrected? It is rarely even mentioned in modern textbooks.

Anomalists will recognize that Swan's statement above assigns factual status to two theories: (1) All life descended from a common ancestor; and (2) The Biogenetic Law.

Actually, Swan's graphs go beyond mere support of the Biogenetic Law; they imply a relationship between the rate of evolutionary development seen in the fossil record and the rate at which the human embryo develops. To illustrate the final ten days of embryonic development represent a much smaller segment of geological time than the first ten days. (WRC)

Reference

- R1. Swan, Lawrence W.; "The Concordance of Ontogeny with Phylogeny," BioScience, 40:376, 1990. (X1,X2)

ODORS

BHA55 Anomalous Human Odors

Description. Unusual odors emitted by the human body under various circumstances.

Data Evaluation. Most of the literature uncovered comes from the 1800s and has a casual, hearsay flavor. Apparently, no systematic, scientific effort has ever been made to categorize or discover the precise causes of human odors.

Rating: 3.

Anomaly Evaluation. The chemicals released by the human body and consequently the body's odors vary with the nature of the food eaten, the state of health,

and one's specific body chemistry. Since biologists seem to have taken little interest in persuing odors in a scientific way, we have no way of knowing whether any of the curious odors cataloged below are anomalous or not. There are no theories to be challenged, and therefore no baseline against which anomalies can be rated. The only possible comment is that human odors are at least intriguing and curious. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Human relative insensitivity to odors; the human nose as an organ (BHO).

Entries

X1. Observations regarding specific individuals. Some people just smell different, sometimes strongly so. G.M. Gould and W.L. Pyle recorded some amusing examples in their Anomalies and Curiosities of Medicine, which we quote here. No scientific points are being made, and no anomalies are claimed!

Many individuals are said to have exhaled particularly strong odors, and history is full of such instances. We are told by Plutarch that Alexander the Great exhaled an odor similar to that of violet flowers, and his undergarmets always smelled of this natural perfume. It is said that Cujas offered a particular analogy to this. On the contrary, there are certain persons spoken of who exhaled a sulphurous odor. Martial said that Thais was an example of the class of people whose odor was insupportable. Schmidt has inserted in the Ephemerides an account of a journeyman saddler, twenty-three years of age, of rather robust constitution, whose hands exhaled a smell of sulphur so powerful and penetrating as to rapidly fill any room in which he happened to be. Rayer was once consulted by a valet-de-chambre who could never keep a place in consequence of the odor he left behind him in the rooms in which he worked. (R4)

X2. An odiferous forearm. The cases of curious odors, some coming from very limited portions of the body, are very common. We limit ourselves to only one of these.

Dr. Spozanza of Parma relates the case of an individual whose left forearm emitted an odor of Amber, or of Benzoin, or Balsam of Peru. The odiferous emanations were sometimes so strong that they filled the whole of the large room in which the Doctor conducted his experiments upon this personage, whom he suspected at first of some charlatanry, but of whose sincerity he was soon convinced. He was a man of thirty-four years of age, of a robust constitution, (having, until that time enjoyed constant health) agreeable eyes, expressive features, dark thick hair, a ruddy countenance, muscles prominent,---a man of ardent feelings and quick penetration; to whom nature had been liberal in her endowments. It did not appear that electricity had any part in the production of this singular phenomenon. An attack of bilious fever, in the course of two months, destroyed the cause, and the effect did not return after his recovery. (R1)

X3. Odor and gender. We quote here from the abstract of R.L. Doty et al, who studied the breath odors of males and females!

During five consecutive daily test sessions, 10 men and women rated the relative intensity and pleasantness of breath odors from 14 males and 19 females on a no-oral-hygiene regimen. In addition, the likely gender of the donor of each odor was estimated. The breath odors of males were rated, on the average, as more

intense and less pleasant than the breath odors of females. Women consistently gave lower pleasantness ratings to the odors than did men. Both the male and female judges assigned the breath odors to the correct gender classes at a frequency unlikely due to chance, although the females were more accurate in this regard. (R5)

X4. Following coitus. Again we rely on Gould and Pyle:

Preisman in 1877 makes the statement that for six hours after coitus there is a peculiar odor noticeable in the breath, owing to a peculiar secretion of the buccal glands. He says that this odor is most perceptible in men of about thirty-five, and can be discerned at a distance of from four to six feet. He adds that this fact would be great medico-legal value in the early arrest of those charged with rape. In this connection the analogy of the breath immediately after coitus to the odor of chloroform has been mentioned. The same article states that after coitus naturally foul breath becomes sweet. (R4)

X5. During illnesses.

Gout, icterus, and even cholera have their own odors. Older observers, confirmed by Doppner, say that all the plague-patients at Vetlianka diffused an odor of honey. In diabetes there is a marked odor of apples. The sweat in dysentery unmistakably bears the odor of the dejecta. Behier calls the odor of typhoid that of the blood, and Berard says that it attracts flies even before death. Typhus has a mouse-like odor, and the following diseases have at different times been described as having peculiar odors,---measles, the smell of freshly plucked feathers; scarlatina, of bread hot from the oven; eczema and impetigo, the smell of mold; and rupia, a decidedly offensive odor. (R4)

X6. During insanity. The following letter is from the Journal of Science of 1881:

Although you ridiculed Dr. Richardson's opinion that the insane have a peculiar smell, perhaps the subject may be worthy of inquiry. I have been assured, by one who had means of observing, that nearly all the insane have a peculiar odour, which varies much in different patients, but which my informant thinks can be generally distinguished from other personal odours. May not disorders of the brain be associated with disorders of the excretions? (R2)

Gould and Pyle state that the odor of lunatics resembles that of yellow deer or mice, and that physicians can use this odor to determine whether a patient is feigning insanity. (R4)

X7. Before death.

Dr. A.B. Isham, Professor of Materia Medica and Therapeutics in the Cincinnati College of Medicine and Surgery, calls attention in the American Journal of the Medical Sciences for April, 1881, to the peculiar ante-mortem odor encountered in many cases at a variable period before the fatal result; in one case he noticed it thirty-three hours before death. The smell is analogous to musk, but is rather more pungent and less diffusible. He is inclined to attribute the phenomenon to the liberation of ammonia and of the peculiar volatile oil (fatty acid) which gives the blood its odor, this liberation being caused by the diminished vitality of the blood. (R3)

References

- R1. "Singular Case of Odiferous Emanations," American Journal of Science, 1:22:368, 1832. (X2)
 R2. "The Smell of the Insane," Journal of Science, 18:623, 1881. (X6)
 R3. "The Death Odor," Scientific American Supplement, 11:4547, 1881. (X7)
 R4. Gould, George M., and Pyle, Walter L.; "Human Odors," Anomalies and Curiosities of Medicine, New

York, 1896, p. 397. (X1, X4-X6)

R5. Doty, Richard L., et al; "Communication of Gender from Human Breath Odors: Relationship to Perceived Intensity and Pleasantness," Hormones and Behavior, 16:13, 1982. (X3)

VIBRATIONS

BHA56 Natural Human Vibrations

Description. Minute vibrations of the entire body detectable only with instrumentation. Vibration amplitudes are measured as only a few microns; the frequencies are in the 6-12 Hertz range.

Data Evaluation. Although only one study of the phenomenon has been found, this reference mentions other work in the field, which has not yet been examined. Rating: 2.

Anomaly Evaluation. Initially, one is surprised to discover that the entire human body vibrates like a drumhead. However, in nature everything seems to vibrate, usually at amplitudes and frequencies that humans cannot detect directly. This phenomenon is akin to the unseen but measurable electrical characteristics of living organisms. As for accounting for the vibrations, the animal body contains muscles that are always in motion, particularly the heart and those associated with breathing. It is not really anomalous then to measure continuous vibrations, given the body's pulsing internal machinery and its complex elastic constitution. Human vibrations, like the earth's microseisms, are to be expected; we therefore relegate them to the curiosity file. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. The vibrations of any physical system (the earth or even an automobile) containing pulsing energy sources.

Entries

X1. General observations. Although we cannot feel them and they are not apparent to others without the use of instrumentation, the human body, and presumably the bodies of other mammals, vibrate continuously. J.G.L. Williams has provided an overview.

Rohracher has claimed that the entire surface of the human or homeothermic animal body exhibits minute

continuous vibrations. During the past several years a number of workers have given support to Rohracher's contention that: "with suitable apparatus a system of continuous microscopic vibrations can be demonstrated in the human and animal body. In a healthy human being in the condition of greatest relaxation its magnitude is 1-5 μ and its frequency 6-12 vibrations per second

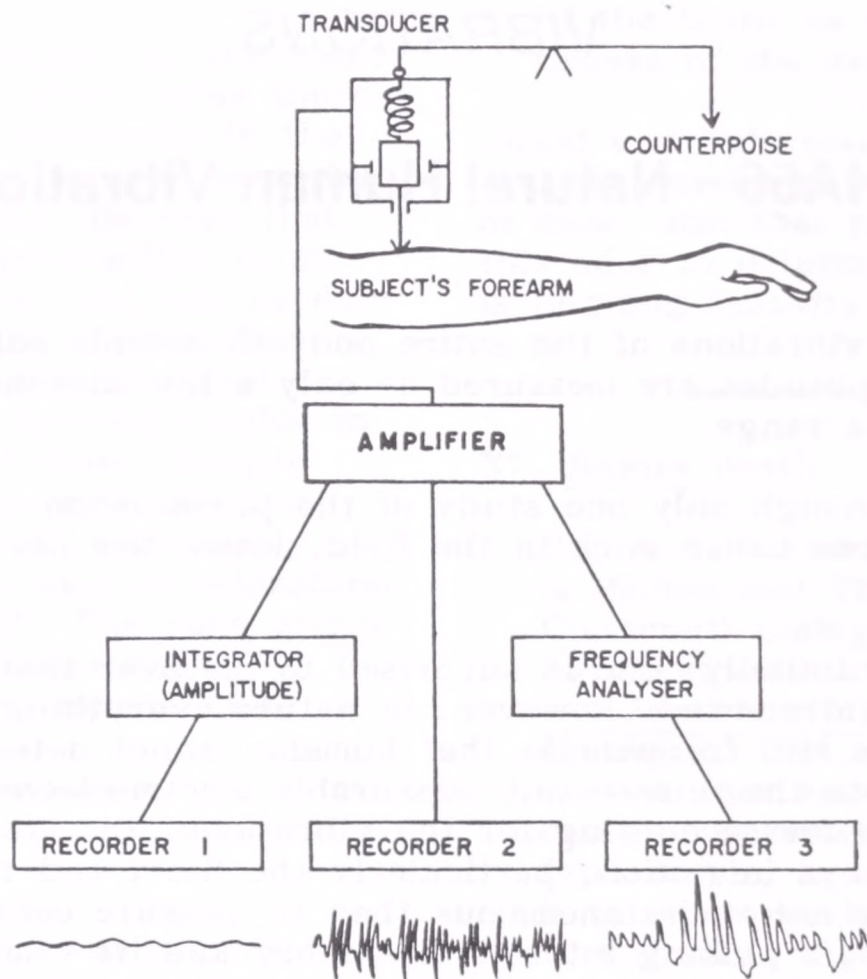
...we are not concerned with electrical processes but with a microscopically small rhythmic vibration system of the organism. (R1)

physical system in resonance. The purpose of the vibrations may be to maintain body temperature and keep the muscles in readiness for action. (R1)

Building upon the work of Rohracher and others, Williams found that the amplitude of the vibrations is a measure of muscle tension and gross bodily activity. Williams points to the body's muscles as the energy source for the vibrations and views the entire body as a complex

Reference

R1. Williams, James G.L.; "A Resonance Theory of 'Microvibrations'," Psychological Review, 70:547, 1963.



Experimental arrangement for recording human microvibrations. (X1)

BHB ANOMALOUS HUMAN BEHAVIOR

Key to Phenomena

BHB0 Introduction

GENERAL ASPECTS OF INDIVIDUAL HUMAN BEHAVIOR

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- BHB2 Similarities in the Behaviors of Identical Twins Reared Apart
- BHB3 Correlation of Disturbed Human Behavior and Solar Activity
- BHB4 Correlation of Disturbed Human Behavior and Lunar Phase
- BHB5 Correlations of Disturbed Human Behavior, Stormy Weather, and Infrasound
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- BHB23 Handedness and Mathematical and Verbal Abilities

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- BHB24 The Uniqueness of Bipedalism
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FERAL CHILDREN

- BHB26 Wolf-Children

HUMAN EMINENCE

- BHB27 Eminence Correlated with Time of Birth
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- BHB29 Eminence in Sports Champions Correlated with the Position of Mars: the "Mars Effect"
- BHB30 Cultural Creativity Correlated with Solar Activity
- BHB31 Cultural Flowering Correlated with Climate
- BHB32 Eminence and Order of Birth
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- BHB34 Eminence Correlated with Longevity

HUMAN INTELLIGENCE

- BHB35 Intelligence Correlated with Season of Birth
- BHB36 Intelligence Correlated with Birth Order
- BHB37 Intelligence Correlated with Myopia
- BHB38 A Relationship between Intelligence and Flicker-Frequency Response
- BHB39 Increasing Intelligence with Vitamin Intake
- BHB40 The Intelligences of Identical Twins Reared Apart
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BHB0 Introduction

This chapter on human behavior differs from the usual discussions found in the textbooks because it is restricted to anomalous behavior---the kind that is hard to assimilate into traditional paradigms. Many of the themes are controversial, as the following list will demonstrate:

- (1) Some aspects of human behavior may be affected by the positions of the moon and the planets.
- (2) Intelligence and other performance parameters may be a function of the individual's order of birth.
- (3) Climate and weather help determine not only individual behavior but also the performance of whole cultures.
- (4) Some aspects of human behavior are periodic or rhythmic.

The nature of many of these potential anomalies requires the researcher to indulge in correlations; that is, the linking of one parameter to another, say, the incidence of disturbed behavior with solar activity. Many dangers lurk in correlation analysis, and some scientists have foundered in statistical morasses. Then, even with strong correlations, a cause-and-effect mechanism is often difficult to find and conventional explanations are impossible.

Behavior is defined broadly here. Handedness, locomotion modes, "flock" behavior, and cultural parameters are included. Certainly the most common aspects of

behavior involved in the anomalies of this chapter are "eminence" and "intelligence". The two parameters may overlap in that some eminent people are obviously very intelligent. However, many of our most intelligent citizens are not eminent. "Eminence" is determined by listings in Who's Who-type books, whereas intelligence is determined by IQ tests. It must be recognized, though, that the two parameters cannot be completely separated.

The series of Catalogs on biological anomalies (the B-series) does not encompass the sort of mental phenomena usually associated with parapsychology, nor does it include mental feats, dissociative behavior, psychosomatic medicine, etc. Such topics are to be found in the Catalog series on psychology (the P-series).

GENERAL ASPECTS OF INDIVIDUAL HUMAN BEHAVIOR

BHB1 Apparently Irrational Human Behavior

Description. Human behavior that seems contrary to the survival and well-being of the species, such as destruction of the environment and the avoidance of population control.

Data Evaluation. Almost every daily paper contains at least one forecast of global doom founded upon human action and/or inaction. This Catalog entry, like the newspapers just mentioned, is not based upon hard scientific data but human perception and expectation. Rating: 3.

Anomaly Evaluation. To be rational and to adhere to the widely accepted dictates of the theory of evolution, the human race should be making every effort to preserve itself and even enlarge its domain. Nevertheless, humanity acts irrationally in many ways, as outlined in X1 below. Actually, it is presumptuous of us to label such behavior "irrational" because some seemingly irrational acts may ultimately turn out to be beneficial; after all, doomsayers have always been with us! Nevertheless, it does seem, intuitively if you will, that the human race could self-destruct. This behavior is contrary to the theory of evolution, which expects each species to endeavor to survive. Therefore, we have here an important anomaly. Rating: 1.

Possible Explanations. Selfish genes modify human behavior to serve their purposes, which may be different from ours. Likewise, endosymbionts may have different agenda from our own.

Similar and Related Phenomena. Many parasites and disease organisms affect the behaviors of their hosts, as in the case of rabies in humans. (BHX)

Entries

X1. General observations. Humans, as individuals and members of society, sometimes engage in behavior that seems

to be contrary to the survival and well-being of the species. Some oft-stated examples of such destructive behavior are:

Total warfare
 Genocide
 Destruction of the environment
 Development of weapons of mass destruction
 Unchecked population explosion
 Widespread use of drugs.

Of course one can argue with any of these examples, saying that despite their apparent irrationality the human population continues to increase and expand its domain. But, since so many forecasters and experts assure us that catastrophe lies just ahead, we hereby label such human behavior as irrational and anomalous---at least for the purposes of the Catalog of Anomalies.

X2. A possible source of irrational behavior. Science avoids supernatural explanations of human behavior, but it very well could be that irrational human behavior is shaped by "selfish genes" as suggested by R. Dawkins in his book The Selfish Gene. (R1) In essence, Dawkins believes that our genes have an agenda different from our own. This could lead to what seems to be irrational behavior to us, while being quite reasonable to our genes. This is obviously a controversial hypothesis. To explain more fully, we quote from a review of Dawkins' book by P.W. Sherman:

He [Dawkins] proceeds by asserting that because genes are the fundamental particles of evolutionary change, they are also the most basic units of egotism. By definition, they behave selfishly. In Dawkins' fanciful prose: 'Now they [genes] swarm in huge colonies, safe inside lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating

it by remote control. They are in you and me;...their preservation is the ultimate rationale for our existence...we are their survival machines.'

Dawkins next argues that because genes are passed from generation to generation and because the ontogeny of at least some behavior is developmentally canalized, all behavior is linked, however, circuitously, to genes. An appreciation of the selective forces causing some genes to outproduce others can lead to a greater understanding of why organisms behave the way they do because phenotypes are nothing more than the selfish genes buffering themselves against past perturbations and unpredictabilities in their environment. In the applicability of these two assertions to human behavior lies the crux of the sociobiology controversy. (R2)

Thus, in Dawkins' view, with the genes in control of human behavior, any impending human catastrophe, due to what appears to ourselves as irrational behavior, will not be dealt at all because the currently operative instructions controlling their carriers (us!) have been highly successful in protecting and multiplying genes. Our genes cannot forecast events; they only react and adjust their carriers (us) later. (WRC)

References

- R1. Dawkins, Richard; The Selfish Gene, New York, 1976. (X2)
 R2. Sherman, Paul W.; "Why Are People?" Human Biology, 50:87, 1978. (X2)

BHB2 Similarities in the Behaviors of Identical Twins Reared Apart

Description. Similar actions, mannerisms, hobbies, life styles, and other aspects of behavior among identical twins reared apart. Often these concordances are labelled "astonishing" and "arcane".

Data Evaluation. Research on identical twins has long been popular. In particular, several large studies have been done on identical twins that have been reared apart. Consequently, the literature on twin similarities is impressive. On the other hand, little has been published on the discordances in the behaviors of identical twins, and still less upon the behavioral similarities between random pairs of unrelated individuals of the same age. Until these omissions are rectified the real significance of the similarities among identical twins will be in question.
Rating: 2.

Anomaly Evaluation. The paradigm that nurture (environmental influences) always dominates nature (the genes) in shaping one's behavior is seriously undercut by the analysis of identical twins reared apart. The remarkable similarities between these twins seem to show that their different environments had little effect in determining their behaviors. However, as pointed out above, twin studies have favored the analysis of similarities over dissimilarities, and we do not have enough information about similarities between unrelated pairs of people of like ages. If this research is done and it supports the work on twin similarities, the behavioral similarities summarized below will constitute important anomalies.
Rating: 1.

Possible Explanations. Behavioral similarities are actually quite common, even among unrelated people in the same age brackets, providing one asks enough questions!

Similar and Related Phenomena. Discordances in the appearances of identical twins reared apart (BHA8).

Entries

X0. Background. The remarkable behavioral similarities between identical twins who were reared apart have long fuelled the nature-versus-nurture controversy. The studies of twins in this regard actually date back more than a century, when Sir Francis Galton introduced them in England. C. Holden has remarked that even a century ago, twin studies tended to favor the "nature" side of the argument:

Galton's famous statement that within a given stratum of a population, 'nature prevails enormously over nurture,' would be a naked heresy to most modern social scientists. It does indeed imply a false dichotomy in view of the interrelatedness of genetic and environmental influences. Yet,

research suggests that Galton's essential perception is closer to the truth than the overwhelmingly environmentalist interpretations of human behavior that have held sway in postwar years. (R8)

Indeed, today's social scientists still strongly favor nurture over nature as a determinant of human behavior. But, as in Galton's time, the often-bizarre similarities in the behavior of identical twins are gnawing away at the nurture-over-nature paradigm.

X1. General observations. Actually, we expect identical twins to look alike and even behave alike, though perhaps to a

lesser degree in the matter of behavior. In other words, their genes may control their appearances to a great degree, but their different experiences and environments should cause their behaviors to diverge. However, even when identical twins have been reared apart, with little or no contact, remarkable, often arcane behavioral similarities have been found. S.L. Farber has generalized in her book Identical Twins Reared Apart:

...why should most of these twins laugh alike, describe symptoms in the same way, smoke similar numbers of cigarettes, choose similar creative pursuits, and sometimes even marry the same number of times? Someone will have to examine if, in fact, the similarity in mannerisms described in this sample exists in another sample, and if it does (and I suspect it will) someone will have to fathom why twins reared in different environments should so frequently bite their nails, grimace, snicker, tap their fingers, and even have "neurotic" symptoms such as globulus hystericus in such similar ways. That activity levels might have innate components is not hard to envision, but the suggested specificity at the level of mannerisms and nervous habits is hard to comprehend. (R2)

Our overview of this phenomenon indicates that its anomalousness, if any, probably derives from both the bizarreness and very detailed character of some of the similarities. Also claimed by some writers (R5) is the occasional synchronicity of some similar actions; that is, there is weak evidence that identical twins, though separated by distance, may on occasion do identical things at the same time. It's no wonder that some students of the phenomenon have resorted to paranormal explanations! (R6) Such do not really seem necessary however.

X2. The case of the two Jims. A classic, oft-quoted case is that of Jim Lewis and Jim Springer, who were adopted by different families when they were four weeks old. Jim Springer's adoptive parents thought that Jim's twin had died at birth and told him so when he was in his teens. When the two Jims were

finally reunited, a strange list of similarities emerged that went beyond the coincidence of their of bearing the same first name:

- Both had worked in law enforcement, as gas-station attendants, and at McDonalds selling hamburgers.
- Both had married women named Linda, divorced their first wives, and re-married women named Betty.
- As children they both owned dogs named Toy.
- Both grew up with an adopted brother named Larry.
- They named their first sons James Alan and James Allan.
- Both employed the same slang words.
- They both spent their holidays at the same beach in St. Petersburg, unaware of each other, after driving there in their Chevrolets. (R5)

Yes, such similarities are bizarre, but in X6-X8, we shall see that one must not overrate them.

X3. The Bridget-Dorothy case. Most articles on the identical-twin phenomenon mention the eerie similarities of these two women. We quote K. Cassill:

Bridget Harrison and Dorothy Lowe are English twins in their late thirties. At their initial encounter, each woman happened to wear seven rings; each had two bracelets on one wrist and a watch and a bracelet on the other. None of the astounded team of researchers who greeted them has been able to get over this "coincidence." Certainly, no one is rash enough to suggest that it was entirely predetermined by the genes.

.....

Bridget Harrison named her children Richard Andrew and Catherine Louise. Her twin, Dorothy Lowe, named hers Andrew Richard and Karen Louise. She chose the name Karen to please a relative...she really wanted the name Katherine. (R5)

X4. Oskar and Jack. C. Holden has reviewed a case where the two twins had radically different upbringings:

When Oskar Stohr and Jack Yufe arrived in Minneapolis to participate in University of Minnesota psychologist Thomas A. Bouchard, Jr.'s study of identical twins reared apart, they were both sporting blue double-breasted epauletted shirts, mustaches, and wire-rimmed glasses. Identical twins separated at birth, the two men, in their late 40s, had met once before two decades earlier. Nonetheless, Oskar, raised as a Catholic in Germany, and Jack, reared by his Jewish father in Trinidad, proved to have much in common in their tastes and personalities---including hasty tempers and idiosyncratic senses of humor (both enjoyed surprising people by sneezing in elevators). (R8)

X5. Synchronism in the lives of identical twins. This aspect of the behavior of identical twins is the most mysterious. It is also supported by very little hard data. K. Cassill has stated:

Synchronous events in the lives of even temporarily separated identical twins may or may not, then, be related to the new information that the Minnesota team is discovering. I refer to those instances, common among twins, when one twin will call her sister to report buying a new beige blouse. The sister had bought the exact same style of blouse, at the same hour, though the two live in different parts of the country. Or a man talking on the telephone to his twin brother will mention having stopped on the way home from work to watch firemen battle a blaze, only to find his brother had, also. (R5)

X6. Discordances between identical twins reared apart. In the popular publications on twins, the emphasis is on similarities. Though these are impressive, discordances in both appearance (BHA8) and behavior do occur; and any complete theory must encompass these, too.

A significant area of discordance is in the matter of smoking. In one study, of nine pairs of twins reared apart, there were four pairs in which one

smoked and the other did not.

In two instances one twin wore glasses but the other did not. Curiously, when their eyes were checked, both did need glasses, and their eyes required the same corrections. (R1)

X7. Similarities between unrelated people. W.J. Wyatt et al, skeptical about the significance of the similarities between identical twins sensationalized in the popular press, decided to compare the similarities among identical twins and among unrelated people of the same sex and roughly the same age. Here are a few sentences from their report:

These data support the notion that we must be skeptical of claims about paranormal causes of similarities between identical twins (even those reared apart because similarities are quite common, even among unrelated individuals.

Thus the population's naturally occurring level of similarity must be taken into account in any evaluation of the subset of identical twins. Our data strongly suggest that it is relatively easy for almost any two people of roughly the same age and sex to find similarities that may seem unusual. For example, one of our unrelated pairs of women shared these characteristics: Both are Baptist; volleyball and tennis are their favorite sports; their favorite subjects in school were English and Math (and both listed shorthand as their least favorite); both are studying nursing; and both prefer vacations at historical places. Had these similarities been found in a pair of identical twins (who had been reared apart) they might have been used as evidence for astrology, ESP, and the like. (R6)

Obviously, great caution is required in assessing similarities. Other researchers have voiced the same warnings, anticipating that by asking enough questions one could find astonishing similarities among unrelated pairs of people in the same age bracket. (R3)

The levels of comparison selected in the study of Wyatt et al yield less-detailed and less-bizarre similarities than in the other twin studies cited earlier.

To illustrate, we would expect a lot of twins and pairs of unrelated people who like pizza, but it is unlikely that we would find many pairs of randomly selected women each wearing seven rings!

References

- R1. Holden, Constance; "Identical Twins Reared Apart," Science, 207:1323, 1980. (X3, X6)
- R2. Farber, Susan L.; "Paradoxes and Speculations," Identical Twins Reared Apart, New York, 1981, p. 268. (X1)
- R3. Ross, Richard J.; "Separated Twins: Data and Their Limits," Science, 215:959, 1982. (X7)
- R4. Powledge, Tabitha M.; "The Importance of Being Twins," Psychology Today, 17:21, July 1983.
- R5. Cassill, Kay; "Twins Reared Apart and the Bonds They Keep," Twins: Nature's Amazing Mystery, New York, 1984, p. 169. (X2, X3, X5)
- R6. Wyatt, W. Joseph, et al; "Natural Levels of Similarities between Identical Twins and between Unrelated People," Skeptical Inquirer, 9:62, Fall 1984. (X7)
- R7. Rosen, Clare Mead; "The Eerie World of Reunited Twins," Discover, 8:36, September 1987.
- R8. Holden, Constance; "The Genetics of Personality," Science, 237:598, 1987. (X0, X4)

BHB3 Correlation of Disturbed Human Behavior and Solar Activity

Description. The positive correlation of disturbed human behavior (psychiatric hospital admissions, suicides, homicides) and solar activity (sunspot number, geomagnetic field disturbances, Forbush decreases of cosmic-ray levels).

Data Evaluation. Several studies of the subject phenomenon are available, but all do not concur on the reality of the phenomenon. Furthermore, the measures used for human behavior are admittedly crude and subjective; and the measures of solar activity, while more objective, are several in number. It is difficult to compare one study with another. Generally, one is forced to say that the data employed in the analyses are vague and inconsistent. Rating: 3.

Anomaly Evaluation. If disturbed human behavior can be linked convincingly to solar activity, it would represent a significant anomaly, because no causal mechanism linking these parameters is now recognized. Rating: 1.

Possible Explanations. Shifting geomagnetic fields could induce changes in the human nervous system. A causal chain might also connect solar activity with human behavior through weather changes and the generation of infrasound, since some scientists now believe that solar activity does influence weather, and that weather systems do generate infrasound which, in turn, seems to affect human behavior.

Similar and Related Phenomena. The correlation of human behavior with the weather and infrasound (BHB5). Solar activity has also been correlated with collective human behavior, such as economic activity (BHB10).

Entries

X0. Background. In the Catalog of Anomalies one finds many phenomena correlated with solar activity. In this section, solar activity is the independent variable, as measured in terms of sun-spot number or by secondary parameters, which are causally linked to solar activity, such as geomagnetic activity and cosmic-ray levels. The dependent variable is general human behavior, in this case disturbed human behavior, as measured by admissions to psychiatric treatment and rates of accidents in various occupations. Admittedly, both the independent and dependent variables are a bit on the vague side. They are, however, adequate for rough exploratory studies.

X1. Admissions to psychiatric treatment. Solar activity has been correlated with just about every human phenomenon. In the case of mental disturbances, the sun-human link was suspected many years ago:

Early studies. In 1918, T. and B. Dull reported on an analysis of about 40,000 cases occurring over 5 years, in which there was a clear correlation between the 67 magnetic storms during that time span and the incidence of mental illnesses and suicides. However, since no causal relationship between magnetic storms and human behavior was known, their study attracted little interest. (R1)

The first report of Friedman et al. The next important study was that of H. Friedman et al, which appeared in Nature in 1963. They attempted to correlate the dates of magnetic storms with the number of admissions to psychiatric hospitals. Here follows their conclusion:

In general, the tentative conclusion of the pilot study can be reaffirmed: a significant relationship has been shown between psychiatric disturbances as reflected in hospital admissions and the natural magnetic field intensity. In any interpretation of this relationship it should be cautioned that it is beyond the scope of this investigation to determine whether the more meaningful geophysical

parameter is magnetic field intensity per se, or some other geophysical parameter intimately associated with it. Speculatively, the results are in keeping with the conception of the behaviour of an organism being significantly influenced, through the direct-current control system, by external force fields. Attention is thus invited to a hitherto neglected dimension in the complexity of psychopathology specifically, and perhaps generally in all human behaviour. (R1)

In 1965, Friedman et al followed up their first report with a second analysis, in which many more details were provided. They began by defining the parameters employed:

Cosmic-ray activity provides a quantifiable geophysical measure which is related to geomagnetic activity. A frequent, though not invariable, association of decrease in high-energy cosmic ray intensity with accompanying magnetic storm, the so-called Forbush decrease, has been well reviewed. Cosmic-ray activity may, in fact, provide a more statistically useful, albeit indirect, index of geomagnetic activity in view of the complexities of scaling K-indexes as compared with the relatively simple readings obtained from neutron monitors.

.....

Hospital admissions to seven central New York State psychiatric hospitals and to the Psychiatric Service of a Veterans Administration General Medical and Surgical Hospital from July 1, 1957, to October 31, 1961, were correlated for 7-, 14-, 21-, 28-, and 35-day periods with cosmic ray activity for the same periods of time.

.....

In general, the findings with regard to the geophysical parameters under investigation are more provocative than definitive, particularly in delineating specific hypothesized causal processes or mechanisms.

This investigation confirms the absence of a significant relationship between total range of geomagnetic

activity as measured conventionally, and parameters of human psychological disturbance. Cosmic-ray indexes, on the other hand, are geophysical parameters which relate significantly to both gross, crude measures of human disturbance, such as psychiatric hospital admissions, and individual specific measures, as ratings of ward behavior. A more precise statement, in view of both significantly positive and negative correlation coefficients, is unwarranted. In terms of psychiatric hospital admissions, however, cosmic rays correlate in a significant, consistently positive linear fashion with coefficients of marked magnitude as high as +0.381, particularly when time periods of 28 or 35 days are used. It is especially the findings with ward behavior ratings which make it impracticable to define more specific relationships. (R2)

Throughout both studies of Friedman et al, vagueness persists, as the authors readily admit. In other words, the correlation seems fragile.

In 1966, A.D. Pokorny and R.B. Mefferd attempted to replicate the findings of Friedman et al. They employed data from the psychiatric service of a Texas V.A. hospital and records of Texas suicides and homicides. Rather than cosmic-ray data, Pokorny and Mefferd took seven related indexes of geomagnetic activity, such as the lengths of the storms and the sums of the K values for each day. They concluded that: "geomagnetic fluctuations do not influence psychiatric hospital admissions, suicides or homicides." (R3)

Therefore, although the work of Friedman et al is often cited as proof of some sort of causal connection between solar activity (via geomagnetic storms) and human behavior, the case for this correlation, given the negative findings of Pokorny and Mefferd, is not strong. (WRC)

X2. Emotional crises. As in X1, the dependent variable here involves human behavior and is therefore difficult to quantify. The research reviewed below seems a bit on the mystical side, as reflected by the tone of two paragraphs now quoted:

We are at the dawn of realizing the unique potential of the relationship that exists between man and the physical universe. Although we are only now beginning to speculate about the positive effects of this relationship, considerable work has already gone into investigating the extent to which our behavior is affected adversely by the cycles of heaven. In this regard it has especially been the activity of the sun and the moon that has been singled out for attention.

.....

So far, no unequivocal pattern of results has emerged. The apparently contradictory findings may be due to the many influences that act upon the individual--the earth is constantly changing its position in relation to the sun; the moon is in a perpetual state of movement relative to the earth and the sun; and the weather is in a state of flux, which is linked to some extent to geophysical conditions. The motion of heavenly bodies, and the changes that occur with regard to the motion, pose a number of methodological issues that require consideration if we want to understand the relationship between us, the sun, the moon, and the clouds in the sky. (R5)

The authors of the forgoing paragraphs, P. Snoyman and T.L. Holdstock, garnered 2,344 cases of crisis incidence occurring in 1976 at a clinic in Johannesburg. From their abstract, we single out their conclusions regarding the possible impact of solar activity, as measured by solar-flare activity and sunspot number:

Males' crisis became more likely with downward economic trends or decreased solar activity. In contrast to female incidence of crisis, which peaked in the spring, that of males peaked in autumn. Increased solar activity was related strongly to the incidence of crisis experienced by people who were retarded, abused drugs and were guilty of assault and/or rape. (R5)

It is difficult to decide what this all means, especially when economic trends

are mixed in.

X3. Traffic and coal-mine accidents.

For this entry, we are obliged to go to a secondary source, namely, L. Watson's Supernature:

A study of 5,580 coal-mine accidents in the Ruhr shows that most occurred on the day following solar activity. Studies of traffic accidents in Russia and in Germany show that these increase, by as much as four times the average, on days after the eruption of a solar flare. (R4)

The study referred to by Watson above is apparently the same as the following work reported in New Scientist:

At a recent session of the Popov Radio Engineering and Electrical Communication Society, Dr. A.K. Podshibyakin reported that research carried out over a number of years at the Tomsk Medical College had found a relation between road accidents and solar activity. Their statistics showed that the day after the eruption of a solar flare, road accidents increased, sometimes by as much as four times above the average. Podshibyakin mentioned that similar findings had also been obtained by workers in Hamburg and Munich. He also

claimed that human response to stimulation is generally slower during a solar flare than at other times. (R7)

References

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- R2. Friedman, Howard, et al; "Psychiatric Ward Behaviour and Geophysical Parameters," Nature, 205:1050, 1965. (X1)
- R3. Pokorny, Alex D., and Mefferd, Roy B., Jr.; "Geomagnetic Fluctuations and Disturbed Behavior," Journal of Nervous and Mental Disease, 143:140, 1966. (X1)
- R4. Watson, Lyall; "Man and the Cosmos," Supernature, New York, 1973, p. 54. (X3)
- R5. Snoyman, Phillip, and Holdstock, T. Len; "The Influence of the Sun, Moon, Climate and Economic Conditions on Crisis Incidence," Journal of Clinical Psychology, 36:884, 1980. (X2)
- R6. Becker, Robert O., and Selden, Gary; "Breathing with the Earth," The Body Electric, New York, 1985, p. 244. (X1)
- R7. "Solar Flares and Road Accidents," New Scientist, 38:160, 1968. (X3)

BHB4 Correlation of Disturbed Human Behavior and Lunar Phase

Description. The correlation of various facets of human behavior with the lunar cycle. In most cases, the phenomenon involves disturbed human behavior, such as homicides, suicides, and psychiatric emergencies. The full and new moons are often claimed to be correlated with such behaviors.

Data Evaluation. Researchers, particularly psychologists, have been attracted to this phenomenon for decades. Consequently, data are abundant. Although we list 27 references below, there are easily several times this number in the scientific

literature. Unhappily, these data often contradict one another, with a few positive correlations with lunar phase amidst many studies that fail to show any statistical relationships. The reality of the phenomenon, therefore, is seriously in doubt. Rating: 3.

Anomaly Evaluation. Since there is no widely accepted, reasonable mechanism by which the moon's phase can affect human behavior, this phenomenon, if proven, would be very anomalous, particularly since most scientists ridicule it. Rating: 1.

Possible Explanations. The phenomenon might have an electric basis involving positive ions, as outlined in X8.

Similar and Related Phenomena. Human behavior correlated with solar activity and geomagnetic variables (BHB3); human eminence correlated with astronomical phenomena (BHB28); the periodicity of human cultural events (BHB15, BHB31, BHB32); human sensitivity to electromagnetic fields (BHT17-19); the correlation of lunar cycles with human electrical potential (BHC); the correlation of lunar cycles with the electrical potential of trees (BPC) and plant growth (BPA); astrology (not cataloged).

Entries

X0. Background. The study of the possibility that the moon might affect human behavior is itself affected---by human philosophical imperatives. Most scientists, for example, strongly resist any suggestion that the positions of astronomical bodies can in any way shape human affairs. This attitude is apparently a carry-over from science's passionate hatred of astrology. But among the astronomical bodies employed by the astrologers the moon does have demonstrable, well-recognized terrestrial effects, such as the tides. Of course, no one doubts the reality of the tides, but human behavior is another matter. Scientists vehemently reject any suggestion that the moon can affect human behavior in any way. In opposition to this philosophical mind-set of the majority of scientists is the seeming willingness of much of the public and a part of the media to be swayed by astrology and fuzzy New Age concepts.

Astrological phenomena are not entered in the Catalog of Anomalies because scientific evidence for their existence is totally lacking. The possibility of lunar effects on human behavior, though, cannot be rejected outright. There are enough positive correlations in the literature to make further investigation worthwhile, even though the preponderance of scientific opinion is negative concerning lunar effects on behavior.

In the entries that follow, the anomalist should remember that philosophical

bias may distort both research and its interpretation---pro and con!

X1. The long history of "lunacy". Almost all reports dealing with the possible effect on the moon on human behavior commence with a short historical review acknowledging the long fascination of man with this celestial object. The things attributed to the moon are remarkable, as set down in part by D.F. Campbell and J.L. Beets:

Superstitious beliefs about the influence of the moon are widespread throughout written history and fictional literature. These have been covered extensively by Stahl (1937), Trapp (1937), Sarton (1939), Oliven (1943), and McDaniel (1950). These reviews noted beliefs in a variety of lunar influences on human physiology. For example, Aristotle wrote that menstruation begins when the moon is waning. Sexual powers are believed to increase until the moon is full and then to decrease with the waning moon. The moon is held to influence both birth and death. Births are thought to increase during the full moon and death is believed to occur when the tide for the nearest body of water is ebbing. These same reviews described (but cited little evidence for) more directly behavioral influences of the moon.

Epilepsy has been attributed to the moon, and seizures are believed to increase when the moon is full. Mental disturbance has long been attributed to the moon. This old belief has become established in language; note the words lunacy (English), avoir des lunes (French), lunatico (Italian), and lunaticus (Latin), which all refer to persons with mental disturbance or epilepsy. The non-empirical literature has related lunar phases to many aspects of mental aberration including pyromania (setting of fires), suicide, alcoholism, somnambulism ("moon walking"), and lycanthropy. Children and persons of poor mental ability have been thought to be particularly susceptible and often have not been permitted to sleep where moonbeams might fall on their faces. (R16)

Outside the human realm, the moon is thought to influence plant growth, the electrical potential in plants, and the behavior of microorganisms, to give just a few instances.

X2. Pre-1972 studies: Negativism prevails. Prior to 1972, the literature-searcher finds little scientific work that encourages a belief in a lunar effect on human behavior. To recap this period briefly, we present an overview plus two negative studies.

1942: D. McG. Kelley's overview. Kelley's review occupies 20 full pages in the 1942 Psychoanalytic Review and is buttressed by 46 references. In this, one sees that humans have been concerned about the moon's influence for some time!

Summary. On the basis of evidence determined to date there is no support for the belief that the light of the full moon affects the psychotic or healthy in a way different from light of any other source. This assumption seems definitely relegated to classification as a superstition which seems to be universal. The belief can possibly be explained by the concept of the projection of a portion of human energy upon the satellite with consequent reactions to the full moon as a symbol charged

with ambivalent powers for good and evil. (R16)

Actually, Kelley's "explanation" of lunar influence is perhaps what one would expect to find in the Psychoanalytic Review!

1961: A negative "search for lunacy".

Summary. Much folklore and anecdotal observation has reported a relationship between outbursts of psychotic behavior and the phase of the moon. To investigate this hypothesis, the phases of the moon were tabulated for the dates of admission for 3,234 patients. No relationship was found between lunar phase and number of admissions.

In addition, phase of moon was tabulated for 1,069 incidents of assaultive behavior as recorded in the clinical folders of 98 schizophrenics, and for 489 incidents recorded in the folders of 39 paretics. There was no relationship between phase of the moon and the incidents of assaultive behavior. In addition, there was no tendency for individual patients to be consistent as to the phase in which their incidents occurred. (R4)

1970: No Transylvania Effect!

Summary. The Transylvania effect---the notion that certain patient behavior coincides with moon phases---was carefully tested during a 3-mo. summer period in 1969. Three non-reactive measures were employed and no significant results were found on any of them. It was concluded that a meaningful correlation between the moon phase and acting-out behavior of mental patients did not exist and, therefore, did not explain many unresolved problems in the area. (R6)

Therefore, as 1972 began, the scientific community seemed united on the nonexistence of a lunar effect on human behavior.

X3. 1972: The Lieber study and reactions to it. In this year, A.L. Lieber and C.R. Sherin published in the American Journal of Psychiatry the results of their studies of homicides in Florida

and Ohio. They departed from previous research and concluded that human behavior was indeed affected by the phase of the moon. Since 1972, this work, by established scientists in a respected scientific journal, has been held up as scientific proof of the lunar effect. It confirmed, in effect, what policemen, hospital workers, and even bartenders had long suspected: people become more emotional around the time of the full moon! This single report amid a sea of negativism was sufficient to put a majority of scientists on the defensive.

lunar effect, augmented by convincing graphs and a popular book (The Lunar Effect: Biological Tides and Human Emotions), naturally encouraged other scientists to try similar statistical correlations. These attempts at replication were largely unsuccessful.

Replication fails in Texas.

Abstract. The authors studied 2,494 homicides that occurred in Harris County, Tex. (Houston), over a 14-year period in an effort to confirm a recent study suggesting that homicides are significantly related to phases of the moon. They found no significant relationship, although homicides did show strong day-of-week and hour-of-day cycles. (R11)

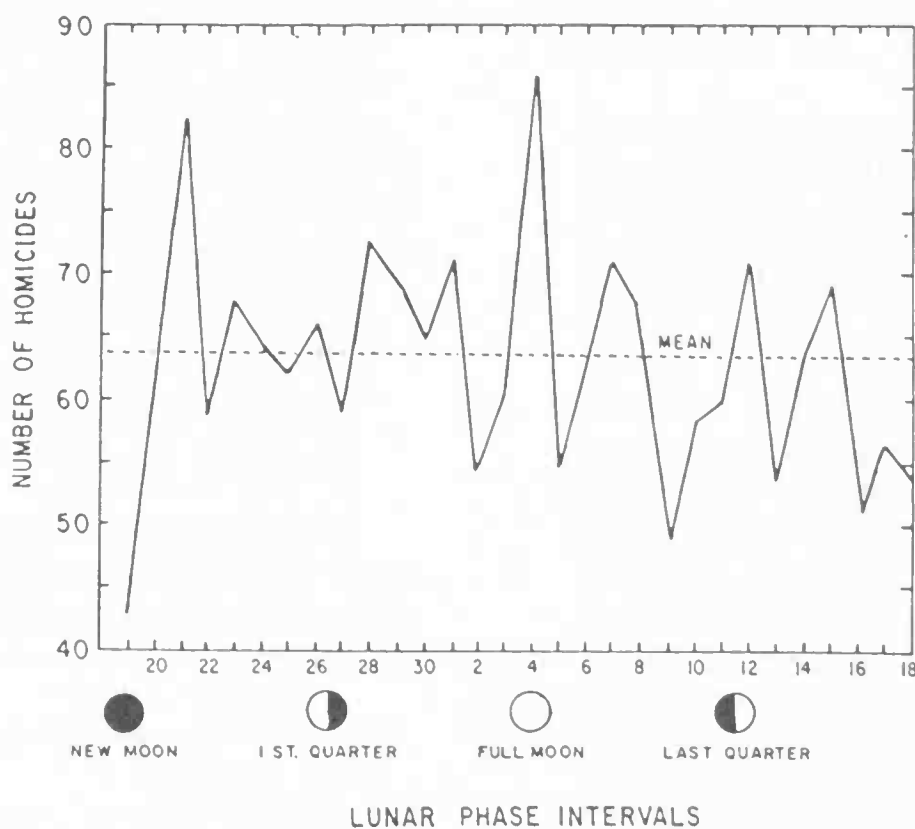
Replication fails in Ohio. To eliminate any question about a "geographical effect", N. Sanduleak examined the data for the Cleveland region, just as Lieber and Sherin had done. Sanduleak's results:

In conclusion, this study found no evidence that the frequency of homicidal attacks in Cuyahoga County, Ohio, during 1971-1981 was related in any way to the phases of the

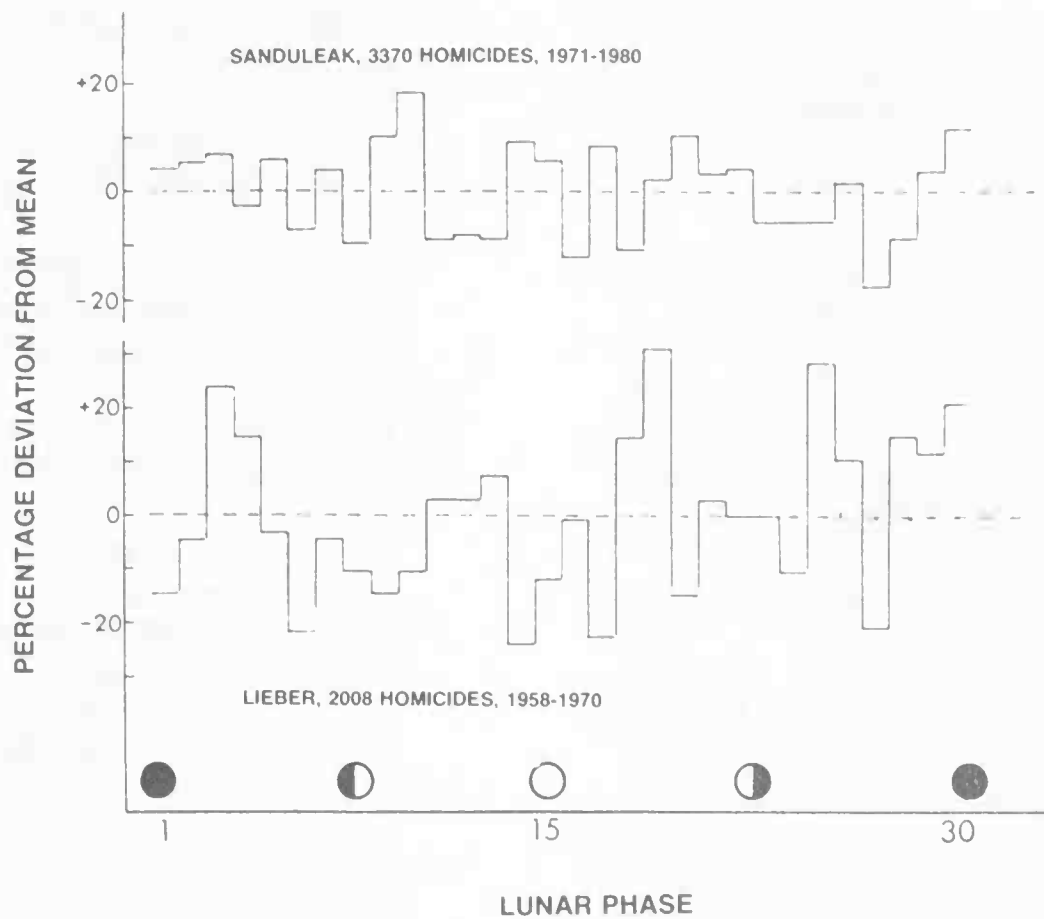
What Lieber and Sherin found.

Abstract. Data on homicides were lyzed by computer to determine whether a relationship exists between the lunar synodic cycle and human emotional disturbance. A statistically significant lunar periodicity was demonstrated for homicides committed in Dade County, Fla., over a 15-year period. A similar, but non-significant, periodicity was found for homicides occurring over a 13-year period in Cuyahoga County, Ohio. (R8)

This seemingly solid proof of the



Possible lunar influence on homicides committed in Dade County, Florida, 1956-1970. (X3)



Comparison of two studies of Cuyahoga County homicide-assault-rate versus lunar phase. (X3)

moon or the action of luni-solar tidal forces. Nationwide data for both homicide and suicide likewise show no relationship to lunar phase. (R23)

Besides these studies that were specifically designed to confirm or challenge Lieber and Sherin, there were additional analyses of possible lunar influences on various types of behavior, such as drug overdose, suicide, and epileptic seizures---all of these were also essentially negative in their conclusions. (R21)

X4. 1980: A melding of data. D.I. Temppler and D.M. Veleber, affiliated with the California School of Professional Psychology, attempted to resolve the conflicting results of the many earlier searches for a lunar effect on human behavior. They blamed the inconsistency on the different methodologies employed. By adopting a standardized method of analysis, Temppler and Veleber hoped to end the confusion.

From other studies they extracted data on suicides, psychiatric emergencies, arrests, psychiatric hospital admissions, etc. To these they added new

information on schizophrenic hospital admissions and first-appointment phone calls. Here is how they framed their results:

Folklore and some literature state that abnormal behavior occurs disproportionately at the time of the full moon, and to a lesser extent, disproportionately at the time of the new moon. Our analysis, which used 3-day new moon and full moon periods, is consistent with this folklore. It is noteworthy that although folklore has placed the greatest stress upon the full moon, these data show somewhat of a stronger tendency for the new moon. (R18)

X5. 1981: P. Katzeff's "Moon Madness". As befits a book intended for a popular audience, P. Katzeff's Moon Madness, is replete with anecdotes. We have room here for just a few:

- Jesus Christ was crucified during the full moon.

- Caesar was assassinated when the moon was full; so were Leon Trotsky, Russia's Alexander II, Count Folke

Bernadotte, and so on.

●At the Japanese prison camps in the Philippines during World War II, the full moon brought increased savagery and atrocities. (R20)

An editorial comment is required here. The idea of what constitutes a "full moon" can vary widely. It can last for three days or almost a week, depending upon the whim of the observer. During a year's worth of 5-day full moons, a lot of things can happen! (WRC)

The following quotation is also typical of Katzeff's approach:

The full moon's reputation for inciting violence is unassailable. The familiar cadre of professional and amateur social scientists swears to it. Harvey Schlossberg, director of the New York Police Department's psychological services unit in 1978, told The New York Times, "There's really no way to explain it scientifically, but there is an increase in the number of assaults and crimes between people at a full moon." Detective Captain Michael Wilson, of the Providence, Rhode Island, police department, has said, "I know we all joke about it. But in a way, it does seem like we get all the unusual calls during a full moon." And he is backed up by Lieutenant Frank Smith of the department's criminal records division, a man whose opinion is based on more than a personal impression. Dominick Longo, Police Chief of the seashore resort of Ocean City, New Jersey, has said that the full moon always brings a rise in crime, nuisance complaints, and assaults on police officers. (R20)

Strangely, this very strong testimony is not born out in the scientific studies, which if not negative are only weakly positive. (WRC)

X6. A few other "pro" studies. The scientific literature has yielded a few other pro-lunar-effect studies. Since the anti-lunar-effect researchers often give the impression that, except for the papers of Lieber and Templer, no reputable scientists can confirm a lunar effect on human behavior, we append

here short summaries of two additional "pro" studies.

1975: Self-inflicted injuries. K.P. and M.D. Ossenkopp found that:

A lunar phase influence on the occurrence of self-inflicted injuries seems to exist for females. (R12, R14)

1976: Criminal offenses. J. Tasso and E. Miller summarized as follows:

Data were gathered in a large metropolitan area over a period of one year as to nine categories of 34,318 criminal offenses committed during the phases of the full moon and non-full moon. It was found that the eight categories of rape, robbery and assault, burglary, larceny and theft, auto theft, offenses against family and children, drunkenness, and disorderly conduct occurred significantly more frequently during the full moon phase than at other times of the year. Only the category of homicide did not occur more frequently during the full moon phase. The results support further exploration and research related to cosmic influences on man's behavior. (R13)

1991: Aggressive misbehavior. W.E. Hicks-Caskey and D.R. Potter found that in a randomly selected group of 20 developmentally delayed women:

Comparisons using the Duncan multiple-range test indicated that the mean number of misbehaviors on the date of the full moon was significantly higher than the mean number on any other day of the lunar period (the next highest was for the three days prior to the day of the full moon). (R28)

X7. The "anti" position. Despite the existence of a handful of analyses that seem to show a lunar effect on human behavior, it is quite clear that the majority of scientific papers treating this phenomenon are negative. I.W. Kelly et al examined a wide range of lunar-effect work. Their conclusion, as printed in The Skeptical Inquirer, is now quoted:

This article outlines the results of a meta-analysis of 37 studies and several more recent studies that examined lunar variables and mental behavior. Our review supports the view that there is no causal relationship between lunar phenomena and human behavior. We also speculate on why belief in such relationships is prevalent in our society. A lack of understanding of physics, psychological biases, and slanted media reporting are suggested as possible reasons. (R24)

X8. The problem of mechanism. Part of science's general disbelief in a lunar influence on human behavior stems from the lack of a convincing mechanism; that is, a way in which known forces or processes can link the moon's position in the sky to human behavior. The fundamental question is: How can the moon, 238,000 miles away, affect what goes on in the human brain? A few suggestions have surfaced over the years.

Gravitational and tide-raising forces. Tide-raising forces are impressive on the scale of the terrestrial oceans, and even on the Great Lakes tiny tides are observable. But miniscule humans are too small for tide-raising forces to have any demonstrable effect. Consider, for example, the easily calculated figure for the gravitational force exerted by a mother on her child 15 centimeters away; it is 12 million times greater than that exerted by the moon! (R24)

Positive ions. That there are more positive ions in the atmosphere when the moon is full has been demonstrated. It is also true that, in the laboratory, high concentrations of positive ions seem to cause depression and irritability in human subjects. But the laboratory concentrations of ions are much greater than those found in the normal atmosphere, even during a full moon. (R25)

Electric potential. H.S. Burr and L.J. Ravitz, and doubtless others, have discovered that trees and even humans exhibit an electrical potential that varies with the lunar cycle. Probably this phenomenon is associated with the positive ions in the atmosphere. Could these changes in human electrical potential be

associated with behavior, considering that the human nervous system is electrical in nature? No one knows! (R3)

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- R4. Chapman, Loren J.; "A Search for Lunacy," Journal of Nervous and Mental Disease, 132:171, 1961. (X2)
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BHB5 Correlations of Disturbed Human Behavior, Stormy Weather, and Infrasound

Description. The correlation of stormy weather with disturbed human behavior through the medium of infrasound.

Data Evaluation. We have found no direct, simultaneous observations of infrasound and disturbed human behavior in the same geographical area. Rather, we find that: (1) Stormy weather is convincingly correlated with disturbed human behavior; (2) Infrasound does affect human behavior adversely; and (3) Violent weather systems do generate infrasound. This combination of correlations suggests indirectly that the phenomenon defined above is a real one. However, the lack of direct proof weakens the argument. Rating: 3.

Anomaly Evaluation. None of the three correlations mentioned above and outlined

in X1-X3, nor the assertion that storms disturb human behavior via infrasound is especially radical. Most mainstream scientists could accept all. The claimed phenomenon, then, is primarily a curiosity rather than an important anomaly. Rating: 3.

Possible Explanations. Storm-generated infrasound waves disturb human behavior.

Similar and Related Phenomena. The malaise of earthquake weather could also be induced by infrasound (GQW10); infrasound sources (GSI1); geomagnetic activity (which may also generate infrasound) correlated with disturbed human behavior (BHB3).

Entries

X0. Background. According to the evidence presented below, human behavior is affected by both stormy weather (X1) and infrasound (X2). The suggestion is also advanced that storms generate infrasound (X3). It is quite reasonable, then, to assert that stormy weather helps shape human behavior via the infrasound it generates. This "super-correlation", although not directly supported by any research we have come across, is implied by the three interlocked correlations of X1, X2, and X3. This Catalog entry, BHB5, presumes this intimate relationship is true.

X1. Stormy weather correlated with disturbed human behavior. C.A. Mills, an early student of weather-modulated behavior, began one of his papers with two image-evoking paragraphs that we must record here.

Certain bodily disturbances have been found closely related to storm changes in temperature and barometric pressure here in North America, and in making studies of mortality statistics it was found that suicides and homicides were to be grouped with these disturbances. As our storm centers sweep down the plains from the Northwest, then turn back up the Mississippi and Ohio River valleys to pass out over the Gulf of St. Lawrence, they leave behind them a trail of human wreckage---cases of acute appendicitis, respiratory attacks of all kinds, and suicides.

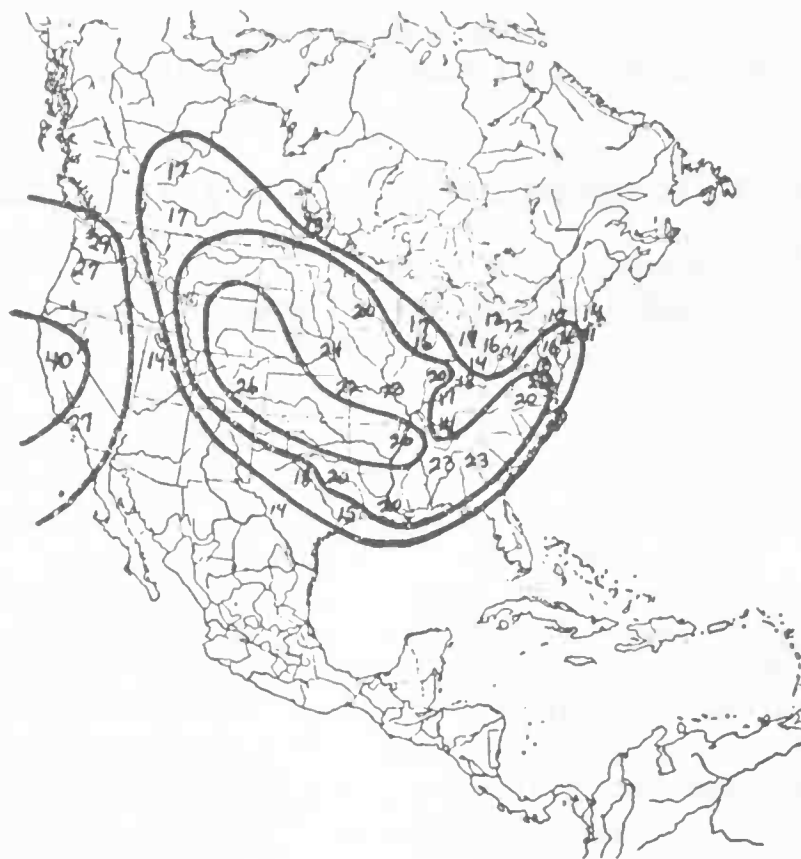
Everyone is aware of the marked changes in mental state that come with these storms. With a center of low pressure approaching---the pres-

sure falling and the temperature rising---we are afflicted with a feeling of futility, and inability to reach the usual mental efficiency, or to accomplish difficult tasks. In children this takes the form of increased irritability, a restlessness and petulance that parents find most trying. Adults on such days are also more quarrelsome and fault-finding, with a tendency to a pessimistic viewpoint toward all matters that arise. Such weather provides the most perfect background for marital outbursts. (R1)

Mills supported these opening generalizations with impressive statistics and maps. The first two points from his Summary are pertinent here:

1. A strong suggestion of storm effect is seen in the distribution of suicides and homicides in North American cities. The rates are not highest where industrialization is most advanced, but rather where barometric pressure and temperature changes are most frequent and severe.
2. Suicides show a definite time relationship to weather changes as high- and low-pressure centers approach and pass by. With falling pressure and rising temperature, suicides rapidly rise. Most peaks in frequency occur at the time of a low-pressure crisis. With rising pressure and falling temperature few suicides occur. (R1)

Supporting work by H. Muecher and H. Ungeheuer. In their stimulating study Muecher and Ungeheuer first defined six different weather "phases": (1) nor-



Suicides per 100,000 population. Annual average, 1924-1928. (X1)

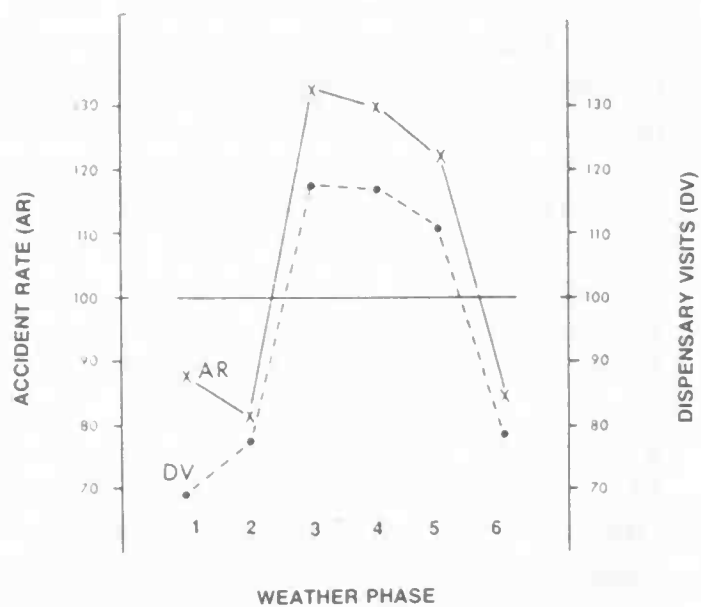
mal diurnal rhythm; (2) increasing solar radiation; (3) foehn-like weather; (4) abrupt advective change; (5) sub-normal solar radiation; and (6) return to normal. They next plotted various quantifiable types of human behavior according to the six weather phases. Here, we have selected two types of "disturbed" behavior for a detailed presentation:

Job accidents (AR). Accident data, more than 3,700 in all, were collected over a period of 388 days in a heavy machinery manufacturing plant having a total labor force of approximately 6,000. Our tabulation contains accidents of all types, including those which are regarded as very minor results of worker negligence and consequently do not typically make their way into official plant operation reports. The accident rate per day per worker was again related to the weather phase criteria...

See the accompanying graphs for results.

Visits to a plant dispensary (DV). In another industrial plant, manufacturing mainly precision equipment,

we were able to tabulate the visits made to the company doctor's office during work shifts. Material, available for all 3,000 employees, provided a total of approximately 3,700 visits distributed over a period of 238 working days. The visits were of two kinds: (a) approximately 2,000 cases of minor or major sur-



Changes in accident rate and dispensary visits with weather phase. See text for definition of the weather phases. (X1)

gery; and (b) approximately 1,700 cases of non-surgical treatment, medication, or any other type of attention, including simple consultation. The weather phase variable shows parallel effects for both types... (R2)

X2. Infrasound correlated with human behavior. In controlled experiments, infrasound generated in the laboratory (simulating that produced by jet aircraft and automobiles) has been shown to increase human reaction time and reduce performance in tracking experiments. (R5) However, the intensity levels of the infrasound in these experiments were generally much higher than those expected from distant storms.

More appropriate was the 1968 study of J.E. Green and F. Dunn, who correlated two statistically determined aspects of behavior (car accident rates and school absenteeism) with distant storms. (Note that Green and Dunn did not actually measure infrasound levels, they assumed these long wavelength sound waves were bathing the study area.)

[Green and Dunn] chose Chicago during the month of May 1967 as the place and time of this retrospective investigation. During this month, weather conditions in the Chicago area were mild, while at the same time the rest of America was experiencing violent storms. An investigation of weather data for this month showed that infrasonic waves due to storms occurring up to 1500 miles away should have been present in Chicago for 13 days during May, the accident statistics and school absenteeism data they obtained from an insurance company and from two large Chicago schools.

After allowing for other likely causes for variations in accidents and absenteeism, Green and Dunn believe that they can show correlations between these behavioural distur-

bances and days of intense infrasonic disturbances. (R4; R3)

X3. Stormy weather as a generator of infrasound. What data do we have demonstrating that powerful weather systems actually do broadcast infrasound? J.E. Green and F. Dunn assert as follows:

More recently, it has been discovered that very low-frequency sound waves having periods of oscillation in the range 10^3 to 10^{-1} sec are produced during severe storm activity, such as high winds and tornadoes, as well as during other naturally occurring phenomena, such as earthquakes and volcanic activity. Such naturally produced infrasonic waves travel over great distances through the lower atmosphere, from the point of origin, experiencing little attenuation. (R3)

References

- R1. Mills, C.A.; "Suicides and Homicides in Their Relation to Weather Changes," American Journal of Psychiatry, 91:669, 1934. (X1)
- R2. Muecher, Hans, and Ungeheuer, Hans; "Meteorological Influence on Reaction Time, Flicker Fusion Frequency, Job Accidents, and Use of Medical Treatment," Perceptual and Motor Skills, 12:163, 1961. (X1)
- R3. Green, J.E., and Dunn, F.; "Correlation of Naturally Occurring Infrasonics and Selected Human Behavior," Acoustical Society of America, Journal, 44:1456, 1968. (X1-X3)
- R4. "Sound Waves from Storms Linked with Car Accidents," New Scientist, 41:586, 1969. (X1-X3)
- R5. Bryan, Michael, and Tempest, William; "Does Infrasound Make Drivers Drunk?" New Scientist, 53:584, 1972. (X2)

BHB6 Correlation of Human Behavior and Climate and/or Season of the Year

Description. The tendency of increased ambient temperatures to correlate with increases in disturbed behavior and decreases in general human mental efficiency. The higher temperatures may be due to geographical location (tropics) or season of the year (summer in the Temperate Zone).

Data Evaluation. Data supporting this phenomenon are uncommon. In the case of general mental activity, we have only vague generalities, although these do accord with common knowledge. Rating: 3.

Anomaly Evaluation. Temperature is the critical parameter here. The higher temperatures of the tropics and the Temperate Zone summer seem inimical to normal, balanced, efficient human behavior. Mainstream science has found no specific reason why this should be true. Indeed, as one writer points out below (X3), a paradox exists. Except for humans, life thrives in tropical climes! Why are humans the exception? Rating: 1.

Possible Explanations. Humans originated recently in the Temperate Zone, where their behavior is optimized; and they have not yet adapted to high temperatures.

Similar and Related Phenomena. Life is also prolific in polar waters, though lacking in diversity.

Entries

X1. Insanity correlated with season of the year. All we have on this phenomenon is a short item from Science News Letter of 1924.

Insanity and physical efficiency increase and diminish according to the season and these changes are almost exactly parallel, says Dr. Frank P. Norbury in a report presented to the American Meteorological Society. Just those times of the year in which most persons feel the fittest are the times when they are most apt to become subject to mental disorders, he declares.

The most favorable time for efficient work and for mental breakdowns has been shown to be the months of spring and early summer, Dr. Norbury states. From June there is a gradual decline until October when another and smaller increase begins, culminating in November, and then declining again to a minimum in February when the yearly rise begins again.

Climate is the underlying cause responsible for this similarity be-

tween the curves of insanity and of efficiency, the alienist continues. Insanity is, he says, very frequently the result of physical exhaustion, and stimulating weather not only promotes efficiency, but exhaustion and subsequent mental or nervous collapse in persons so disposed. (R1)

X2. Male violence toward women correlated with season.

Over 27,000 reports about women abused by their live-in male partners were provided by 23 shelter organizations in five locations in the United States. Cosinor analyses revealed statistically significant annual rhythms in the frequencies of abuse, with maxima in the summer. The rhythms were closely related to annual changes in ambient temperature in these locations, and the time of the maxima was similar to those previously reported for assault and rapes. The findings support the hypothesis that violence by men to-

ward women increases in summer independently of any major seasonal changes in the opportunity for contact between perpetrator and victim. (R3)

X3. Correlation of human behavior and climatic zones: A Paradox. The effects of climate and season upon human behavior are so important that we decided to include the following general observations despite their racist overtones. S.D. Porteus penned them in 1970.

There are, of course, many causes of ethnic group retardation, and foremost among them would be the lack of stimulation characteristic of high temperatures. As [N.] Wehl suggests, torrid heat "may prevent individuals of superior minds from using them effectively, not only most of the time but in such critical situations as warfare or hunting... The reasonable inference is that natural selection for intelligence would operate in the tropics with vastly impaired efficiency."

But this hypothesis, inviting as it sounds, poses an extraordinary paradox, namely, that such tropical weather seems to induce in all organisms except Man the greatest acceleration of growth and development. Africa, particularly, possesses the world's largest land animals, relics of the age of monsters, including the

elephant, rhinoceros, hippopotamus, python, giraffe, ostrich, buffalo, and great herds of zebras and many species of antelopes.

Tropical waters are also fringed with immense mangrove swamps, jungles that match the huge forests that clothe the inland regions. The total area of the Great Barrier Reef, plus the coral growths that fringe the islands of the South Pacific, must be prodigious. How can we reconcile this riot of growth with the poverty of resourcefulness characteristic of peoples who live on or near the Equator? As we are well aware, much of Africa and South America, the Malayan Archipelago which includes the Philippines, Borneo, Sumatra, Celebes, New Guinea and Melanesia have so far made a disproportionately small contribution to the world's scientific knowledge. (R2)

References

- R1. "Insanity and Efficiency Show Like Seasonal Change," Science News Letter, 4:7, March 22, 1924. (X1)
- R2. Porteus, S.D.; "Possible Effects of Rate of Global Spin," Perceptual and motor Skills, 30:503, 1970. (X3)
- R3. Michael, Richard P., and Zumpe, Doris; "An Annual Rhythm in the Battering of Women," American Journal of Psychiatry, 143:637, 1986. (X2)

BHB7 Unusual Behavior Induced by Rhythmic Stimuli

Description. Erratic human behavior, such as twitching and trance induction, caused by beating drums and rhythmically flashing lights.

Data Evaluation. A single report from the biological literature. Obviously, much more information is required here. Rating: 3.

Anomaly Evaluation. The precise mechanism and scientific meaning of erratic behavior induced by rhythmic stimuli remain mysterious. Why is the human nervous system susceptible to such stimuli, and how are they converted into apparently involuntary behavior? These are not paradigm-shattering questions, because there

are no paradigms operational here. We are simply ignorant. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. Human hypnotic induction using a pendulum (series P catalogs); seasickness; animal hypnosis (BMB, BBB, BRB, etc.).

Entries

X1. General observations. Human behavior is affected in peculiar ways by rhythmic stimuli, such as the beating of drums and the flashing of lights.

In the case of drums, this strange behavior can be observed in some parts of the world in ceremonies involving drums.

This behavior is often described as a trance state in which the individual experiences unusual perceptions or hallucinations. In the extreme case, twitching of the body and a generalized convulsion are reported. These physiological and psychological states, and the importance of the use of drums, have remained a mystery. (R1)

Better known are the very similar

effects induced by a flashing light, particularly when the flash frequency is close to the basic alpha rhythm of the brain. In order of importance, these effects are: (1) visual perceptions not in the stimulus (different colors and patterns); (2) kineasthetic and cutaneous sensations (vertigo, skin tingling); (3) emotional experiences (fear, pleasure); (4) organized hallucinations; and (5) psychopathic states and epileptic seizures. (R1)

Reference

R1. Neher, Andrew; "A Physiological Explanation of Unusual Behavior in Ceremonies Involving Drums," Human Biology, 34:151, 1962. (X1)

COLLECTIVE HUMAN BEHAVIOR

BHB8 Cyclicity of Violent Collective Behavior

Description. The periodic increase and decrease of violent human behavior, as measured by the numbers and magnitudes of wars, revolutions, mass actions, etc.

Data Evaluation. The basic data are in the historical record; but it is essential to realize that these data are sometimes modified for political or philosophical ends. Furthermore, while one can count the number of mass actions fairly easy, it is much more difficult to rate them in terms of severity and significance. Indexing or weighting is a subjective business, and it is at the core of cycle research. Finally, the indexes of human mass violence usually yield several periodicities, most of which cannot be paired with any natural cycles or known driving forces. For these reasons, cycle-research data and derived indexes are less than completely satisfactory. Rating: 2.

Anomaly Evaluation. Analyses of human mass violence usually single out the sunspot cycle (11 years) and the double sunspot cycle (22 years) as especially strong signals in the historical data. Cycle researchers can only speculate that perhaps sun-modulated geomagnetic variations affect human behavior through, say, increased tension and irritability, leading to warfare and other mass actions. Of course they can point to data showing that the behavior of individuals also seems to be disturbed in synchronism with the solar cycle (BHB3). As for the several other periodicities appearing in the historical data, they do not seem to match any known natural cycles, although vague references to "climatic cycles" are made. Cause-and-effect explanations of the claimed periodicities are very weak or nonexistent. The basic phenomenon, therefore, is very anomalous. Rating: 1.

Possible Explanations. See above. It is also possible that humans may have an inherent cyclic tendency to violence and require no periodic, external driving force, as may be the case for ants. (BAB)

Similar and Related Phenomena. Cyclic economic activity (BHB9); correlation of the disturbed behaviors of individuals with solar activity (BHB3) and the moon (BHB4); ant colonies have been observed to engage in self-excited, cyclic activity (BAB).

Entries

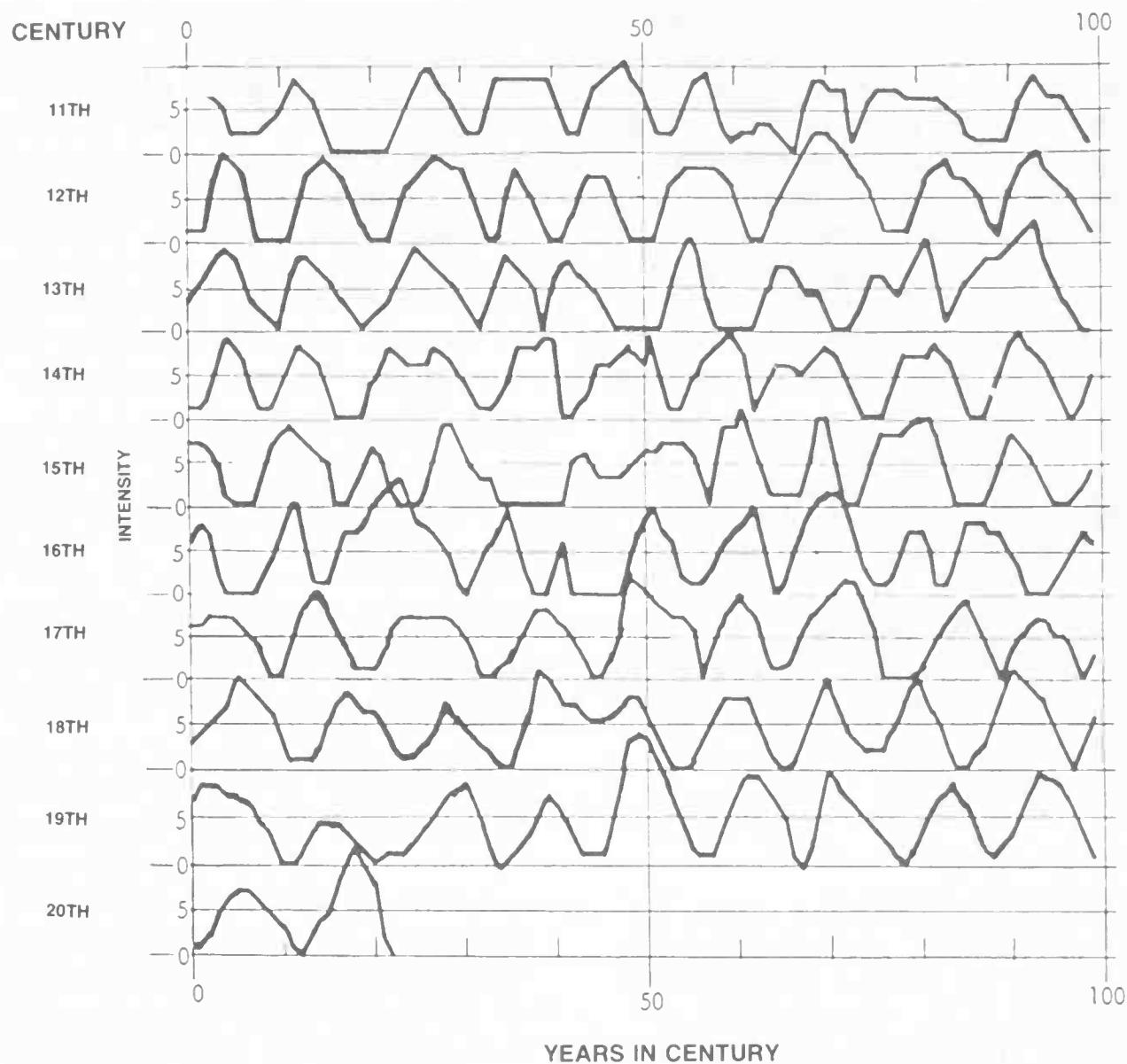
X1. Human "excitability" correlated with the sunspot cycle. In 1926 a paper by a Russian professor, A.L. Tchijevsky, was presented at the annual meeting of the American Meteorological Society. Tchijevsky proposed that somehow sunspots modulated collective human behavior so that wars and other episodes of mass violence recurred about every 11 years. A translation of Tchijevsky's paper can be found in R2. Sufficient for Catalog purposes is a review of the Tchijevsky paper by C.E.P. Brooks from the 1928 Meteorological Magazine.

There is a well-known theory, due to W.S. Jevons, that commercial crises have an eleven-year cycle corresponding with that of sunspots, but the relation is generally considered to be an indirect one, resulting from the effect of sunspot periodicity in rainfall on the yield of crops. Equally well-known is the relation between weather conditions and crime, including suicide, and here again there is the possibility of an indirect relation with sunspots.

The author of the present paper postulated a close relation between sunspots and the collective activity of the mob, as expressed in rebellions, revolutions, riots, religious movements and other "mass-historical" events. As the result of "a minute scrutiny of the history of all the peo-

ples and states known to science, beginning with the V. century B.C.," he finds that "as soon as the sunspot activity approaches its maximum, the number of the important mass-historical events, taken as a whole, increases," and he calculates that 60 per cent of these events occur in the three years of sunspot maximum, compared with only five per cent in the three years of spot minimum. During the latter period there is, instead, a time of peaceful, creative work. A curious individual instance is a curve showing the parallelism between outbursts of revolutionary activity in Russia and outbursts of sunspots day by day from October, 1905, to April, 1906. This seems to indicate that the supposed relation does not take effect through the ordinary weather channels such as rainfall, but acts far more quickly. The author does not venture an explanation, but one immediately thinks of the nervous effects of variations of atmospheric potential gradient.

The author's results are certainly striking, and we may yet hear an anarchist accused of bomb-throwing plead in defence the influence of sunspots, but there must be difficulty in avoiding bias in the selection of "mass-historical" events, and for the present it would be as well to keep an open mind. (R1)



Tchihevsky's Index of Mass Human Excitability plotted from the beginning of the Eleventh Century through the early 1920s. There is a tendency for nine waves to occur each century from the Fifth Century BC onward. (Adapted from R4, X1)

X2. More recent studies of the cyclicality of collective violence. Much modern research on "mass-historical" events derives from the compilations of R.H. Wheeler, such as his Indices of International and Civil Conflict. S.W. Tromp has summarized some of these tedious analyses, providing in addition a few of his own thoughts in the introductory paragraph.

A major problem in the study of cycle synchronies is to accept a common cause for entirely different, apparently non-related, phenomena. Since all the evidence points to worldwide environmental forces triggering the cycles, it has been sug-

gested that perhaps extraterrestrial stimuli are involved, as part of the observed cycle synchronies are astronomical cycles, e.g., sunspot cycles.

Support for world-wide influences was given by [E.R.] Dewey in his study of cyclic patterns in human aggression leading to national and international conflicts; the study of mental processes of man and his behaviour. Dewey's study was based on the data collected by [R.H.] Wheeler. Wheeler was formerly Chairman of the Department of Psychology at the University of Kansas. He prepared a year-by-year index of International War Battles for the period 600 BC-1943 AD and Civil War Battles of the period 600 BC-1941 AD. This index puts forth a parameter with which to measure the degree of aggression in the world at one time. The index

was later extended by Shirk and Wheeler up to the year 1957. Time series analysis of this vast collection of material was carried out by Dewey and Vaux around 1968. Nine cycles were observed, all of which, with one exception (53.5-year), were statistically highly significant ($0.006 > p > 0.0007$). The following cycle lengths were found: 6, 9.66, 11.25, 12.33, 17.75, 22, 53.5, 143 and 164 years. It could be shown that if random figures instead of Wheeler's data were used no cycles were found. (R5)

In his 1971 book *Cycles*, Dewey comments on some of the cycles cited by Tromp. The 11.25-year cycle is, of course, the sunspot cycle; but the double sunspot cycle, 22+ years, which is actually the length of the sun's magnetic cycle, occasioned the following from Dewey:

In February 1951 I reported on a twenty-two-year cycle in war. At first, I had traced it back through twenty-five repetitions to the year 1400.

Then, in 1956, I traced it all the way back to 600 B.C., and I had the longest continuous series of waves I had ever found---116 repetitions of a cycle over a period of 2,500 years! The odds of this cycle occurring purely by chance are only 8 in 10,000. The continuous presence of a cycle of this length for 2,500 years explodes the idea that wars come when a new generation that does not know the horror of war

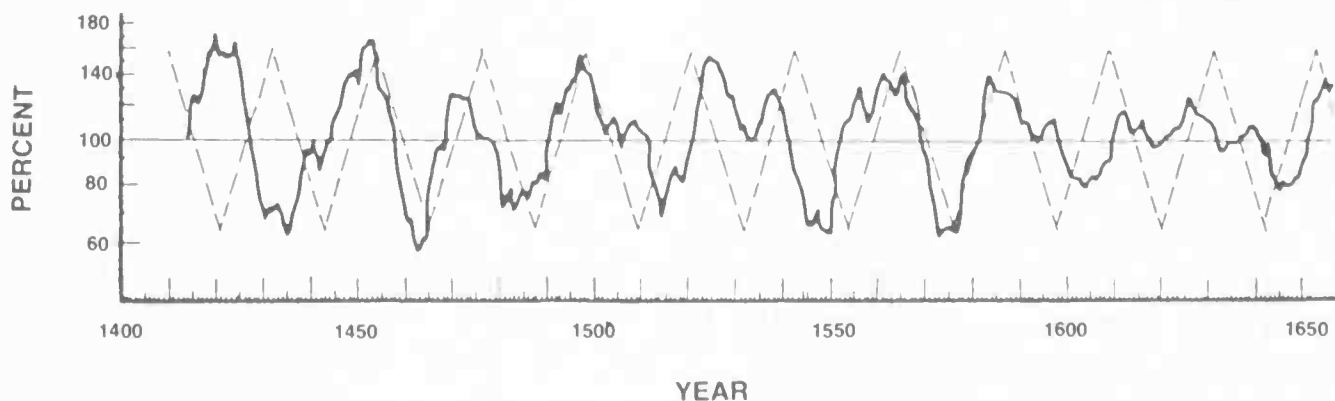
grows up. Behavior resulting from such a cause could not possibly be as regular as this. (R4)

The accompanying graph of the 22-year cycle is normalized to eliminate longer periodicities. When actual values of the Wheeler Index are used, one sees a strong 142-year cycle in International Battles. Furthermore, a steady increase is obvious and, since the Index is plotted on a logarithmic scale, the world's future seems bleak if one takes cycle analysis seriously!

Dewey adds two pertinent comments regarding the 142-year cycle: (1) This relatively long cycle in human belligerency might be associated with some long-period natural phenomenon, such as climate change; and (2) From 600 BC to 900 AD (not shown on graph), the cycle period was 163.5 years rather than 142 years, Dewey puzzles, "No other figures that I know of have switched cycles like this. It is very baffling." (R4)

X3. Searching for a mechanism. B. Payne has accused geomagnetic storms in the fomenting of collective human violence:

Geomagnetic storms are postulated as the triggering event since: (1) Geomagnetic storms are known to occur with greater frequency and intensity near sunspot peak; and (2) Geomagnetic storms have been found by other researchers to be associated with increased frequency of acci-



The 22 1/5-year cycle in international battles, 1400-1650. Dewey states that this cycle has persisted for 2500 years. (Adapted from R4, X2)

dents, illness, psychiatric hospital admissions, and crimes. (R6)

A somewhat different perspective has been advanced by N. Alcock and J. Quittner, who see wars as products of political and economic turmoil. Again, we quote from S.W. Tromp's review paper:

Recent studies by Alcock and Quittner of the Canadian Peace Research Institute established a number of statistically significant cycles, in connection with civil violence, until the year 2001. Three cycles (8.6-, 17.4- and 34-year) seem to predict changes in the global political system, while four cycles (5.6-, 9.4-, 20.5- and 54-year) predict changes in the global economic system. These changes in the political and economic systems could predict changes in the level of civil disturbance. (R5)

It is unclear how the periodicities calculated by Alcock and Quittner can account for the entirely different periodicities in warfare. To an outsider looking for natural periodic driving forces, all of these different cyclicities are not only confusing but they raise questions about the usefulness of cycle research.

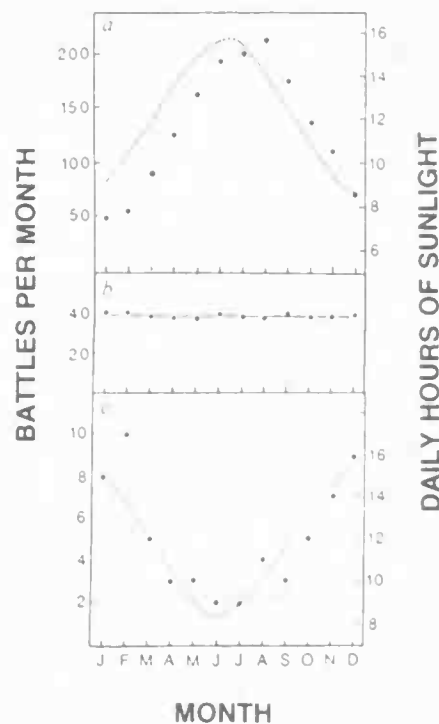
X4. The rhythm of wars. Using 2,131 acts of hostility recorded over the last 3,500 years, G. Schreiber et al have shown that these conflicts did not begin at random. Instead, onsets of hostility are nicely correlated with the number of hours of sunlight in the day each war began:

In the Northern Hemisphere, latitudes 30-60° N., the annual rhythm in the opening dates of wars shows a peak in August and a nadir in January (a in the figure). An inverse pattern in the annual rhythm of wars with a peak in December-February and a nadir in July was found in the Southern Hemisphere latitudes 30-60° S. (c in the figure....The results in the Northern Hemisphere suggest that there is a phase shift of about one month between the two rhythms. We found a constant rate of acts of hostility throughout the year around the line of the Equator (b in the figure). (R7)

Replying to Schreiber's hypothesis, R. Bennett thought that the rather impressive correlation might be due simply to the fact that the best season for starting wars is when there is plenty of daylight and warm weather. (R8)

References

R1. Brooks, C.E.P.; "Physical Factors in the Historical Process," Meteorological Magazine, 63:47, 1928. (X1)
 R2. Tchijevsky, A.L.; "Physical Factors in the Historical Process," Cycles, 8:31, 1957. (X1)
 R3. Dewey, Edward R.; "Economic and Sociological Phenomena Related to Solar Activity and Influences," Cycles, 41:151, 1990. (Reprint of a 1968 article) (X2)
 R4. Dewey, Edward R.; "The Patterns of War," Cycles, New York, 1971, p. 145. (X2)
 R5. Tromp, S.W.; "Studies Suggesting Extra-Terrestrial Influences (Apart from Solar Radiation) on Biological Phenomena and Physicochemical Processes on Earth," Cycles, 33:179, 1982. (X2, X3)
 R6. Payne, Buryl; "Cycles of Peace, Sunspots, and Geomagnetic Activity," Cycles, 35:101, 1984. (X3)
 R7. Schreiber, Gabriel, et al; "Rhythms of War," Nature, 352:574, 1991. (X4)
 R8. Bennett, Robert; "Rhythms of War," Nature, 353:310, 1991. (X4)



Battles-per-month and length-of-day plotted by month for: (a) the Northern Hemisphere; (b) Equatorial latitudes; and (c) the Southern Hemisphere. (X4)

BHB9 A Relationship between Number of Wars and Number Killed

Description. The curious mathematical relationship between the number of wars and/or fatal quarrels and the number of people killed in them.

Data Evaluation. A short report in *Nature* covering the period 1820-1929. Much happened before 1820 and after 1929. It would be useful to expand the reported study. Rating: 2.

Anomaly Evaluation. No *a priori* reason exists for expecting any relationship between the number of conflicts and the numbers killed in each, although we would intuitively expect large wars to be less frequent than small fatal confrontations, such as murders. The magnitude of a war depends in part upon available technology, political organization, issues involved, individuals involved, population density, etc. Our research has found no theory incorporating all such pertinent factors that could lead to the claimed mathematical relationship. For this reason, the phenomenon is mildly anomalous. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Cyclicity of violent human behavior (BHB8); population explosions of animals, such as lemmings and squirrels (BMD).

Entries

X1. A survey of fatal quarrels.

In order to investigate the causes of wars by counting occurrences, let the magnitude of any war be defined to be the logarithm, to the base ten, of the number of persons who died because of that quarrel. This definition has the advantage that it applies, not only to what are ordinarily called wars, but also to all kinds of fatal quarrels, including insurrections, frontier incidents, riots and murders.

The number of wars of various magnitudes, which ended from 1820 to 1929 A.D. inclusive, have been counted, after laborious search in works of history. The number of murders is an estimate from the statistics of crime. Between the wars and the murders, in the range between magnitudes 2.5 and 0.5, there were certainly many fatal quarrels; but statistics of them are scanty, presumably because such incidents are mostly too small to be history and too large to be crime. The results are:

| | | | | | | |
|-----------------------------------|-------------------|-------------------|-------------------|-------------------|-----------|-------------------|
| Ends of range or magnitude | $7\pm\frac{1}{2}$ | $6\pm\frac{1}{2}$ | $5\pm\frac{1}{2}$ | $4\pm\frac{1}{2}$ | | $0\pm\frac{1}{2}$ |
| Observed number of fatal quarrels | 1 | 3 | 16 | 62 | | 10^7 |

It is seen that the numbers of wars in successive equal ranges of magnitude are nearly in agreement with the geometrical progression 1, 4, 16, 64; but that when this progression is continued, it gives 16,384 for the number of murders instead of the observed 10^7 .

These remarkable relations call for explanation. (R1)

Reference

- R1. Richardson, Lewis F.; "Frequency of Occurrence of Wars and Other Fatal Quarrels," Nature, 148:598, 1941. (X1)

BHB10 Correlation of Economic Activity with Solar Activity

Description. The correlation of solar activity (usually measured by the number of sunspots) with terrestrial economic activity (measured by such factors as stock prices, manufacturing levels, employment, or, in early cycle research, simply booms and busts).

Data Evaluation. Modern sunspot data are excellent; even century-old sunspot counts are of good quality. Economic statistics are many and varied and less reliable as one looks backward in time. The correlation of time series of sunspot and economic indicators are sometimes good over limited spans of time for specific variables. On the other hand, the simple comparison of sunspot and economic periods is often disappointing because the solar cycle period is far from constant. To make matters worse, economic data often yield several different periods that do not match the average sunspot period. In sum, the basic data employed to explore the putative phenomenon are good, but the correlations of the two types of data are often unconvincing. Rating: 3.

Anomaly Evaluation. The causal bridge between solar activity and terrestrial economics is elusive. The chain commencing with the sun's effect on weather, progresses through the weather's effect on crops, to the crops' effect on the economy. This chain is viewed unfavorably today. Many cycle researchers hypothesize that solar activity affects human psychological outlook, perhaps through changes in the geomagnetic field. Human psychology then modulates the economy. Of course, no one understands how any of the links in this chain really operate. Assuming that a causal chain actually does link the sun to human economics, our ignorance about its workings makes this phenomenon highly anomalous. Rating: 1.

Possible Explanations. Solar activity varies the geomagnetic field which, in turn, affects human psychology, which then modulates the economy. Obviously, some links have been omitted in this causal chain.

Similar and Related Phenomena. Correlations of disturbed human behavior and solar activity (BHB3); the confusing variety of periodicities in various economic indicators (BHB13).

Entries

X1. The pioneering work of W.S. Jevons. Well over a century ago Jevons observed regularities in economic activity and speculated that commercial booms and busts waxed and waned in step with the sunspot cycle. Thus began the cult of sunspottery, at least that is what some detractors called the rash of attempts to correlate human activities with those of the sun. Sunspottery is far from dead, so it is educational to begin with Jevons' own thinking on the subject.

It is curious to notice the variety of the explanations offered by commercial writers concerning the cause of the present state of trade. Foreign competition, beer-drinking, over-production, trades-unionism, war, peace, want of gold, superabundance of silver. Lord Beaconsfield, Sir Stafford Northcote, their extravagant expenditure, the Government policy, the wretched Glasgow Bank directors, Mr. Edison and the electric light, are a few of the happy and consistent suggestions continually made to explain the present collapse of industry and credit.

It occurs but to few people that what is happening now is but a mild repetition of what has previously happened time after time. October, 1878, is comparable with May, 1866, with November, 1857, with October, 1847, and, going yet further back, with a somewhat similar condition of things, in 1837, in 1825-26, and even in 1815-16. The incidental circumstances of these commercial collapses have indeed been infinitely diversified. At one time the cause seemed to be the misconduct of the great firm of Overends; in 1837 there was the mutiny in India, the peace with Russia, and a commercial collapse in the United States; in 1847 occurred the Irish famine and a failure of European harvests generally, following upon the great railway mania; the crisis of 1837 succeeded an immense expansion of home trade, the establishment of joint stock banks, and the building of multitudes of factories and other permanent works; 1825 was preceded by extravagant foreign speculations and foreign loans; 1815 was the year of

general peace. All kinds of distinct reasons can thus be given why trade should now be inflated and again depressed and collapsed. But, so long as these causes are various and disconnected, nothing emerges to explain the remarkable appearance of regularity and periodicity which characterises these events.

The periodicity of the earlier portion of the series is so remarkable that, even without the corroboration since received, it convinced scientific inquirers that there was some deep cause in action. Dr. Hyde Clarke, for instance, wrote, more than thirty years ago, a paper entitled "Physical Economy---a preliminary inquiry into the physical laws governing the periods of famines and panics." This paper was published in the Railway Register for 1847, and is well worth reading. In the commencement he remarks: "We have just gone through a time of busy industry, and are come upon sorrow and ill-fortune; but the same things have befallen us often within the knowledge of those now living. Of 1837, of 1827, of 1817, of 1806, of 1796, there are men among us who can remember the same things as we now see in 1847. A period of bustle, or of gambling, cut short in a trice and turned into a period of suffering and loss, is a phenomenon so often recorded, that what is most to be noticed is that it should excite any wonder." (R1)

It is this sort of thinking that propelled Jevons into hypothesizing a causal link between commercial fluctuations and a natural phenomenon possessing about the same period---10-11 years---the sunspot cycle. Jevons tied sunspots to weather and thence to agricultural successes and failures.

Critics were quick to point out that the commercial crises often occurred well before and after the sunspot peaks. One doubter found that only seven of Jevons's 17 crises came within two years of the spot maximum. Furthermore, the crises of 1804, 1815, and 1837 were bad matches indeed. (R3) Even so, Jevons had started something, and people are still trying to match human terrestrial events with heavenly activity.

X2. The Garcia-Mata/Shaffner analysis.

In this Catalog we only have room to review a few studies of the purported phenomenon. One of the most important of those that followed Jevons' rather inconclusive attempts was that by C. Garcia-Mata and F.I. Shaffner. They began with the purpose of showing that there was absolutely no correlation between solar activity and terrestrial economic cycles. They found otherwise!

Garcia-Mata and Shaffner first reviewed the research that had been done since Jevons' time. In particular, they singled out the efforts of H.L. Moore, W.M. Persons, and E. Huntington. They summarized the situation as of 1934 as follows:

First, the fact of a correlation between the solar cycle series and a business cycle series has not yet been established through statistical methods.

Second, the logical reason for a connection has not been found. There is still a "missing link," as Jevons said. The explanations through weather and crops have not been proved sound, and the same can be said of the explanations through the effect of meteorological phenomena on human health. (R4, R5)

But, they continued, much had been learned about the solar cycle since Jevons' time. A most important point was that the cycle length varied between 8.2 and 15 years---there was no exact period for the sunspot cycle. The proper way to test for a relationship between sunspots and terrestrial economic activity would be to correlate time series of each; for example, on a month-by-month basis. This is just what Garcia-Mata and Shaffner did.

One of their graphs, using more refined data than Jevons had access to, is reproduced here. The similarities of the curves are impressive. Garcia-Mata and Shaffner concluded with the following paragraph.

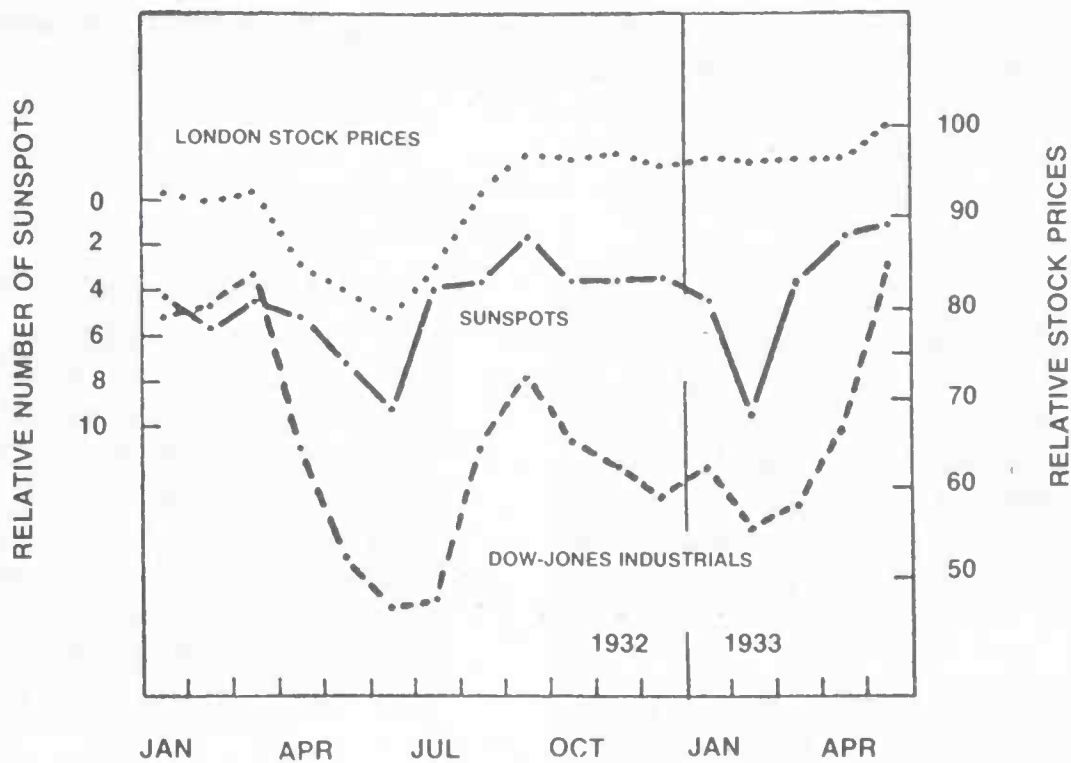
By way of conclusion, we wish to repeat that the results of this paper are not supposed to be in any sense final. The results are so striking, however, that it is thought desirable

to publish them in their present preliminary stage in the hope that other investigators may be encouraged to do further work along the same lines and contribute suggestions and criticisms. In particular, it should be noted that the aspect of this subject which requires the most careful attention is that which concerns the direct effect of various manifestations of solar activity upon the psychological attitudes of human beings. The value of the high correlations obtained depends upon the proof of the validity of a direct causal relation between solar and human activity. (R4, R5)

The sample graph from the Garcia-Mata/Shaffner study shows little or no time lag between the presumed driving force (the sun) and human activity. This makes it obvious that the causal connection, if it exists, cannot be transmitted through long-time-lag channels, such as agriculture. The choice of a near-instantaneous effect of solar activity on human psychology is consistent with many of the preceding Catalog entries dealing with solar activity and human behavior. However the four Catalog entries that follow demonstrate that the various human economic activities display many periodicities that are incompatible with the solar-cycle signal. (WRC)

References

- R1. Jevons, W. Stanley; "Commercial Crises and Sun-Spots," Nature, 19: 33, 1878. (X1)
- R2. Jevons, W. Stanley; "Sun-Spots and Commercial Crises," Nature, 19: 588, 1879.
- R3. "Sunspots and Commercial Panics," English Mechanic, 28:487, 1879. (X1)
- R4. Garcia-Mata, Carlos, and Shaffner, Felix I.; "Solar and Economic Relationships: A Preliminary Report," Quarterly Journal of Economics, 49:1, 1934. (X2)
- R5. Garcia-Mata, Carlos, and Shaffner, Felix I.; "Solar and Economic Relationships: A Preliminary Report," Cycles, 9:222, 1958. (X2) Reprint of R4.
- R6. Sparkes, J.R.; "Sunspots and the Business Cycle," Nature, 252:520, 1974. (X1)



Sample graph from the Garcia-Mata/Shaffner analysis showing stock prices varying with solar activity. (X2)

BHB11 Correlation of Economic Activity with the Lunar Tidal Forces

Description. The correlation of economic activity (stock prices, agricultural output, construction, etc.) and tidal forces (as calculated from the position of the moon and, to a lesser extent, the sun).

Data Evaluation. The tide-raising forces of the moon are well-known and predictable. On the other hand, although data representative of human economic activities have been compiled for roughly two centuries, they are bewilderingly complex and seem to contain many poorly understood periodicities. (BHB13) Many of the periodicities, in fact, do not seem to be associated with any natural cycles. This fact makes it difficult to identify any cause-and-effect relationships. This confused situation has led to many bizarre and poorly substantiated claims.

Rating: 3.

Anomaly Evaluation. As with the possible correlation of solar activity and terrestrial economic activity (BHB10), weather and crop production have been implicated in a cause-and-effect chain. While there is some physical justification for this, most mainstream scientists remain doubtful that the moon even affects the weather, much less economic activity. Therefore, this possible correlation is contrary to current thinking. Rating: 2.

Possible Explanations. The moon-weather-agriculture-economic activity connection. Complex systems, such as human economic activities, can exhibit natural periodic fluctuations without external driving forces.

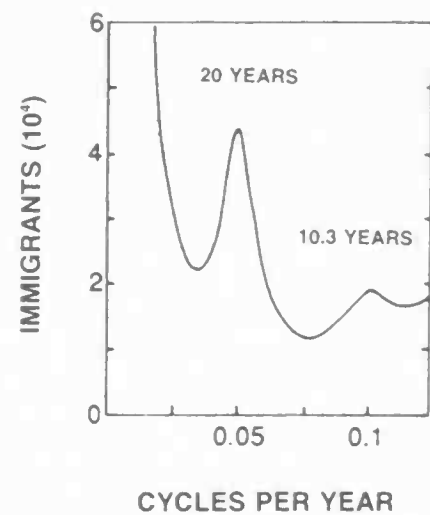
Similar and Related Phenomena. Correlation of sunspots and economic activity (BHB10); correlation of lunar phase and the weather (GWS1).

Entries

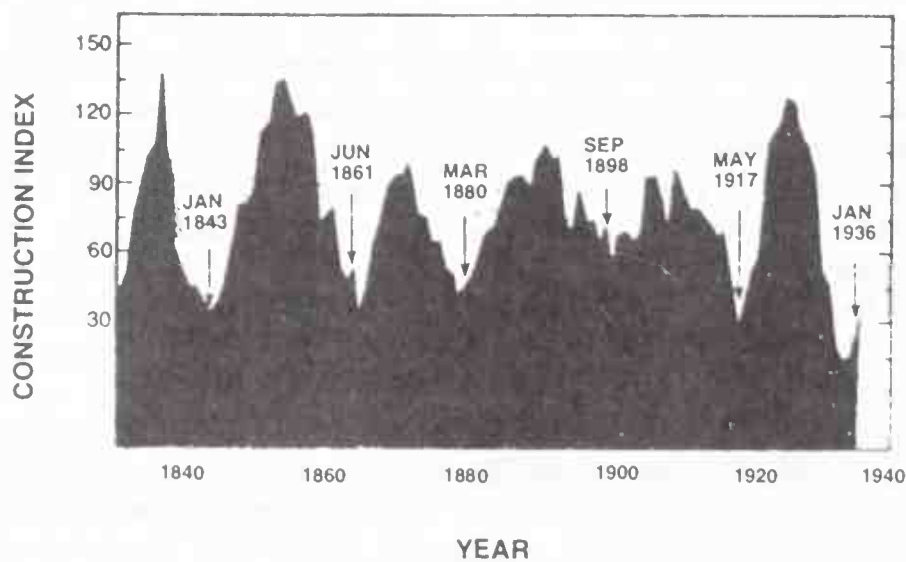
X1. The 18.6-year agricultural connection. The 18.6-year nodal periodicity in lunar motion seems to show up in some rainfall and crop-production records. R. Currie theorizes that these signals are transmitted to the economies of nations and show up in various measures of economic activity. He begins as follows:

For thousands of years, many people have believed that the Moon influences events on Earth. Now it seems this belief may be founded on fact. The changing spatial relationship of the Moon and Sun, relative to the Earth, produces a repeating pattern of alignments that was known to the Babylonians. They and others used it to predict eclipses. This pattern exerts a strong tidal force on the Earth, which varies over a period of 18.613 years. I have found that this tide, through its influence on the atmosphere of our planet, modulates rainfall in the US, which, in turn, affects crop production. I propose that this effect causes the "Kuznets long swings", cycles roughly 20 years long in the American economy, first noted in 1930 by the economist Simon Kuznets. (R2)

This postulated effect can be seen in two graphs presented by Currie. The first graph takes American building construction as a measure of investment. The second plots the number of immigrants arriving in the United States, presumably in response to economic problems in their homelands. Currie also provides agricultural yield curves that show the 18.6-year signal, but cautions that this periodicity does not show up



Frequency plot of U.S. immigration, which probably reflects foreign economic conditions. (Adapted from R2, X1)



Index of U.S. building construction versus time, illustrating the 18.6-year economic cycle. (Adapted from R2, X1)

in the crops harvested in some regions of the country. Further caution is recommended because, as will be shown later, the many different economic indexes display a wide variety of periodicities, many of which have nothing to do with lunar motion. (BHB13).

X2. Tidal signals in stock prices. J.B. Bradshaw looked at the long record of New York Stock Exchange prices and tried to account for the variations observed by appealing to the various components of lunar tidal force. He did not attempt to find a cause-and-effect relationship. His precis follows:

This paper investigates the hypothesis that long term variations in tidal potential may, in turn, be related to otherwise inexplicable fluctuations in economic phenomena.

A set of twenty-nine cosine, sine curves based on Fourier Analysis of four different fundamental periods related to astronomical tidal variations are suggested which explain eighty-eight percent of the variance in and

closely approximate the outline of a time series reflecting New York Stock Exchange prices from 1792 to 1977 when they are expressed in current terms. (R1)

In one sense, Bradshaw tried to reconstruct the stock data by adding together known lunar tidal signals. He wisely cautioned the reader, however, that spurious periodicities can be introduced by the extensive use of moving averages and even by random processes. Bradshaw termed his results "provocative", but did not claim to have proved a lunar relationship.

References

- R1. Bradshaw, John B.; "A Preliminary Inquiry into the Possibility of a Relationship between Long Term Variations in Tidal Potential and Fluctuations in an Economic Time Series," Cycles, 31:9, 1980. (X2)
- R2. Currie, Robert; "Lunar Tides and the Wealth of Nations," New Scientist, p. 52, November 5, 1988. (X1)

BHB12 Correlation of Economic Activity with Solar-System Configurations

Description. The correlation of economic activity (specifically the Standard & Poors monthly index) with solar-system configurations (notably alignments of Jupiter, solar-system center-of-mass, and the sun). Such configurations are considered "instabilities" by the framer of this anomaly.

Data Evaluation. Only one study has been found identifying this unusual correlation. Furthermore, this study was not in the refereed scientific literature. Rating: 3.

Anomaly Evaluation. The scientific position regarding this claimed anomaly is that the gravitational effects of Jupiter and the other planets have negligible influences on terrestrial and solar events and processes. The other recognized natural forces, such as the electromagnetic force, are considered to have even less influence. Therefore, this Catalog entry is highly anomalous. Rating: 1.

Possible Explanations. Even though the planets' influence on solar activity is

dismissed as negligible, planetary positions have been correlated with solar activity (AOS9). It is possible, then, that the following causal chain might exist: planetary position/solar activity/terrestrial weather/human economic activities.

Similar and Related Phenomena. The correlation of planetary configurations with solar activity (AOS9), with terrestrial weather (GWS8), with radio propagation (GER11), and with earthquake frequency (GQS7).

Entries

X0. Background. The solar system's planets are so small and so far away from the earth that one cannot imagine how they might modulate terrestrial affairs. Their gravitational forces at the earth's distance would be too tiny to have any effect. Also electrical forces seem out-of-the-question. In the face of such reasoning and the derision of most scientists, some correlations actually have been claimed between planetary positions, particularly that of Jupiter, and several terrestrial phenomena, such as weather (GWS8), radio propagation (GER11), and even earthquake frequency (GQS7). Is there a common denominator here? It also seems that the sunspot cycle may also correlate with the positions of the planets (ASO9), presenting us with the possibility of a planets-sun-earth cause-and-effect chain! If such a series of correlations is real, why not a planets-sun-earth-human behavior series? This could account for planetary-position signals in economic data.

tiate strong impulses of torque in the sun's orbital motion about CM. Their astrophysical effects have been dealt with elsewhere [again by the author].

According to recent results of research in complex dynamical systems, JU-CM-CS events release instability because they are boundary phenomena. The sun reaches a zero phase in its oscillatory motion about CM. The torque acting on it approaches zero, changes sign, and shows sharp increase in the opposite direction. The sun changes from approaching the center of mass to receding from it, or vice versa. This turning point in the sun's cyclical motion about CM, related to the transgression of a zero phase and resulting instability, induces corresponding turning points in terrestrial cycles that are linked to the sun's activity. JU-CM-CS events form cycles with a mean period of 9.275 years. Intriguingly, Dewey and Vaux found a 9.225-year cycle in stock prices. (R1)

X1. Economic activity and solar-system instabilities. T. Landscheidt has expanded upon this rationale in a 1989 paper in Cycles:

It has been shown [by the author] that energetic solar eruptions and related geomagnetic storms can be predicted by means of major and minor instability events released by special solar system configurations. Minor instability events occur when the sun's center (CS), the solar system's center of mass (CM), and Jupiter (JU)---the weighty center of the world of planets---are in line (JU-CM-CS). Such configurations ini-

To demonstrate the claimed economic effects of these solar-system instabilities, Landscheidt plotted the Standard & Poors 500 monthly index. On this he marked the epochs of solar-system instabilities. The peaks and dips of the chosen economic index do match quite well with Landscheidt's instabilities. (R1)

References

- R1. Landscheidt, Theodor; "Mini-Crash in Tune with Cosmic Rhythms," Cycles, 40:317, 1989. (X1)

BHB13 Periodicities in Various Economic Parameters

Description. The periodic variation of various measures of economic activity with the passage of time. Key characteristics of these periodicities are: (1) the great variability in length; (2) their stability over decades, even centuries; (3) the absence of any obvious correlations with recognized natural driving forces; and (4) the existence of more than one frequency some for some parameters.

Data Evaluation. We have not delved into the voluminous literature of economics, where considerable research has been done on economic cycles. Rather, to reduce labor, we rely here on periodicities announced by the Foundation for the Study of Cycles. The number of periodicities from just this one source is overwhelming, and only a few have been cataloged. These should be adequate to prove the existence of many periodicities in economic activity. Rating: 2.

Anomaly Evaluation. Many natural systems, including some very complex ones, are naturally periodic; that is, one or more parameters may vary cyclically without the presence of any external driving force. Old Faithful is a rather simple example. Economic systems, though more complex, can also oscillate. This is interesting but scarcely anomalous. What is remarkable about the examples cited below is their long-term stability amid social changes and wars. Additionally, the world's complete economic system consists of hundreds of these smaller systems, many operating with different periodicities. Scientists remain ignorant about many of the variables that affect each of the small systems and how they all mesh together. It is this ignorance and our inability to predict economic activities, rather than any paradigm challenge, that makes us assign a low level of anomalousness to this phenomenon. Rating: 3.

Possible Explanations. None required.

Similar and Related Phenomena. Economic activity correlated with natural driving forces: the sun (BHB10); the moon (BHB11); the positions of the planets (BHB12).

Entries

X0. Background. In recent years, the search for periodicities in economic activities has been spearheaded in the United States by the Foundation for the Study of Cycles. The founder of this group, E.R. Dewey, in his book Cycles, has singled out about a score of economic factors involving either production or prices that display strong cyclicity. The periods range from 3.5 to 54 years. The two salient features of these periodicities are: (1) their markedly different lengths; and (2) the lack of correlations with any known natural potential driving forces.

Many additional periodicities in economic activities can be found in the journal of the Foundation for the Study of Cycles, appropriately named Cycles. For review here, we select just a few periodicities mentioned in Dewey's book.

X1. The 3.5-year cycle in corn prices.

Even the most casual study of a chart of corn prices, 1720 to date, shows evidence of a cycle of a little less than four years long which repeats time after time with reasonable regularity.

Actually the period has varied a bit down the years, with two 4.75-year waves early in the phenomenon's history; but since 1860 it has settled down to 3.5 years for 95 years. (R1)

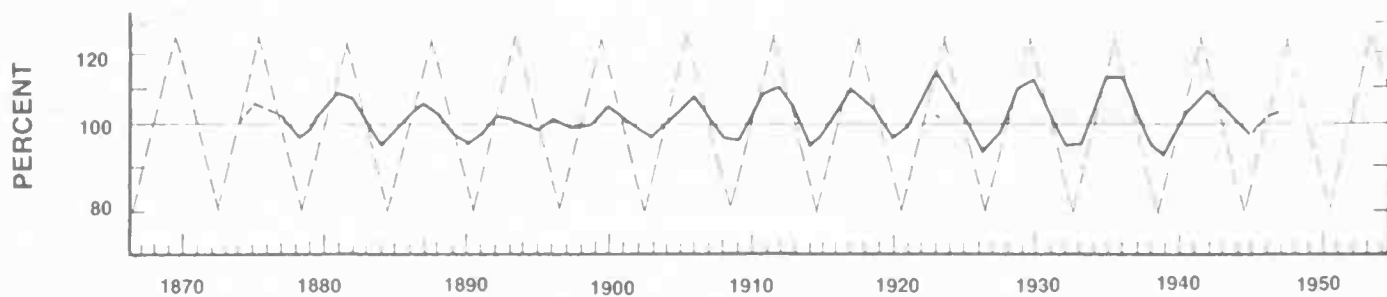
X2. The 6-year cycles in General Electric orders and steel production. Here two diverse parameters have the same period. The General Electric data show

this periodicity for the 50-year period 1896-1946; the U.S. production of steel ingots shows the same rhythm for the period 1874-1947.

A rhythm of this length is very common in American industry. Of thirty companies studied it is present in the sales and production of twenty-five. (R1)

The recurrence of this cycle over the span of 85 years, and the strength and regularity displayed, made this cycle an important factor for agriculturists involved in our great multi-million dollar wheat industry.

Dewey remarked that the same cycle is apparent in lynx abundance, salmon abundance, and deaths from heart dis-



The 6-year cycle in steel production, 1874-1947. (Adapted from R1, X2)

X3. The 6.4-year cycle in aluminum production. The United States has been producing aluminum for just over a century. In 1885, only 500 pounds were produced; today production is many million times that figure. Despite this rapid growth and fluctuations in demand (as in wars), a strong periodicity of 6.4 years can be seen in the departures from a smooth growth curve. Other economic parameters exhibit the same period.

In the economic field we have a cycle of about this length in the liability of commercial and industrial failures, in the unit sales of General Motors passenger cars and trucks, in pig iron prices, in cotton prices, in rail stock prices. (R1)

X4. The 9.6-year cycle in wheat acreage. The following quotation is attributed to the May 1951 issue of Cycles:

We are happy to announce the discovery of a cycle of about 9.6 years in length which has been present in the acreage of wheat in the United States from the earliest figures, 1868, to the present [1951].

ease. (R1)

When such disparate factors vary with the same periodicity, the existence of a common driving force seems most unlikely. (WRC)

X5. The 17.75-year cycles in pig-iron and cotton prices. Both of these commodities have the same period; cotton for over 220 years, and pig iron since 1874. Speaking of cotton prices, Dewey elaborates:

In the past we have had 21 tops and bottoms...15 came on time or within 2 years of perfect timing, 4 came 3 years one way or the other of perfect timing, 1 was 4 years off and 1 was 5 years off. (R1)

Considering the many factors that go into determining the price of cotton, it is remarkable that the periodicity has remained so stable.

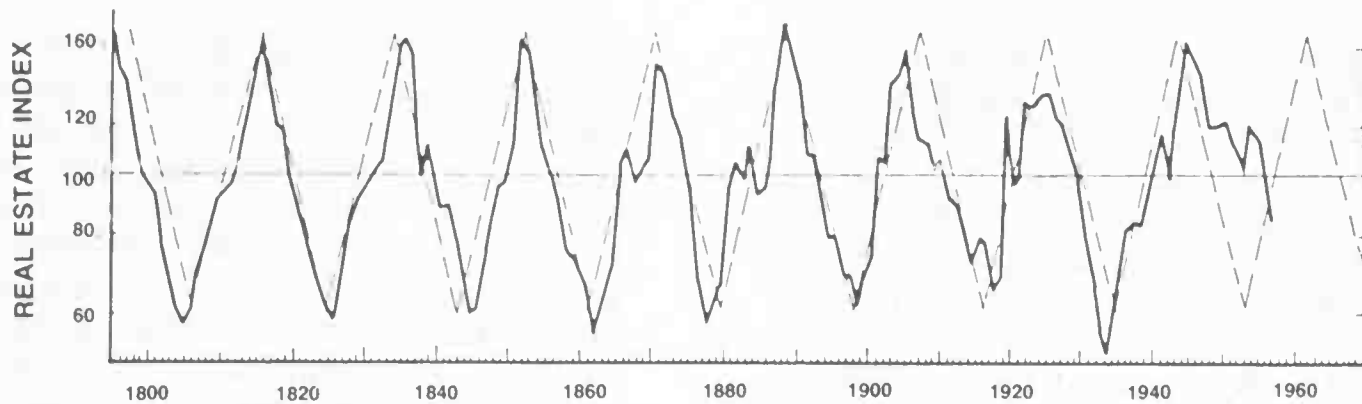
X6. The 18.3-year cycle in real-estate activity.

Real estate activity in the United States has fluctuated since 1795 in a very regular cycle slightly over 18

years long...From 1795 through 1946 there were eight repetitions of the 18 1/3-year cycle. The experience covers a time span of 150 years and the waves are too clear and regular to be denied or ignored. (R1)

Reference

R1. Dewey, Edward R.; Cycles: The Mysterious Forces that Trigger Events, New York, 1971. (X1-X6)



The 18.3-year cycle in real-estate activity, 1795-1958. (Adapted from R1, X6)

BHB14 Human Culture: An Enigma of Evolution

Description. The high levels of humanity's religiousness, artistic talents, and capabilities in mathematics and science---as determined by humans themselves! Humanity, in general, is thought to display immense cultural advances over those of the "lower" animals. In addition, and more important, is the fact that human cultural levels seem far greater than necessary for the survival of the species.

Data Evaluation. The cultural aspects of human evolution have been debated from the time of Darwin and Wallace down to the present. Scientists and philosophers have written extensively on the subject. Most of the assertions and declarations, however, are anthropomorphic! In sum, the data may be voluminous, but they are colored by human presumptions..Rating: 2.

Anomaly Evaluation. The anomaly addressed here is not so much the apparent advance of human culture over those of the other animals as the perceived evolutionary overshoot; that is, those aspects of culture that are far in excess of what is needed for survival in the natural world. To illustrate, singing talent and mathematical genius are unnecessary for tracking game and digging roots. Many philosophers of science have suggested that human cultural overshoot is not only contrary to the slow, incremental working of evolutionary theory but also suggests a special role for humanity in the universe. Both of these thoughts are anathema to modern science. Rating: 1.

Possible Explanations. Human culture is a temporary, accidental overshoot of evolution; and, since high culture is apparently unnecessary for survival, it will eventually be smoothed out. The religiously inclined believe that human culture is part of God's plan.

Similar and Related Phenomena. Cyclicity in human religiousness (BHB15); human altruism (BHB17); the Anthropic Principle; individual human genius and calculating prodigies (Series-P catalog volumes); anomalies associated with human intelligence (BHB35-43); anomalies of human eminence (BHB27-34).

Entries

X1. Collective religious behavior. We humans are believed by many to differ from the other animals in our religious and ethical behavior. Humans everywhere establish codes of ethics and the tenets of religion. Historically, religious activities have absorbed much of humanity's energies; they have led to great mass movements, exploration of the planet, and bloody conflicts. It is not necessary to dwell further upon the importance of religious behavior. Instead, we must ask why humans have this behavioral trait, what its biological significance is, and whether its presence is anomalous.

Defining religiousness. Toward the end of his book Cosmic Life Force, F. Hoyle identified religiousness as one of humanity's "non-Darwinian" gifts:

Humans are also the only creatures endowed with what could be called a religious instinct. We assign an importance to ourselves beyond the immediate dictates of survival. We think of our kith and kin and all fellow members of our species as having an importance as individuals, as well as an importance that transcends individual identities. We have an innate yearning, it seems, to be identified as a part of some ill-defined grander scheme of things. We are purposeful creatures, and to discover an ultimate purpose that links us one to another and to the wider Universe, Man has traditionally turned to religion

Religion is probably as old as Man himself. Every religion that has evolved can be seen as an effort to discover a greater purpose for which we might live and die, and to seek a First Cause for all living things.

(R7)

Is religion unique to humanity? We cannot answer this question because no one really knows what the other animals think, or even if they can think as we

do. We do see that individual dogs, for example, sometimes exhibit guilt and bad conscience, but can go no further than this in such an inquiry. We cannot enter their minds. In later volumes of this Catalog, we shall see that animals occasionally participate in collective ritualistic behavior, but this is rare and hard to interpret, and it seems reasonable to assume that religiousness is a unique human attribute. Further, since all human societies seem to indulge in religious activities, we can also assume that this rare trait is inheritable.

Does religiousness have survival value? Speaking in Darwinian terms, religiousness, as an inheritable trait, would persist in humanity only as long as it contributed to the survival of our species. Unfortunately, modern man has existed for only an instant in terms of geological time. We observe that religiousness helps hold societies together and succor the weak, but it also can lead to great carnage. As far as this trait's survival value is concerned, the jury is still out!

The biological import here is that religiousness could well be non-Darwinian; that is, of little or no (or possibly even negative) survival value. Like the human brain, the trait of religiousness could be a case of evolutionary overshoot---too much of a good thing---or completely extraneous to the business of survival. On the other hand, religiousness could signify the existence of a Grand Plan and a Grand Planner. If such is the case, and the passage of geological time does not erase it, religiousness as a variety of human behavior, is highly anomalous, for mainstream science does not countenance Grand Planners!

Finally, religiousness being inheritable must somehow be expressed in the genome and then in our brain's circuitry. No one has an inkling as to how behavioral traits can be coded onto the genes.

X2. Artistic behavior. Music, art, literature, and related aspects of human culture are widely judged as pinnacles of human achievement. But in the spotlight of evolutionary mandates, what survival value do they have? Has human evolution depended upon singing abilities or talent with watercolors? If artistic behavior has no survival value, why did it arise, and especially why did it appear in such abundance. Human talents in music, dancing, and writing far exceed anything needed either today or in late Pleistocene times.

Darwin himself struggled with this dilemma, for it was obvious to all that human artistic abilities represented a quantum leap over those of the animals. Darwin explained the cultural gap between humans and the other animals by appealing to the struggles between human tribes and societies rather than competition with other species. During this human-human struggle, artistic talents improved bit by bit, as demanded by evolution. This hypothesis did not impress A.R. Wallace one bit, L.C. Eiseley recounts Wallace's thinking:

He [Darwin] committed the Darwinian heresy of maintaining that their [native peoples'] mental powers were far in excess of what they really needed to carry on the simple food-gathering techniques by which they survived.

.....

Finally, Wallace challenged the whole Darwinian position upon man by insisting that artistic, mathematical, and musical abilities could not be explained on the basis of natural selection and the struggle for existence. Something else, he contended, some unknown spiritual element must have been at work in the elaboration of the human brain. Why else should men of simple cultures possess the same basic intellectual powers which the Darwinists maintained could only be elaborated by competitive struggle? (R2)

Human artistic abilities represent no mean problem to evolutionists, and all who tackle this problem go back to Wallace's formulation of the problem. S.J. Gould, for example, thought it worthwhile to quote Wallace's position on human musical talent:

Wallace did not confine this general argument to abstract intellect, but extended it to all aspects of European "refinement," to language and music in particular. Consider his views on "the wonderful power, range, flexibility, and sweetness of the musical sounds producible by the human larynx, especially in the female sex."

"The habits of savages give no indication of how this faculty could have been developed by natural selection, because it is never required or used by them. The singing of savages is a more or less monotonous howling, and the females seldom sing at all. Savages certainly never choose their wives for fine voices, but for rude health, and strength, and physical beauty. Sexual selection could not therefore have developed this wonderful power, which comes only into play among civilized people. It seems as if the organ had been prepared in the anticipation of future progress in man, since it contains latent capacities which are useless to him in his earlier condition. (R4)

Wallace also maintained that, because of culture and its ethical values, the weaker elements of humanity were being allowed to survive, thus thwarting natural selection. (R1)

Perhaps because of Wallace's racist remarks, few pay much attention to him today. Yet, some modern scientists have also pointed out this paradox presented by human esthetic proclivities. J.C. Marshall remarked:

No human culture is devoid of music and dance, the visual arts, poetry and story-telling. All normal children stomp unprompted to the band, scribble on the walls or doodle in the sand; devoted to our doggerel din they demand the selfsame story 'til their parents' imperfect patience wears exceedingly thin. No obvious utilitarian value attaches to such phenomena. The notion that the young are merely exercising their muscles and memories lacks conviction; the pleasure seems to be genuinely 'aesthetic' (although one might be hard pressed to provide rigorous corroboration) and intrinsic to our species. (R6)

Do other animals have an esthetic sense?

In our volume on mammals, Section BMB, we will find that chimps and perhaps even elephants have a tinge of artistic sense. The bower birds of Australasia do seem to decorate their bowers and carefully position bright (often blue) objects in a manner that probably seems artistic to them. In general, though, animals build structures and birds sing for strictly utilitarian purposes. In sum, the human esthetic sense and the actions it stimulates are far above and beyond anything detectable among the rest of the animals. (R6)

How did the human esthetic sense arise?

The dedicated evolutionist follows Darwin, saying that the great difference between human and animal esthetics arose gradually because of human-human competition. S.L. Washburn ventures that human esthetic values were first applied to stone tools and weapons. The best-crafted of these worked the best and provided their makers with more food and adulation from his peers. Little by little, esthetic values developed in the context of the appreciation of fine workmanship. (R3) This hardly applies to the acquisition of a good singing voice. (WRC)

An entirely different approach was advanced by J.S. Bleakney:

It is difficult to imagine any survival value or reproductive premium being placed on selection of genes for artistic appreciation. But one can imagine this esthetic sense being an inadvertent byproduct of the brain structure and learning processes which have accounted for the behavioral patterns of survival characteristic of the mammalian group of vertebrates....If the earliest experience of anthropoid infants, especially pleasant ones of warmth, food and love, are associated with round faces and their symmetrically disposed components, and with linear fingers, then could it not be that patterns seen or constructed (the latter process being relatively easy for an animal inadvertently endowed with manual dexterity) which are familiar and can thus be related, will hold the most appeal and yield the greatest satisfaction? I would suggest that natural objects which interested early man, such as fossil echino-

derms and corals, were attractive because of the similarity of their central disc and radiating lines to the patterns of man's own hand. Modern man is equally fascinated when he recognizes familiar shapes in a strange object or foreign material; driftwood shapes for example. (R8)

X3. Mathematical and scientific talents.

While religiousness and artistic capabilities are shared by most humans, the talents for mathematics, science, chess-playing, and similar pursuits are more rare. To be sure, most can be taught arithmetic, even algebra, but as a species we do not play with calculus like we hum tunes or go to church on Sunday. Furthermore, mathematical talents of individuals may be truly incredible---far above the norm for the species. (See the Series-P Catalogs for elaboration of this theme). In this vein. L. Watson once wrote:

Amongst all the improbability, nothing stands out more dramatically than the human brain, in the creation of which---said Arthur Koestler ---"evolution has wildly overshoot the mark." It seems to be an instrument well in advance of our needs. Why else should it be possible for anyone to respond, just four seconds after being asked to turn 4/47 into a decimal, with the reply "Point 08510638-297872340425531914." A.C. Aiken, then Professor of Mathematics at Edinburgh University, did this in just 24 seconds, then stopped to think for a moment before adding "8936170212765-9574468---and that's the repeating point. It starts again then at 085. (R5)

Watson also mentioned R. Mahadevan who could recite pi from memory to 31,811 places!

In the realm of math and science, therefore, we must explain not only our capabilities as a species, but also the occasional appearance of great genius. (Of course, genius occurs in the arts, too.)

One would never entertain the idea that chimps or dogs could master calculus or split the atom, so there's no question here about the human intellect having advanced far beyond those of

the other animals.

But where did these talents come from and to what purpose? Darwinian evolution by small random steps seems ridiculous here. It is made even more unlikely by the existence of calculating prodigies, who have exceptional mathematical talents but are dull or even retarded in other intellectual endeavors. It seems that mathematical talents, especially, burst upon us like bombshells, completely oblivious to the paradigm of evolution. (WRC)

References

- R1. "On the Failure of 'Natural Selection' in the Case of Man," Eclectic Magazine, 8:1521, 1868. (X1)
- R2. Eiseley, Loren C.; "Was Darwin Wrong about the Human Brain?" Harper's Magazine, 211:66, 1955. (X1)
- R3. Washburn, S.L.; "Comment on: 'A Possible Evolutionary Basis for Aesthetic Appreciation in Men and Apes'," Evolution, 24:824, 1970. (X2)
- R4. Gould, Stephen Jay; "Natural Selection and the Human Brain: Darwin vs. Wallace," The Panda's Thumb, New York, 1980, p. 56. (X2)
- R5. Watson, Lyall; "Self," Beyond Supernature, New York, 1988, p. 89. (X3)
- R6. Marshall, John C.; "The Sublime and Synaptic," Nature, 341:577, 1989. (X2)
- R7. Hoyle, Fred, and Wickramasinghe, Chandra; "The Concept of a Creator," Cosmic Life Force, New York, 1990, p. 141, (X1-X3)
- R8. Bleakney, J. Sherman; "A Possible Evolutionary Basis for Aesthetic Appreciation in Man and Apes," Evolution, 24:478, 1970. (X2)

BHB15 Cycles of Religiousness

Description. Periodic changes in church membership and in the timing of religious festivals.

Data Evaluation. Studies of this phenomenon are very scarce; only one for each claimed periodicity has been found. Rating: 3.

Anomaly Evaluation. Both of the periodicities claimed for this phenomenon imply the existence of mass psychological imperatives of unknown origin(s). These periodicities could be either triggered by external forces, or they could be natural psychological rhythms intrinsic to human society, akin to cyclic activity in ant colonies (BAB). Science recognizes no external forces capable of promoting mass religious feeling. Nor have sociologists, to our knowledge, identified intrinsic social rhythms and explained why they exist. Rating: 1.

Possible Explanations. None offered beyond the above discussion.

Similar and Related Phenomena. Religiousness as an evolutionary enigma (BHB14); great religious movements, such as some of the Crusades and the massive religious revival in Wales in 1904-1905.

Entries

X1. The 9-year cycle in religiousness. In his book Cycles, E.R. Dewey recounts his meeting with H. Martin, a Congregational pastor, who had amassed and graphed an immense amount of data on membership in the Protestant church. Martin had derived three rather curious facts from his labors, and Dewey confirmed them:

The first thing that Mr. Martin had discovered was that, regardless of location, there is a tendency for additions to membership to go up and down together. For example, when people were flocking to join the Congregational churches in Boston, they were also flocking to join the Congregational churches in Norwalk, San Francisco, and Seattle.

.....

The second discovery made by Mr. Martin was that additions to membership in different Protestant denominations went up and down more or less together. At times when great numbers of people were joining Congregational churches, great numbers were also joining the Methodist church, the Episcopal church, and the Presbyterian church.

.....

Finally, Mr. Martin made a third discovery, and it was this that brought him to Foundation headquarters. He discovered that at least some of the ups and downs of new membership in the various churches showed rhythm. There was a tendency for man to "return to God" every nine years---in a cycle. (R2)

X2. The 7.6-month cycle in religious festivals. Besides the 9-year periodicity in religiousness remarked upon in X1, there may also be a shorter cyclicity in the human urge for ritual. J.H.D. Web-

ster sees a 7.6-month cycle in several human phenomena, including intellectual creativity, the advent of psychoses, and the psychological need for religious activity. In the last context, we quote from Webster's 1951 paper.

The 7.6-month cycle is often a seasonal one; it divides the year roughly into a two-thirds and a third (the period and the half-period). This division of the year has been recognized in the history of humanity in many of the chief secular and religious dates of festivals. So there has been laid down, in the group consciousness, a social-psychological rhythm, illustrated by the interval from the mean Easter Day to Christmas, and on to Easter again; or in ancient Rome, from the Great Mother and Floralia festivals in April to the Saturnalia in 17-23 December; and in ancient Greece from the lesser Eleusian Mysteries in February-March to the Greater Mysteries in October-November---the latter corresponding to the departure to the underworld of Persephone for a third of the year (winter), while the spring festival celebrated her return to her welcoming mother Demeter. (R1)

Webster underlines the reality of this 7.6-month cycle in human affairs with other psychological phenomena showing the same rhythm.

References

- R1. Webster, J.H. Douglas; "The Periodicity of the 'Sevens' in Mind, Man and Nature: A Neo-Hippocratic Study," British Journal of Medical Psychology, 24:277, 1951. (X2)
- R2. Dewey, Edward R.; "The Mob Cycles," Cycles: The Mysterious Forces that Trigger Events, New York, 1971, p. 70. (X1)

BHB16 "Flock Behavior" in Human Groups

Description. The rapid propagation of maneuver signals throughout human groups, notably chorus lines.

Data Evaluation. An unreferenced allusion to a 1950 study of chorus-line synchrony represents our current inventory of data on human "flocking behavior". However, considerably more data are available on birds and fish. Rating: 4.

Anomaly Evaluation. An anomaly is present in human chorus lines if the maneuvers are propagated faster than can be explained mechanistically; that is, by chorus-line individuals perceiving the oncoming wave of motion and synchronizing their motion with it. The data at hand are inadequate to decide whether an anomaly truly exists here, although there seems to be an anomaly in bird flocks.

Possible Explanations. The mechanistic explanation given above. Telepathy or morphic resonance.

Similar and Related Phenomena. Bird and fish flocking and wheeling (BBB and BFB).

Entries

X0. Background. The precise, synchronized wheeling and maneuvering of flocks of birds and fish are the primary reference for this collective-action biological phenomenon. High-speed photography of bird flocks has not yet resolved all the puzzles associated with the millisecond timing of extended flocks. (See BBB in another volume.) Apparently, human groups exhibit the same phenomenon. Of course, some collective human activities are synchronized by music, but not all.

X1. Human chorus lines. In the 1950s, experiments were carried out using experienced chorus-line dancers; music apparently was not involved.

The dancers rehearsed particular maneuvers; then these were initiated by a particular person without warning, and the rate at which they propagated along the line was estimated from films. This was on average 107 milliseconds from person to person, nearly twice as fast as an average human visual reaction time of 194 milliseconds. [W.] Potts suggests that this was accomplished by the individuals seeing the approaching maneuver wave and estimating its ar-

rival time in advance. (R1)

.....

Potts's chorus-line hypothesis begs a further question. He assumes that the very rapid propagation of maneuvers along a well-rehearsed human chorus line is itself explicable mechanistically in terms of known physical principles. There is no evidence for this. From the present point of view, the chorus-line routines may themselves depend upon morphic fields which are stabilized by morphic resonance from previous rehearsals and performances. (R1)

The author of the foregoing paragraphs. R. Sheldrake, is understandably using the chorus-line experiments to support his own theory of morphic resonance. However, the data presented by Sheldrake for human chorus lines is really insufficient to decide whether an anomaly really exists with human chorus lines. The mechanistic explanation proposed by Potts above is appealing and possibly correct. In fact, all other theories, such as telepathy and Sheldrake's own morphic resonance hypothesis, are undeniably radical.

It must be added that the mechanistic theory is severely challenged in the case of bird flocking. See BBB, in another volume.

Reference

- R1. Sheldrake, Rupert; "The Morphic Fields of Animal Societies," The Presence of the Past, New York, 1988, p. 234. (X1)

*INDIVIDUAL HUMAN BEHAVIOR***BHB17 The Evolution and Persistence of Altruism**

Description. The evolution and persistence of human altruism despite the fact that it reduces the fitness of the individuals whose genes carry the trait. One would expect such a trait to be eliminated through natural selection, particularly where resources are scarce.

Data Evaluation. The explanation of altruism has puzzled evolutionists ever since the time of Darwin. We reference only a few of the many papers on the subject. Rating: 1.

Anomaly Evaluation. Altruism is anomalous if its evolution and persistence cannot be explained in terms of random mutation and natural selection; that is, what we customarily call "evolution". As related below, the appearance of altruism in early human groups seems explicable in evolutionary terms, since it does confer an advantage on individuals living in protective and supportive groups and societies, even though these individuals must sacrifice some of their fitness for the good of their group. Therefore, the appearance and short-term persistence of altruism does not appear to be anomalous. In the long term, however, altruism would seem to impose upon society an increasingly heavy burden of physically, mentally, and, perhaps, morally deficient individuals. Societies may collapse as these burdens become intolerable, particularly when food and energy resources are scarce. Extrapolating along this line of thinking, altruism should eventually be eliminated from the human genome because altruistic societies will ultimately be dragged down by their benevolence! If this sort of reasoning is correct, it is the persistence of altruism that is anomalous, not its appearance and short-term existence. Apparently, altruistic humanity is so young in terms of the clock of evolution that it has not succumbed to this affliction. Of course, much of what we say here is merely surmise, and we lack hard facts and understanding. For these reasons, we assign the persistence of altruism a low level of anomalousness. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. The evolution and persistence of homosexuality (BHB18).

Entries

X1. Altruism: A statement of the problem. We humans, as a species, are naturally selfish and aggressive, but when we organize into groups we must suppress these attributes for the group to cohere. The more complex the group, the more of our primitive instincts we must stifle. Instead, we must be kind, sharing, and considerate. The evolutionary puzzle posed by these contradictory human urges was well-stated by S.J. Gould in his book Ever Since Darwin.

The essential ingredient of human kindness is altruism---sacrifice of our personal comfort, even our lives in extreme cases, for the benefit of others. Yet, if we are to accept the Darwinian mechanism of evolution, how can altruism be a part of biology? Natural selection dictates that organisms act in their own self-interest. They know nothing of such abstract concepts as "the good of the species." They "struggle" continuously to increase the representation of their genes at the expense of their fellows. And that, for all its baldness, is all there is to it; we have discovered no higher principle in nature. Individual advantage, Darwin argues, is the only criterion of success in nature. The harmony of life goes no deeper. The balance of nature arises from interaction of competing teams, each trying to win the prize for itself alone, not from the cooperative sharing of limited resources. (R2)

Gould then asks the obvious question: How, in the long struggle for survival, did humans ever evolve the trait of altruism? Altruism, as we shall see, does confer some advantages upon kind and generous people as well as upon the societies in which they live.

X2. Short-term advantages of altruism. First and foremost, altruism helps to cement societies and other groups together. The poor and disadvantaged are helped; a member of a group can usually depend upon fellow members for protection, for succor, and for comfort. Members pay taxes for the common good; they may pay with their lives in war in

defense of their society. It is a social contract.

But what about the individual who, after all, is the carrier of those genes that transmit altruism to the next generation? If he dies in battle or his fitness is reduced in some other way, his genes are lost, while someone else's will survive because of his sacrifice. This is the individual's payment for the benefits society confers upon him. The net effect of altruism is the reduction of individual fitness and the increase of society's fitness. In general, however, society's members don't die in battle. Rather, the society will prosper as individuals work together helping one another. With society's success, the average individual also succeeds. He lives better and longer and leaves more offspring than he would if he lived outside outside of the group.

Another facet of the subject is the fate of the poor, the weak, and the disadvantaged. Society's protection and aid allows the genes of some individuals to survive when they would have surely perished otherwise.

In the short term, then, altruistic individuals will prosper in a society and pass their genes, which are coded for altruism, on to their children. In this interpretation, as soon as humans formed societies, altruists became "fitter" than loners who would not give up a little for the common good.

X3. Theories of altruism. We have just described "reciprocal" altruism; that is, altruism that evolved because the altruist gave to society and got something in return. Two other ideas about the evolution of altruism are also worth mentioning.

First, the altruism seen in some social animals (notably insects, but also a few birds and mammals), can be explained quite well by "kin selection". Basically, the theory of kin selection states that an organism can help perpetuate his genes by sacrificing himself in one way or another to help close relatives, which also carry some of his genes. Juvenile birds, for example, may help their parents feed their brothers and sisters, since with their kin's success some of their genes will be perpet-

uated. Kin selection, though, does not apply to that sort of altruism in a human society where one pays taxes to a faceless government or lays down his life in a foreign war for society members who are distantly related.

Second, in 1990, H.A. Simon cast human altruism in a rather uncomplimentary light. Bluntly, Simon said that humans are altruistic only because they are docile and stupid. Actually, he employed the phrases "receptive to social influence" and "bounded rationally." Because of human docility, he stated:

...society can impose a "tax" on the gross benefits gained by individuals from docility by inducing docile individuals to engage in altruistic behaviors. Limits of rationality in the face of environmental complexity prevent the individual from avoiding this "tax." An upper bound is imposed on altruism by the condition that there must remain net fitness advantage for docile behavior after the cost to the individual of altruism has been deducted. (R4)

X4. Long-term disadvantages of altruism.

H.A. Simon, just quoted in X3, mathematically modeled altruistic societies and, hardly surprisingly, concluded that societies that promote altruism (most do) will thrive as long as the costs of altruism to individual fitness do not exceed the benefits deriving from docility. (R5)

The costs of altruism to both individuals and societies can be exorbitant; but, since altruism is considered a moral imperative in modern society, these costs are seldom considered or weighed. Over a century ago, during debates concerning natural selection, writers were not afraid to adopt Mathusian tones and speak apocalyptically about the dangers of altruism. We quote below from an 1868 article in the Eclectic Magazine.

The two great instruments and achievements of civilization are respect for life and respect for property. In proportion as both are secure ---as life is prolonged and as wealth is accumulated---so nations rise, or consider that they have risen. Among wild animals the sick and maimed are slain; among savages

they succumb and die; among us they are cared for, kept alive, enabled to marry and multiply. In uncivilized tribes the ineffective and incapable, the weak in body or in mind, are unable to provide themselves food; they fall behind in the chase or in the march; they fall out, therefore, in the race of life. With us, sustenance and shelter are provided for them, and they survive. We pride ourselves---and justly---on the increased length of life which has been effected by our science and our humanity. But we forget that this higher average of life may be compatible with, and may in a measure result from, a lower average of health. We have kept alive those who, in a more natural and less advanced state, would have died; and who, looking at the physical perfection of the race alone, had better have been left to die. Among savages the vigorous and sound alone survive; among us the diseased and enfeebled survive as well; but is either the physique or the intelligence of cultivated man the gainer by the change? In a wild state, by the law of natural selection only, or chiefly, the sounder and stronger specimens were allowed to continue their species; with us, thousands with tainted constitutions, with frames weakened by malady or waste, with brains bearing subtle and hereditary mischief in their recesses, are suffered to transmit their terrible inheritance of evil to other generations, and to spread it through a whole community. (R1)

Obviously, discussion was freer in 1868; few today would dare voice such sentiments, so strong is the hold of altruism.

If the pessimism of the 1868 writer is justified, altruism in the long term will burden society so heavily with individuals who are physically and mentally wanting that society itself will collapse. Thus, altruism may be beneficial to both individuals and humanity in the short run but not in the long run. Evolution could therefore be called shortsighted in this matter; but, since evolution is thought to depend upon random opportunism, perhaps we should not expect it to be long-sighted. (WRC)

References

- R1. "On the Failure of 'Natural Selection' in the Case of Man," Eclectic Magazine, 8:1521, 1868. (X4)
- R2. Gould, Stephen Jay; "So Cleverly Kind an Animal," Ever Since Darwin, New York, 1977, p. 260. (X1)
- R3. Smith, John Maynard; "Problems of Evolutionary Biology," The Problems of Biology, New York, 1986, p. 56.
- R4. Simon, Herbert A.; "A Mechanism for Social Selection and Successful Altruism," Science, 250:1665, 1990. (X3)
- R5. Horgan, John; "A Modest Proposal on Altruism," Scientific American, 264:20, March 1991. (X4)

BHB18 The Evolution and Persistence of Homosexuality

Description. The well-known prevalence of homosexuality throughout recorded history.

Data Evaluation. The existence of homosexuality is common knowledge. Rating: 1.

Anomaly Evaluation. On the surface, homosexuality seems to mount a serious challenge to the theories of evolution and natural selection. If, the reasoning goes, the trait of homosexuality is transmitted through the genes, how could it have ever evolved and persisted when homosexuals produce no children? Despite the apparent logic here, there exist several loopholes through which genes coding for homosexuality can be passed along. See X2, below, especially items 1, 5, and 6. Given these several potential explanations, far-fetched though some of them may be, we have to assign the existence of homosexuality a low level of anomalousness. Rating: 3.

Possible Explanations. See X2 for a list.

Similar and Related Phenomena. The existence and persistence of altruism (BHB17).

Entries

X1. Homosexuality and Darwinism. Assuming that homosexuality is genetically transmitted, how could it evolved at all, seeing that those carrying the genes for the trait do not have progeny? R. Dawkins states the problem thusly:

On the face of it, the existence of a substantial minority of men who prefer sexual relations with their own sex rather than the opposite sex constitutes a problem for any simple Darwinian theory. The rather discursive title of a privately circulated homosexualist pamphlet, which the

the author was kind enough to send me, summarizes the problem: "Why are there 'gays' at all? Why hasn't evolution eliminated 'gayness' millions of years ago?" The author incidentally, thinks the problem so important that it seriously undermines the whole Darwinian view of life. (R2)

Intractable though the problem of homosexuality may seem to evolutionary theory, Dawkins has a few suggestions, as does S.J. Gould. See X2 below.

X2. Possible explanations of homosexuality.

1. Homosexuality has no genetic component, being entirely a product of the social environment.
2. The "kin selection" theory applies here, as it did in altruism (BHB17). A homosexual, even though he does not pass his genes on directly can, by aiding his close kin, who carry some of his or her genes, promote the survival and propagation of his genes through them. Dawkins likens such homosexuals to sterile workers among insect societies. (R1, R2)
3. In the "sneaky male" theory, some males fake homosexuality to disarm dominant males, as in a harem, in order to surreptitiously gain access to females. "Sneaky males" are well-known among the fishes. (R2)
4. The "time-lag" theory asserts that the genes determining today's homosexuality were evolved long ago for some other purpose. They code for homosexuality today because the physical and societal environments have changed. (R2)
5. Homosexuality is an evolutionary mistake, but it persists because there has

not been enough time for natural selection to eliminate the trait.

6. The trait may be passed along genetically by bisexuals.

In 1991, S. LeVay, at the Salk Institute, reported finding a difference in the hypothalamic structures in the brains of heterosexual and homosexual men. We await confirmation of these findings as well as further interpretation. (R3-R5)

References

- R1. Gould, Stephen Jay; "So Cleverly Kind an Animal," Ever Since Darwin, New York, 1977, p. 266. (X1, X2)
- R2. Dawkins, Richard; "Constraints on Perfection," The Extended Phenotype, San Francisco, 1982. (X1, X2)
- R3. Maddox, John; "Is Homosexuality Hardwired?" Nature, 353:13, 1991. (X2)
- R4. Barinaga, Marcia; "Is Homosexuality Biological?" Science, 253:956, 1991. (X2)
- R5. LeVay, Simon; "A Difference in Hypothalamic Structure between Heterosexual and Homosexual Men," Science, 253:1034, 1991. (X2)

BHB19 Unusual Human Sexual Behavior

Description. Continual sexual receptivity and face-to-face copulation. These two types of sexual behavior are very rare among the mammals and may have a common explanation.

Data Evaluation. The two phenomena considered together here are matters of common knowledge. What is less well-known is the rarity of these phenomena among mammals. Rating: 1.

Anomaly Evaluation. Human sexual receptivity and face-to-face copulation are considered together here because they are widely believed to have a common cause: The strengthening of male-female bonding, which is so important to the rearing of human children through the long years until they are self-sufficient. The reasoning here is that frequent sexual bonding plus the (supposedly) more

romantic and tender face-to-face position are more effective over the long term. If this explanation of both behaviors is correct, one then must explain how the suppression of the estrous cycle (needed for continual sexual receptivity) evolved in concert with the forward rotation of the vagina (required for face-to-face copulation), with both changes being reinforced by the improvements in child-raising occasioned by enhanced male-female bonding. To a skeptic, this scenario seems strained!

A few have suggested that neoteny (BHA10) may be involved; that both the absence of the estrous cycle and vaginal orientation are primitive features of mammals. This interpretation only moves the enigma back to the fetus.

The aquatic-ape hypothesis states that face-to-face copulation shows that humans went through an aquatic phase in their evolution, since many other, but not all, water-dwelling mammals exhibit the same behavior. This hypothesis is generally rejected by mainstream science.

In view of these continuing concerns, the two phenomena cataloged here deserve at least a low anomaly rating. Rating: 3.

Possible Explanations. See above discussion.

Similar and Related Phenomena. Neoteny in humans (BHA10); the unusual position of the human vagina (BH); suppression of the human estrous cycle (BHF); human-orang similarities (BHA11). See also Catalog Subject Indexes under Aquatic-ape hypothesis.

Entries

X1. Continual sexual receptivity. For the great majority of other mammals, sexual activity is defined by the female estrous cycle and similar periods of heightened sexual interest in the males, such as the rutting season in the deer family. Humans are different:

The highly unusual sexual behavior of man may now be brought into focus. Human females are continually sexually receptive and have essentially no externally recognizable estrous cycle; male approach may be considered equally stable. Copulation shows little or no synchronization with ovulation. (R1)

The only exception we have noted in our research is the female orang utan, which is generally considered to be "permanently receptive" and possessing a suppressed estrous cycle. This position, however, is contrary to some observations. (BHA11) There may be other exceptions.

vagina is positioned consistent with this position, in contrast to most other mammals.

In support of the aquatic-ape hypothesis is the fact that many water mammals also prefer front-to-front copulation. Among them are the whales, the dolphins, sea otters, the sirenians (sea cows), and even the beaver. The same behavior in humans is thought to indicate a recent aquatic phase in human evolution. (R2, R3)

Other explanations of this rather rare mode of copulation are: (1) The face-to-face position is supposed to be more personal and tender, helping to cement the pair-bond; and (2) Neoteny, in which humans are considered to be sexually mature, but actually underdeveloped apes. This explanation is based on the unconfirmed observation that the vagina in the primate fetus has the same position as it does in mature women---in mature apes it has rotated toward the rear. (R3). See BHA10 for the treatment of neoteny.

X2. Front-to-front copulation. Those of the aquatic-ape persuasion make much out of the fact that humans generally prefer face-to-face copulation. They point out, too, that the human

References

- R1. Lowenstein, Jerold M., and Zihlman, Adrienne L.; "The Wading Ape," Oceans, 13:3, May 1980. (X2)

- R2. Lovejoy, C. Owen; "The Origin of Man," Science, 211:341, 1981. (X1)
 R3. Morgan, Elaine; "Copulation," The Aquatic Ape, New York, 1982, p. 61. (X2)

HANDEDNESS PHENOMENA

BHB20 The Puzzle of Human Handedness

Description. The asymmetrical handedness of humans. In contrast to many, but not all, other animals, where a 50:50 split is believed to prevail between right- and left-handedness, humans are roughly 90% right-handed. This asymmetry is apparently not a "nurture" phenomenon, since it is also seen in the womb. It seems to be related to the origin of language.

Data Evaluation. For many years, it was confidently believed that, with perhaps a minor exception or two, humans were the only strongly asymmetrically handed animals. In the 1980s, more and more contrary evidence began to surface. As a result, considerable doubt now exists as to the extent of handedness in the natural world. For example, some of the observations, among the great apes in particular, are very ambiguous. The data are not clear-cut. Rating: 3.

Anomaly Evaluation. We know of no reason why humans should be so different from the most other animals in the matter of handedness. It is tempting to say that this strong asymmetry arises from the human brain, which is highly asymmetrical in the functions of its two halves. But, if this were true, we would expect that the apes, which are so close to us biologically, would be more asymmetrical in handedness. Suffice it to say that the origin of human handedness (and that of any other animals) represents a major enigma. What controls it? Why did it evolve at all, since it does not seem to confer any advantages? How is it related to the origin of language, which like the dominant right-handedness in humans, is a left-brain function? Rating: 1.

Possible Explanations. A potential explanation assumes that the human brain is so far advanced over those of the other animals, especially in its asymmetrical functioning, that its effect on handedness (possibly only a byproduct) reaches observable levels only in humans.

Similar and Related Phenomena. Human asymmetry (BHA1); handedness and human longevity (BHB21); handedness and human health (BHB22).

Entries

X1. General observations circa 1985. Humans are biologically asymmetrical in several ways: our hearts, spleens, and other internal organs are positioned

preferentially on one side or the other; even the opposite sides of our faces are different. (BHA1) Such asymmetries are also found throughout the animal king-

dom. In the use of our hands, however, humans are unusual in being highly asymmetrical; almost all of us (90%) favor our right hands. In 1985, J.L. Bradshaw summarized the situation as understood at that time:

Our most obvious asymmetry, and one that is far from superficial, is our preference for one hand over the other for tasks such as eating, writing and shaking hands (or shaking a fist). Individuals of other species may well prefer one or other paw or claw, but the distribution of pawedness or clawedness is almost always 50:50. Other than some species of parrot that always use the same claw for feeding, humans are unique in that 90 per cent of individuals are right-handed. Why should this be so? What could possibly be the advantage to the species that enabled this asymmetry to evolve? (R3)

As we shall see in X2, below, Bradshaw's claim of near-uniqueness can no longer stand scrutiny.

This dominance of the right hand in humans is universal; it transcends race and culture. Handedness in humans may be hereditary, but no one knows for sure what its basic origin is. We do know, though, that nature in general is asymmetrical; the universe exhibits chirality from sea shells to the sugar molecules in our food. (R7)

It should be added that right-handed people do use their left hands for some things and vice versa. Handedness is simply a preference, not an either-or trait.

Handedness is also related to the brain and the way it is used. For example, the corpus callosum, which is the main fiber connecting the right and left sides of the brain is some 11% larger in left-handers. This is just one more puzzle involving the human brain. (R4) (See BHO.)

X2. Questioning the claim of the uniqueness of human handedness. When in X1, J.L. Bradshaw asserted that strong asymmetry in handedness (of pawedness) was virtually unknown among the other creatures, he was simply stating the mainstream belief. But just six years

later, in 1991, he reversed his position. We quote here a few sentences from the Abstract of his long review article on the subject:

At the time of the last major review on this subject in the British Journal of Psychology (Walker, 1980) there was, with a few notable exceptions, little evidence of anatomical or behavioural asymmetries in non-human species at all comparable to our own. In the past decade this picture has changed dramatically, and now includes invertebrates from the Cambrian formations of half a billion years ago, many species of birds, rats and mice, antelopes, cats, dogs, whales, and primates. Asymmetries may differ as a function of sex (including hormone status---females of many species including humans appearing more lateralized at a motor level), developmental status and environmental influences. Effects may be manifest anatomically (limb or brain dimensions), or at a sensory, cognitive or motor level (paw preference, turning biases). A recurring observation across species is that the right hemisphere seems to be weakly specialized for spatial and emotional roles, and the left for learning, discriminatory and communicatory functions. (R9)

Also in 1991, P. MacNeilage, a linguist at the University of Texas in Austin, vigorously attacked the mainstream position on human handedness. He stated, "There is now no question that handedness exists in primates." Animal psychologists responded by reopening the question; but, as V. Morell, describes, ambiguity remains in some areas:

While experiments with prosimians and some monkey species seem to confirm the existence of hand preferences, evidence for handedness among the great apes is ambiguous. For example, [J.] King and his colleague Virginia Landau report strong left-hand preferences among 18 squirrel monkeys attempting to catch goldfish in a bowl and in a wading pool. Similarly, Jeanette Ward, a psychologist at Memphis State University, noted in a paper in the Journal of comparative Psychology that when

ruffed lemurs were faced with the task of retrieving food tossed into a moat, they made 515 out of 516 reaches with their left-hand. (R10)

While Bradshaw and MacNeilage seem to harbor no doubts about the non-uniqueness of human handedness, not all data support their position. It must also be pointed out that MacNeilage has developed a new theory involving handedness, brain symmetry, and the origin of languages. The latter is pertinent here because the left hemisphere of the human brain is believed to control both the language faculty and right-handed dexterity. (R10)

X3. Handedness in twins. One might suspect that the handedness of twins would provide some insight into the origin of our dominant right-handedness. Unfortunately, this is not true; twins, whether identical or fraternal, are born predominantly right-handed. The exceptions are mirror-image twins (BHA9) which are always right-handed and left-handed, like many of their other physical features. (R2)

X4. Handedness in the womb. Scientists at Queen's University, in Belfast, using ultrasound, have imaged fetuses in the womb to determine handedness.

Researchers using ultrasound examinations found that only 12 of 224 fetuses preferred to suck the left thumb. The 212 others favored the right thumb.

The study found that the position of the fetus did not affect thumb preference. Repeated observations of 17 fetuses found that preference for a particular thumb continued through pregnancy, the researchers said. (R6)

These results show even fewer left-handers in the womb than we count after birth---about 6% versus 10%. However, we do not know for certain that fetal thumbsucking is an accurate measure of handedness after birth. We also do not know why some lefties in the womb switch to righties after birth.

X5. Right-handedness is an ancient trait. By examining the stone artifacts of ancient man, archeologists can tell whether they were made by right- or left-handers. For example, N. Toth, at the University of California, Berkeley, analyzed the flakes struck from flint cores at archeological sites in Kenya and Spain---the former was dated at 1.5-2 million years, the latter at 250,000 years. At both sites, the stone flakes were mostly the product of right-handers. These results suggest that right-handedness also predominated early in hominid history. (R5)

Contrary to Toth's findings is an assertion, made in 1933, by German archeologist R. Kobler, that the ancient stone tools he had examined could not have been used effectively in the right hand. He concluded our distant ancestors were lefties! (R1)

X6. A remarkable exception. When human females cradle a baby, 80% hold it against the left side of their body, regardless of whether they are right- or left-handed. Apes present the same statistics. One theory is that the mother instinctively places the child near her heartbeat to sooth it. Others think that in this position mothers can better monitor the infant with their left visual and auditory fields. (R8)

References

- R1. "Stone Age Tools Mostly 'Left-Handed,'" Science News Letter, 23: 121, 1933. (X5)
- R2. Cassil, Kay; "The Living Laboratory," Twins: Nature's Amazing Mystery, New York, 1984, p.226. (X3)
- R3. Bradshaw, John; "The Importance of Being Right- (or Left-) Handed," New Scientist, p. 46, January 24, 1985. (X1)
- R4. Witelson, Sandra F.; "The Brain Connection: The Corpus Callosum Is Larger in Left-Handers," Science, 229:665, 1985. (X1)
- R5. Lewin, Roger; "Dexterous Early Hominids," Science, 231:115, 1986. (X4)
- R6. "No Contest among Fetuses: Righties 212, Southpaws 12," New York

- Times, October 4, 1990. (Cr. J. Covey) (X4)
- R7. Hegstrom, Roger A., and Kondapudi, Dilip K.; "The Handedness of the Universe," Scientific American, 262:108, January 1990. (X1)
- R8. Mason, Georgia; "Why Do Humans and Apes Cradle Babies on Their Left Side?" New Scientist, p. 28, July 21, 1990. (X6)
- R9. Bradshaw, John L.; "Animal Symmetry and Human Heredity: Dextrality, Tool Use and Language in Evolution," British Journal of Psychology, 82:39, 1991. (X2)
- R10. Morell, Virginia; "A Hand on the Bird---and One on the Bush," Science, 254:33, 1991. (X2)

BHB21 Handedness and Longevity

Description. Statistical evidence that right-handers live longer than left-handers.

Data Evaluation. The data associated with this phenomenon are hardly conclusive. Two studies, both by the same authors and both widely criticized, tend to show a strong longevity deficiency for left-handers. Two additional efforts by other scientists attempting to confirm the phenomenon either failed to do so or were weakly supportive. All studies used rather small samples of individuals.

Rating: 3.

Anomaly Evaluation. Even though data supporting decreased longevity for left-handers are not very convincing, there is no shortage of potential explanations, as listed in X3 below. Some of these possible explanations are backed by statistics. (BHB22) In view of all the reasonable, potential explanations of the phenomenon, a low level of anomalousness prevails. It seems that a shorter life for left-handers may be destined by biological and environmental factors. Rating: 3.

Possible Explanations. See X3 below.

Similar and Related Phenomena. Asymmetric handedness in humans (BHB20); handedness and health (BHB22).

Entries

X0. Background. It is a startling fact that the proportion of left-handers in the population is about 15% at the age of 10 but has declined to nearly zero at the age of 80. (R6) These remarkable statistics begged for further research. Do right-handers really live longer? The figures just given are for living people and do not translate into longevity figures. The difficulty in longevity studies is that death certificates do not indicate handedness. Special sources are required.

Baseball-player statistics provide one

source, since handedness is usually recorded in this game. In addition, one can always ask relatives of the deceased for handedness information. D.F. Halpern and S. Coren have employed both sources and, not surprisingly, have also stirred up considerable controversy.

X1. Testimony of The Baseball Encyclopedia. Using the 1979 edition of The Baseball Encyclopedia, Halpern and

Coren used only those players who were not switch hitters. They discovered that the mean age of death for the 1,472 right-handers was 64.64 years, while for the 236 lefties it was 63.97 years. More startling is the following conclusion:

We found that the groups are virtually identical in mortality until the age of 33. From that age onwards about 2 per cent more right-handers survive at each age. (R1)

The natural question is why should older left-handed persons die faster than righties? The result, however, is consistent with the general observation that virtually no one over the age of 80 is left-handed.

Using broader samples. E.K. Wood responded to the work of Halpern and Coren by repeating it with the larger 1985 edition of The Baseball Encyclopedia. With 2,829 righties and 645 lefties, Wood found the average life expectancy of the left-handers had pulled almost even with that of the right-handers, 66.7 compared with 66.8 for the righties. He concluded that there was no statistically significant difference between the two population groups. (R3)

M.G. Anderson also used a more recent edition of The Baseball Encyclopedia and came to a different conclusion:

Right-handers used to live longer ---but not anymore...He finds left-handed baseball players born after 1890 have in general outlived that non-lefty contemporaries. Moreover, the survival gap---already surpassing 2 years, he calculates---appears to be widening. (R4)

Anderson's results were criticized for not rigidly excluding ambidexterous players and for including players who died younger than 33. (R4)

Due to their mixed message, the statistics from baseball have not convinced many that handedness is important in longevity studies.

the general populace. R. Pool summarized their findings in Nature after discussing the baseball-player results.

On 4 April, Coren and Halpern reported a much stronger result in the New England Journal of Medicine (324:998, 1991). They had determined the handedness of 987 people who died in two southern California counties, defining as right-handed all those who wrote, drew and threw a ball with their right hands, while left-handers and mixed-handers were lumped together as 'non-right-handed'. When Coren and Halpern calculated the average age of death for the two groups they found it to be 75 years for right-handers and 66 among the non-right-handers." (R8)

Obviously, a 9-year difference in longevity is unexpectedly large and very hard to understand. A common criticism of such longevity studies has involved the practice of parents and teachers to encourage---even force---children to use their right hands. In other words, some long-living righties may actually have been born left-handed.

X3. Speculations about a cause. If the above disparities in longevity are real, what could be the cause? Scientists have suggested several:

- Prenatal and perinatal birth stressors (pretty vague) (R1)
- Genetic effects and interuterine hormones may have reduced the effectiveness of the immune system. (R1, R6, R8)
- Left-handers may have more accidents because the world is designed for right-handers (R1, R4, R6, R8)
- Left-handedness is correlated with other health-related phenomena: allergies (R6); mental retardation (R6); and premature birth and low-birth weight (R8).

See BHB22 for elaboration of some correlations of handedness with health factors.

X2. A more general study. Coren and Halpern next turned their attention on

References

- R1. Halpern, Diane F., and Coren, Stanley; "Do Right-Handers Live Longer?" Nature, 333:213, 1988. (X1, X3)
- R2. Perry, Richard J., et al; "Right-Handed Longevity Not So Sinister After All," Nature, 333:603, 1988.
- R3. Wood, E.K.; "Less Sinister Statistics from Baseball Records," Nature, 335:212, 1988. (X1)
- R4. Weiss, R.; "Lefties and Longevity: Look Again," Science News, 136:180, 1989. (X0, X1, X3)
- R5. Charles, Dan; "Left-Handers Don't Die Young After All," New Scientist, p. 21. April 27, 1991. (X1, X3)
- R6. Holden, Constance; "Right Handers Live Longer," Science, 251:742, 1991. (X1, X3)
- R7. Holden, Constance; "Slugging It Out over Left-Handed Mortality," Science, 252:916, 1991. (X1)
- R8. Pool, Robert; "Can Lefties Be Right?" Nature, 350:545, 1991. (X2, X3)

BHB22 Handedness and Health

Description. The higher incidence of alcoholism, immunological disorders, and other health problems in left-handers when compared to right-handers.

Data Evaluation. Although we reference below only survey-type papers, the medical literature contains substantiating data for the surprisingly large number of health problems preferentially affecting left-handers. Rating: 1.

Anomaly Evaluation. Explanations for the extra health problems of lefties focus on the brain and its possible sensitivity to various chemicals---prenatally and/or postnatally. Both testosterone and psychoactive drugs have been implicated; but, in actuality, scientists have only suspicions so far. The problem here is simply one of positively identifying a detailed mechanism (probably chemical in character). Rating: 3.

Possible Explanations. See X2 below.

Similar and Related Phenomena. Human handedness (BHB20); handedness and longevity (BHB21); handedness and mathematical ability (BHB23).

Entries

X1. General observations. Left-handers are over-represented in samples of eminent mathematicians, musicians, athletes, artists, and professional people (BHB23); but they are also afflicted preferentially with many health problems. These are so numerous that it is easiest to list them and add useful comments when they are available.

Alcoholism. W.P. London comments as follows:

Alcoholism relates to handedness in several important ways. Four studies in addition to my own show that alcoholic men are more frequently left-handed (as determined by a handedness questionnaire). In comparison

with right-handed alcoholic men, left-handed alcoholic men have a less favorable treatment outcome (two studies) and a higher frequency of having alcoholic fathers. Both findings link left-handedness to a more severe form of alcoholism. (R3)

Immunological disorders. Again, we quote W.P. London:

Left-handedness is linked to disorders of cellular immunity, which include autoimmune diseases and the ability to fight viruses, fungus or cancer. (R3)

Breast cancer. Left-handed women seem to develop breast cancer earlier than right-handed women. (R3)

Continuing the list. The following diseases also afflict lefties more frequently than righties, but we have no further details:

Immune thyroid disorders (R3)
 Insulin-dependent diabetes (R3)
 Ulcerative colitis (R3)
 Regional enteritis (R3)
 Dyslexia (R1, R3)
 Epilepsy (R2, R3)
 Mental retardation (R2, R3)
 Autism (R1, R3)
 Stuttering (R1, R3)
 Schizophrenia (R3)
 Cleft palate (R3)
 Early-onset Alzheimer's disease (R3)

X2. Potential explanations. N. Geschwind, a Harvard neurologist, suspects that many of the health problems that accrue preferentially to left-handers may arise in the womb:

Geschwind proposes that excess testosterone or unusual sensitivity to testosterone during fetal life can alter brain anatomy so that the right hemisphere of the brain becomes dominant for language-related abilities and the person is left-handed. The association with the immune system

arises, Geschwind suggests, because testosterone production, sensitivity to testosterone, and the activity of the immune system are genetically linked. (R1)

A similar explanation applying to post-natal left-handers has been preferred by P. Irwin and M. Fink, based on their studies of the effects of psychoactive drugs on the brain responses of people, as measured by electroencephalograms. Left-handers turned out to be markedly more sensitive to psychoactive substances.

Irwin believes that this seemingly greater brain sensitivity to drugs among left-handers could also explain why left-handedness is associated with conditions such as epilepsy, mental retardation and learning disorders, assuming that the level of endogenous, neurally active substances has a critical role to play. (R2)

Since psychoactive substances are quite common in nature, Irwin also sees them playing a role in the early development of humans. Right-handers would have been much more resistant to the psychoactive substances in plants being used as foods by early man. This factor in natural selection might account for today's low fraction (10%) of left-handers in the populace. (R2)

References

- R1. Kolata, Gina; "Math Genius May Have Hormonal Basis," Science, 222: 1312, 1983. (X1, X2)
 R2. Grist, Liz; "Why Most People Are Right-Handed," New Scientist, p. 22, August 16, 1984. (X1, X2)
 R3. London, Wayne P.; "Lefthandedness and Life Expectancy," Perceptual and Motor Skills, 68:1040, 1989. (X1)
 R4. Durden-Smith, Jo, and DeSimone, Diane; "Hidden Threads of Illness," Science Digest, 92:51, January 1984. (X1, X2)

BHB23 Handedness and Mathematical and Verbal Abilities

Description. The higher percentage of left-handers among those who score high on tests measuring mathematical and verbal talents, when compared to the general population.

Data Evaluation. Only one study available at present. More data needed.

Rating: 3.

Anomaly Evaluation. Apparently superior abilities in math and verbal activities are coexistent with the health problems of left-handers mentioned in BHB22. In the way of explanation, we can do no better than the discussion in BHB22-X2.

Rating: 3.

Possible Explanations. See BHB22-X2.

Similar and Related Phenomena. Human handedness (BHB20); handedness and longevity (BHB21); handedness and health (BHB22); idiot savants (Series-P Catalogs).

Entries

X1. General observations. Left-handers are compensated, in part at least, for their extra health burdens (BHB22) by disproportionate talents in mathematics, the arts, and athletics. Of these desirable capabilities, we have specific data only for mathematical and verbal abilities.

C. Benbow and J. Stanley, using a national sample of over 100,000 children, aged 12-13, found 292 who scored at least 700 (out of 800) on the mathematical reasoning section of the Scholastic Aptitude Test (SAT). They also identified 165 who scored at least 630 on the verbal section.

Over 20 percent of the children with the top scores are left-handed or ambidextrous, reported Benbow at a conference on the "Neurobiology of Intellectually Giftedness" in New York City last week. This is twice the rate of left-handedness found among the general population of 12- to 13-year-olds. (R2; R1)

Despite the high intellectual performances of selected left-handers, many psychologists have maintained that, as a group, left-handers are intellectually inferior to right-handers. Indeed, the results from various studies are mixed in this regard. However, a review of the research results available in 1982, by A.B. Sunseri, concluded that the empirical evidence demonstrated that left-handers were not deficient intellectually in any way. (R3)

References

- R1. Durden-Smith, Jo., and DeSimone, Diane; "Hidden Threads of Illness," Science Digest, 92:51, January 1984. (X1)
- R2. Bower, B.; "The Left Hand of Math and Verbal Talent," Science News, 127:263, 1985. (X1)
- R3. Sunseri, Anita B.; "Intellectual Deficiencies in Left-Handers: A Review of the Research," Perceptual and Motor Skills, 55:235, 1982. (X1)

WALKING PHENOMENA

BHB24 The Uniqueness of Bipedalism

Description. The unique nature of human bipedalism and the special muscular and skeletal modifications required to make it effective. Humans are the only mammals that are habitually bipedal.

Data Evaluation. Casual observation suffices to prove human bipedalism unique on a local basis. Centuries of searching prove that it unique on a worldwide basis. Since human bipedalism is difficult to account for, a considerable literature has built up around the phenomenon. Rating: 1.

Anomaly Evaluation. Even Darwin pondered the origin of bipedalism. He thought that bipedalism arose when man's ape-like ancestors descended from the trees and found advantages in a two-legged existence. All of the muscular and skeletal modifications were acquired, in Darwin's view, by small random changes. Today's biologists generally echo Darwin's explanation, although some consider it unconvincing. The aquatic-ape hypothesis, mentioned frequently in this volume, has a different explanation (See X5 below.), but this theory is generally ridiculed by mainstream science. Proponents of neoteny maintain that bipedalism is a primitive trait, but cannot explain why this unusual form of locomotion arose at all. Furthermore, neoteny seems to imply than apes descended from bipedal mammals; that is, so-called "initial bipedalism". In sum, none of the explanations for bipedalism is particularly convincing, so the phenomenon must be considered anomalous. Rating: 2.

Possible Explanations. See X5 below.

Similar and Related Phenomena. Primitive human features (neoteny) (BHA10); physiological similarities between humans and orangs (BHA11); morphological differences between humans and apes (BHA12); the primitive character of human feet (BHA50); see Subject Index for Aquatic-ape hypothesis.

Entries

X1. How human bipedalism is unique. The manner in which humans walk and the significant anatomical changes that had to be acquired to develop this unusual mode of locomotion lay difficult questions at the doorstep of the evolutionists. E. Morgan has evaluated this enigma in these words:

Man is the only mammal whose normal method of locomotion is to walk on two legs. A pattern of mammal behavior that emerges only once in the whole history of life on earth takes a great deal of explaining. (R6)

Antievolutionists in their attacks on Darwinism are quick to seize upon the uniqueness of human bipedalism and the

morphological distance this trait has opened up between humans and our supposed close relatives, the apes and other primates. The two quotations that follow are of this genre.

The first is from D. Dewar's The Transformist illusion, a 1957 attack on Darwinism.

The supposition that man is descended from a quadrupedal ancestor is, I submit, unsustainable. Man's upright posture and gait mark him off very sharply from all other types. That great comparative anatomist, L. Vialleton, goes so far as to assert that man is as far separated from his supposed simian relatives as bats and whales are from all other animals.

Professor F.G. Parsons, who is a transformist, writes (Ency. Brit. vol. 15, p. 990): there is 'a greater gap between the musculature of man and that of the other Primates than there is between many different orders.' Darwin did not appreciate this. The change from quadrupedal to bipedal gait presented no difficulty to him. He wrote (Descent of Man, p. 78): 'We see...in existing monkeys a manner of progression between that of a quadruped and a biped.' This is not so. Monkeys are quadrupedal, but, as they spend most of their time in the trees, they are more agile, more supple than creatures which rarely leave the ground. Hence, those who derive man from a quadruped naturally assert that this ancestor was a tree-dweller, be it ape, tarsier, or lemur. They have to get man's ancestor up a tree. How it got there, how it became transformed from a ground to a tree-dweller, they make no attempt to explain. Darwin starts off with an ape living in the trees and then makes it descend to the ground. (R3)

It is fashionable today to remark upon the close similarity of human DNA to that of the apes. It is then all the more remarkable then that those aspects of human musculature and skeleton required for bipedalism should be so different from those of the apes. D.W. Cheek carries along with this theme, and further emphasizes the uniqueness of human bipedality.

Perhaps the most obvious anatomical difference between man and the other primates is his upright posture. Recent studies have concluded that analysis of muscle function is not sufficient to reveal all of the essential differences but that the whole behavioral repertoire must be analyzed in terms of function. A gorilla's thigh extensor is power-oriented while man's is speed-oriented. Man also possesses a more effective lateral balance control while walking. Correlated with the above features of the gluteus medius and gluteus minimus and numerous other features of the pelvic girdle and especially the innominate bone that are strikingly unique to man as summarized here.

(1)...the dorsal extension of the

dorsum ilii, which brings the gluteus maximus and gluteus medius muscles into a different alignment at the hip joint;

(2) the great dorsal extension of the iliac crest, which provides a more extensive attachment for the muscles used in supporting the trunk in the erect posture, and in particular for the powerful sacrospinalis muscle...(R4)

Cheek's enumeration of important human-ape differences associated with the postulated change from quadrupedalism to bipedalism continues through (8). We think the point has been made sufficiently at just (2).

Pertinent to these comparisons of human and ape locomotion is the observation that all apes are knuckle-walkers, except the orang-utan. Humans and orangs are more therefore more nearly alike in their mode of locomotion than are humans and chimps---despite the fact that DNA comparisons put orangs much farther away from humans than chimps. (R7) Refer to BHA11, where many additional similarities between humans and orangs are listed. Comparisons of human and ape DNA are discussed in BHG, in another volume.

X2. Advantages of bipedalism. It is usually assumed that bipedalism evolved from quadrupedalism. If this was so, bipedalism, unique to humans, must have conferred important advantages to our distant ancestors. Three advantages are commonly claimed:

(1) Bipedalism leaves the hands free for carrying weapons and tools. However, apes are perfectly able to carry small objects while knuckle-walking. (R6)

(2) Humans standing erect can see farther when searching for game and watching for predators. Full bipedalism is not necessary to achieve this, for prairie dogs and bears are very good at surveying their surroundings without adopting bipedalism. (R6)

(3) C.O. Lovejoy has linked bipedality with the ability of males to carry large quantities of food long distances back to females and young. (R5, R6)

These slim advantages seem more than balanced by several disadvantages.

X3. Disadvantages of bipedalism.

(1) Humans, as bipeds, are notably slower than quadrupeds. (R5, R6) This is a serious problem for a tree-dweller that supposedly moved out onto the predator-rich savannas.

(2) Bipedalism brings with it instability and a greater chance of falling and injury. (R6)

(3) With a vertical spinal column, the biped, supposedly restructured from a quadrupedal mold, is subject to many physical ills, such as muscular strains, prolapses, hernias, backaches, slipped disks, etc. (R6)

Weighing the advantages and disadvantages of bipedalism, one naturally wonders how it evolved in a highly competitive environment without more going for it! (WRC)

X4. Some curious facts pertinent to the discussion of bipedalism. Sometimes a debate can be swayed by what seem, on the surface, to be trivia. With this in mind, here are three curious data.

Quadrupedal children. A very few children develop the ability to run effectively on all fours before learning to walk upright. (R2) Is this an atavism, perhaps like the occasional human tail? See also "wolf children" in BHB26.

A human tribe virtually incapable of walking. In 1903 a (possibly apochryphal) tale came out of New Guinea describing a tribe that lived in a marshy area that was too soft for walking and essentially impassable for canoes. The people had therefore become almost completely sedentary. Their limbs had shrunk, and they could not walk on hard ground without their feet bleeding. (R1) In effect, their legs were on the way to becoming vestigial organs!

Neotenous reflections. The erect posture that goes with human bipedalism requires that the foramen magnum (the

opening in the skull through which the spinal column passes) be more centrally placed than in quadrupeds. Curiously, in the ape fetus, this opening is placed more centrally---as if the ape were going to be bipedal! As growth proceeds, the opening migrates backward to the position needed by a quadruped. (R6) The implication here is that bipedalism may be more primitive than quadrupedalism, at least for the primates!

X5. Theories of bipedalism. Without question, most anthropologists believe that humans evolved from quadrupeds and that the most closely related of these quadrupeds are the apes. The advantages listed for bipedalism in X2 are thought to confer enough additional "fitness" to account for the whole series of morphological and behavioral changes necessary to bipedalism.

Those biologists who value neoteny as an explanatory tool see bipedalism as a primitive feature. Humans in this view are only unspecialized apes. Related to this approach are the unusual human big toe and our plantigrade feet, which are also considered examples of neoteny. See BHA50 for more on this.

E. Morgan, who champions the aquatic-ape hypothesis, suggests that the first impulse to human bipedalism came when ancestral primates entered the water and found that an erect posture was advantageous in keeping the head above water. (R6)

References

- R1. English Mechanic, 78:112, 1903. (X4)
- R2. Hrdlicka, Ales; "Children Who Run on All Fours," Science, 67:273, 1928. (X4)
- R3. Dewar, Douglas; "Some Transformations Postulated by the Doctrine of Evolution," The Transformist Illusion, Murfreesboro, 1957, p. 238. (X1)
- R4. Cheek, Dennis W.; "The Creationist and Neo-Darwinian Views Concerning the Origin of the Order Primates Compared and Contrasted: A Preliminary Analysis," Creation Research Society Quarterly, 18:93, 1981. (X1)

R5. Lovejoy, C. Owen; "The Origin of Man," Science, 211:341, 1981. (X2)

R6. Morgan, Elaine; "Bipedalism," The Aquatic Ape, New York, 1982, p. 49. (X1-X5)

R7. Lowenstein, Jerold, and Zihlman, Adrienne; "The Invisible Ape," New Scientist, p. 56, December 3, 1988. (X1)

BHB25 Human Asymmetry in Locomotion

Description. The strong tendency of humans to walk, swim, and otherwise progress in circles or spirals when visual or other clues are absent. The direction of circling and spiraling does not seem to be correlated with right-handedness or left-handedness. It is "thought" that quadrupeds are not afflicted by this problem.

Data Evaluation. It is commonly believed that humans lost in featureless forests or deserts will wander in circles. Although some "blindfold" experiments are alluded to in X1, below, we really know very little about this phenomenon and how accurate "common knowledge" is. Neither have we come across any data on whether quadrupeds of all types are really unaffected by this phenomenon. Rating: 3.

Anomaly Evaluation. Our asymmetry of locomotion is probably a consequence of asymmetry in bodily construction, including muscles, nerves, and sensors. One side of the body could be stronger or possibly the sensing of motion is more sensitive on one side. Science certainly seems very ignorant here. Assuming that such physical asymmetry leads to nonlinear motion, we have little inkling as to why this physical asymmetry should have arisen in the first place. (See BHA1.) Since asymmetry in locomotion would appear to be an evolutionary disadvantage (as in finding one's way back to one's cave), it should have been eliminated long ago. In X2, below, it is suggested that human asymmetries may be a product of our bipedalism. Nothing further on this has been found. With so many unknowns, we assign a moderate level of anomalousness here. Rating: 2.

Possible Explanations. See above discussion.

Similar and Related Phenomena. Human asymmetry in appearance (BHA1); human handedness (BHB20).

Entries

X1. General observations. A.C. Neville, in a survey paper on human asymmetry, pointed out some human asymmetries in locomotion.

A suprisingly strong asymmetrical bias in locomotion is revealed when humans are blindfolded. Such subjects are told to walk, swim, row a boat or drive a car in a straight line. Although they are convinced that

they progress in a straight line, the subjects walk in spirals with a diameter as small as 15 metres and swim in circles of diameter 6 metres. There is no correlation between sense of spiralling and left- or right-handedness. As well as this unconscious asymmetry, humans also possess a conscious sense of asymmetry. I can distinguish my right from my left-side with 100 per cent accuracy.

A computer cannot do this, or at least only if it is built or programmed by humans to do so. (R2)

X2. Searching for answers for human asymmetry in locomotion. It is hard to add much to this 1912 probe of the problem.

Many explanations are offered why people lost in the fog or in a desert seem bound to wander round in a circle till they find themselves back at their starting place. A writer in Prometheus ascribes the deviation of a traveller's path from a straight line to the general asymmetric build of the body. He quotes D.G. Brinton, who maintains that the upright posture of man to be the immediate cause of his one-sided development, the anthropoid apes being ambidextrous. The adoption of the erect stature led to a redistribution of the forces and stresses in the animal economy in such a manner as to compensate for the tax laid upon the heart. As a matter of fact, Brinton tells us, the large arteries leading from the aorta conduct blood by a shorter path to the left half of the brain than to the right, and this has been the cause of a predominating development of the left cerebral hemisphere, which in turn determines the uneven development of the functions of the right and left half of the body.

The writer points out that a man's walk is not by any means a progression in a straight line, but that the body is alternately carried to the right and left with each step. We are unconscious of this largely because the body compensates for the motion, which becomes much more evident, if by special effort, the trunk is kept rigid and stiff while walking. In point of fact, it is found that the right foot points outward in nearly all individuals more than the left, and thus in walking the influence of the right leg tends to outweigh that of the left, not because it is longer or stronger, but because it is moved at a slightly

greater angle from the general line of progress. Again, if we attempt to cross the street in the dark, we feel very much more at ease and confident if we cross obliquely to the right than if we move in a direction inclined to the left.

Finally, the writer suggests that perhaps the faculty which many animals have of finding their way, under circumstances where human instinct would fail, may be ascribed to the fact that, walking as they do on four legs, they are free from this defect of an asymmetric mode of progress. (R1)

On the other hand, asymmetry in walking may stem from bodily asymmetry, namely legs of unequal length, as suggested by R.R. Baker:

It is well known that when people are lost in a mist, they commonly find they have walked in a complete circle, a fate that once befell Lord Baden Powell, founder of the scout movement. The most detailed study of this behaviour is perhaps that by Lund, who asked his subjects to walk blindfolded in a straight line across a football field. Their track was followed and a consistent veering was found, most often to the right. When asked to walk backwards, the geographical direction of veering was reversed. Most subjects had a longer left leg and most of these veered to the right. (R3)

References

- R1. "Why Do Lost People Walk Round and Round?" English Mechanic, 95: 268, 1912. (X2)
- R2. Neville, Anthony Charles; "Symmetry and Asymmetry Problems in Animals," The Encyclopedia of Ignorance, Ronald Duncan and Miranda Weston-Smith, eds., New York, 1977, p. 335. (X1)
- R3. Baker, R. Robin; "Route-Based Navigation: From Fiction to Fact," Human Navigation and the Sixth Sense, New York, 1981, p. 36. (X2)

FERAL CHILDREN

BHB26 Wolf-Children

Description. The existence of children who have been seen in the company of wolves (or other animals) and who exhibit the characteristics of wild animals, such as running on all fours and being unable to speak.

Data Evaluation. Scores of feral-children reports exist, mostly from India and involving wolves, and mostly from the Nineteenth Century. These tales are suspect, not so much because of their age, but because they are almost always second- and third-hand. In only one case has an acceptable observer seen, with his own eyes, children consorting the wolves. Additionally, some examples of the phenomena have proven to be hoaxes, further weakening confidence in the reality of feral children. Although the quantity of reports is large, the quality is mostly poor. The reality of animal-nurtured, manifestly wild, children is still in doubt. Rating: 3.

Anomaly Evaluation. Let us suppose that wolf-children really to exist in some remote part of the world; are they really anomalous? Since the females of many mammalian species readily suckle other species, it is not beyond reason that a female wolf might adopt a human infant under certain circumstances. Deprived of human cultural contact during its most impressionable years, it is also reasonable that such a child might growl rather than talk and otherwise adopt the characteristics of its foster species. After all, don't dogs think they are people? All in all, the wolf-children phenomenon is not really counter to what we learn from biology and sociology. But because science emphatically rejects the possibility of feral children, we record the phenomenon as weakly anomalous. Rating: 3.

Possible Explanations. None required. The existence of feral children is not unreasonable, merely proscribed.

Similar and Related Phenomena. The frequent adoption of the young of other species by mammalian mothers. The spontaneous walking on all fours by normal children (BHB24).

Entries

X0. Background. Stories about feral children are at least as old as that relating how Romulus and Remus, the legendary founders of Rome, were suckled by a she-wolf. We have at hand, in fact, a long history replete with scores of fascinating, though vague, tales of human children being reared by all manner of other mammals. Somehow these accounts appeal to us---perhaps like those of the Loch Ness monster---touching an inner chord. However, we feel obliged to write this introductory paragraph to warn readers not to let this subtle appeal blind them to some very real problems associated with the phe-

nomenon of feral children. Are the stories really believable? Even if they are, are they scientifically significant?

X1. A positive introduction. Two staunch Forteans, J. Michell and R.J.M. Rickard, have little doubt that feral children do exist. They begin with:

Several mythologies embody the theme of human children cared for by animals. Miletus of Crete, son of Apollo, is an example. It was once respectably believed that Romulus

and Remus, founders of Rome, were suckled as infants by a wolf; but by the nineteenth century, during which there seems to have been a sort of competition among scholarly and scientific people to see how much of popular lore and old history could be discredited, such reports were regarded as fables, amusing for children but too absurd for the attention of serious people. Yet at the same time as they were rationally being proved impossible, more and more cases of humans fostered by animals kept being reported. Several were supported by good evidence and reliable witnesses. Finally in 1920 the carefully documented history of the wolf children of Midnapore convinced all but the willfully sceptical that children may indeed be nurtured by wild animals. (R22)

Later on, we shall see what some of these "willfully skeptical" people have had to say.

X2. A typical tale from India. The great majority of feral children have been found in India, with she-wolves as the foster mothers. The following tale, from 1851, is very much like all the others in our files---in fact it is suspiciously similar. It was written by Sir R.I. Murchison for Annals of Natural History and then repeated in our source, the Zoologist.

Colonel Sleeman told me one of the strangest stories I ever heard, relative to some children, natives of this country (Oude), carried away and brought up by wolves. He is acquainted with five instances of this, in two of which he has both seen the children and knows the circumstances connected with their recapture from the animals. It seems that wolves are very numerous about Cawapore and Lucknow, and that children are constantly being carried off by them. Most of these have of course served as dinners for their captors, but some have been brought up and educated after their own fashion by them. Some time ago, two of the King of Oude's own sowars (mounted gens d'armes) riding along the banks of the Goomtje, saw three animals come down to drink.

Two were evidently young wolves, but the third was evidently some other animal. The sowars rushed in upon them and captured the three, and to their great surprise found that one was a small naked boy. He was on all fours like his companions, had callosities on his knees and elbows, evidently caused by the attitude used in moving about, and bit and scratched violently in resisting the capture. The boy was brought up to Lucknow, where he lived for some time, and may, for aught I know, be living still. He was quite unable to articulate words, but had a dog-like intellect, quick at understanding signs, and so on. (R1)

X3. A survey of stories about feral children. Accounts of the capture of feral children, usually in wolves' dens, are not at all rare. D.G. Mandelbaum assembled twenty such tales in 1943, including one of a leopard boy. But even with a leopard for a mother instead of a she-wolf, the story is much the same as those of all the wolf-children. Mandelbaum gave the following synthesis derived from his 20 cases:

In spite of such vicissitudes, the characteristics attributed to the children are quite similar in all the stories. Sixteen of the 20 are said to have gone on all fours, this may have been true for the other cases as well. Sixteen never learned to speak, though two of them, respectively, uttered a single word. Information is lacking on this trait from three of the other four, and the fourth is the old man (No. 7) whose authenticity is doubted by Sleeman. Eight would eat only raw meat when taken. Relevant information on this point is not given for the others, save for No. 20 whose diet was grass and roots. In 10 of the instances the children would not wear clothes and ripped off their garments when they could do so. Other traits are shared in lesser degree, from the five who ate their food on the ground like dogs, through the two who gave off an offensive odor, to the one case which carefully sniffed food before eating. (R19)

Many similar cases exist in addi-

tion to Mandelbaum's 20. We have, therefore, a large reservoir of fairly consistent tales of strange children. But, as we shall see, children can be strange without being feral; that is, brought up by wolves or some of other mammal. The key to establishing the reality of wolf children, or feral children in general, is ascertaining whether they were really found in close association with wolves or other animals. Otherwise, they may be simply "strange" children, whose strangeness can easily be accounted for in other ways. What is really needed to prove the case for children being reared by animals is unshakable testimony from an unimpeachable individual, who saw with his own eyes children consorting with wolves or some other wild animal. Searching for this intimate wolf-child attachment, we turn to the most famous case of all, that of the Midnapore wolf-girls.

X4. The Midnapore wolf-girls. The first scientific reference we have found to Amala and Kamala, the Midnapore wolf girls, is in a letter from J.A.L. Singh to P.C. Squires, which appeared in the American Journal of Psychology in 1927, shortly after newspapers had announced the finding of the two girls in India. Rev. Singh operated the orphanage to which the wolf-girls were taken soon after their capture. Since the validity of this renowned case depends heavily upon Rev. Singh's testimony, we now quote extensively from his early letter on the case.

The wolf-children were first seen by natives on various occasions. I heard of these children for the first time on August 26, 1920. The same 'ghost story' was repeated to me on September 24, 1920. The children were seen through a field glass by several people (Europeans and Anglo-Indians), from a distance of about one hundred yards, on the 9th and 10th of October, 1920.

Three wolves were observed to come out of a tunnel-like passage from their den, closely followed by two cubs; then there appeared a human head covered with bushy hair, with a ghastly look about the face. This head tarried for a little while looking to this side and that side, then a human form came out of the

den followed by another human being at its heels. The two children crawled on all fours.

Excavation of the wolf-den took place on October 17, 1920. I took charge of the wolf-children on November 1, 1920. I brought them home on November 4, 1920. I guess their ages to be, the elder about eight years and the younger about two years. The younger one died September 21, 1921. She was baptized some time before she expired. We named her Amala. Kamala, the surviving one, was baptized January 1, 1925.

At the present time Kamala can utter about forty words. She is able to form a few sentences, each sentence containing two, or at the most, three words. She never talks unless spoken to; and when spoken to she may or may not reply. She is obedient to Mrs. Singh and myself only. Kamala is possessed of very acute hearing and evidences an exceedingly acute animal-like sense of smell. She can smell a meal at a great distance. She was never known to kill any domestic animal but is fond of pouncing upon any killed animal if found anywhere by her. Never weeps or smiles, but has a 'smiling appearance.' Shed a single tear when Amala died and would not leave the place where she lay dead. She is learning very slowly to imitate. Does not now play at all and does not mingle with other children. Once, both Amala and Kamala somewhat liked the company of an infant by the name of Benjamin while he was crawling and learning to talk. But one day they gave him such a biting and scratching that the infant was frightened and would never approach the wolf-children again. Amala and Kamala liked the company of Mrs. Singh; and Kamala, the surviving one of the pair, is much attached to her. The eyes of the children possessed a peculiar glare, such as that observed in the eyes of dogs or cats in the dark. Up to the present Kamala sees better at night than during the daytime and seldom sleeps after midnight. The children used to howl in a peculiar voice, neither animal nor human. Kamala still makes these noises at times. She is averse to all cleanliness, and serves the calls of nature anywhere, wherever she may happen to be at the time. Used to tear her clothes off. Hence,

a loin-cloth was stitched to her in such a fashion that she could not open or tear it. Kamala used to eat and drink like a dog, lowering her mouth down to the plate, and never used her hands for the purpose of eating or drinking. She would gnaw a big bone on the ground and would rub it at times in order to separate the meat from the bone. At the present time she uses her hands for eating and walks straight on both legs, but cannot run at all. (R8)

Although we have more detail in this account, it is indeed very much like the "typical" example given in X2 and the "synthesis" of X3.

In 1931, the American Journal of Psychology published another letter from India, written by J.A. Howard of Midnapore, dated January 22, 1931. In it, Howard relates the capture of the wolf-children of Midnapore in the words of their captor, who is never identified. The details of this story are so different from those of Rev. Singh above that one wonders if the same case is being described. The dates differ, and the elder was said to have lived only to the age of six. (R9)

D.G. Mandelbaum, in his very skeptical survey of wolf children, uses the information provided in Professor Gessell's book on the Midnapore wolf-children (R23), which, in turn, is based on the diary kept by Rev. Singh. In this account, Rev. Singh is accompanied by only two Anglo-Indians at the den site (no Europeans!). (R19) Still another description of the sightings and capture was printed in Scientific American, March 1941. (R18) It accords well with that of Mandelbaum.

In sum, the accounts of the capture hang together well, except for the letter of J.A. Howard, which contains obvious errors of fact. One must conclude, cautiously, that the wolf-children of Midnapore were probably raised by wolves and, by extension, that some of the other stories of feral children are also likely to be true.

But what of those "willfully skeptical" people mentioned by Michell and Rickard?

In our wanderings through the literature, we have come across two strongly skeptical scientists. The first, D.G. Mandelbaum, finds Rev. Singh's diary, which is the best arrow in the quiver

of the feral children proponents, to be full of exaggerations, naiveté, and inconsistencies; but these shortcomings do not falsify the basic story itself. The key here is Rev. Singh himself. Was he an honest man? Mandelbaum puts it this way:

But the one great difference between the Midnapore manuscript and the other wolf-child accounts is this. Rev. Singh says that he himself saw the children in a wolf den and in the company of wolves. In all the other stories, the author was not an eyewitness nor did he write the report from direct observation of the child among animals. Far be it from us to impugn lightly the word of any informant, but in view of the questionable tenor of the other sections of the diary, this part of Rev. Singh's testimony could only be accepted after a good deal of investigation and questioning of the others who are said to have been at the scene of the capture. This has not been done, although it still may be possible to do so. (R19)

Mandelbaum is unquestionably a "willful skeptic".

The second published doubter is W. Dennis, who states that all the evidence is hearsay:

All were writing what they had heard from others. The scientist's information in this case was no better than the hunter's or peasant's or soldier's information. (R17)

Such a statement cannot apply to the Midnapore wolf-children, assuming that Rev. Singh was an honest man.

But Dennis goes on to make some very pertinent points about mental defectives who have obviously not been raised by wolves and yet resemble feral children:

- Mentally defective children are also deficient in language.
- The utterances of idiots are the same as those animal sounds of wolf-children.
- Mentally defective children are just as untidy as feral children.
- Idiots will eat and drink anything within reach, including raw meat and offal.

- The mentally deficient also do not seem to feel the heat and cold, just like the wild children.
- Nor do the feeble-minded form strong attachments with normal humans.
- Many idiots cannot walk upright. (R17)

Dennis' points have been echoed by psychologist W.N. Kellogg. (R10)

It appears, then, that children who are severely handicapped mentally behave much like the so-called feral children. Of course, this does not mean that wolf-children do not exist. A child separated from the intellectual and cultural stimulation of civilization, and exposed instead to animal life during its most impressionable years, could well seem to be mentally deficient. They might even be unretrievable by society. (R17)

Summarizing, the wolf-children stories, buttressed by the extremely detailed testimony of Rev. Singh, are sufficiently good for us to retain feral children as a possibly anomalistic phenomenon. However, those "willful skeptics" have revealed deficiencies that must be remedied. The data are not unassailable. In this respect, the feral-children phenomenon resembles many other events at the periphery of science, such as UFOs and the Loch Ness monster. (WRC)

X5. Feral children supposed nurtured by animals other than wolves. Most feral children reported have been associated with wolves. Bears are next in popularity. We note below a few cases where animals other than wolves were involved. We are certain that this listing is not complete.

Leopards. A boy about 5 years old was captured with two leopard cubs in Assam, India. He ran on all fours, and bit and fought with everyone. Identified as a boy who had been carried off by a leopardess 3 years before. (R19)

Jackals. Circa 1923, in India, a girl of European origin was rescued from a pack of jackals. Made frantic efforts to escape back to her pack. Died in a few months. (R19)

Bears. 1887, in Bengal, India. A 3-year-old girl was discovered in a den with a bear. She ran on all fours, and

growled, ate, and drank like bears. Although she learned how to walk, eat, and drink like a human, she never was able to speak. (R15, R19)

Michell and Rickard also mention two little boys who were seen in the company of bears in Lithuania. One was caught but could not be taught to speak or give up his bearish habits. This example occurred in the 1600s, a period when several other bear-children were reported in this part of the world. (R22)

Baboons. A "baboon-boy" was reported to have been captured in South Africa in 1903. After considerable publicity in the 1940s, the story was proven to be a hoax. (R12-R14, R16)

Gazelles. A boy who ate grass with gazelles, and who could run 50 miles/hour was reported to the press in 1946. Scientists refused to believe the story. It is considered to have been a hoax. (R20, R21)

Feral children without animal parents. In 1893, a boy of about 14 years, was found in the jungle near Bazitpore, India. He ran on all fours, could not speak, and ate raw fish and frogs. He would not wear clothes and would never enter a dwelling. This story closely resembles the other feral-child accounts, but this boy was apparently surviving on his own without any animal companions; i.e., he was completely feral. (R19)

X6. Other intraspecies nurturing. It is well known that nursing dogs, cats, pigs, and other domesticated animals are tolerant of the young of other species. In this light, it is not unreasonable for a nursing wolf to suckle a human baby, especially if it had somehow acquired the scent of the wolf cubs. Wolf children are hardly anomalous in this context, since there is no paradigm to challenge. Nevertheless, wolf-children are generally considered "impossible" by most scientists. (WRC)

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HUMAN EMINENCE

BHB27 Eminence Correlated with Time of Birth

Description. The tendency for eminent people to have birthdays in the colder months of the year. It is also claimed that the greater the eminence of the people in the sample, the more pronounced the cold-weather effect. Eminent people are defined as those who have in some way acquired recognition by being listed in various compendia of famous people, such as a Who's Who.

Data Evaluation. The data here are less than satisfactory. Although there are several statistical studies of eminence and time of birth, the cold-weather effect does not appear in all of them, including some using very large samples. (See entries below.) Further, the births of individuals in some occupations (military officers) peak in the late summer and early fall rather than the cold season. Therefore, there is a question of the general validity of the claimed phenomenon,

even though small samples of eminent people do seem to show the cold-weather effect. Rating: 3.

Anomaly Evaluation. The scientific expectation here would be that the births of eminent people would be distributed evenly throughout the calendar year. This is a very reasonable position because there is no known mechanism whereby astronomical or meteorological conditions can increase the innate capabilities of children conceived or carried in the womb at specific times of the calendar year. To illustrate, how could the spring weather be translated into a genome that results in an eminent person? From a purely genetic viewpoint, this is a very anomalous situation. Rating: 1.

Possible Explanations. Some scientists, E. Huntington in particular, maintained strongly that the colder climates and seasons always promoted the vigor and accomplishments of both individuals and societies. The mechanisms that might relate cold-season births and greater eminence in later life are obscure. It seems unlikely that they would be genetic in nature. But it is possible that the strength and well-being of a child's parents prior to conception and during gestation might be involved. Cold-weather children are conceived in the spring and fetal development occurs during the summer and fall, when food is plentiful and sickness less common. Such considerations might have a bearing on this purported anomaly.

Similar and Related Phenomena. Intelligence correlated with season-of-birth (BHB35); all of the other correlations of intelligence (BHB36-43) and eminence (BHB27-34).

Entries

X1. An early study of famous people and their birth dates. Superficially, one would expect individuals who have risen to eminence in society to have birthdays spread uniformly across the calendar. But it was noticed long ago that, contrary to this expectation, famous people were more likely to be born in the colder months of the year. One of the early inquiries into this suspected and popularly believed phenomenon was that of F.J. Allen. He wrote:

In order to find, if possible, the causes which underlie the production of increased numbers of eminent intellects at certain periods (as, for example, the year 1809 and a year or two before and after it), I collected statistics on the dates of more than two hundred eminent persons. The list consists chiefly of creative intellects,---poets, literati, musicians, painters, architects, men of science, explorers, and inventors, with a few statesmen and military men. Analysis of the dates shows that the greater number of these persons were born in the colder months of the year; but the distribu-

tion of the numbers is somewhat erratic. February is distinctly the richest month, having produced a galaxy of eminent persons; December comes next; August and June are the best among the warm months.

Sixty pre-eminent names, chosen for no reason but their pre-eminence, were found to be distributed as follows:---In warmer months: April, 4; May, 6; June, 7; August, 5; September, 3; total, 27. In colder months: October, 4; November, 1; December, 9; January 3; February, 9; March, 5; total, 33.

The difference is more evident when the months are taken in groups of three, as follows: December to February, 23; March to May, 15; June to August, 14; September to November, 8. (R1)

Allen noted, too, that the distribution of the birthdays of the eminent people was quite different that that for "ordinary" people. He surmised that human germ cells were more vigorous at certain seasons. For example, those born during the cold months were conceived in the spring months, "a time of

increased vigor of most living things."

Of course, Allen's study involved only a relatively small sample, and it was heavily biased in favor of the Northern Hemisphere and Western cultural values. (WRC)

X2. Huntington's work. One cannot treat this topic without encountering E. Huntington. Huntington's classic Season of Birth (New York, 1938) was a milestone in the exploration of the effects of climate and season upon the destinies of individuals and nations. The following paragraphs are taken from his book:

For decades or even generations there has been a wide-spread idea that men of genius are more likely to be born in February than in any other month. In America the fact that Washington was born on February 22 and Lincoln on February 12 has doubtless had something to do with this. Among the 31 presidents of the United States, no less than 26, or nearly 4 per month, were born in the 7 cooler months from October to April, and only 5, or 1 per month, in the warmer months from May to September. Among the 67 known birthdays of persons in the Hall of Fame at New York University, 27 or about 40 per cent occur in February, March, and April.

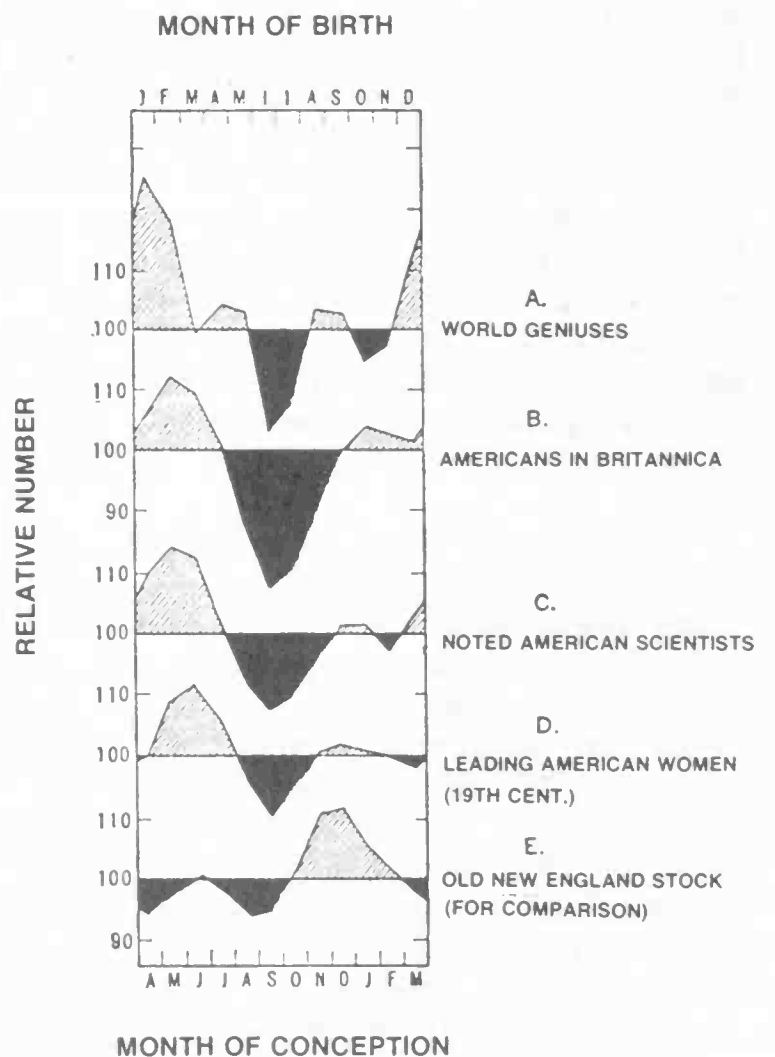
Several tabulations of world geniuses indicate a similar tendency. Cattell (1903), Ireland (1925), Gini (1912), Kassel (1929), Pintner (1933), and Petersen (1936), are some of the writers who have discussed the fact that eminent people tend to be born in cool weather, especially from January to March. The group of geniuses most commonly used is Cattell's list of 1000 greatest names of all time, among whom the birthdays of 271 are known. The seasonal distribution of these births is shown in Curve A. Three other groups of leaders are added for comparison, namely, B, the 1226 Americans included in the fourteenth edition of the Encyclopaedia Britannica (tabulated by Mr. Ziegler); C, 1374 scientists who are starred as outstanding leaders in American Men of Science (tabulated by Pinter), and D, 1078 leading

American women of the nineteenth century who are mentioned in A Woman of the Century (tabulated by Mr. Ziegler). These four curves have been smoothed by our usual formula to eliminate the minor irregularities which are inevitable with small numbers of cases. All have a strongly developed maximum in January, February, or March, and equally distinct minimum in June, and a minor maximum in August, September, or October. (R3)

Huntington saw two trends in the four graphs:

One is a steady tendency for the the maximum to occur later in the season as we go from the greatest geniuses to other leaders and then down to ordinary people. The other is for the amplitude of the curves to decrease as we go from the more to the less competent. (R3)

In X1, Allen found a similar intensification of the phenomenon as he went from eminent to preeminent people. This



Month-of-birth for eminent people. (X2)

effect may explain an apparent washing-out of the effect as more and more of the less-*eminent* are included. (See X3 and X4.) Huntington explained the claimed tendency of eminent people to be born in the colder months in terms of one of his major hypotheses about human culture:

The data in this book support the idea that season of birth bears a close relation to genius and eminence. Unusually high ability is probably never the result of accidents. Accidents tend almost inevitably to injure rather than improve the delicate mechanism of the brain. Genius apparently arises from a fortunate combination of the genes within the chromosomes at the time of conception. In order to reach fruition it needs an environment sufficiently favorable to give the innate capacities full chance for expression. The facts set forth in this book indicate that the births of persons of unusual genius conform to the annual rhythm and to the temperature much more closely than do births in general. This is just what would be expected on the basis of what we have seen as to sex and length of life. The high percentage of girls and the long lives which are associated with birth at the most favorable season are indications of vigor. Unusual achievements are a similar indication. (R4)

Huntington contended that the cooler climates encouraged the rise of human culture, while the heat and humidity of the tropics repressed human development.

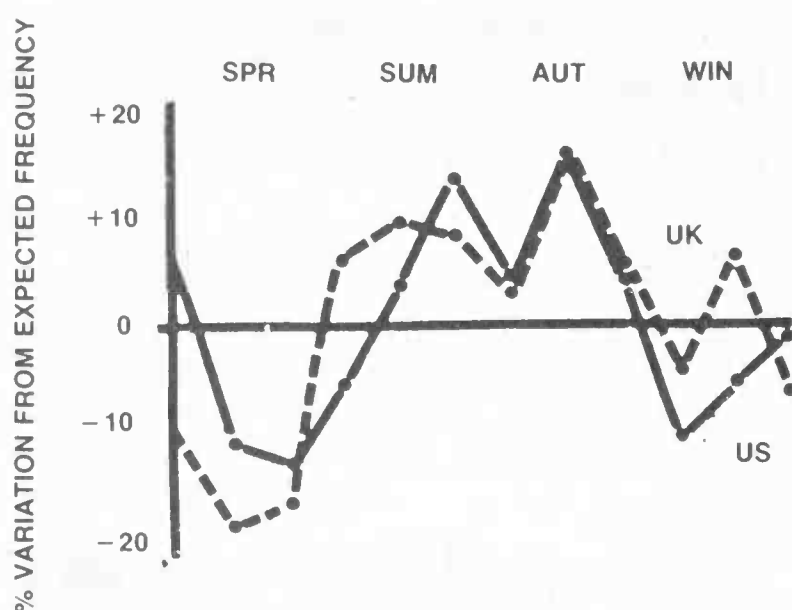
X3. Dissecting eminence. Eminence is obviously a composite measure, being composed of all manner of occupations, skills, and talents. H.J. Cooper divided eminent individuals by occupation and discovered that expected seasonal effects on eminence were out-of-phase.

If the birthdates of eminent soldiers, doctors, artists, and musicians are listed, they cluster occur at certain times of the year beyond chance expectation.

Peak periods were found to be as follows: (a) soldiers---mid Summer

to late Autumn; (b) doctors---early Summer to mid Autumn; (c) artists ---late Winter to late Spring; and (d) musicians---late Autumn to middle Spring. (R5)

Manifestly, Cooper's results clash with those of Huntington and Allen. Cooper (with A.G. Smithers) next analyzed the birthdates of a very large sample of American army officers (12,000 in all), taken from the USA Army Register, 1972. Once again, the peaks occurred in mid-summer and late autumn. (R6)



Month-of-birth for U.S. and U.K. army officers. (X3)

X4. A very large sample of eminent men. The phenomenon at hand is further confused by analyses of very large samples of eminent men in all categories. In such cases, the rather impressive cold-weather effect seems to get washed out. Perhaps, as Huntington, observed above, the phenomenon fades away as lesser geniuses are included.

To illustrate, R. Pintner and G. Forlano took 22,565 men listed in Who's Who in America and American Men of Science and found that their birthdays did not peak significantly in the colder months. They found by quarters: January-March, 5639; April-June, 5377; July-September, 5849; and October-December, 5700. They concluded:

Our data do not show any reliable differences between months or sea-

sons with reference to the birthdays of eminent men. There is little consistency in the trend from sample to sample. The highest percentage may fall in almost any season or any month. (R2)

For some reason, Huntington, who must have been aware of this 1934 paper of Pintner and Forlano, did not mention it in any of his quotations provided above.

It is a very strange phenomenon that affects most strongly only the birth dates of the most illustrious individuals. (WRC)

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BHB28 General Eminence Correlated with Planetary Position

Description. The tendency of eminent individuals, in various professions, to be born shortly after the rise or culmination of certain planets. Some professions are associated with Mars, others with Saturn and other planets. Eminence is usually established by reference to lists or catalogs of famous scientists, poets, etc. This phenomenon includes only the most renowned individuals. The inclusion of lesser talents in samples reduces the magnitude of the phenomenon. Not all professions exhibit the effect, nor are all planets involved.

Data Evaluation. Very large samples (thousands and even tens of thousands) of individuals have been amassed, but still the phenomenon is not particularly pronounced, although it is considered statistically significant. Some attempts at replication, using rather small samples, have been unsuccessful. The largest samples and the strongest demonstrations of the phenomenon have come from a single group (the Gauquelins). Large-scale replications are desirable here. Rating: 2.

Anomaly Evaluation. Within the realm of accepted scientific paradigms one finds no explanation of this phenomenon. Indeed, scientists generally insist that it cannot exist at all. The many scientific and philosophical reservations and problems are presented in X6, below. But, if this phenomenon is valid, it betokens forces or influences completely unknown to science. Rating: 1.

Possible Explanations. The data are somehow biased and/or the data processing introduces artefacts. The planets generate some unappreciated influence over children at birth. This latter assertion is equivalent to according status to astro-

logy and is manifestly unacceptable to science.

Similar and Related Phenomena. The Mars Effect (BHB29); planetary positions correlated with solar activity (AOS9), disturbed human behavior (BHB3), and economic activity (BHB12); planetary positions correlated with terrestrial weather (GWS8), radio propagation (GER11), and earthquake frequency (GQS7); solar eclipses and pendulum motion (ASX6).

Entries

X0. Background. The most important investigators of the possible effects of planetary positions upon human eminence have been M. Gauquelin, a French psychologist and statistician, and his wife, F. Gauquelin. Although the Gauquelins reject and claim to have disproved the tenets of conventional astrology, they still assert that the positions of the planets at a person's birth are somehow related to that person's eminence, in one field or another, in later life. Naturally, mainstream scientists throw up their hands in horror at such a suggestion. They recognize no viable cause-and-effect link between astronomy and human accomplishment. The Gauquelins do not provide convincing explanations either; they have concentrated on the statistical correlations. Their correlations, though, are sufficiently impressive to warrant cataloging them.

The presentation of the Gauquelins' results is split into two parts: (1) The general phenomenon as it involves eminence in several diverse professions (BHB28); and (2) The possible connection between the position of Mars at birth and athletic proficiency (BHB29). The latter aspect of this phenomenon deserves special attention because it has been the focus of much scientific criticism and attempted replications.

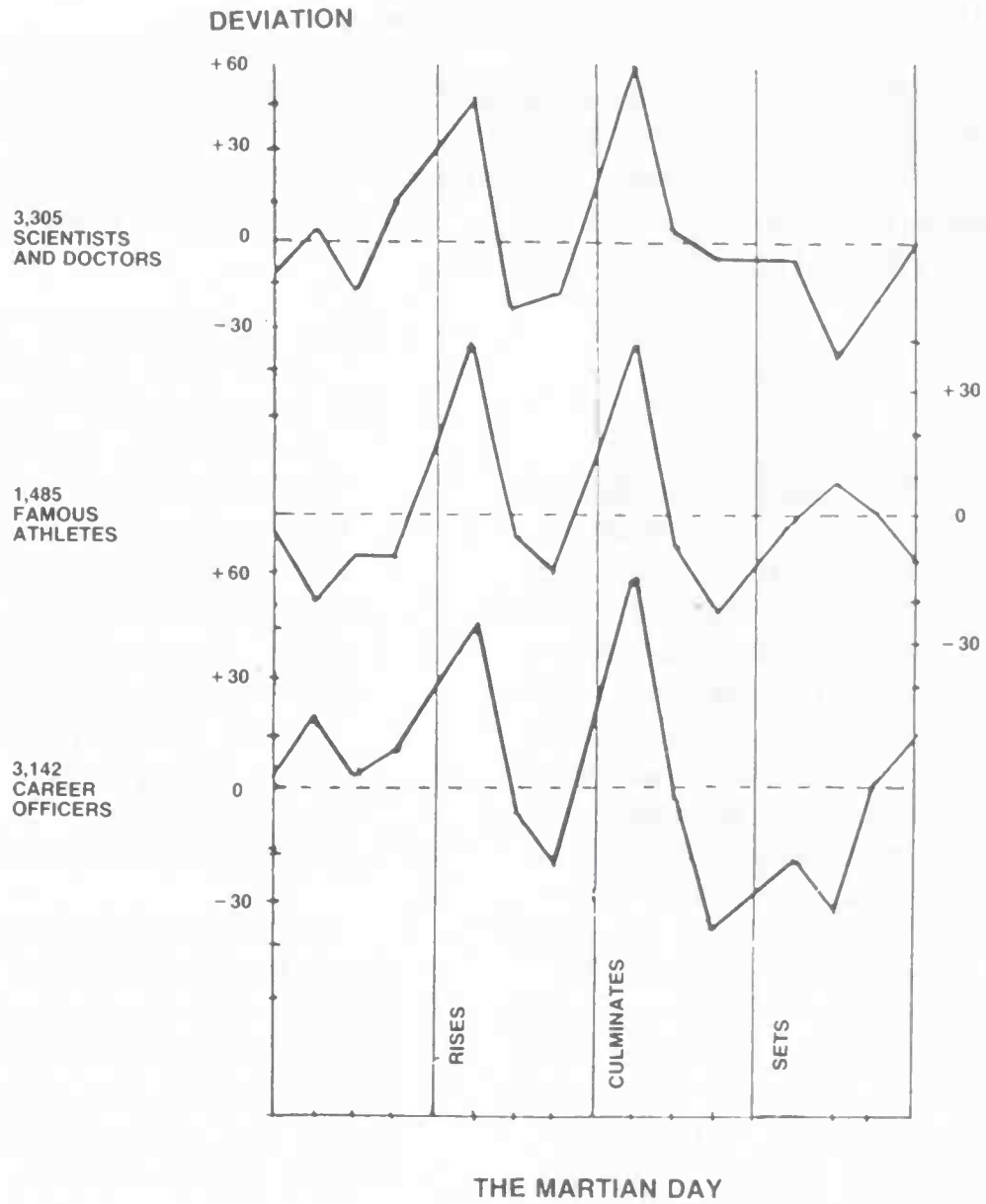
X1. The Gauquelins' early study of eminent physicians. We employ M. Gauquelin's words here:

Around 1950, as we were preparing our critique of traditional astrology, we found ourselves confronted, somewhat unwillingly, with a strange result. In one of our research samples ---composed of the birthdates of 576 members of the French Academy of Medicine---the frequency of the posi-

tion of certain planets was altogether unusual. The phenomenon did not correspond to any of the traditional laws of astrology, but it was interesting, nevertheless. What we had observed was that a large number of future great physicians were born when the planets Mars and Saturn had just risen or culminated in the sky. (R1)

The Gauquelins quickly discovered that this association with Mars and Saturn did not prevail when they sampled normal ("non-eminent") individuals at random from the census records. Pursuing the phenomenon further, they enlarged their sample,

We thus assembled a second sample of 508 eminent physicians. The work involved was not simple; we had to find not only the names of these doctors but also the date and locality of their births; then we had to write to the mayors of their home towns to obtain the exact time of birth. This precision was necessary because the planets change their positions hour by hour, as a function of the daily rotation of the earth; it was also necessary to conduct this work on the most solid demographical and astronomical base, to avoid erroneous conclusions.....At the end of our second study, the evidence reproduced itself with stubborn insistence: as in the first group, the birth dates of the famous physicians clustered after the rise or the culmination of Mars and Saturn. An undeniable statistical correlation appeared between the rise and culmination of these planets at the child's birth and his future success as a doctor. (R1)



The birth times of eminent persons related to the Martian day. (After M. Gauquelin, R1, X1)

X2. Extension of the Gauquelins' study to other professions. Led on by their strong correlations between the birth dates of eminent French doctors and the positions of Mars and Saturn, the Gauquelins decided to include other professions in their sample and eminent individuals from other countries as well. In fact, one critic had suggested that perhaps the phenomenon applied only to the French!

The Gauquelins once again found an impressive correlation between planetary positions and professional eminence. As Mars came over the horizon famous scientists, as well as eminent physicians, were more likely to be born. Artists, musicians, and painters, however, were seldom born during these periods. On the other hand, the rising of Jupiter seemed to correlate with the births of renowned soldiers and politicians. These findings were so startling that the Gau-

quelins were pressed to gather larger samples covering greater geographical areas.

L. Watson described the next phase of the Gauquelins' work in his book Supernature.

Gauquelin was forced to do similar work in Italy, Germany, Holland, and Belgium until, three years later, he had twenty-five thousand records. The results were the same. Scientists and doctors were positively linked with Mars and Saturn; soldiers, politicians, and team athletes with Jupiter. Writers', painters', and musicians' births were not linked to the presence of any planet but clearly avoided Mars and Saturn, while scientists and doctors were negative on Jupiter. Solo performers such as writers and long-distance runners were much more markedly

linked to the moon than to any of the planets. This time three well-known statisticians, including Favre, the professor of statistics at the Sorbonne, studied the results and could find no fault with Gauquelin's calculations or the methods he used to collect his data. A control experiment was performed on people selected at random, which yielded results strictly according to the laws of chance. (R2)

X3. The role of personality. Probing more deeply into the phenomenon, the Gauquelins examined the personalities of the eminent people who exhibited these "planetary" effects. In this work they collaborated with E.G. Eysenck, finally publishing their results in the British Journal of Social and Clinical Psychology. Here is their Abstract.

The precise birth dates and locations of several thousand famous French scientists, sportsmen, and actors were ascertained from their biographies, as well as personality descriptions. From the data relating to birth times and locations the precise positions of the planets Mars, Jupiter and Saturn were calculated for each person, with particular attention being paid to the period immediately following the rise and upper culmination of the respective planets. The personality descriptions were independently rated in terms of their relevance to the three major personality dimensions of E (extraversion), N (neuroticism), and P (psychoticism), and scores assigned to each of the people forming the sample on these dimensions, and their opposites (i.e. there are separate scores for introversion as well as for extraversion.) It was predicted and found that introverts are very significantly more frequently born when Saturn had just risen or just passed its upper culmination; extraverts when Mars and Jupiter had just risen, or just passed their upper culminations. No positive effects were found for neuroticism and only relatively weak effects for psychoticism. (R3)

In other words, the positions of some planets seem to be associated with

the birth times of individuals with certain temperments. Following this line of thought, there could be a "Mars temperament," which in the scheme of the Gauquelins is concordant with the drive and aggressiveness typical of champion athletes. Obviously, findings of this sort smack strongly of astrology. The Gauquelins may deny astrological proclivities, but their research is definitely supportive of astrology. (WRC)

X4. The apparent inheritability of "planetary temperaments". In a long review of the controversy over the so-called Mars Effect (BHB29), G.O. Abell described how the Gauquelins assessed the inheritability of "planetary temperaments".

Some psychologists believe that character traits tend to be inherited. Can there, then, be a hereditary effect in the planetary distribution at birth? Between 1959 and 1965 the Gauquelins analyzed the planetary sectors at the times of birth of more than 30,000 French parents and their children. Sure enough, they found a significant correlation. A child is more likely to be born with Mars in a key sector, they report, if one or both of his parents also had Mars in a key sector at birth; and the same for certain other planets. (R4)

Thus, the situation becomes more confused. Does a child have its temperament and its future eminence passed on through the genes or does it acquire features of its parents' temperaments only because it was born with the same planet in the sky? No wonder mainstream scientists generally shy away from this and like phenomena!

X5. Physical and philosophical problems posed by the phenomenon. Few scientists have shown any interest in the possible influence of planetary position upon human behavior because of the astrological implications involved. After all, research funds and reputations are at stake! However, one scientist, A. Muller, has given much thought to possible explanations. In so doing, however, he has identified six aspects of

the phenomenon which make it exceedingly difficult to bring the phenomenon into the arena of modern scientific theory---and these "problems" are over and above the onus of the "astrology" label.

1. A scientist would expect the magnitude of the planetary effect to begin at the planet's rising and increase steadily as culmination approaches and then decrease afterwards. Instead, peaks occur shortly after both rising and culmination. Such behavior is difficult to fit into a mechanistic explanation.

2. The phenomenon seems independent of the sun's position, even though the sun's influence upon terrestrial life is large and well-accepted by science.

3. The moment of birth, which is used in establishing this phenomenon, is only the end point of a process of varying duration. One would expect the correlation to be with the beginning of labor, not the moment of birth.

4. How can different planets impart different "temperaments"? Does the induced temperament depend upon the planet's mass, its chemical constitution, or what? Such an effect is hard to cope with in scientific terms.

5. There seems to be no explanation for this phenomenon in evolutionary terms. If the phenomenon has survival advantages, they are obscure.

6. The planetary temperaments established by the research of the Gauquelins accord well with astrological thinking. In fact, astrologers have welcomed the Gauquelin's researches, while science has ridiculed it. This concurrence with astrology is embarrassing to the Gauquelins because they also claim to have disproven conventional astrological methods. (R6)

To these "problems" raised by Muller, we add three more:

7. The phenomenon seems to apply only to very eminent individuals; it does not apply to lesser but still talented persons. Why is there a cutoff and what defines it?

8. Some notably eminent people, such as basketball stars, also escape the in-

fluence of the planets.

9. Finally, the phenomenon is weak even where it is most pronounced (as among sports champions). Here, it is termed the "Mars Effect". (See BHB29 for elaboration.) G. Abell, an astronomer who has looked into this facet of the Gauquelin's work, has commented as follows:

I must emphasize that while the Mars effect is one of the Gauquelins' strongest correlations, it is nevertheless relatively weak. The excess of athletes born with Mars in key sectors is only about 5 percent of the total sample; most great athletes are not born with Mars in key sectors and most people who are [born in these sectors] never become sports champions. (R4)

X6. Searching for a cause-and-effect linkage. To be acceptable to modern science, the phenomenon at hand must be explainable in mechanical terms; that is, recognized forces must connect planets and individuals at birth. (It does not matter that all recognized physical forces are arcane to say the least!) In X4 and X5, above, we have cataloged the possible involvement of psychological attributes and inheritance in the broader phenomenon of planetary effects on behavior. Any forces used in explanation, must also account for these aspects of the phenomenon.

First of all, all who have looked at the phenomenon agree that none of the recognized physical forces is strong enough or has the proper characteristics to even come close to explaining the phenomenon. The only approach having any scientific legitimacy is the identification of chains of correlations. The most important of these chains involves the claimed, but very controversial, effect of planetary position on solar activity (ASO9). Since solar activity affects the terrestrial magnetic field and this field in turn is correlated (controversially) with human behavior (BHB3), there does exist a very tenuous circumstantial link between planetary position and eminence. Just what this link is anybody's guess.

A. Muller, who has searched diligently for causal chains and explanations, speculates about how ancient worship of

planetary gods might be involved. Perhaps, he ventures, children born during the "presence" of the god; i.e., its rising or culmination, might be socially favored and thus have higher odds of survival. This effect might then be incorporated somehow in the genome. Even though he stretches very far for rational explanations, Muller has to include a mysterious "force" in his explanation:

Oscillations, rays, or other effects (not yet discovered) of the planet are sensed by the pregnant woman and the fetus, especially at the beginning of the effect after the rise (R) and its climax during culmination (C). (R6)

All in all, explanation of the purported phenomenon in currently acceptable scientific terms is a long way off.

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- R3. Gauquelin, M., et al; "Personality and Position of the Planets at Birth: An Empirical Study," British Journal of Social and Clinical Psychology, 18:71, 1979. (X3)
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- R5. Kelly, Ivan; "Cosmobiology and Moon Madness," Mercury, 10:13, 1981. (X3, X4)
- R6. Muller, Arno; "Planetary Influence on Human Behavior ('Gauquelin Effect'): Too Absurd for a Scientific Explanation?" Journal of Scientific Exploration, 4:85, 1990. (X5, X6)

BHB29 Eminence in Sports Champions Correlated with the Position of Mars: the "Mars Effect"

Description. The tendency of sports champions to be born either as Mars rises in the sky or passes culmination. The phenomenon occurs only with the very best athletes, indicating the presence of a threshold effect.

Data Evaluation. Birth data from large samples of superior athletes have been used in establishing the existence of this phenomenon. These birth data as well as the astronomical calculations and statistical analyses have been checked and accepted by groups and individuals skeptical of, even hostile to, the existence of this phenomenon. So astounding is the Mars Effect that all aspects of it have received the most severe scrutiny. Even so, the Effect seems impossible to deny objectively. Subjective rejection, however, is common. Rating: 1.

Anomaly Evaluation. As in the case of the correlation of eminence-in-general with planetary positions (BHB28), there exists here no explanation of the Mars Effect within the scope of accepted scientific paradigms. It seems easiest for most scientists to doubt its existence outright without examining the data supporting it. Many scientific and philosophical objections have been raised against the Mars Effect. (See a list in BHB28-X6.) The similarity of the Mars Effect to purported astrological phenomena turns many scientists and laymen against it prematurely. If the Mars Effect is real, it implies the existence of bizarre, unrecognized forces or influences in the cosmos. Rating: 1.

Possible Explanations. The most common explanations are that the data are biased or the statistical analyses are faulty---despite repeated replications and verifications. Seemingly, the only alternative is the postulation of "something" about the position of Mars in the sky that affects people at birth, ridiculous though this may seem.

Similar and Related Phenomena. Eminence correlated with planetary positions (BHB28); planetary positions correlated with solar activity (AOS9), disturbed human behavior (BHB3), and human economic activity (BHB12); planetary positions correlated with terrestrial weather (GWS8), radio propagation (GER11), and earthquake frequency (GQS7).

Entries

X0. Background. The Mars Effect is a type of planet-correlated human behavior that was treated more generally in BHB28. More specifically, the Mars Effect is that tendency of sports champions to be born more frequently just after the rise and just following the upper culmination of Mars. As with the phenomena cataloged in BHB28, the Mars Effect has been studied in depth by M. and F. Gauquelin, who have accumulated large data bases of birth times of individuals eminent in several professions. The size of the Gauquelins' data bases, the meticulousness of their analyses, and their strong support of an astrology-like phenomenon has made the Mars Effect a fascinating intellectual battleground.

The Mars Effect is singled out for special treatment here because: (1) It provides the strongest evidence that eminence is correlated with planetary positions; (2) It represents that part of the Gauquelins' work that has been replicated independently; (3) This part of the Gauquelins' data base and statistical analysis has been thoroughly reviewed by other scientists; and (4) The phenomenon has been the focus of an acrimonious controversy and several highly criticized attempts to disprove the reality of a phenomenon that is anathema to mainstream science.

This Catalog is not the place for a detailed discussion of the Mars Effect debate. Suffice it to say that the US-based Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) attempted to replicate the Gauquelins' work on the Mars Effect using data on American sports champions. (See X4 below.) The progress and presentation of the CSICOP work has been said by some to have been

marked by a lack of objectivity and questionable methodology. (R11, R12) The CSICOP side of the story can be found in the pages of the Skeptical Inquirer, a CSICOP publication. (R5-9, R15)

X1. The nature of the Mars Effect. The Mars Effect was recognized by M. Gauquelin early in his research investigating the claims of astrology. Although he failed to discover any validity in conventional astrology, he did find that the births of highly successful persons were not totally independent of the positions of the planets. He described the events as follows:

I published my observations in a first book, L'Influence des Astres, complete with the 6,000 birth data items on which they were based. It was in this book---unfortunately not yet available in English---that I described what has become known as the "Mars effect." This is the marked tendency for champion athletes to be born when the planet Mars has either risen over the horizon or passed its upper culmination. This particular pattern is seen far more frequently around the birth of outstanding athletes than for low ranking ones. As some readers are aware, the Mars effect referred to here has been under skeptical scrutiny by experts for many years...

It is important to emphasize, however, that the Mars effect for sports champions is merely one among many findings concerning famous individuals. For instance, Jupiter, in analogous fashion, was found to be

linked with success in politics, cinema, theater, and journalism; Saturn, with accomplishment in science; the moon, "favorable" in the case of writers.

.....

It is logical that scientists are most reluctant to accept findings of such an extraordinary nature. Indeed, biases or errors seem to be the most reasonable explanation. It is, therefore, necessary to describe my methodology in greater detail. (R20)

Gauquelin next reveals how his data base was gathered, how the astronomical data were established, and how the expected birth frequencies were computed. These were not minor tasks, for birth registries do not always record the required precise moment of birth--- and these must be natural, uninduced births. In addition, the analysis must incorporate the fact that births are not distributed evenly throughout the 24-hour day. The meticulous nature of Gauquelin's work is attested by the general lack of criticism of his data-gathering and his methods of analysis.

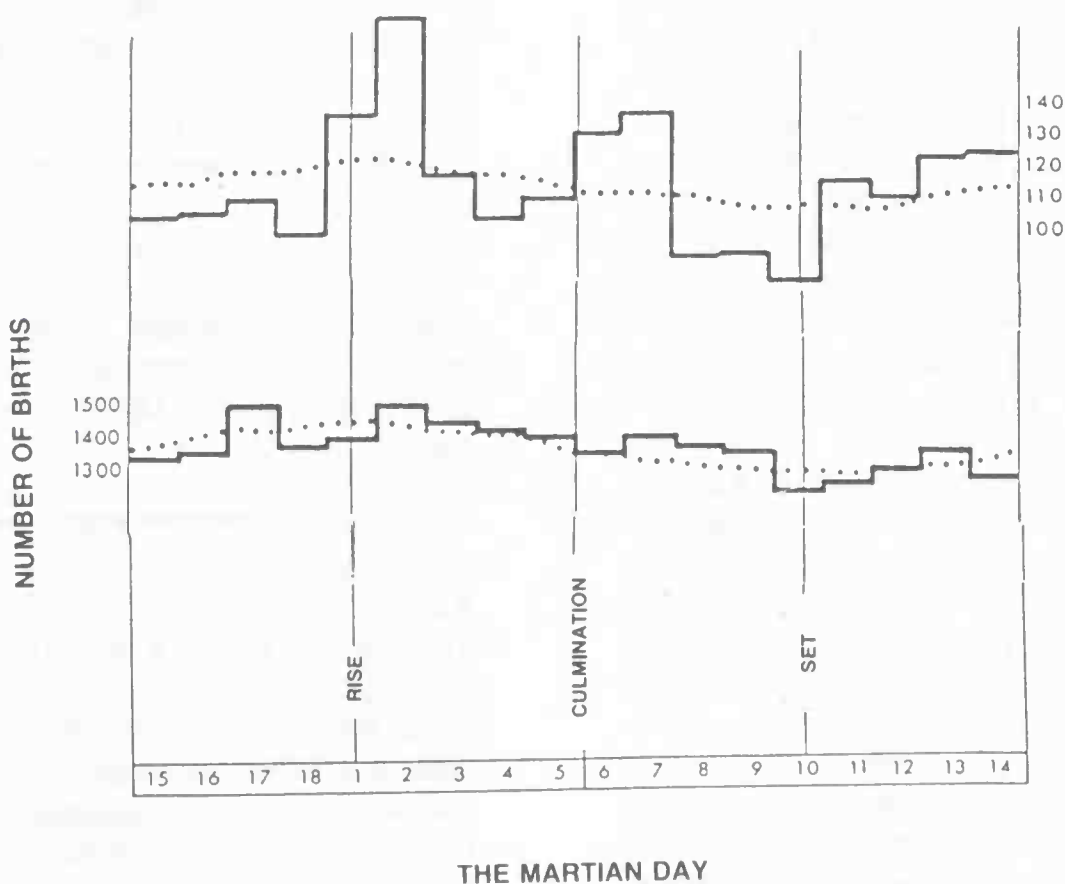
The Mars Effect can be described very simply by comparing the number of births of sports champions with those of a control group of average citizens. Gauquelin describes the phenomenon in both a contingency table and a revealing graph.

The evidence for a "Mars effect," that is, the tendency for sports champions to be born more frequently when Mars is in Sector 1 (rise) and in Sector 4 (culmination) of the 12-sector division, can be cast in the form of a 2x2 contingency table:

| | Mars in Sectors 1 & 4 | Mars in other sectors |
|-----------------|-----------------------|-----------------------|
| Champion births | 452 | 1,636 |
| Control births | 4,296 | 20,665 |

For this table, $X^2 = 26.2$, which with one degree of freedom, yields $p < 10^{-6}$. Figure 2 is a graphic illustration of this highly significant result. (Note that this is the equivalent 18-sector mapping.)

This observation pertains to Mars and sports champions only; yet, however significant, it would not have



(Top) Distribution of births in an 18-sector Martian day for 2,088 sports champions. (Bottom) Ditto for 24,961 ordinary persons. (After M. Gauquelin, R20, X1)

been sufficient by itself to conclude that there is a correlation between planetary motion and time of birth of famous individuals. In fact, as briefly mentioned in the introduction, several other statistical analyses showed significant results not only for Mars but also for Jupiter, Saturn, and the moon. (R20)

X2. The Comite Para replication. The startling results of Gauquelin prompted replications, as they should. The first of these was conducted by Comite Para, a Belgian group similar to the U.S. CSICOP. I. Kelly summarized their initial results as follows:

The Comite Para gathered data on a group of 535 European sports champions to replicate the findings of Gauquelin that sports champions are more often born after the rise and upper culmination of the planet Mars than are unnoted athletes.

The results of the study were statistically significant. However, an examination of the Comite Para data, as Dennis Rawlins has pointed out in The Skeptical Inquirer (Vol. 3, No. 2, Pg. 72) reveals that, although more athletes were born with Mars rising than with Mars in any other sector of the sky, the other part of the hypothesis---namely, that more athletes would also be born when Mars had reached an upper culmination than were born when Mars was in other sectors---was not substantiated. Of the twelve sectors, the sector with Mars rising ranked first, but the sector with Mars in upper culmination was ranked fifth (when compared with expected calculated frequency) in numbers of athletes. Hence, the Comite Para test provides only partial support for the Gauquelin hypothesis. (R10)

Nevertheless, Gauquelin and many others considered these initial results as confirmatory of the Mars Effect. In fact, the Committee's report stated as much:

The distribution of the actual frequencies of Mars is far from uniform. They display the same general pattern found by M. M. Gauquelin with samples of other sports champions,

the main characteristics being a clear predominance in sector "1" (rising) above all the others. The Comite therefore gives its agreement on this point with the results of M. M. Gauquelin. (R20)

Despite their apparent, though partial, replication of the Gauquelins' results, Comite Para was not convinced that both their calculations and those of the Gauquelins were free of demographic and astronomical biases of one sort or another. Accordingly the Comite performed "counter experiments" designed to expose such biases. These exercises only further confirmed the existence of the Mars Effect. Gauquelin remarked:

That was not, surprisingly enough, the final conclusion of the Para Committee's report. Actually, the Para Committee discarded the results of their own counter-experiments. According to their rationale, it is "impossible" to calculate any expected frequencies for Mars because the problem is too complex. Without being more specific the report claims that I surely must have made some methodological mistake somewhere. (R20)

Not all members of the Comite Para agreed with the conclusions. L. de Marre, for example, expressed his concern over the Comite's conclusions and his disillusionment over the Comite's objectivity in a comment published in the Zetetic Scholar. (R14)

Clearly, more work would be required before the doubters in Belgium and elsewhere would be convinced. The so-called Zelen test was a step in this direction.

X3. The Zelen test. A basic objection of Comite Para was that the probability of a person being born varies with both time and geographical location, and that this variability was not factored into the Gauquelins' calculations. To avoid this problem, M. Zelen proposed a new kind of test, as related by J. Cherfas:

Zelen's challenge was for Gauquelin to compare the Mars data for his champions with data for ordinary people born at the same place on the same day. This would control for possible demographic effects---Mars

spends a disproportionate amount of time in certain sectors and more births could be occurring then among future champions and non-champions alike. Zelen claimed that he was providing "an objective way for unambiguous corroboration or disconfirmation." (R11)

The Zelen test was conducted by G.O. Abell, P. Kurtz, and M. Zelen, all CSICOP members. Their calculations supported the methods of the Gauquelins:

In summary, the purpose of the Zelen test was to avoid any question over the proper way to calculate the theoretically expected distribution of Mars among the sky sectors at the times of birth of those belonging to the general population. It is our judgment that in this instance, at least, the procedure used by Gauquelin appears to have been vindicated. To say this, however, in no case verifies that the Mars effect is real, for we had no way to assure that the sample selected by Gauquelin was unbiased. It was our opinion that the best procedure available to us was to attempt to replicate the effect with a completely independent sample of sports champions born in the United States. (R15)

X4. The CSICOP-associated U.S. test. For the U.S. test, Abell, Kurtz, and Zelen consulted five different sports directories, such as Who's Who in Football (1974), and state birth registries. After considerable labor, they had a sample of 408 U.S. sports champions. G.O. Abell described the results of this attempted replication of the work of the Gauquelins:

The Mars sectors for these athletes were calculated by astronomer Dennis Rawlins of San Diego; to avoid bias, he was given no control over this selection. Fifty-five, or 13.5 percent of the 408, had Mars in key sectors. The overall distribution of Mars sectors does not differ appreciably from chance. It does differ with very high significance, however, from the Gauquelins' prediction of 22 percent with Mars in key sectors. For our sample of champions, the

Mars effect is clearly not present. (R13)

M. Gauquelin responded to this U.S. test with the complaint that the sports champions selected were not select enough; that is, too many lesser athletes were included. To demonstrate his claim that a threshold of eminence existed, Gauquelin chose from the U.S. sample 88 champions he believed were truly superior. Interestingly enough, the Mars Effect did indeed appear in this limited sample. I. Kelly, though, remarked that, as in the Comite Para test, the Mars Effect also appeared prominently in sectors besides 1 and 4 (rise and culmination). (R10 In sum, the small subset of 88 Gauquelin-selected U.S. sports champions did not provide a clear-cut endorsement of the results of the Gauquelins.

X5. Gauquelin's replication demonstrating the threshold effect. We use here I. Kelly's description of the next phase of the controversy.

A third replication was conducted by Gauquelin with a new sample of 432 European sports champions. Gauquelin tells us that the position of Mars in sectors at the birth of these champions was computed and the results indicated that they were born with Mars in the expected sectors more often than would be theoretically expected, whereas a control group of 423 lesser, but well-known athletes did not display the effect. (R10)

Abell et al challenged these results. In particular, they were disturbed by the claim of a threshold effect. One would expect intuitively that the 423 lesser athletes would show the Mars Effect to a lesser degree. And how does one determine when an athlete is truly outstanding? They were also bothered by the apparent fact that basketball players do not show the Mars Effect at all! (R10)

X6. Summary of the early attempts to replicate the Mars Effect. In X0, we mentioned how the CSICOP-associated replications of the Gauquelins' findings

were accompanied by considerable internal and external discord. In retrospect, this discord weakened the impact of the CSICOP-associated results. Even the key players in the CSOCOP drama (Abell, Kurtz, Zelen) acknowledged mistakes and shortcomings in a 1983 "reappraisal" published in the Skeptical Inquirer. Even so, they ended their article with the following paragraph:

In summary, we regard it as improbable that the Gauquelin planetary effects are real. Yet, because they suggest hitherto unknown cosmic influences, they have great appeal to astrologers, and the subject has thus received worldwide attention. We regret that at the outset we had not the foresight to exercise a great deal more care in our experiments and in reporting them. Had we done so, we might have been able to reach conclusions more convincing to others. On the other hand, it is doubtful if anything we would have done would have settled the matter. The final verdict will require time and new attempts at replication. We urge future investigators to proceed with the utmost care. Until there are further independent replications, we believe that judgment should be suspended as to whether the "Mars effect" is genuine. (R15)

On their part, the Gauquelins stand by their findings. They point to their "considerable statistical significance, the satisfactory checks of the procedures, the independent replication by the Para Committee, and the results of the Zelen test." They believe further that even the U.S. test, when truly great sports champions are selected, substantiated the reality of a Mars Effect. (R20)

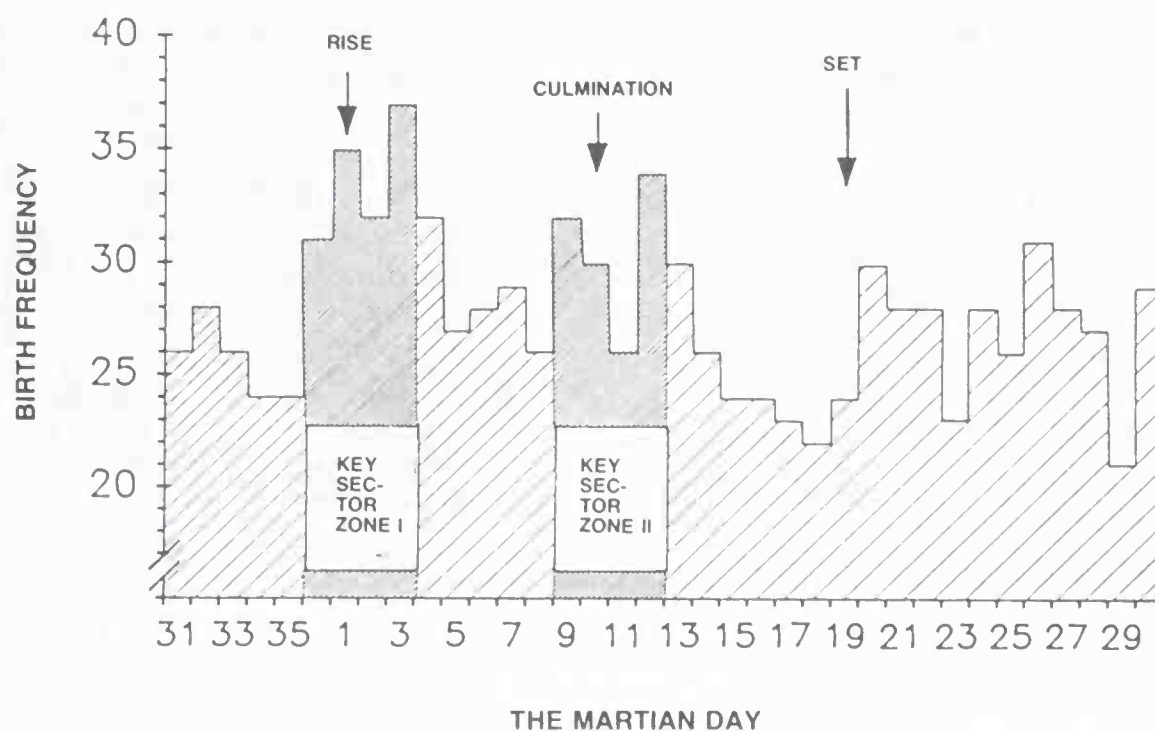
X7. The replication of S. Ertel. Following the CSICOP-associated research, the most important contribution to the elucidation of the Mars Effect came from S. Ertel, a scientist at the Institut für Psychologie, at the University of Göttingen. Ertel employed larger samples of sports champions, citation counts for determining eminence, and more astronomical sectors than did the Gauquelins in their early work. We now reproduce

the Abstract from a 1988 paper by Ertel.

By 1955, Michel Gauquelin had begun to publicize the claim that famous athletes are born with frequencies far beyond chance at times when Mars is rising over the Earth's horizon ("key sector I") or when the planet crosses the meridian ("key sector II"). Critics did not succeed in refuting his claim empirically: The "Mars effect" survived three such attempts. It was largely doubts over the impeccability of M. and F. Gauquelin's data base, however, which kept researchers from pursuing the problem further. The present study incorporates the entire repertoire of birth data of athletes available to date (N = 4391). The objective is to test the alleged planetary correlation as a function of degree of sportive eminence, the latter being determined by citation counts. It is contended that this procedure is superior to Gauquelin's own; and that the predicted eminence could hardly be expected to materialize in case his former results were due to biased data treatment. Findings corroborate the eminence prediction: The proportion of athletes born at Mars key sector hours increases from the lowest to the highest of five ranks of sporting eminence; the trend is highly significant ($p > .005$) by several criteria. It is concluded that Gauquelin's hypothesis, after having passed this crucial examination, deserves the most thorough attention. (R19)

With the publication of Ertel's results, denial of the Mars Effect became difficult for scientists. For instance, in 1990, C. de Jager, from the Laboratory of Space Research, Utrecht, wrote the following in an article on fringe science and pseudoscience:

...important progress was made in a thorough statistical study by Ertel who investigated 4391 sportsmen, including the samples of the Gauquelins and of Kurtz et al. With this larger data set a finer subdivisions of sectors appeared possible. Criteria were established to define in an objective way the degree of eminence of sportsmen: five classes were defined. The Zelen test was thoroughly



Birth frequencies of eminent athletes plotted for a 36-sector Martian day. (After S. Ertel, R19, X7)

applied. The result was that the Mars effect appeared clearly and beyond any reasonable doubt. In addition the 'eminence effect', already suspected by Gauquelin, came out clearly.

To call this result surprising is perhaps an understatement. But one has to note that what has been found is a correlation. It should [not] be confused with a causal relation. It has not yet appeared possible to find an explanation for the Mars effect. It seems most difficult to assume that the position of Mars in the sky might have any effect whatsoever on the bodily qualities of newly-born children. (R22)

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- Abell-Kurtz-Zelen 'Mars Effect' Experiments: A Reappraisal," Skeptical Inquirer, 7:77, Spring 1983. (X3, X6)
- R16. Curry, Patrick; "More on the Mars Effect Controversy," Zetetic Scholar, no. 11, p. 22, 1983. (X0)
- R17. Ianna, Philip A., et al; "Astrology and Cosmobiology," Nature, 313:426, 1985. (X6)
- R18. Ertel, Suitbert; "An Assessment of the Mars Effect," The Explorer, 4:8, October 1987. (X7)
- R19. Ertel, Suitbert; "Raising the Hur-
dle for the Athletes' Mars Effect: Association Co-Varies with Eminence," Journal of Scientific Exploration, 2:53, 1988. (X7)
- R20. Gauquelin, Michel; "Is There a Mars Effect?" Journal of Scientific Exploration, 2:29, 1988. (X1)
- R21. Gauquelin, Michel; Written in the Stars, Wellingborough, 1988. (X1)
- R22. de Jager, Cornelis; "Science, Fringe Science and Pseudoscience," The Skeptic, 4:14, July/August 1990. (X7)

BHB30 Cultural Creativity Correlated with Solar Activity

Description. Bursts of human creativity in the arts and sciences correlated with increases in solar activity following prolonged quiet periods, such as the Maunder Minimum. These cultural "flourishes" seem to be synchronous over wide geographical areas.

Data Evaluation. Only a short abstract of a single paper has been found so far.
Rating: 3.

Anomaly Evaluation. If the cultural flourishes are triggered by some unrecognized solar "influence", a first-rank anomaly exists. However, if the phenomenon operates via climatic changes induced by variations in solar activity, the anomaly is not as severe; since, as in BHB31, a causal connection is easier to conceive.
Rating: 2.

Possible Explanations. Changes in solar activity trigger changes in the terrestrial climate which, in turn, affect cultural vigor and individual creativity.

Similar and Related Phenomena. Solar activity correlated with disturbed human behavior (BHB4) and economic activity (BHB10); the evolution of human culture (BHB14); cycles of religious activity (BHB15).

Entries

X1. General observations. Sociologists have long remarked that creativity in human cultures has occurred in bursts throughout history. S. Ertel ventures that such flourishes may have been linked to solar activity.

In a previous paper, evidence has been reported suggesting a link between historical oscillations of sci-

entific creativity and solar cyclic variation. Eddy's discovery of abnormal secular periods of solar inactivity ("Maunder minimum" type) offered the opportunity to put the present hypothesis to a crucial test. Using time series of flourish years of creators in science, literature, and painting (AD 600 - AD 1800), it was found that, as expected: (1)

Cultural flourish curves show marked discontinuities (bursts) after the onset of secular solar excursions, synchronously in Europe and China; (2) During periods of extended solar excursions, bursts of creativity in painting, literature, and science, succeeded one another with lags of about 10-15 years; (3) The reported irregularities of cultural output are prominent throughout with eminent creators; they decrease with ordinary professionals. The hypothesized extraterrestrial connection of human cultural history has thus been considerably strengthened. (R1)

It is curious to note that Ertel has found that the "extraterrestrial effect"

applies only to the eminent creators, which accords with the threshold effect claimed with the Mars Effect (BHB29).

Since periods of solar inactivity, such as the Maunder Minimum, are also correlated with climatic changes (ASO4), it is possible that climate may be in the cause-and-effect chain. See BHB31.

Reference

- R1. Ertel, Suitbert; "Synchronous Bursts of Creativity in Independent Cultures: Evidence for an Extraterrestrial Connection," The Explorer, 5:12, Fall 1989. (X1)

BHB31 Cultural Flowering Correlated with Climate

Description. The general rise in the quantity and quality of artistic and scientific activities following the onset of a cooler climate or, equivalently, the identification of "dark ages" with very warm periods. Cultural flowering can be measured in terms of the number of eminent artists and scientists produced.

Data Evaluation. The data here are rather vague; they consist mainly of superficial observations that vigorous, productive cultures seem to be associated with cooler climates. No criteria for measuring cultural flowering seem to have been established, nor are detailed correlations with climate records given. In fact, a just-as-superficial survey finds that the hot subcontinent of India has been the home of many eminent scientists and mathematicians, while the cool, temperate regions of South America have produced few world-class artists and scientists. However, this could well be a biased North American perspective. It is apparent from such statements and quick judgments that objectivity is lacking here.
Rating: 3.

Anomaly Evaluation. Despite the probable subjectivity of the hypothesis, it is widely believed that excessively hot climates shackle human cultural progress and, in consequence, the number of eminent artists and scientists. In addition to the supporting superficial historical observations provided below (X1 and X2), the hypothesis has a biological rationale. Too much heat suppresses bodily functions (including mental activity) because of the difficulty of dissipating waste metabolic heat. Here again, we have assertions without scientific support. (See X2 below.) However, should the number of eminent artists and scientists prove to be truly correlated with cool climates, we do have the makings of a reasonable explanation. Rating: 3.

Possible Explanations. Hot climates suppress physical and mental activities. Since climate may be affected by solar activity, as indicated in BHB30, the sun and its vicissitudes may also be involved in this phenomenon.

Similar and Related Phenomena. Human behavior correlated with climate (BHB6); cultural creativity correlated with solar activity (BHB30).

Entries

X1. E. Huntington's thesis. The geographer E. Huntington wrote at length on the effect of climate and weather on individuals and cultures. The following is a synopsis of one of his papers:

Upsurges in human genius, such as occurred during the Golden Age in Greece in pre-Christian times and in the Renaissance in Europe, are linked with long-range changes in the weather by Dr. Ellsworth Huntington, Yale geographer, in a theory presented to the Association of American Geographers.

During the two ages of brilliant human activity, among the cultural landmarks of all time, storms occurred with an increased frequency along the northern rim of the Mediterranean Sea. According to Dr. Huntington's hypothesis, with the changes in climate the crops grew unusually well, and a dense population could be comfortably supported. The storms also gave the climate an unusually healthful and stimulating quality. More than the usual number of parents were endowed with great physical vigor, hence from conception onward, their children also enjoyed unusually good health and vigor.

Only by some such hypothesis, he said, can be explained the fact, known to historians, that the "solitary genius is a rarity," and that great geniuses are usually surrounded by people who almost rival them in ability. (R1)

X2. C.A. Mills' thesis. C.A. Mills echoed Huntington, but he was more specific about the mechanism that bottled up human genius and talent. The nemesis of human genius and productivity is temperature. The waste heat generated by metabolism in humans must be dissipated easily if humanity is to flower. Mills describes the consequences of living in a hot climate as follows: Following several weeks of difficulty in dissipating waste heat, physical

and mental activity declines, and there is a drop in the combustion rate. Some of the glands of internal secretion, which so largely influence combustion rate, go into a less active, or resting, state. This is particularly true with the thyroid, adrenal, and sex glands, probably also with the pituitary. A lowered total combustion rate means less energy for thought and action, as well as less waste heat to be dissipated. Physical and mental characteristics thus change from the dynamic and pushing, to a more passive, "let George do it" type. Personal initiative gives way to a desire for security. (R2)

Mills then underscores Huntington's ideas in a more detailed look at humanity's last 10,000 years.

Through the last 10,000 years of the earth's history, cyclic changes in temperature have left fairly clear records. A millennium of rapidly receding glaciers and polar ice caps was succeeded by one of stability or advance. Five such cycles are in evidence over the last 10,000 years of rapid Ice Age regression. The next-to-last cold millennium fell in the days of early Greek and Roman glory and was followed by the thousand years of Dark Age warmth, when cereal grains could be ripened in Iceland and grapes in England.

The peak of Dark Age warmth occurred about A.D. 850, when optimal temperatures in far northern Scandinavia activated the Norsemen and Vikings into a century of exploration and settlement. The gradual return of benumbing cold to their homeland and to the Greenland and Iceland settlements from the tenth to the fourteenth centuries dimmed their glory. Central Europe at the same time was relieved of her enervating warmth and entered the Renaissance and the period of industrialization. The miracles of this Western mechanistic civilization have reached a peak in America during the century

just passed. (R2)

Precociously, Mills wondered if changes in solar activity might be at the root of the phenomenon.

References

- R1. "Geographer Links Upsurges of Human Genius and Weather," Science Digest, 5:18, April 1939. (X1)
- R2. Mills, Clarence A.; "Temperature Dominance over Human Life," Science, 110:267, 1949. (X2)
- R3. Huntington, Ellsworth; "Season of Birth: Its Relation to Human Abilities," Cycles, 9:160, 1958. (X1)

BHB32 Eminence and Order of Birth

Description. The tendency for eminent individuals to be first-borns, or, to a lessening degree, later-borns.

Data Evaluation. At hand are merely two lists; one of eminent first-borns, the second of famous later-borns, which obviously denies the phenomenon's existence. These are only superficial, subjective lists. Furthermore, they are almost completely confined to the eminent of Europe and North America. In other words, the data are unsatisfactory, and the existence of the claimed phenomenon is in doubt. It is worthwhile cataloging the phenomenon, however, because it parallels the purported correlation of intelligence with order of birth (BHB36). Rating: 4.

Anomaly Evaluation. A person's eminence or fame may be derived to some degree from parental attention and help in acquiring education and opportunities of various sorts. Since first-borns often get more parental attention, particularly if they are only children, there is justification for assigning a low anomaly rating here. Rating: 3.

Possible Explanations. See above discussion. In addition, first-borns are usually blessed with younger and more vigorous parents than later-borns.

Similar and Related Phenomena. Intelligence and order of birth (BHB36).

Entries

X1. A few eminent first-borns. A list of sorts, with slight tongue-in-cheek commentary, appeared in an 1899 issue of the English Mechanic:

Does the first-born have the best of it from the start? According to Prof. Axenfeld (in the Revista Moderna di Cultura), all the men of genius are first-born sons. He says that eminent persons can also be second or third children of a family, but a

fourth, fifth, and sixth child will never be a great light. After a sixth child, the rest may again become men of talent. This is a terrible discovery. The poor fourth, fifth, or sixth sons, as they have no chance of having brains, are not worth giving a high education, and will make very mediocre husbands! Prof. Axenfeld quotes names to prove his theory, all mixed up any way: Luther, Schopenhauer, Francesco d'Assisi, Cath-

erine de Medici, Guizot, Dante, Raphael, Leonardi di Vinci, Perugino, Luigi Gonzaga, St. Benedict, Charlemagne, Alexander the Great, Boccaccio, Confucius, Heine, Goethe, La Bruyere, Campanella, Mohammed, d'Alembert, Shelley, Christina of Sweden, Goldoni, Cantu, Buffon, Talleyrand, Milton, Moliere, Carlyle, Rossini were all first-born or only sons. Beethoven, Michael Angelo, Cuvier, Pascal, and Garibaldi were second sons. But there have been other famous men in the world. Cannot somebody produce some comfort for the late-comers in a family? (R1)

It does seem that non-Europeans and women have been slighted above. Also, some of the names have definitely not survived the test of time! (WRC)

X2. Some eminent later-borns! A few issues later, a subscriber to the English Mechanic came to the rescue of the later-borns.

On p. 152, Prof. Axenfeld's theory that all men of genius are first-born sons is mentioned, and the list of great names which follows seems to

afford great corroboration. On testing the hypothesis, however, one finds it somewhat delusive, for many eminent men have not enjoyed the advantages of primogeniture. Thus, among those who were not, I think, the eldest sons were Dalhousie, Clarendon, the Pitts, Walpole, Wilberforce, Gladstone, Bach, Bellini, Mozart, Cherubini, Wagner, Schubert, Calvin, Butler, Taylor, Milman, Chateaubriand, North, Montague, Beaumont, De Quincey, Coleridge, Scott, Boyle, Humboldt, Bacon, Franklin, Thackeray, Sheridan, Tennyson, Van Dyck, Rembrandt, Sherman, Washington, Wallace, Peter the Great, Wellington, and Napoleon I. Indeed, it appears to me that the hypothesis would be quite untenable were it not that men of genius who never had any brothers or sisters are included amongst the "first-born." (R2)

References

- R1. "Genius and Heredity," English Mechanic, 70:152, 1899. (X1)
 R2. Dormer, J.; "Genius and Heredity," English Mechanic, 70:185, 1899. (X2)

BHB33 Periodicity in the Population of Living Eminent People

Description. The periodic increase and decrease of the number of living eminent people, as defined by various encyclopedias. The cycle length is estimated at about 400 years. This phenomenon resembles the "cultural flowering" phenomenon of BHB31, but the population being studied here differs strongly. Here, flowering is quantified by counting famous people irrespective of what they have contributed to culture; that is, mainly, the arts and sciences. For example, encyclopedias list notorious criminals and dictators as well as musical geniuses, the latter contribute to culture as it is usually defined, while the former do not.

Data Evaluation. Encyclopedias provide the names and dates of tens of thousands of individuals and, by listing them, automatically define eminence. The listings are understandably biased toward recent famous people and, in English-language

encyclopedias, toward the Western World. Rating: 2.

Anomaly Evaluation. The anomaly claimed here is the periodicity of humanity's production of eminent people. (This phenomenon may be synchronous with the cultural flowering mentioned in BHB31. No one seems to have looked into this.) The source of rhythmicity could be: (1) Periodical changes in climate; and (2) An intrinsic, long-term biological cycle. The first cause is often advanced in connection with the rise and fall of civilizations; but its mechanisms are poorly understood. The second cause has been proposed without elaboration. Biological cycles 400-years in length are unknown otherwise and seem unlikely. All in all, any periodicity in the production of eminent people is difficult to explain and, therefore, anomalous. Rating: 2.

Possible Explanations. Long-term climate changes seem the more likely cause.

Similar and Related Phenomena. Human behavior correlated with climate (BHB6); cyclicity of violent human behavior (BHB8); cycles of religiousness (BHB15); eminence correlated with planetary positions (BHB28); cultural flowering correlated with climate (BHB31).

Entries

X1. A census of eminent men over the last 2500 years.

The number of famous men and women alive in the Western World is not constant from age to age. There are periods of greatness and periods of mediocrity. If one counts the number of eminent people alive in the world, decade by decade, using a standard biographical source, such as the Columbia Encyclopedia, one can confirm the suspicion that there have been wide fluctuations in the production of able individuals by the human race. (R1)

The above is the introductory paragraph to a report by S.W. and N.E. Gray, published in Cycles, in 1958. The Grays took 25,000 names from the Columbia Encyclopedia and plotted the number alive in each decade during the past 2,500 years. This curve naturally favored the more recent centuries and, of course, rose rapidly with the world's rapidly increasing population. There are, however, surprisingly regular "bumps" on the curve, which can be filtered out by subtracting the secular trend of the curve. This second plot accentuates the bumps, as shown. The Grays next discussed the structure of this graph:

Inspection suggested that cyclic variation might be present, but no tested cycle length fit well until we

reached 400 years. At this interval, six clear waves appeared in the data. Their peaks averaged 392 years apart, and their troughs averaged 398. Strictly, we should say 39.2 and 39.8 decades, for our time unit was the decade and not the year.

This 400-year cycle did not turn out to be a simple wave. It was a complex of at least three component waves. We have termed it an epicycle. Each crest has a double or bimodal peak with about 100 years between maxima. (R1)

The Grays also graphed similar data taken from the Encyclopedia Britannica and other sources. While the heights of the peaks and troughs varied with the different sources, "the essential cycle lengths that we have described remained unaltered."

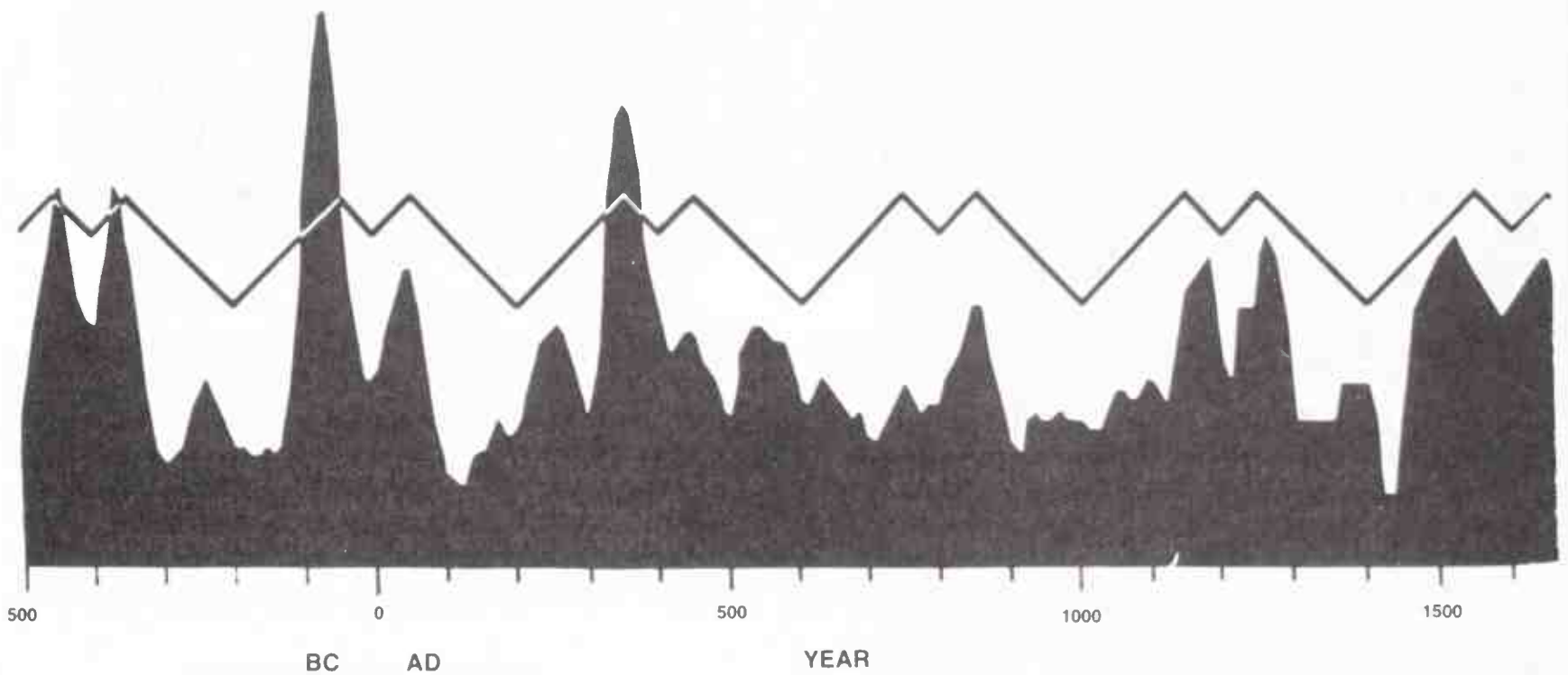
Finally, the Grays speculated upon the cause of the cyclic variation:

Being biologists we are inclined to view them as endogenous variations in the genetic make-up of man rather than the result of external factors such as climate or cosmic radiation. (R1)

Reference

R1. Gray, Stephen W., and Gray, Netta

E.; "Cycles in the Numbers of Eminent Men," Cycles, 9:193, 1958. (X1)



Graph illustrating the periodicity in the number of living eminent humans at any point in time. Since the effect of increasing world population has been subtracted out, the amplitude (ordinate) is a relative number only. (Adapted from S.W. and N.E. Gray, R1, X1)

BHB34 Eminence Correlated with Longevity

Description. The tendency of individuals of eminence to live to advanced ages. A threshold effect seems to exist here, because the greatest geniuses seem to die earlier than normal.

Data Evaluation. The data comprise a table of roughly 150 famous artists, statesmen, military men, scientists, etc., all selected by a single individual. Famous women were omitted completely, as were most non-Europeans. Any conclusions drawn from the table are therefore limited. Rating: 2.

Anomaly Evaluation. One might argue that genius goes hand-in-hand with physical robustness and, therefore, longevity; or, perhaps, that the worldly success of geniuses allowed them to lead more healthy lives. Such is surmise. Many geniuses led miserable lives; many others were physically and mentally ill. (See BHA6.) No obvious explanation of the phenomenon comes to mind. The apparent threshold effect applying to the greatest geniuses is even more mysterious. Rating: 2.

Possible Explanations. None offered.

Similar and Related Phenomena. Physical degeneration correlated with genius (BHA6); longevity in general (BHH).

Entries

X1. General observations. The subject here is genius, not intelligence per se. Geniuses may be artists, generals, discoverers, even reformers, at least according to long lists that appeared in an 1897 issue of the Scientific American Supplement.

The title of this article poses the question: Are geniuses long-lived? The text begins with:

No, says the popular verdict, based not unreasonably on the idea that the drain on the nervous forces which is attendant upon genius is not conducive to longevity. Yes, says a writer, David Lindsay, in the Gentlemen's Magazine, basing his answer upon a long array of figures showing the age at death of a large number of the world's most illustrious sons, selected with "strict impartiality," which figures prove that nearly one-half of the greatest geniuses of the world have passed the Psalmist's limit of threescore and ten. We give below his tables, which, it will be observed, include none of the gentler sex.

It is impractical to reproduce the entire table. We confine ourselves to the scientists and philosophers, giving name and age at death.

| | | | |
|------------|----|------------|----|
| Humboldt | 89 | Linnaeus | 70 |
| Carlyle | 85 | Leibnitz | 70 |
| Newton | 84 | Huxley | 70 |
| Herschel | 84 | Socrates | 68 |
| Plato | 82 | Arago | 67 |
| Buffon | 80 | Aristotle | 62 |
| Kant | 79 | Cuvier | 62 |
| Galileo | 78 | Hegel | 61 |
| Locke | 72 | Tycho Brae | 55 |
| Epicurus | 71 | Descartes | 53 |
| Copernicus | 70 | Spinoza | 44 |

When all of the geniuses are summarized:

| | |
|----------|----------|
| Above 80 | 17% died |
| 70-80 | 28% died |
| 60-70 | 25% died |
| 50-60 | 17% died |
| Under 50 | 13% died |

Continuing with the quote:

While, therefore, nearly one-half of those whose names appear in the foregoing lists passed the age of seventy, most of their best work, Mr. Lindsay goes on to remark, appeared at a comparatively youthful age. He continues: 'What then, are the laws that control the age of genius? Why should a Keats die at twenty-four and a Chaucer at seventy-two? Why should philosophers and men who look deeply into the heart of things, and who would naturally be supposed to wear out their vital energy more quickly than other men---why should these be longer lived than musicians?'

'To this latter question there is an answer. It is not until after long years of technical training and brain working that such men as Leibnitz and Decartes blossom out into all their glory of genius; and there are doubtless many great thinkers even now in our midst who may some day astonish the world by the brilliancy of their teachings---but they may first die. With music it is different. Beethoven, while yet in his early infancy, showed unmistakable signs of his natural abilities; when he was a mere youngster he composed works which, to this day, will stand on their own merits. It is the same with every great musician. Granted that he live to reach early manhood, his fame is secured. And at the time when all Europe is ringing with his praises, his science-loving brother is toiling in obscurity, not to step forth into the light of popularity for maybe another quarter of a century, or perhaps not at all, for in the meantime, as we have said, he may die.

'It is true that the very greatest masters of all do not usually live out all their normal length of days: Napoleon, Cromwell, Shakespeare, Beethoven---none of these passed into old age. But it is hard to define the term "genius." If we are to limit it to some score of men, we must then, consider that it is incompatible with

length of life. If we give the word larger meaning, and honor it with the thousand lesser lights who illumine the page of history, why, then, it would seem to be a healthy thing to be a genius.' (R1)

In this last paragraph we once more see a threshold effect, where only the individuals of the greatest eminence are

affected---just as in the Mars Effect (BHB29). (WRC)

Reference

R1. "Are Geniuses Long Lived?" Scientific American Supplement, 44:18177, 1897. (X1)

HUMAN INTELLIGENCE

BHB35 Intelligence Correlated with Season of Birth

Description. The slightly higher intelligence levels of individuals born during the spring and summer months. The claimed effect is more pronounced among the mentally deficient, who, correspondingly, are more apt to have been born during the winter months. Curiously, the season-of-birth effect seems to be much stronger when eminence is correlated rather than intelligence. (See BHB27.)

Data Evaluation. We use here only a modest fraction of the studies available in the literature. Although the data are abundant, the season-of-birth effect on intelligence is far from dramatic. Some scientists doubt its reality for normal persons, though it seems better established for the mentally deficient.
Rating: 3.

Anomaly Evaluation. Several sensible explanations of the phenomenon have been advanced. (See X3 below for details.) For this reason, the anomaly rating here is low. Rating: 3.

Possible Explanations. See X3 below.

Similar and Related Phenomena. Eminence correlated with month of birth (BHB27).

Entries

X0. Background. Although many studies have been undertaken of the possible effect of the season of birth on intelligence, none has produced strong, clear-cut results. Consequently, rather than assign a lot of space to the several studies at hand, capsule summaries are deemed sufficient.

X1. 1933: R. Pintner and G. Forlano. 17,502 IQs in sample. "The distribution of our cases according to month of birth is very much like that of births in general in the United States." Those born in the winter months (January-March) had the lowest IQs, but their mean IQ was only 1.7 points lower than the mean for the highest season (Spring). (R1)

X2. 1941:G. Forlano. 7,897 IQs in sample.

Adolescents born in the Spring months (March 21-June 20) were on the average brighter than those born in Winter (December 21-March 20). The difference, 4.50, is statistically significant---2.90 times its standard error. (R2)

X3. R. Pintner and G. Forlano. A survey of eleven previous studies of the effect of season-of-birth on mental capabilities. An overview:

There seems, therefore, to emerge from all these studies a strong suggestion of a slightly lower mean intelligence among individuals born in the winter-autumn half of the year, the cold, darker months, as compared with a slightly higher mean intelligence for individuals born in the spring-summer half of the year, the warmer-lighter months. The difference is very slight and in many cases where the author has reported the statistical significance of his data, it is well below conventional limits, but in some cases it is also well above. However, whether the differences are statistically significant or not, the general picture presented...clearly indicates some universal trend. It is not a picture such as mere chance differences in seasonal IQ would present. The results come from many different investigators in many different countries and include individuals of very divergent ages. (R3)

Pintner and Forlano also survey the causes that have been hypothesized for the presumed effect. We list the most interesting of these:

1. Sunlight is important to children during the first few months of growth, especially in suppressing rachitic diseases. Spring- and summer-born children should therefore be healthier and very likely more intelligent.
2. Children born during the winter have more illnesses due, in part, to more illnesses among pregnant women during this season.

3. Intelligent people tend to plan the births of their children for the summer because it is common knowledge that this is the best time of the year for births!
 4. Humans possess a natural internal seasonal rhythm that favors summer births! (R3) Many other mammals have a seasonal rhythm. (WRC)
-

X4. 1944: J.F. Roberts. "Small" sample of children. "...children conceived in winter are, on the average, somewhat more intelligent than those conceived in the summer." Roberts opined, without elaborating, that the phenomenon might be due to intelligent parents conceiving children more often in the winter! (R4)

X5. 1958: H. Knobloch and B. Pasamannick. 5,855 mentally defective children. "...it was found that significantly more had been born in the winter months." The authors hypothesized that the effect might be due to third-month embryos (when the cerebral cortex is becoming organized) developing during the hot summer months, when pregnant women might decrease their protein intake, thus starving the embryo. (R5)

X6. 1963: J.E. Orme. 188 mentally deficient adults. Those born in the summer and autumn showed better intellectual performance. (R6, R7) This finding contradicts, in part, earlier studies.

X7. 1968: F.H. Farley. 230 adolescent, male trade apprentices.

No differences in intelligence and personality, as measured, were found between W-S [Winter-Spring] and S-A [Summer-Autumn] births. Little optimism was expressed for the possibility of finding such season-of-birth effects among other than severely intellectually subnormal subjects. (R8)

Equivalently, Farley has also commented elsewhere to the effect that among normal individuals, the season-of-

birth effect on intelligence is very small. (R9)

X8. 1972: S. Kanekar and S. Mukerjee. 80 graduate students of both sexes in India.

There were 30 summer-borns (17 males and 13 females), 28 born during the rainy season (11 males and 17 females), and 22 winter-borns (12 males and 10 females). On the variable of intelligence, the summer borns scored significantly higher than the winter borns....Those who were born in the rainy season had an intermediate score which did not differ significantly from the other scores. (R10)

References

- R1. Pintner, Rudolph, and Forlano, George; "The Influence of Month of Birth on Intelligence Quotients," Journal of Educational Psychology, 24:561, 1933. (X1)
- R2. Forlano, George, and Ehrlich, Virginia Zerilli; "Month and Season of Birth in Relation to Intelligence, Introversion-Extraversion, and Inferiority Feelings," Journal of Educational Psychology, 32:1, 1941. (X2)
- R3. Pintner, R., and Forlano, G.; "Season of Birth and Mental Differences," Psychological Bulletin, 40:25, 1943. (X3)
- R4. "Intelligence and Season of Conception," Nature, 153:401, 1944. (X4)
- R5. Knobloch, Hilda, and Pasamanick, Benjamin; "Seasonal Variation in the Births of the Mentally Deficient," American Journal of Public Health, 48:1201, 1958. (X5)
- R6. "A Summer Season for Intelligence," New Scientist, 20:10, 1963. (X6)
- R7. "Birthday Affects IQ Psychologist Claims," Science News Letter, 85:25, 1964. (X6)
- R8. Farley, Frank H.; "Season of Birth, Intelligence and Personality," British Journal of Psychology, 59:281, 1968. (X7)
- R9. "The Stars May Foretell Abnormal Intelligence," New Scientist, 44:281, 1969. (X7)
- R10. Kanekar, Suresh, and Mukerjee, Sumitra; "Intelligence, Extraversion, and Neuroticism in Relation to Season of Birth," Journal of Social Psychology, 86:309, 1972. (X8)

BHB36 Intelligence Correlated with Birth Order

Description. The tendency of the intelligence of individuals to decline with order of birth. Early-borns are more likely to have higher IQs than laterborns.

Data Evaluation. Since several socio-economic factors contribute to intelligence, clear-cut support for the birth-order phenomenon was initially elusive. In the 1970s, however, the studies by L. Belmont, et al, using a huge sample (386,114) of subjects, put the birth-order effect on more solid ground. Biases were corrected for, and the effect stood out clearly. This is a well-studied phenomenon. Rating: 2.

Anomaly Evaluation. Several cogent sociological and biological explanations are available (See X5 below.), so that we cannot assign a high level of anomalousness to the effect of birth order on intelligence. Rating: 3.

Possible Explanations. Firstborns get more parental attention; intelligent parents

tend to have fewer children; the increasing effects upon the fetus of immunological reactions with laterborns.

Similar and Related Phenomena. Eminence and birth order (BHB32); intelligence correlated with season of birth (BHB35).

Entries

X1. 1966: R.C. Nichols. This and the next entry come from an anonymous report in Science News Letter.

Intellectual achievement seems to descend in stairstep fashion from the first born to the younger siblings.

In two large surveys, the eldest of two, three and four children earned better scores on mental achievement tests reported Dr. William D. Altus, professor at the University of California, Santa Barbara.

.....

Dr. Altus referred to an unpublished study done by Robert C. Nichols of the National Merit Scholar Corporation, of gifted high school students. Of 1,311 Merit finalists coming from families of two to five children, firstborns made up 60% of the total. Among the 550 students who had one brother or sister, eldest children accounted for 66%. (R1)

X2. 1966: W.D. Altus. Continuing the Science News Letter item:

Results of the Merit competition are similar to those Dr. Altus found in a study of 4,000 university students in Santa Barbara. In tests of verbal intelligence, firstborns scored higher than laterborns, in quantitative or mathematical ability there seemed no connection with birth order. (R1)

Altus hypothesized that these results could be attributed to the special attention that parents give their first born.

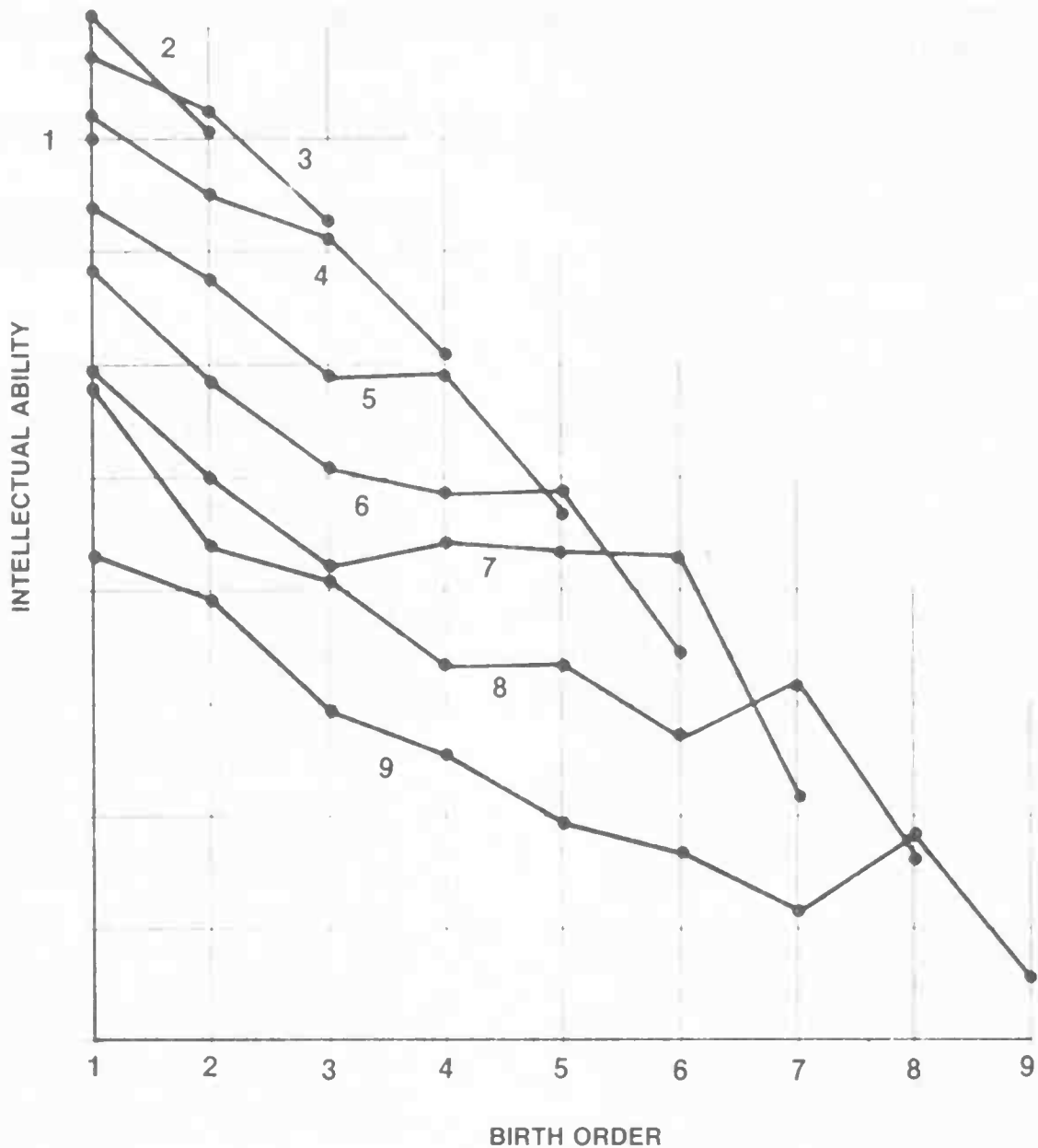
X3. 1973: J.N. McCall. McCall's study differed from the two above in that it attempted to correct for "expected differences" due to sex and socio-economic status.

A 1% subsample of Project Talent Data Bank's national high school sample provided test score and demographic data from 3,308 Ss [subjects]. Partial correlation and multiple regression methods were used to test hypotheses concerning birth-order differences in special ability, over and above expected differences due to sex or to socio-economic status. After controlling for socio-economic status and family size, birth order accounted for only 2% of the variance in Vocabulary and English test scores; and birth order accounted for less than 1% of the variance in the Mechanical Reasoning, Visualization, Arithmetic Computation, Clerical Checking, and Object Inspection scores. (R2)

In the body of his report, McCall mentioned that older studies had produced mixed results, with some even favoring lastborns rather than firstborns. Still other researchers had found a negligible order-of-birth effect on intelligence. However, later studies reported below have favored firstborns.

X4. 1973: L. Belmont and F.A. Marolla. R.B. Zajonc reviewed the results of these two investigators of birth-order effects on IQ in the January 1975 issue of Psychology Today.

The best evidence for these effects came from a remarkable study by Lillian Belmont and Francis A. Marolla, who examined birth order and intelligence scores of 386,114 Dutchmen. These data, taken from the Dutch military examinations, represented almost the entire population of 19-year-old men in the Netherlands born between 1944 and 1947. Studies on birth order ordinarily involve small samples, and cannot, therefore, control for some important factors. However, with their large data set, Bel-



Intellectual ability versus birth order (IQ). The numbers indicate the number of children in the family. (X4)

mont and Marolla were able to examine family size and socioeconomic status.

.....

They found a clear effect of family size on IQ, and an effect of birth order within a given family size. The brightest children came from the smallest families, and within a given family size, the brightest children were those who came along early. The first child in a family of two, for example, got the highest scores, while the last child in a family of nine produced the lowest scores. (R3)

The research of L. Belmont and her colleagues resulted in the publication of several papers beginning in 1973. Specific references can be found in R4.

X5. Proposed explanations of the birth-order effect. In X2, W.D. Altus repeated the commonest hypothesis, which asserts that parents favor their firstborns. (R1)

R.B. Zajonc ventured that perhaps the most intelligent parents deliberately limit family size so that they would have more time and money to create a more favorable intellectual environment for them. Children in such families not only get more attention from their parents, but they also inherit their parents' intelligence. Some studies correct for such biases as best they can. (R3)

Zajonc also discusses what might be termed the "dilution" effect:

With each additional child, the family's intellectual environment depreciates, because a child's intellectual growth is partly controlled by the overall intellectual climate of his household. Children who grow up

surrounded by people with higher intellectual levels have a better chance to achieve their maximum intellectual powers than children who develop in intellectually impoverished milieus. Thus, children from large families, who spend more time in a world of child-sized minds, should develop more slowly and therefore attain lower IQs than children from small families, who have more contacts with grown-up minds. (R3)

On the other hand, there may be a purely biological explanation, as expounded by J.W. Foster and S.J. Archer:

A hypothesis is here presented that the effect of birth order upon intellectual performance may result from an increasing probability of maternal immune attack upon the fetal brain in utero with order of parity. In support of this hypothesis, evidence is adduced from the literature that the fetal brain is antigenic, that fetal antigens may reach the immune system of the mother, that the incidence of maternal sensitization to fetal antigens increases with parity, that antibodies may readily cross the placenta and reach the fetal brain, that antibodies can be highly teratogenic, and that certain antibodies may damage, in a lasting way, the structure,

function, and learning capacity of brains in experimental animals and human infants. (R5)

Also pertinent here is the observation that Mongoloid children tend to be born late in families. (R6)

References

- R1. "Firstborns Seem Smarter," Science News Letter, 89:55, 1966. (X1, X2, X5.)
- R2. McCall, John N.; "Birth-Order Differences in Special Ability: Fact or Artifact?" Psychological Reports, 33: 947, 1973. (X3)
- R3. Zajonc, Robert B.; "Dumber by the Dozen," Psychology Today, 8:37, January 1975. (X4, X5)
- R4. Belmont, Lillian, et al; "Relation of Birth Order, Family Size and Social Class to Psychological Functions," Perceptual and Motor Skills, 45:1107, 1977. (X4)
- R5. Foster, John W., and Archer, Stanley J.; "Birth Order and Intelligence: An Immunological Interpretation," Perceptual and Motor Skills, 48:79, 1979. (X5)
- R6. Murphy, Miles; "The Birth Order of Mongol and Other Feeble--Minded Children," Human Biology, 8:256, 1936. (X5)

BHB37 Intelligence Correlated with Myopia

Description. The high fraction of myopia-afflicted high-scorers on the mathematics sections of the Scholastic Aptitude Tests.

Data Evaluation. We have merely a passing reference to the phenomenon in an article on mathematical genius in Science. No further details nor corroborating data are available. Rating: 3.

Anomaly Evaluation. No one has suggested any biological mechanism connecting mathematical ability and myopia. This is a bizarre correlation, to say the least! Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. The possible correlation of genius with physical degeneration (BHA6).

Entries

X1. General observations. C. Benbow and J. Stanley, of Johns Hopkins University, have found that a high percentage (70%) of the high scorers on the mathematics section of the Scholastic Aptitude Tests (SATs) are myopic! (R1)

Reference

R1. Kolata, Gina; "Math Genius May Have Hormonal Basis," Science, 222: 1312, 1983. (X1)

BHB38 A Relationship between Intelligence and Flicker-Frequency Response

Description. The increasing intelligence of subjects with increasing duration of the bright flash in flicker-frequency experiments---up to a specific duration, after which intelligence decreases. (See X1 for background.)

Data Evaluation. We have found a short item from a 1950 issue of Science News Letter and a supporting scientific report. Generally, though, this phenomenon has not yet been well-studied. Rating: 3.

Anomaly Evaluation. Although both intelligence and flicker-frequency response are associated with the central nervous system, there is no apparent reason why the two human-performance factors should be related. Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. The possible association of epilepsy with both genius and flicker-frequency response (BHA6 and BHH).

Entries

X1. General observations. The following is from a 1950 item in Science News Letter:

The length of the dark period between flashes of light necessary for you to see the light as flickering and not continuous is determined by your central nervous system and not by your eyes.

New evidence of this is reported by Dr. Wilson P. Tanner, Jr., of

the University of Michigan. (R2) He found that this "flicker frequency" is related to scores on intelligence tests.

.....

A surprising discovery in the course of the experiment was the fact that the relation with intelligence varies with the length of the light flashes separated by the periods of darkness. It increases with in-

crease in the length of the light flash, up to 84 thousandths of a second, and then decreases with further increase of the length of the light flash. (R1)

An interesting connection here is the well-known stimulation of epileptic seizures by flickering lights and the observation that genius may be weakly correlated with epilepsy. (BHA6)

References

- R1. "Flicker Frequency Found Related to Intelligence," Science News Letter, 58:137, 1950. (X1)
- R2. Tanner, Wilson P., Jr.; "A Preliminary Investigation of the Relationship between Visual Fusion of Intermittent Light and Intelligence," Science, 112:201, 1950. (X1)

BHB39 Increasing Intelligence with Vitamin Intake

Description. The enhancement of non-verbal IQs of children with increased intake of vitamins and other dietary supplements.

Data Evaluation. A single, highly-criticized, published in a small journal edited by one of the researchers. Rating: 3.

Anomaly Evaluation. It is not unreasonable that the intellectual development of some children might benefit from dietary supplements and better eating habits. Intellectual development and good health are generally perceived to go hand-in-hand. Therefore, despite the uproar over a specific report affirming this phenomenon, the phenomenon itself is not considered particularly anomalous. Rating: 3.

Possible Explanations. Good nutrition enhances intellectual development.

Similar and Related Phenomena. None.

Entries

X0. Background. In 1991, a scientific controversy erupted when a research paper affirming a relationship between human intelligence and vitamin intake appeared in a small scientific journal. Almost simultaneously, the results were aired on prime-time television. Scientists deplored all the publicity before the scientific community had a chance to evaluate the research. Additionally, both the research paper and instantaneous publicity had the trappings of salesmanship and subjectivity. (R1)

X1. General observations. The fundamental claims in this IQ-vitamin controversy were summarized in Nature by S. Blinkhorn:

The scientific controversy centers on a "symposium" issue of the journal Personality and Individual Differences (12:329, 1991), which contains studies by S.J. Schoenthaler, H.J. Eysenck, J. Yudkin and colleagues purporting to show that a modest dietary supplement of 23 vitamins and minerals taken on a sustained basis leads to a significant elevation of non-verbal IQ...The claimed improvement is 3.7 points using the

well-known WISC-R test over a 13-week experimental period. The effect is reported only for a supplement of 100 per cent of recommended daily allowance (RDA). (R2)

Blinkhorn castigated the report on several scientific counts (incompleteness, statistical methodology, "blatant post-hocery", etc.). He states that the report is "an unhappy piece of work. The association could well be due to chance." (R2)

However, Blinkhorn does go on to say that the claims of Schoenthaler et al are consistent with other suggestive work on IQs and vitamins, and that there very well may be a phenomenon here worthy of further study. (R2)

H.J. Eysenck (R3) and S. Schoenthaler (R4) responded vigorously to Blinkhorn's harsh criticisms. In addition to discussing several highly technical points, Schoenthaler added some results from tests with large groups of school children:

It is a pity that most assessments of our study, including Blinkhorn's, have focused on the pros and cons of taking vitamin supplements and have neglected the reason why this

research was done. Our previous work showed that when 803 schools implemented diet policies that allowed only nutrient-dense meals, scholastic achievement rose 16% for 1.1 million children. The number of children performing two or more grades below expectations fell from 124,000 to 49,000. A positive correlation between food consumption and achievement occurred after these diet policies were implemented, whereas a negative correlation existed before. (R4)

Schoenthaler's simply stated conclusion was: "Eat smart to be smart."

References

- R1. Aldhous, Peter; "IQ Data Controversy," Nature, 350:5, 1991. (X0)
- R2. Blinkhorn Steve; "A Dose of Vitamins and a Pinch of Salt," Nature, 350:13, 1991. (X1)
- R3. Eysenck, H.J.; "IQ and Vitamin Supplements," Nature, 351:263, 1991. (X1)
- R4. Schoenthaler, Stephen; "Diet and IQ," Nature, 352:292, 1991. (X1)

BHB40 The Intelligences of Identical Twins Reared Apart

Description. The high concordance of the IQs of identical twins far-separated since birth. The implication is that genetic factors far outweigh environmental influences in shaping human beings.

Data Evaluation. The data here are generally good and plentiful. Research on identical twins has been progressing rapidly during the past several decades. In consequence, several books and many scientific papers are available. Rating: 1.

Anomaly Evaluation. "Nature" seems more powerful than "nurture" in determining the IQs of identical twins who have had no or scant contact since birth. This still-contested finding runs counter to the claim of some behaviorists that environmental forces predominate. The nature-nurture battle is perhaps more political than scientific. Rating: 2.

Possible Explanations. Possibly the IQ tests are inadequate to resolve the nature-nurture debate.

Possible Explanations. "Nature" is more powerful than "nurture" in the development of human intelligence.

Entries

X0. Background. The inheritability of intelligence, as measured formally by IQ tests, figures large in the nature-versus-nurture debate, particularly where racial differences are manifest. The pro-nurture faction would like IQ tests of identical twins reared apart to show wide differences, so that they can claim that environmental effects dominate genetic contributions.

X1. General observations. Unfortunately for the "nurture" side of the controversy, C. Holden, in a 1980 review of twin research, was able to state:

One thing that will not make the environmentalists happy is the fact that IQ seems to have a high degree of heritability, as indicated by the fact that of all the tests administered to identical twins separately reared, IQ shows the highest concordance. (R1)

Eight years later, after much more twin research, especially at the University of Minnesota, T. Bouchard, Jr., was able to quantify the concordance:

Twins who had been "highly separated" had similar or identical IQ's an astonishing 76 percent of the time, while, paradoxically, "little separated" twins showed a far lower 65 percent correlation. (R3)

The "little-separated" twins are be-

lieved to be less alike than the "far-separated" twins, because the more contacts identical twins have with each other, the more they intentionally try to differentiate themselves.

Finally, S.L. Farber, another twin researcher, warns that IQ data alone cannot resolve the nature-nurture debate:

To say that these data close the case on environmental effects on IQ is a scientific farce. They do not close the case; they open it...Those who persist in maintaining that an accurate heritability estimate can be obtained from these data and who extend the estimate to discuss racial differences in IQ (which are problematical in their own right) should question their own motivation and commitment to a dispassionate search for full understanding. (R2)

The careful wording of Farber's statements show how politically sensitive this subject is.

References

- R1. Holden, Constance; "Identical Twins Reared Apart," Science, 207: 1323, 1980. (X1)
- R2. Farber, Susan L.; "Paradoxes and Speculations," Identical Twins Reared Apart, New York, 1981, p. 269, (X1)
- R3. Rosen, Clare Mead; "The Eerie World of Reunited Twins," Discover, 8:36, September 1987. (X1)

BHB41 Likelihood of College Matriculation and Season of Birth

Description. The significantly higher probability that children conceived during the winter months will matriculate at college

Data Evaluation. This phenomenon is cataloged on the basis of a single study based upon a sample of 45,000 freshmen. The sample is large, but corroborating research is desirable. A major reason for caution is that the phenomenon at hand is inconsistent with correlations of IQ with season-of-birth (BHB35), which find higher IQs for spring-summer births! Rating: 3.

Anomaly Evaluation. In BHB-35, there are four rationalizations for why spring-summer births might logically correlate with higher intelligence. To some degree, these rationalizations can be extended to births during the fall months, which are equivalent to the winter conceptions being studied here. For example, intelligent parents might plan births for fall harvest time when food is more abundant! But, as in BHB35, these rationalizations are mostly guesswork. Even so, the existence of this phenomenon (and that of BHB35) does not endanger any important biological paradigms. Rating: 3.

Possible Explanations. In addition the above thoughts, C.A. Mills, claimer of the phenomenon, asserts: "The higher metabolic level of parental protoplasmic vigor during winter cold seems to be transmitted through the germ plasm, and to exert a lasting effect upon the future course of offspring." (R1)

Similar and Related Phenomena. Intelligence correlated with season of birth (BHB35).

Entries

X0. Compiler's comment. Although college matriculation is not necessarily an indicator of intelligence. It is probably closely related. Therefore, it is cataloged here.

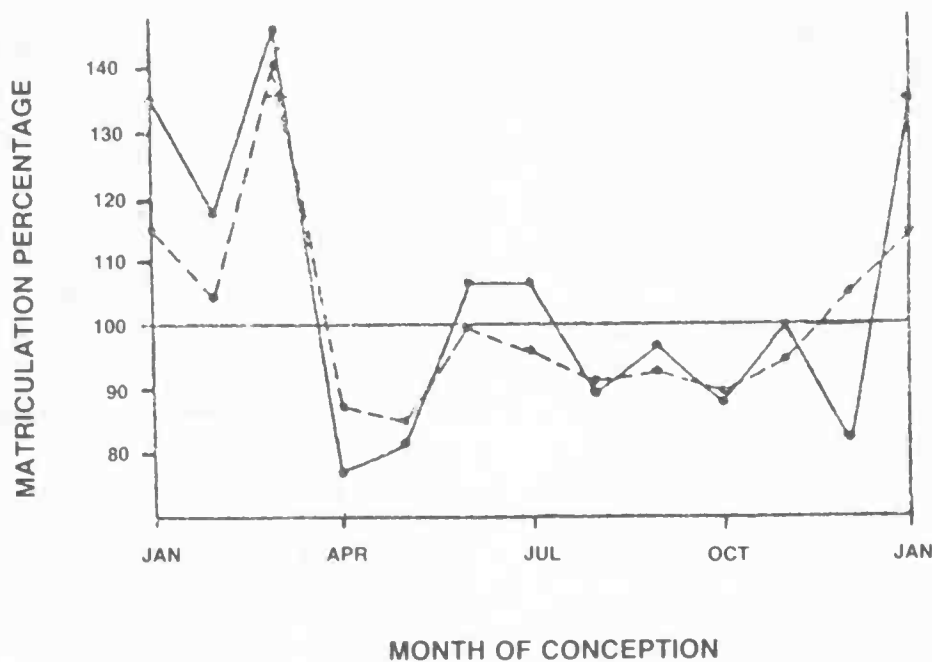
X1. General observations. We quote here one of the paragraphs that C.A. Mills wrote introducing his 1941 paper in Human Biology:

In the following pages are presented height, weight, and menarchial data on over 45,000 freshmen enrolling in certain American colleges. These data indicate an undoubted influence of season of conception over the

later development of the individual. The likelihood of college matriculation is about 60 per cent greater with children conceived during the winter season than with those conceived in the summer heat. Winter conception also results in significantly earlier onsets of the menses in girls. Curiously enough, winter conception seems also to result in slightly inferior adult stature. (R1)

Reference

- R1. Mills, C.A.; "Mental and Physical Development as Influenced by Season of Conception," Human Biology, 13: 378, 1941. (X1)



College matriculations (as a percentage of normal expectancy) for Wisconsin boys (solid lines) and girls (dashed lines) versus month of conception. (X1)

BHB42 Mathematical Ability: Sex Differences

Description. The large differences between the mathematical abilities of precocious boys and girls, as determined by Scholastic Achievement Tests. The differences are most pronounced in the area of advanced mathematical reasoning.

Data Evaluation. Very large data samples (over 100,000) are available. However, the major studies of this phenomenon have been restricted to the United States and to high-scoring individuals taking SAT tests. Rating: 2.

Anomaly Evaluation. Different curricula and several possible environmental biases seem to have been eliminated as explanations. One scientist has proposed an explanation based upon the action of the male hormone testosterone on the fetal brain, but the precise mechanism is unclear. Ultimately, we have here an area of ignorance, but not one which seems to challenge any important paradigms. Rating: 2.

Possible Explanations. Male brains differ from female brains in certain aspects, perhaps due to the action of the male hormone during fetal development.

Similar and Related Phenomena. The correlation of mathematical and verbal talent with handedness (BHB23).

Entries

X1. 1980: C.P. Benbow and J.C. Stanley. A debate was ignited when Benbow

and Stanley published, in Science, their finding that boys score much higher

than girls on the math section of the Scholastic Aptitude Test (SAT). The data were collected in the Study of Mathematically Precocious Youth (SMPY) over a period of eight years. The total number of individuals involved was 9927.

A large sex difference in mathematical ability in favor of boys was observed in every talent search. The smallest mean difference in the six talent searches was 32 points in 1979 in favor of boys. (R1)

The greatest disparity between boys and girls was in the "upper ranges of mathematical reasoning ability." Boys and girls did equally well on the verbal section of the SAT tests.

Benbow and Stanley concluded that their data contradicted the hypothesis that the taking of different courses by boys and girls accounted for the difference in mathematical abilities. (R1)

X2. 1983: C.P. Benbow and J.C. Stanley. During the 1980-1982 period, these researchers collected almost 40,000 additional SAT test scores from exceptionally talented seventh-graders in the U.S. Middle Atlantic region. Students under the age of 13 willing to take the test were also included.

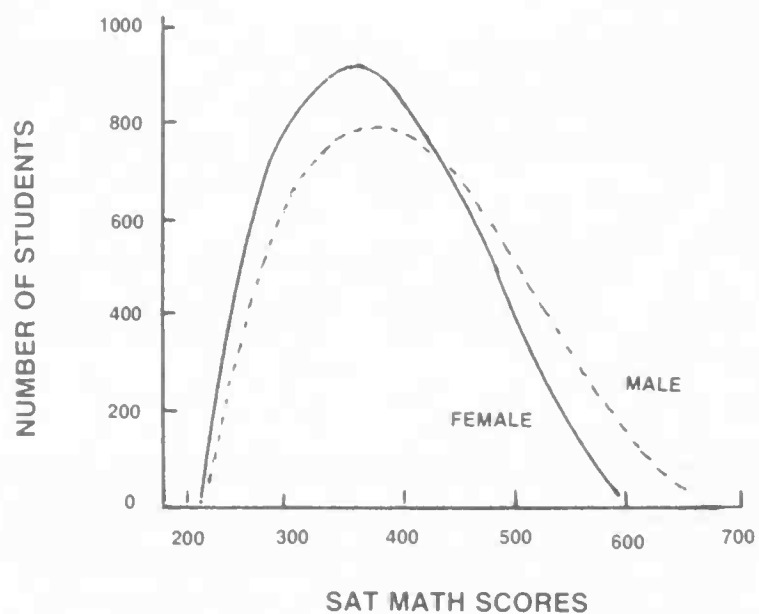
The results obtained by both procedures establish that by age 13 a large sex difference in mathematical reasoning ability exists and that it is especially pronounced at the high end of the distribution: among students who scored > 700, boys outnumbered girls 13 to 1. (R2)

In this study, Benbow and Stanley concluded that "environmental" hypotheses put forward to explain the sex differences were inadequate. The factors of social conditioning and differing expectations for boys and girls in particular seemed to be inoperative. (R2)

X3. 1986: C.P. Benbow and C.L. Raymond. By 1986, the sample size had increased to over 100,000, with the same sex differences manifest in the SAT scores. Here, the focus of the study was the examination of two hypotheses

that had been proposed to explain the results: (1) That girls are less motivated in mathematics because it is perceived to be a masculine activity; and (2) That parents encouraged their male children more aggressively in quantitative studies. Neither hypothesis was supported by the data. (R5)

X4. 1991: The controversy continues. When C. Holden reviewed the Gender Gap controversy in 1991, perhaps the most notable feature of her article was her description of the politically and emotionally charged atmosphere. Not only is there a dispute about the reality of the Gap, but the old nature-versus-nurture argument has dominated much of the scientific discourse. (R6)



SAT math scores show a gap at the high end of the distribution (at the far right) between males and females. (X4)

The Meta-Analyses. A popular modern tool for resolving controversies is the meta-analysis, in which many studies in an area of research are pooled quantitatively in an effort to prove or disprove a theory. In seeking a resolution of the Gender Gap issue, scientists have carried out several such meta-analyses. Some of these suggested that the Gap has been narrowing in recent years. But this conclusion has been challenged by D. Halpern, who maintains that the Gender Gap has actually remained unchanged for 25 years. (R6) Obviously no consensus exists here.

Two additional observations on the nature of the Gap. (1) Although males are overrepresented among the highest scorers on the SAT mathematics sections, they are also overrepresented at the bottom of the distribution. There is, say the cognitive researchers, "greater male variability." (2) When males and females attack math and spatial problems, the females seem to achieve the correct results through reasoning processes. Whereas, comments D. Lohman, "Men just look at it [the problem] and know that's the way it is...it's almost as if they look at it without trying to analyze or process it." (R6)

X5. The hormonal theory. N. Geschwind, of the Harvard Medical School, has suggested that excess testosterone or an unusual sensitivity to testosterone during fetal life somehow alters the brain so that the right hemisphere becomes dominant for language-related activities. Mathematical ability is generally thought to be a right-brain function. The supposed damage caused by the testosterone, Geschwind opines, is paradoxical, because just the right amount produces genius, the wrong amount generates people who are very bad in math. Of

course, testosterone is a male hormone, so that males only will be affected by the presumed damage.

Interestingly enough, the same hormone is associated with left-handedness and immune system disorders. See BHB-23. (R3)

References

- R1. Benbow, Camilla Persson, and Stanley, Julian C.; "Sex Differences in Mathematical Ability: Fact or Artifact?" Science. 210:1262, 1980. (X1)
- R2. Benbow, Camilla Persson, and Stanley, Julian C.; "Sex Differences in Mathematical Reasoning: More Facts," Science, 222:1029, 1983. (X2)
- R3. Kolata, Gina; "Math Genius May Have Hormonal Basis," Science, 222:1312, 1983. (X5)
- R4. Fox, Lynn H.; "Sex Differences among the Mathematically Precocious," Science, 224:1293, 1984. (X1, X2)
- R5. Bower, B.; "The 'Math Gap': Puzzling Sex Differences," Science News, 130:357, 1986. (X3)
- R6. Holden, Constance; "Is 'Gender Gap' Narrowing?" Science, 253:959, 1991. (X4)

BHB43 Intelligence Correlated with Stature

Description. The tendency of taller individuals to score higher than shorter persons on intelligence tests.

Data Evaluation. Although only one scientific report was acquired for this entry, this report does list corroborating research of this unlikely phenomenon.

Rating: 3.

Anomaly Evaluation. Since an individual's general physical development (stature, robustness, brain development, etc.) are determined in part by nutrition and environmental influences on the way to maturity, it is reasonable to expect that larger people might be somewhat more intelligent. This phenomenon does not appear to be anomalous. Rating: 4.

Possible Explanations. See above.

Similar and Related Phenomena. Intelligence correlated with season-of-birth (BHB35) and birth order (BHB36). Both of these phenomena may have "nurture" explanations.

Entries

X1. 1991: T.W. Teasdale et al. As far back as 1911, psychologists were aware that taller children and adults are slightly more intelligent than their shorter peers. In a recent confirming study, T.W. Teasdale et al have found:

Stature and intellectual ability are commonly found to correlate positively ($r \sim 0.2$). In this study we have assessed whether this relationship holds true at the extremes of stature in adults. From a representative study population of 76,111 young Danish men, we defined an extremely short group as those below the 2d percentile (< 163 cm) and an extremely tall group as those above the

98th percentile (> 191 cm). The short group had intelligence test scores and educational levels lying at approximately two-thirds of a standard deviation below the overall means. The tall group had means lying approximately one-half standard deviation above the overall means. (R1)

Reference

- R1. Teasdale, T.W., et al; "Intelligence and Educational Level in Adult Males at the Extremes of Stature," Human Biology, 63:19, 1991. (X1)

BHT UNUSUAL SENSES AND FACULTIES

Key to Phenomena

BHT0 Introduction

SIGHT

- BHT1 Telescopic Vision
- BHT2 Moonblindness
- BHT3 Blindsight
- BHT4 A TV-Snow Visual Phenomenon
- BHT5 Color-Vision Deficiency of Ancient Peoples
- BHT6 Color Sensitivity Correlated with Lunar Phase
- BHT7 Anomalies in the Evolution of Color Vision
- BHT8 Dermo-Optical Perception
- BHT9 Visual Phenomena from the Passage of High-Energy Particles through the Eyes

HEARING

- BHT10 Facial Vision or Human Echo-Ranging
- BHT11 Our Sound-Suppression Faculty
- BHT12 Electromagnetic Radiation Perceived as Sound
- BHT13 Hearing under Anesthesia
- BHT14 Variability and Sophistication of Human Tone Perception

COMMUNICATION

- BHT15 Anomalous Communication in Children
- BHT16 Discontinuity in the Evolution of Communication

HUMAN SENSITIVITY TO MAGNETIC FIELDS

- BHT17 The Ability to Sense and/or Detect Magnetic Fields
- BHT18 Human-Navigation Senses
- BHT19 Exposure to Low-Frequency Electromagnetic Field Lengthens Reaction Time

SWIMMING AND DIVING

- BHT20 Human Drowning Proneness
- BHT21 Human Diving Reflex Unique among Primates

CONSCIOUSNESS

- BHT22 The Paradoxes of Consciousness

MISCELLANEOUS FACULTIES

- BHT23 Anomalous Skin Adhesive Power
- BHT24 Chicken-Sexing Faculty
- BHT25 The Ability to Perceive Established Information

BHT0 Introduction

The purpose of this chapter is to gather in one place those human faculties, particularly those originating with our sensory apparatus, that are remarkable in some way or difficult-to-account-for, either in terms of their physics of operation or their acquisition through biological evolution.

The primary human information-gathering organs are the eyes, the ears come next; but humans may have other organs, as yet unidentified, that take measure of the geomagnetic field and perceive cryptic information patterns. Consciousness, too, is a faculty we value highly but do not understand well, or even know if we are the only organisms possessing it.

Sight and hearing are easier to grasp than consciousness, but even here there are anomalies. Some people are blessed with telescopic vision, while others cannot tell red from green. In fact, the excellent color vision most humans possess may actually be a very recent evolutionary acquisition---if the writings of the ancients are true indicators. As for our ears, blind people are thought to use them for navigating bat-wise by echo-location. And a few rare individuals have "perfect pitch," suggesting that they have reference frequency standards stored somewhere in their brains!

SIGHT

BHT1 Telescopic Vision

Description. The ability to discern and identify objects at much greater distances than normal people. No specific criteria exist to define this phenomenon precisely.

Data Evaluation. The literature on this subject is generally both old and anecdotal. So far, nothing has come from the modern professional literature.
Rating: 3.

Anomaly Evaluation. Humans normally possess a rather wide range of visual capabilities. Even the rather extreme cases introduced below can be accounted for as merely being at the far edge of the normal distribution curve. Also, visual acuity is to some degree a function of a person's training and environment. With these considerations in mind, most cases of telescopic vision are more curious than anomalous. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. The varying degrees of human color perception. (BHT5)

EntriesX1. General observations and a case of telescopic vision from South Africa.

The following quotation is taken from an article entitled "Signaling among the Ancients", by H.N. Shore, published in 1916.

In considering the means of transmitting messages in ancient times, whether ashore or afloat, the question of visual power must not be ignored. There is every reason to believe, indeed, that the visual sense, in former times, was much superior to what we find among the highly civilized nations of the present day. Few people, moreover, outside the ranks of experts, seem to realize how widely the power of vision differs among individuals, and the extent to which this sense is governed by conditions of life. It is easy to understand, however, that peoples whose lives are passed in wide, open tracts of country and clear atmosphere, where long-distance vision is in constant demand, would develop powers of sight which must appear almost miraculous to town-bred folk whose visual organs are seldom taxed beyond the recognition of a friend across the street.

In the course of our South African wars, for example, many instances have come under notice of quite abnormal powers of sight among natives---both white and colored. Apropos of which may be cited the case of a young negro, mentioned by Dr. Lindsay Johnson at the Institute of Ophthalmic Opticians, some years ago, who was found, on examination, to possess four times the normal sight. This astonishing youth could see three of Jupiter's moons with the naked eye, and could read a leading article in the Times at a distance of ten feet.
(R2)

X2. A similar case from Louisiana.

There is a story in the New Orleans Delta, of the discovery of a child in St. Mary's parish, in the interior of Louisiana, that possesses the wonderful power of seeing with the naked

eye what other people take a telescope to perceive, while to things that are perfectly near he is almost blind. The writer of the article says that he has unusually large eyes, but not prominent, and that having a small telescope of power sufficient to observe the satellites of Jupiter and Saturn, he directed the boy's attention to these planets, and in a moment he saw the satellites like three golden marbles around old Jupiter, and Saturn in the same manner by four, the boy observing with his eye and the writer of the article with his telescope, and it would seem the boy's eye was found to be as correct as the instrument and more powerful.
(R1)

X3. The art of nauscopy. Nauscopy is the ability to see indications of ships or land at great distances. (Note that we say "indications", for the real ship or object may not actually be visually detected.) For examples, we again quote H.N. Shore:

For some curious examples of nauscopy we are indebted to the narrative of the voyage of H.M.S. Nissus, 32 guns, Capt. Philip Beaver, in 1810, compiled by Mr. James Prior, surgeon. Referring to certain stories, "related as facts," current in the island of Mauritius, concerning the great distance at which ships had been sighted from the hills, Mr. Prior writes: "This faculty of far-seeing, or rather divination, is confined to a few, and appears something like the second sight of Scotland."

It seems that one of the persons thus gifted reported having distinctly observed from the island the shipwreck of a vessel in one of the ports of Madagascar, at a distance of 400 miles. Though laughed at, he persisted in his story, mentioned the day, the hour, and the precise scene of the mishap, all of which being duly noted, turned out afterward to be correct. On another occasion, the same person discovered a man on board a vessel, three days' sail from the island, who, he stated, was at

the time engaged in washing his clothes---all of which likewise proved true.

"Without attending to improbable tales," continues our authority, "I am told by credible persons that vessels have been distinguished at far as ninety miles distant, as was afterwards ascertained by comparing dates with their subsequent run toward the land; which may perhaps be accounted for by the clearness of the atmosphere, reflecting objects from the surface of a smooth sea to the sky, whence they become visible to those who possess acute visual organs."

The obvious comment of an old-time sailor-man on such a story as this would have been, "You may tell that to the marines!" And were it not for confirmation of these strange happenings coming from a most unexpected quarter, we should be inclined to class "nauscropy" and the quoted instances of "far-seeing, or divination," as "travelers' tales."

In a work entitled "Memoire sur le Nauscopie," by M. Bottineau, published toward the close of the eighteenth century, we are given the results of the author's own experiments, conducted with the sanction and under the close observation of French government officials.

We omit here the details of the experiments and the controls that we exercised by the officials. The site was the island of Mauritius, in the Indian Ocean, and the observer, M. Bottineau.

During the eight months over which the observations extended, M. Bottineau announced the approach of one hundred and fifty ships, none of which was visible to watchmen stationed on the hills at the time of their report. It was shown, moreover, from the register of his reports, that he was wonderfully accurate. The government officials, indeed, who---it may be remarked---were anything but favorable to him, had to bear testimony to the reality of his extraordinary powers, in making their report to the French minister, and this report is embodied in the aforementioned "Memoire."

It would take us too far afield to discuss the various explanations of M. Bottineau's uncanny powers

which have been advanced. Suffice to state that, while one writer accounts for the phenomena by asserting that, when one ship approaches another, or land, there appears in the air a meteor of a particular nature, which with a little attention is visible to any person...It must be confessed that these so-called explanations do not take us very far. (R2)

It is all too easy to write nauscropy off as a hoax perpetrated upon preoccupied French officials over two centuries ago. However, R.T. Gould, a very cautious investigator of unusual phenomena, published a thorough study of nauscropy in his book Oddities, making use of old records and even correspondence from Bottineau himself. Bottineau never claimed to actually see the vessels in question, but rather to discern their effect upon the atmosphere over them. Further, he stated that anyone with normal vision, if properly instructed, could see the effect, too. After weighing all the evidence, Gould had to conclude: "Bottineau was no charlatan." (R3)

Just what Bottineau (and a few others) saw has never been explained. Is there some unrecognized atmospheric phenomena associated with distant objects at sea, perhaps an effect associated with a vessel's thermal emissions? (WRC)

X4. Pre-Mariner Observations of Martian Craters. Evidence exists that two astronomers, J. Mellish and E.E. Barnard, saw the craters of Mars through their telescopes decades before they were photographed by the Mariner-4 space probe in 1965. Quite possibly, these two observers were more keen-sighted than their colleagues, for no one else saw craters on this assiduously-observed planet. Of course, many astronomers recorded "canals" on Mars, which are not to be found on close-up photos taken by several spacecraft. For more information on the Mellish-Barnard observations, see AMO2, in another volume of the Catalog. (R4)

X5. Daytime observations of Venus. It is widely believed that the planet Venus can be seen in the daytime only when the sun's light is somehow blocked.

Some people, it seems, do not require such artificial shielding. L. Watson has examined this possible case of anomalously acute eyesight in his book Beyond Supernature:

Sometimes, from the bottom of a mine-shaft, or shielded from the sun in the deep canyons of a great city street, I can look up still and see our sister planet [Venus] high in sky at noon. There are, however, those who can do this at any time, anywhere, pointing out the planet with unerring precision as they go about their tribal business in the Andes or the Kalahari. A few hundred years ago, sailors from our own civilization navigated with the aid of Venus, following its path as easily by day as they did by night; but something has happened to us in the interim. (R5)

Watson is implying, of course, that

we all once possessed far-sight, but that, since we no longer need that attribute, it has atrophied.

References

- R1. "Telescopic Vision," Scientific American, 2:325, 1847. (X2)
- R2. Shore, Henry N.; "Signaling among the Ancients," Scientific American Supplement, 81:154, 1916. (X1, X3)
- R3. Gould, Rupert T.; "The Wizard of Mauritius," Oddities, New Hyde Park, 1965, p. 173. (X3)
- R4. Gordon, Rodger W.; "Mellish and Barnard---They Did See Martian Craters!" Strolling Astronomer, 25:196, 1975. (X4)
- R5. Watson, Lyall; "Self," Beyond Supernature, New York, 1988, p. 103. (X5)

BHT2 Moonblindness

Description. The onset of blindness due to long exposure to moonlight, usually after sleeping on a ship's upper deck. A peculiarity of moonblindness, as stated in the literature, is that moonblindness is operative only during nighttime hours; day-time vision is unaffected!

Data Evaluation. We have only old, very doubtful tales of the sea, with no trustworthy, recent accounts. This phenomenon is highly questionable. Rating: 4.

Anomaly Evaluation. If weak moonlight can blind a sleeping person (with closed eyes), we most assuredly have a first-class anomaly. Rating: 1.

Possible Explanations. None required.

Similar and Related Phenomena. Snowblindness; temporary (sometimes permanent) blindness due to exposure to lightning, laser beams, the sun during solar eclipses, etc.

Entries

X0. Introduction. Moonblindness is today considered a ridiculous fabrication by seamen. This may be true, but the

phenomenon was considered quite real a century and more ago. In addition, it is well-known that prolonged, very

bright light can cause temporary blindness, as in snowblindness. Of course, moonlight is too weak to wreak such visual havoc, particularly since moonblindness usually occurs while sleeping on deck with one's eyes closed. Nevertheless, tales of moonblindness do occur in the literature, and they are interesting to read.

X1. The 1850s. The ship Langdale. The subject vessel was in the East Indian trade and the source of the following anecdote:

About half-way between St. Helena and the Line, some of the watch below (that part of the crew off duty), found it too hot in the fo'castle for sleeping, came on deck, and, picking out the softest planks, coiled up on them and went to sleep. Again the moon was high and shining brilliantly, and when the sleepers were roused up, three of them were quite blind---moonblind. Those who are stricken with moonblindness can see nothing at night, but their sight is quite normal during the day. The victims, in this case, had to be led about at night, and the ropes put into their hands, and, of course, they could not take their trick at the helm, nor keep their look-out. Before reaching Falmouth, where we called for orders, two of the three had almost recovered from their affliction, but the third one, a strap-

ping young Aberdonian, named Mof-fat, was, when he left us in Falmouth, just as sightless at night as when he was stricken. (R2)

The most bizarre aspect on this supposed phenomenon is that it affects vision only at night! This certainly does have the trappings of a sailors' yarn.

X2. General observations. These observations were presented at a meeting of the British Association:

The author [G. Robinson] gave several instances of his men who had slept on deck exposed to the moonbeams being so blind on landing that they had to be led by the hand. Also the sailors were in the habit of waking up the soldiers who attempted to sleep on deck, and warning them that they would be blinded. (R1)

No mention is made here on moonblindness being operational only at night. (WRC)

References

- R1. Robinson, G.; "On Moon Blindness," Report of the British Association, 1858, part 2, p. 19, 1858. (X2)
 R2. Murdoch, Samuel; "Effect of Moonlight on Fish and Men," English Mechanic, 85:496, 1907. (X1)

BHT3 Blindsight

Description. The ability of some blind people to detect and indentify some events and situations with their eyes, but without forming visual images. This phenomenon must not be confused with "facial vision". (BHT10)

Data Evaluation. One report in a popular-science magazine provides an account of scientific research on the subject phenomenon. No confirming scientific papers have been found to date. Rating: 2.

Anomaly Evaluation. In effect, the phenomenon implies that the human midbrain

also processes information received from the eyes, even though no images are formed. The receptors, neural pathways, and information-processor contributing to blindsight remain to be identified. Blindsight is an unexpected faculty that does not seem to be widely recognized or investigated by science. The phenomenon is at odds with prevailing thought, but it could be incorporated without too much reworking of scientific paradigms. Rating: 2.

Possible Explanations. A primitive, non-visualizing part of the brain is the source of blindsight.

Similar and Related Phenomena. Facial vision (BHT10).

Entries

X1. General observations. L. Weiskrantz, of Oxford University, and colleagues at London's National Hospital have asserted that certain blind people possess a form of unconscious vision that allows them to "see" after a fashion, without being aware of it! They have named this faculty "blindsight". J. Hansen elaborated in an article in Science Digest:

There are many causes of blindness and the category of people able to "see without knowing it" is a very small minority. What the research team [Weiskrantz et al] has discovered is this: Working with patients who had acquired visual defects as a result of damage to the brain cortex, they found that their subjects, if asked what they saw, said they saw nothing. In testing, though, asked to guess, they "guessed" right nearly 90 percent of the time. This is far beyond the success rate accountable to pure chance.

The researchers theorize that the kind of "sight" detected by these tests depends on a different neural pathway from the eye to the brain,

one that passes through the midbrain rather than the cortex. In evolutionary terms, the midbrain is much older than the cortex. In a sense, it may be the animal part of our brain---an evolutionary holdover from our pre-human past. (R1)

Blindsight, in fact, seems to be the type of sight required by a hunting animal, as opposed to that form of vision used in reading or drawing. Blindsight detects events, movements, and sharp contrasts of dark and light. It seems to be "sight without the picture." Those blind people employing it feel but do not visualize happenings. They believe they saw nothing---and indeed they are blind to images---but they can usually identify what happened. (R1)

Reference

R1. Hansen, James; "'Blindsight'---Seeing without Realizing that You Can See," Science Digest, 87:14, January 1980. (X1)

BHT4 A TV-Snow Visual Phenomenon

Description. The different appearances of TV snow when viewed binocularly and monocularly.

Data Evaluation. Casual observations by technically trained people. No controlled

scientific studies have been uncovered. Rating: 3.

Anomaly Evaluation. Apparently, this phenomenon reveals unrecognized characteristics of the eye-mind information-processing system. The observations are anomalous because they cannot be explained in the light of present knowledge. We assume this phenomenon is on a par with optical illusions, which are hard to explain in terms of information-processing, but which do not seem particularly challenging to science. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Subliminal perception.

Entries

X1. General observations. The complexity of our visual system can be explored while watching television. R.I. MacDonald discovered a curious effect while observing TV "snow":

While watching noise displayed on a television screen recently, I noticed a visual effect which I report here. As normally viewed, displays of video noise ('snow') have the appearance of fields of small speckles which seem to dart about at random. When, however, the noise is viewed monocularly, the texture of the field seems finer and the speckles more nearly static. The display seen monocularly has the appearance of a field of smaller speckles which scintillate in situ. I have shown the effect to about ten friends and colleagues, without telling them what to expect. All noticed some difference between binocular and monocular viewing and several promptly described exactly what I had seen. In general, the size change was more consistently re-

ported than the motion change.

.....

That the effect can be obtained whether or not the noise is binocularly correlated might suggest that even when the binocular images of the noise fields discussed here are correlated, they in some way exceed the ability of the visual processor to perceive the correlation. In any case it is not clear why a planar field of randomly changing visual noise should not appear the same to two eyes as to one. An adequate explanation of this effect might yield new information about the functioning of the visual system. (R1)

Reference

- R1. MacDonald, R.I.; "Kinetic Cyclopean Effect," Nature, 249:192, 1974. (X1)

BHT5 Color-Vision Deficiency of Ancient Peoples

Description. The apparent inability of the ancient Greeks and peoples of other cultures to distinguish a large variety of colors, as indicated by the lack of rich color vocabularies in their languages. This impoverishment carried over into art. The implication is that our modern color vision evolved in the space a few thousand years.

Data Evaluation. Several studies of ancient languages agree that the ancient Greeks and Indians had few words for colors and their nuances, when compared with modern languages. Ancient artists, too, apparently employed only a few different colors in their work. However, it also turns out that primitive tribes living today speak languages that are similarly impoverished, even though the peoples who speak them have normal color vision. Taking everything into account, the data do not support the claimed phenomenon. Rating: 4.

Anomaly Evaluation. If the ancient Greeks and Indians truly did suffer from partial color-blindness, our modern highly developed color-sense would have to have evolved in about 2,500 years. This very rapid evolution of a very complex physical attribute is incompatible with the slow development associated with the accumulation of random mutations as modified by natural selection. The claimed phenomenon, therefore, is incompatible with a major paradigm. Rating: 1.

Possible Explanations. The claimed phenomenon did not occur.

Similar and Related Phenomenon. The supposed bicameral mind of the ancients (series-P catalogs); the rapid evolution of Hawaiian fruit flies (BAA).

Entries

X0. Introduction. Were the ancients partially color-blind? For that matter, are some primitive tribes today lacking in color perception? Studies of ancient literature and the languages of some modern cultures reveal a certain poverty in words used in expressing colors and the nuances thereof. From such evidence, some have concluded that the color sense of modern, civilized humans is recently evolved!

X1. The evidence of ancient literature. The English statesman and author, W.E. Gladstone, seems to have been the first to notice the Ancient Greeks' impoverished color vocabulary.

It was Gladstone who first, in 1858, called attention to the rather extraordinary vagueness of early color nomenclature. Collating from the Iliad and Odyssey the passages which referred to color, he found such uncertainty and inconsistency in the application of color names as to lead him to deny to the Greeks of Homeric times any clear notions of color whatever. "I conclude," he says, "that the organ of color and its impressions were but partially developed among the Greeks of the heroic age." (R4)

More specifically:

Homer had no word for 'color' nor for any of the primary colors. In like manner the term usually translated 'black' is very indefinite. It is used of the bronzed complexion of Ulysses and of his henchman, Eurybates; of the ripe grape; of beans; of wine; and of the storm cloud. We moderns would say that it is strictly applicable in the last case only; certainly the difference between the hue of the storm cloud and the darkest complexion of a white man is very marked. (R2)

Homer, for instance, uses one of the words for black (melas) to describe fresh blood, newly ploughed earth, water, ships and wine, while Theognis applies it to rust and clouds. White is employed to denominate snow, tin, water, ivory, grapes, honeycombs and, now and again, leafy wreaths which for some unknown reason are never called green. (R5)

X2. The evidence of ancient art and sculpture.

The fact that the ancients habitually speak of only four colors is almost proof positive that they did not discriminate more. In addition to the evidence already cited, there is to be added that of painting. What is

known of the art of Polygnotus, the earliest of the distinguished painters of antiquity and a contemporary of Pericles, leads to the conclusion that he used no greater number, according to the ideas of his time. Like all early painters he worked on terracotta vases and on walls, not on canvas. It seems highly probable that throughout antiquity no discrimination was made between orange and yellow, nor between indigo and blue, nor between the darker colors that shade into black. Many of the lower races, both at home and abroad, share this defect. Both have also the same liking for what is gaudy and striking. It is probable that the fondness for 'loud' colors is a species of survival that may be studied in children and in persons that are color-blind. The latter defect is a species of arrested development, and being an organic defect can not be overcome. On the other hand, some primitive races are reported to exhibit a very acute color-sense. This mental condition has likewise its analogy among children, some of whom are indifferent to colors, while in others the color-sense shows itself very early. At any rate, modern analogies will not enable us to decide the question for or against any people of antiquity. Two theories have long been held to account for the poverty of terms to designate colors in remote times. The one most in harmony with the evolution hypothesis is that the color-sense has followed the general law of development; the other, that primitive races perceive colors as clearly as we do, but that their languages lack words to designate minor differences. (R2)

X3. The evidence of modern languages. The literary evidence for color-vision deficiencies among the ancients is confused by the discovery that some modern languages are likewise lacking in rich assortments of words for the various colors. Writing in 1910, R.S. Woodworth stated that modern Welsh has no word for blue and, more generally, that: "That the late appearance of names for green and blue is too wide-

spread a phenomenon to be explained in terms of racial differences." (R4) The problem, then, may not be that the ancients were physically insensitive to some colors, but rather that, in the slow evolution of languages, only the most striking colors were given specific names early. Woodward continued:

The views of Geiger were warmly espoused by Magnus, who, besides attempting to trace a gradual evolution in the use of color names in Greek literature, took the important step of examining, on a wide scale, both the color vocabularies and the color sense of existing primitive peoples. As a result of a questionnaire, with a set of colors to be named and distinguished, sent out to traders and missionaries, Magnus discovered that most primitive tribes possessed a color nomenclature which was incomplete in about the same way as that of Homer or of the Vedas. But he also found that the limits of color vision were the same among these tribes as among Europeans. They could see and distinguish all the colors from red to violet, though usually they did not possess names for them all. (R4)

The import of philology is that we cannot really determine for certain today whether the ancients had deficient color vision or whether they, too, were just slow in developing a rich color vocabularies. (WRC)

References

- R1. Eddy, William A.; "The Evolution of a New Sense," Popular Science Monthly, 16:66, 1880. (X1)
- R2. Super, Charles William; "Sight and Seeing in Ancient Times," Popular Science Monthly, 70:413, 1907. (X1, X2)
- R3. Super, Charles William; "The Color Sense of the Ancients," Scientific American Supplement, 64:46, 1907. (X1, X2)
- R4. Woodworth, R.S.; "The Puzzle of Color Vocabularies," Psychological Bulletin, 7:325, 1910. (X1, X3)
- R5. "Were the Greeks Colour-Blind?" New Scientist, 39:166, 1968. (X1, X2)

BHT6 Color Sensitivity Correlated with Lunar Phase

Description. The periodicity of human color sensitivity, with its peaks occurring at full moon.

Data Evaluation. A passing mention in a lengthy survey of possible extraterrestrial influences on human beings. Supporting references were not examined. Rating: 3.

Anomaly Evaluation. This purported phenomenon is highly anomalous, for there is no known reason why the moon's phase should have any effect upon human color vision. Rating: 1.

Possible Explanations. None offered.

Similar and Related Phenomena. Disturbed human behavior correlated with lunar phase (BHB4).

Entries

X1. Passing mention. In a long review of possible extraterrestrial influences on humanity, S.W. Tromp recorded the following paragraph:

Dresler established a lunar periodicity in the colour sense of man for green (546 nm) and orange (589 nm) light. Maximum values for the quotients of the two sensitivities were observed during full moon. Dresler's findings were confirmed by Kohlrausch. (R1)

The references cited by Tromp were

not examined, so we mention them now: Dresler, A. (Licht, 10:79, 1940) and Kohlrausch, A. (Film und Farbe, 91:98, 1943).

Reference

R1. Tromp, S.W.; "Studies Suggesting Extraterrestrial Influences (Apart from Solar Radiation) on Biological Phenomena and Physicochemical Processes on Earth," Cycles, 33:179, 1982. (X1)

BHT7 Anomalies in the Evolution of Color Vision

Description. The human evolutionary loss of diurnal color sensitivity (including ultraviolet sensitivity) and the failure to recover it, although the characteristic would seem to be advantageous. The apparent recent acquisition of trichromacy (three color pigments), which, in contrast, seems unnecessary to survival.

Data Evaluation. A thorough, rather technical history of the evolution of the vertebrate eye. This report is accompanied by many references. Rating: 1.

Anomaly Evaluation. Two questions about how evolution works arise here: (1)

Why have mammals (including humans, of course) not recovered vertebrate diurnal color sensitivity that they supposedly lost during the nocturnal phase of their history? Such recovery would seem advantageous. (2) Why have humans recently acquired trichromacy when there seems to be no survival value attached? Is this another example of evolutionary overshoot? The lack of answers here allows us to assign a degree of anomalousness to human color vision. Rating: 2.

Possible Explanations. Possibly, biological characteristics lost through disuse cannot be easily recovered. Recent human trichromacy may be linked to the expansion of the human brain and/or the evolution of human culture. (Actually, these are surmises rather than explanations.)

Similar and Related Phenomena. The development of the human brain (BHO); the possible color-deficiency of early humans (BHT5).

Entries

X1. General observations. From our experiences in observing color in nature and in art, we humans feel intuitively that our sense of color is remarkably good. We perceive and name an incredible range of colors and shades. In actuality, all classes of vertebrates possess color vision, with the birds probably being the best endowed. Compared to the other vertebrates, however, humans have substantially reduced diurnal color vision. When mammalian eyes are examined very closely:

Cones are usually few, and lack myoids and oil droplets. Even where there are many cones, however, there are characteristically only two cone opsins. (R1)

In less technical language, mammalian eyes have lost through evolution many advances in color vision retained by the other vertebrates. Mammalian eyes are even worse, for they have no receptors of near-ultraviolet light, as do all other classes of vertebrates.

The reason usually given for poor color and ultraviolet sensitivity in mammals is that they evolved as creatures of the night and lost these capabilities through lack of use.

Contrasting with this generally poor spectral performance of mammals is the surprising trichromacy of the primates. Trichromacy means that the eyes of the primates include three different cone

pigments, each sensitive to a different portion of the spectrum. Most other vertebrates possess only one or two pigments; birds, though, seem to have four or five! Since additional color pigments usually confer a broader, richer color sense, primates in a way have compensated for the general mammalian diurnal insensitivity to colors.

Not only is primate trichromacy surprising but, in humans at least, it seems to be a recent acquisition. T.H. Goldsmith put it this way:

Against this evolutionary backdrop, the trichromacy of Primates is an exception, but the molecular biology of human cone pigments reveals that its origins are, evolutionarily speaking, relatively recent. (R1)

Humans, then, have recently acquired a relatively advanced form of color vision, but they have not recovered their lost diurnal sensitivity. How does evolutionary theory explain such changes?

Reference

- R1. Goldsmith, Timothy H.; "Optimization, Constraint, and History in the Evolution of Eyes," Quarterly Review of Biology, 65:281, 1990. (X1)

BHT8 Dermo-Optical Perception

Description. The perception by the human skin of one or more of the following: (1) presence and absence of light; (2) displayed colors; and (3) displayed text and objects. Text-reading is implied in the last item. Naturally, visual observations by the subjects being tested must be precluded.

Data Evaluation. Stimulated by popular claims of dermo-optical perception in the 1960s, several scientists attempted to verify the phenomenon under controlled conditions. Some of these experiments had inadequate controls to protect against cheating. In fact, cheating has been so common as to undermine the credibility of all dermo-optical experiments. Finally, some of the experiments yielded negative results. Consequently, the data supporting the reality of dermo-optical perception must be considered rather weak. Rating: 3.

Anomaly Evaluation. Since light receptors do exist in the skins of some animals, it is not impossible that human skin may also possess some unrecognized capability for detecting light. However, color recognition and the reading of text using the human skin have no reasonable biological basis. Therefore, dermo-optical perception, if verifiable in all claimed aspects, would be highly anomalous. Rating: 1.

Possible Explanations. Undetected hoaxing and cheating by subjects.

Similar and Related Phenomena. The performances of professional mentalists and magicians. Some parapsychological phenomena are also difficult to verify because of the ease of cheating (Series-P catalogs).

Entries

X0. Background. Although the peak of the controversy over the reality of dermo-optical perception occurred in the 1960s, the basic phenomenon was reported long ago. In the 1820s, for example, a doctor described a mental patient who could perceive and describe objects in a glass case in a dark room. And there was a Yoga who could see through his skin and a sailor who read print with his fingers! (R14)

Absurd as such claims seem today, the detection of light by the skin is not as ridiculous as it sounds. Dermo-optical perception is rare in the animal world, but metazoans and some aquatic and amphibious organisms do possess skins bearing light sensors. The human skin also supports a maze of receptors, and it is not out of the question that some of them might respond to light.

In exploring this subject, we proceed from simplicity to complexity:

(1) The simple detection of the presence of light and darkness by the skin. Potential implication: the presence of

light-sensitive receptors in the human skin.

(2) The recognition of colors by either touch or the proximity of colored targets to the skin. Potential implication: the human skin possesses color receptors.

(3) The reading of text or the identification of symbols and drawings by the fingertips or some other portion of the anatomy. Potential implication: imaging devices reside in the human skin or, alternatively, some sort of extrasensory perception is active.

Our order-of-march will follow the above outline. Readers should be warned, though, that hoaxing and cheating are endemic in dermo-optical research.

X1. Dermo-optical perception of light. The simplest type of dermo-optical experiment consists of placing a subject's hands in a light-tight box and then turning a light on and off. Of course,

precautions have to be taken to eliminate all potential clues, such as light leaks, switch noises, and infrared radiation (to which the skin is sensitive). Two such simple experiments are reported below.

1965. S.M. Barrett and P. Rice-Evans. In this light-box experiment, the effect of infrared radiation was reduced with heat-absorbing glass. A total of 73 subjects were tested. There was only a slight tendency of the subjects to be right rather than wrong about whether the light was on or off. The researchers concluded:

At this relatively low light intensity the experiment does not appear to support the proposition that hands are sensitive to visible light. (R6)

1966. D.D. Steinberg. In these experiments at the University of Hawaii, precautions were taken to reduce the effects of infrared and ultraviolet light. One hundred student subjects were tested. Interestingly enough, most stated after the tests that they could sense heat on many of the light trials. The highest scorer, though, felt "nothing special" and used only his "intuition". Steinberg summarized his work as follows:

To determine whether light, appropriately controlled for infrared and ultraviolet rays, could be sensed by the hands or forearms, 100 Ss [subjects] were tested in a discriminative learning situation. An analysis of trend was performed and a statistically significant linear trend was found. A posteriori testing of pairs of means showed that the difference between the first and last blocks of trials was significant. It was concluded that Ss learned to discriminate very slightly between light and dark conditions, and hence were able to sense light dermally. (R10)

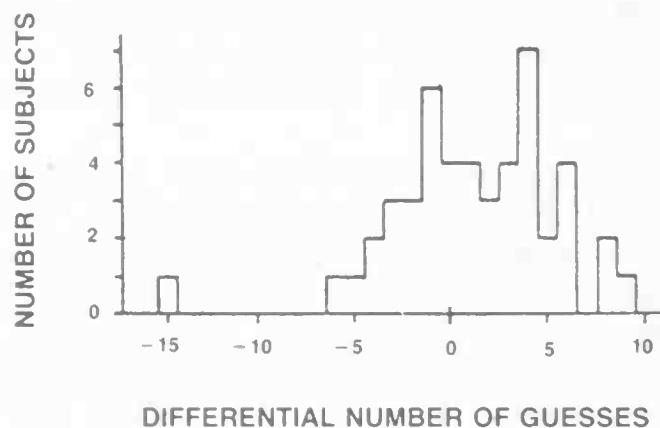
X2. Black-and-white tactile vision.

Tactile vision is a variety of dermo-optical perception in which black or white target materials are actually touched by the subjects. In experiments of this sort, great care must be taken that the surfaces of the targets do not provide clues as to their blackness or

whiteness. Black ink, for example, might be distinguishable from white paper by its "feel". The objective is to determine whether the subject can identify blackness and whiteness without the usual senses of sight and touch.

In C.N. French's experiments with tactile vision, so-called "stimulus cards" were actually photographs of three types: all-black, all-white, or half-and-half, all with the same surface "feels". Subjects went through decks of 72 such cards, 24 of each type, with their hands in a light-proof box. Each subject went through a deck of stimulus cards with a light in the box on and again with the light off. Forty-eight subjects were used in the experiments.

By chance, the number of correct "guesses" would be 24 for each run. The observed means were 25.3 with the light on, and 24.2 with the light off. Clearly, the light helps, but even with it on, the scores are not impressive, considering the small number of subjects. (R7)



Additional number of correct guesses with the light on rather than off. (X2)

X3. Color tactile vision. The dermo-optical identification of colors is by far the most common manifestation of the phenomenon. Many of the experiments seeking to verify color-vision have been flawed in design. Nose-peeking has been especially prevalent, for many of the color-vision tests have been conducted in the light with the subjects merely blindfolded. M. Gardner has explained how easy it is for a nose-peeker to get surreptitious views of the targets through chinks in blindfolds. (R11) In consequence, some experiments with the dermo-optical perception of colors are highly suspect.

1923. R.H. Gault. Gault worked with a girl who was totally blind and deaf, and who presumed she detected the color of objects by their smell! Nevertheless, Gault took the precaution of blindfolding her:

The bandage consisted of a pair of automobile goggles of the cup-shaped variety lined with black paper, stuffed with cotton wool and bound around the head with stiff elastic. The cotton wool projected over the temples and brows and below almost to the point of her nose. It was impossible either for me or for one of my graduate students, who accompanied me as assistant, while wearing the bandage to peek underneath it or to distinguish through it a lighted window from a dark wall. While she was bandaged in this manner I threw upon the table before her a pile of 90 yarns without selection and asked her to pick out all that were blue or "on the order of blue." It turned out that there were 22 in the heap that could be properly so described. Four of them she failed to find. She succeeded exactly in selecting 13 that were red and a tint of red. There were nineteen that were yellow: tints, shades and mixtures. These she selected correctly. From time to time she described one as lighter or darker than another. She placed an orange yarn with the yellow group remarking as she did so that she could have included it with the red group. (R1)

Convincing as Gault's experiment may seem, it is remarkable how naive scientists are about the methods magicians and "mentalists" use to dupe their audiences. Gault's precautions may well have been inadequate in light of our present knowledge of how hoaxers circumvent blindfolds. (R11)

1963-1964. R.P. Youtz. Some 40 years later, amidst reports emanating from the USSR that individuals had been found who could distinguish colors and even read text while blindfolded, R.P. Youtz, a psychologist at Barnard College, discovered a woman, P.A. Stanley, a housewife, who seemed to be able to distinguish colors with her fingers in complete darkness. Youtz began a series of experiments with Mrs. Stanley.

In a sample experiment, Mrs. Stanley was blindfolded with a sleeping mask lined with tissue and seated before a black plywood box about the size of an orange crate. Leading out of the front panel of the box were two black velveteen armholes into which her hands were fitted. There was no light in the box.

Three cards were put into the box through a door in the back. One card had a red square on it; two cards had blue squares. A transparent plastic cover was placed over the cards to keep the texture the same. Heavy black tape surrounded the edges.

Dr. Youtz asked Mrs. Stanley to pick two cards of the same color and name the colors. Mrs. Stanley fingered the cards, indicated two of them and said they were blue. She did this five times in a row. She never saw the cards and she was never told if her answers were right or wrong.

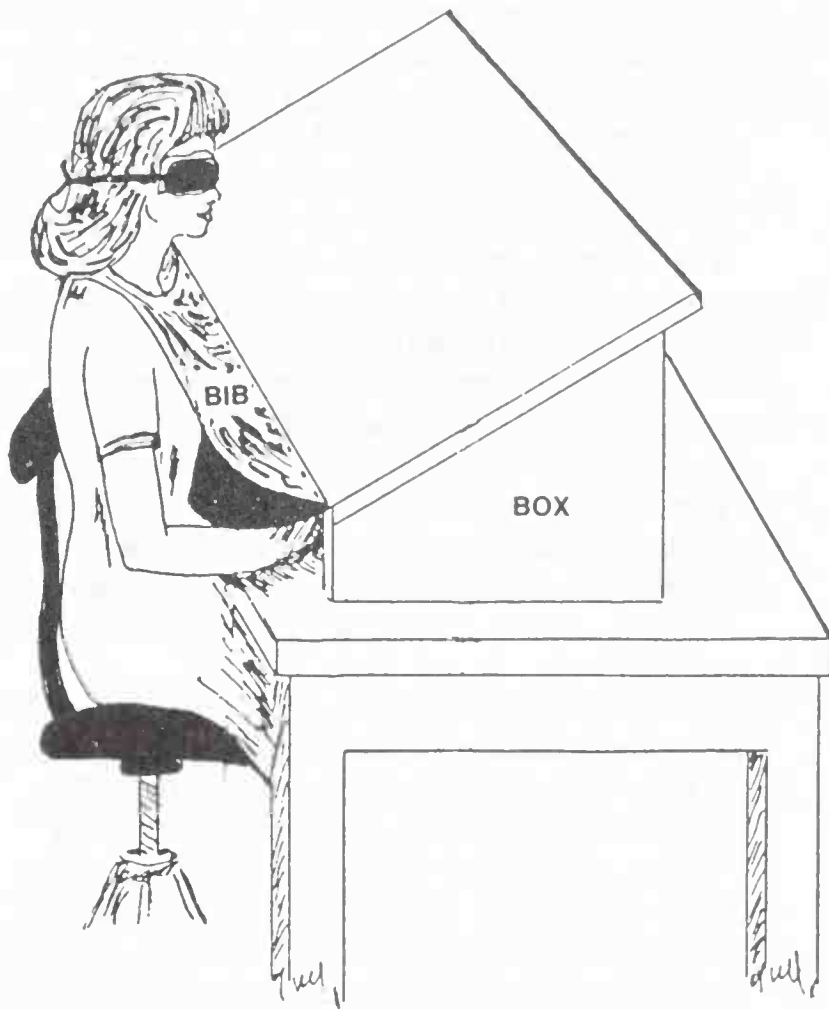
To pick the colors correctly once is a chance of one in three. To do it five times in a row is a chance of one in 243. But Mrs. Stanley has done the series of five over and over again with many different colors. The odds for this are less than one in 10,000, far beyond chance. (R4) (It was not revealed how these latter odds were figured! WRC)

Mrs. Stanley avers that light and dark colors "feel" different. She sometimes confuses pale yellow with white because they are both so light. If her fingers are below 75°F or submerged in warm water, her power fails. (R4)

M. Gardner, in an article in Science, faulted Youtz's tests as poorly designed, implying that Mrs. Stanley somehow peeked. (R11) Both Youtz (R12) and A. Zavala et al (R15) objected to Gardner's characterization of Youtz's experimental set-up---which Gardner apparently had never seen. Zavala et al stated relative to Youtz's apparatus:

Contrary to Gardner's conclusions, opportunities to use vision seem to be eliminated by the special box and bib-like cloth used to conceal the stimuli. (R15)

See the accompanying drawing for Youtz's methods to circumvent peeking.



R.P. Youtz employed a combination of bib box and blindfold in some of his dermo-optical perception tests. (X3)

After the first series of tests described above, Youtz and Gardner did exchange information about forestalling cheating. Adopting some of Gardner's suggestions, Youtz ran two more series of tests with Mrs. Stanley in early 1964. In the first of these, she scored just a bit above chance; in the second, she was completely unsuccessful. Youtz attributed her failures to the cold weather. (R11, R12)

1965. R. Buckhout. Buckhout's experiments were conducted with 40 male and 40 female undergraduates at Washington University. Colored stimulus plates covered with plastic were employed. The subjects examined them with their hands in a box, which did contain a light. In his Summary, Buckhout terms color tactile vision "aphotic digital color sensing."

An investigation of "aphotic digital color sensing" (finger vision) was conducted with students attempting to detect an odd color with their fingers when normal visual contact was eliminated. The results did not support the hypothesis that dermal color

discrimination occurs in man. Interpretation of the data raises doubts about previously published statistical support of the hypothesis. (R9)

Buckhout's conclusion was soon challenged by additional experiments.

1966. J.Z. Jacobson et al. Warned of the perils of using inadequate blindfolds, Jacobson et al employed not only an elaborate blindfold but, in addition, a box with a curtain located in a photographic darkroom. Here is their Summary:

A 21-yr.-old woman was found to possess the ability to discriminate colors through her fingertips under conditions which controlled for normal visual information, order of stimulus presentation, experimenter-produced cues, and textural differences. A forced-choice method employing four different colors and knowledge of results was used. The data indicated that light on the stimulus cards was necessary for her discrimination. (R13)

1967. A. Zavala et al. Zavala et al were also aware of Gardner's concern about possible cheating and designed their apparatus accordingly. Their primary goal was the testing of a young woman (known only as "A"), who had come to their attention because of her reputed ability to detect colors with her fingers. They wrote:

To determine whether there was anything unusual about her sensory behavior, S [that is, "A"] and three controls were tested using plastic discs, projected light and playing cards as stimuli. The stimuli were presented so as to prevent use of visual cues for identification. Results indicated that S performed reliably above chance and above the level of the controls as a group in discriminating colored plastic discs, colored projected lights, and in discriminating the suit and number of playing cards. Some controls performed reliably above chance but below A. (R15)

It is impossible to tell from the reports just summarized how good the controls were to prevent "peeks down the nose" and other tricks used by mental-

ists. Perhaps each experimental set-up should be checked beforehand by professional magicians and/or mentalists. (WRC)

X4. Image-forming in dermo-optical perception. By far the most astounding claim for dermo-optical perception is that some individuals can actually read text and form other images with their fingers, noses, ears, etc. Such remarkable talents have entertained audiences for years. M. Gardner, for example, relates how J. Dunninger and K. Bux, both stage performers, easily read text and described objects while seemingly securely blindfolded. When performing such tricks of "eyeless vision", Bux has both eyes covered with large globs of dough and then his whole face wound turban-like with yards of opaque cloth. Yet, he still can see and read! (R11)

As in other facets of dermo-optical perception, hoaxers and cheaters can foil the most carefully planned experiments.

Rosa Kuleshova. L. Watson in his book Supernature relates several cases of finger-reading but focusses upon a Russian girl, R. Kuleshova. In fact, in the early 1960s, Kuleshova's supposed talents attracted attention all over the world. She was a media event and, in this role, helped launch several scientific explorations of dermo-optical perception. We use here Watson's description of Kuleshova's talents.

Rosa Kuleshova can see with her fingers. She is not blind, but growing up in a family of blind people she learned to read Braille to help them and then went on to teach herself to do other things with her hands. In 1962 her physician took her to Moscow, where she was examined by the Soviet Academy of Science and emerged a celebrity, certified as genuine. The neurologist Shaefer made an intensive study with her and found that, securely blindfolded with only her arms stuck through a screen, she could differentiate among the three primary colors. To test the possibility that the cards reflected heat differently, he heated some and cooled others without affecting her response to them. He also found that she could read newsprint and sheet

music under glass, so texture was giving her no clues...In rigidly controlled tests, with a blindfold and a screen and a piece of card around her neck so wide that she could not see around it, Rosa read the small print in a newspaper with her elbow. And, in the most convincing demonstration of all, she repeated these things with someone standing behind her pressing hard on her eyeballs. Nobody can cheat under this pressure; it is even difficult to see clearly for minutes after it is released. (R16)

When M. Gardner first saw a photograph of Kuleshova performing, he says he broke into a loud guffaw. For to him, cheating was going on, based on his long experience with magic tricks. (R11) Gardner's skepticism was reinforced when J. Zubin reported in Science on tests with a young subject who claimed to possess dermo-optical perception. This subject's feats were amazing indeed, but they were ultimately all found to be the consequence of inspired peeking. Even the most elaborate blindfolds seemed to have chinks in them. With adequate precautions, the subject failed all tests, forcing Zubin to conclude:

...the subject certainly demonstrated a high level of talent in reading at unusual angles through an aperture which often could not have exceeded a millimeter in diameter. (R8)

Of course, one cannot state unequivocally that all dermo-optical perception tests are flawed, but certainly extreme caution is advised. (WRC)

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- R14. Deleted.
- R15. Zavala, Albert, et al; "Human Derma-Optical Perception: Colors of Objects and of Projected Light Differentiated with Fingers," Perceptual and Motor Skills, 25:525, 1967. (X3)
- R16. Watson, Lyall; "Matter and Magic," Supernature, Garden City, 1973, p. 167. (X4)

BHT9 Visual Phenomena from the Passage of High-Energy Particles through the Eyes

Description. Light flashes and streaks perceived by human subjects exposed to cosmic rays and high-energy particles.

Data Evaluation. The testimony of lunar astronauts and the results of one experiment in which humans were exposed to neutrons. Rating: 2.

Anomaly Evaluation. Given the energies of subatomic particles, it is not surprising that they can stimulate the eye to create visual phenomena as they pass through it. Although the exact details of the process are unknown, these visual phenomena have mainly curiosity value. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. "Seeing stars" after a blow to the head.

Entries

X1. Experimental observations. During flights to the moon, astronauts perceived light flashes and streaks of light of unknown origin. The phenomena occurred at the rate of one or two sensations per minute. It was surmised that these phenomena were caused by the passage of cosmic rays through the

eyes. To test out this hypothesis, T.F. Budinger et al exposed human subjects to neutrons in an attempt to duplicate the phenomena. Their Abstract indicates some degree of success:

Six subjects reported multiple star-like flashes and short streaks on ex-

posure to neutrons of energies up to 25 million electron volts. The probable mechanism is interaction with the retina rods by proton recoils and by alpha particles released from neutron reactions with carbon and oxygen.
(R1)

Reference

- R1. Budinger, Thomas F.; "Visual Phenomena Noted by Human Subjects on Exposure to Neutrons of Energies less than 25 Million Electron Volts," Science. 172:868, 1971. (X1)

HEARING

BHT10 Facial Vision or Human Echo-Ranging

Description. The ability of blind persons to detect obstacles without auditory clues. This ability is popularly called "facial vision", but the primary sense involved is maintained to be hearing. In actuality, it is generally believed that auditory clues are the only ones operating in facial vision, but this may not be the case; and these alternative clues form the basis of the present anomaly.

Data Evaluation. The remarkable ability of blind persons to navigate around obstacles is common knowledge; it is also a fact confirmed by many scientific experiments. At issue here is whether blind and deaf individuals also display facial vision. Some studies say "yes"; others, "no". Therefore, the data, though abundant, are incompatible. Rating: 3.

Anomaly Evaluation. The sprinkling of experiments that deny that auditory clues alone constitute facial vision are anomalous in the sense that they contradict the general consensus. Everyone does seem to agree that reflected sound is the primary mechanism of facial vision, but it seems that other senses also contribute. Facial vision itself is not anomalous, but the evidence that thermal, olfactory, and other clues are involved does weigh against a firmly stated "scientific fact". Such evidence is only slightly anomalous, though, since the "fact" being questioned is only a minor one. Rating: 3.

Possible Explanations. Facial vision involves several sensory clues, not just auditory cues.

Similar and Related Phenomena. Blindsight (BHT3).

Entries

X1. General observations. D. Diderot, the renowned French encyclopedist, remarked in 1749 on the "amazing ability" of the blind to perceive obstacles and judge their distances. Diderot supposed that this talent was due to the action of the air on the blind person's face, where the sensitivity of the facial

nerves had been enhanced in the blind.
(R3)

Science has come a long way since 1749, but, as we shall see, so-called "facial vision" is not a simple phenomenon. The sense of hearing undoubtedly plays the major role in guiding blind persons around obstacles. Experiments

confirm this and, indeed, mainstream science considers it proven that hearing is the only sense involved in facial vision. Nevertheless, there do seem to be other, more subtle, sensations involved.

No one questions, however, the remarkable abilities of blind people to navigate successfully. The two quotations below reflect views about facial vision from 1918 and 1988, respectively.

And we have known a blind man who ran up and down stairs, in and out of rooms and corridors, with amazing speed and precision, and who actually travelled alone on the New York subway twice daily without mishap, solely through his ability to detect the presence of a wall several yards away by sensing the slight compression of the air between the obstruction and his face. (R2)

Some blind people can walk unaided down a busy street without bumping into anything. One blind six-year-old could even steer a tricycle almost as skillfully as a sighted child. Such people describe their ability as being due to 'shadows' or 'pressure' felt on the face, and so the skill has come to be known as facial vision. However, when researchers plugged the ears of volunteers, their facial vision disappeared showing that they were actually being guided by sound. In fact, blind people sense objects by detecting the sounds reflected off them, particularly the sounds of footsteps. (R7)

But, if there were not more to this story, we would not catalog it at all!

X2. 1909. An early holistic view. In a 1909 issue of the English Mechanic, an anonymous author remarked first on Spallanzani's experiment a half-century earlier with blinded bats, and then applied Spallanzani's results to facial vision, which he termed the "distance sense."

This experiment proved that warning of the presence of objects is received through some part of the surface of the body other than the eyes. In the case of blind persons, it was thought at one time that this warning was

given by sound-waves reflected by the objects, but this theory is disproved by a simple experiment. When a blind man's ears are stopped completely, the sense of distance remains, although it is greatly diminished. This shows that the sense of distance is not identical with the sense of hearing, and that a distinction must be made between the sense of distance and the directional power of the blind. This power depends chiefly on the sense of distance, but involves also hearing, smell, the temperature sense, and perhaps still other factors. (R1)

X3. The 1940s. Experiments at Cornell. When the facial-vision experiments began at Cornell University, scientists were divided as to how the blind avoided obstacles. The experiments that had been conducted down the years were inconclusive. The Cornell work employed both blind subjects and sighted subjects who were blindfolded. Conducted in a large hall over a period of several years, the Cornell scientists evaluated the impact of various sensory clues upon the subjects' ability to detect obstacles. The general conclusions of the long series of careful experiments were:

- (1) Our deaf-blind Ss [subjects], who were selected upon the basis of their ability to get about alone, do not possess the 'obstacle sense' and they are incapable of learning it.
- (2) The cutaneous surfaces of the external ears (meatuses and tympanums) and not sufficient to the perception of obstacles.
- (3) The pressure theory of the 'obstacle sense' is untenable.
- (4) Auditory stimulation is both a necessary and a sufficient condition for the perception of obstacles by the blind.
- (5) The problem of this study is answered: the aural mechanism involved in the perception of obstacles by the blind is audition.
- (6) The auditory theory, sustained by the results of this study, should

no longer be regarded as theory but as established fact. (R4, R3)

As is common in science, the Cornell researchers were attempting to "close the book" on the facial-vision phenomenon. In their view, further research seemed unnecessary.

X4. 1953. Experiments at Tulane. The Tulane experiments were designed to confirm the Cornell results in an environment that duplicated more nearly that of the blind in everyday life; that is, with background noise, varying walking surfaces, etc. In a sense, the findings at Tulane "reopened the book" as far as facial vision is concerned.

Of greatest interest to us is the fact that deafened subjects either instinctively increased the noise of their footsteps to try to break through the ear-blocks, or, failing this, some of the subjects finally discovered thermal and olfactory clues that helped them navigate with some success. When these clues were eliminated they, too, failed to avoid obstacles. The Tulane group concluded:

The fact that some of our Ss failed to perceive the obstacle because of the lack of sound and others because of the lack of thermal or olfactory cues, leads us to conclude that no single condition is necessary for the perception. Obstacles may be perceived without vision under certain conditions by many different means ---sound, temperature (cold and warmth), wind pressure, and odor.

Audition, however, is the principal basis of the perception and it is necessary only in the sense that its cues are the most reliable, accurate, and universal of all the cues yielding the perception. (R6)

This conclusion is at odds with the Cornell pronouncement, in X3, that sound is the only source of clues.

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- R7. Downer, John; "Sound Sense," Supersense, New York, 1988, p. 88. (X1)

BHT11 Our Sound-Suppression Faculty

Description. The ability to suppress extraneous sounds and, as a consequence, attend to activities more important to survival.

Data Evaluation. We have only a paragraph in a popular-science book. Very little seems to be known about this phenomenon. Rating: 3.

Anomaly Evaluation. Sound suppression is actually a rather profound capability, for it affects heart-beat, skin resistance, and other bodily parameters. It doubtless is based in the brain and nervous system, but the actual mechanism is a matter of surmise; as is the nature of the circuitry that immediately informs us when the disturbing sound source has changed or disappeared. Rating: 2.

Possible Explanations. None beyond locating the circuitry in the brain-plus-nervous system.

Similar and Related Phenomena. The suppression of pain and other stimuli; negative hallucinations (Series-P catalogs).

Entries

X1. General observations. People who live near train tracks, busy highways, and airports can usually "tune out" disturbing, extraneous noise. Otherwise, life would verge on the intolerable. Certainly visitors to such places find the sounds unpleasant. The physical and psychological aspects of our impressive sound filter have been mentioned by L. Watson in his Beyond Supernature:

When you walk into a room that contains a grandfather clock, the tick-tock seems very loud. Your brain-waves, heart-beat and skin resistance all fluctuate in time with the noisy mechanism. But after a while, you no longer find it quite so intrusive and eventually cease to hear it at all. You tune it out, your skin

resistance remains undisturbed and, if measurements are taken from your auditory nerve, these show that news of the clock is no longer being sent on from the ear to the brain. The clock becomes a constant part of the environment, one without further news value. But if the clockwork rhythm changes or stops altogether, then attention returns to it immediately. Something has happened which might be significant and needs to be considered. (R1)

Reference

R1. Watson, Lyall; "Mind," Beyond Supernature, New York, 1988, p. 86. (X1)

BHT12 Electromagnetic Radiation Perceived as Sound

Description. The perception of strong electromagnetic radiation as sound, particularly radar transmissions.

Data Evaluation. The literature reveals ample testimonial and experimental evidence as to the reality of this phenomenon. Rating: 1.

Anomaly Evaluation. Researchers have offered several mechanisms by which electromagnetic radiation might be converted into the sensation of sound. (See X5 below.) The electromagnetic waves do not have to be transformed somehow into actual sound, simply into signals in the nervous system that the brain interprets as sound. There seem to be several ways in which this might be done. The sci-

entific community has not agreed upon which mechanism is the correct one. Even so, no important scientific hypotheses are at risk. Rating: 3.

Possible Explanations. See X5 below.

Similar and Related Phenomena. It is widely believed that energetic auroras and high-altitude meteors generate electromagnetic waves that we perceive as sound on the earth's surface. These acoustical phenomena are treated in depth in GSH3 and GSH2, respectively.

Entries

X1. General observations. Informal reports of people "hearing" radar emissions surfaced in the 1950s and doubtless go back to World War-II days. The first scientific report we have found dealing with the phenomenon was published in *Science*, in 1962, by A.H. Frey. (R2) For a general description of "radar hearing", we rely upon C.E. Ingalls, who, incidentally, was led to the phenomenon by the anomalous sounds associated with auroras and meteors (cataloged under GSH3 and GSH2, respectively). He quickly associated these enigmatic sounds with "radar hearing".

An interest in problems connected with re-entry bodies in the atmosphere led to an interest in reports of "hearing" meteors and auroras. The hearing of meteors was supposedly under conditions requiring sound to travel at a velocity far exceeding the velocity of sound in air at 343 meters per second, probably approaching the velocity of electromagnetic wave propagation. At this time there was a report of someone hearing a radar at an installation in Turkey. On investigation, this proved to be true.

A like radar was found in the United States and a meter secured for field strength measurements to avoid overexposure and possible damage to the eyes, brain, or other parts of the body. Although there was considerable ambient noise, the radar could be heard by a person who immersed himself in the edge of the beam, the center of the beam being strong enough to be hazardous. The sound was something like that of a bee buzzing on a window, but with, perhaps, more high frequencies.

Possibility of the effect being

noise by sound waves from the radar was eliminated by placing a large (about 3- by 3-foot) square of window screening between the observer and the radar, close to the observer. With the screen shield in place, the radar sound disappeared. A hole was cut in the screening, large enough to put the ear through. When the ear was put through the hole, there was still no sound. The only part of the body which allowed the observer to hear the radar was a place on the head above the forehead. From this, it appears that the electromagnetic wave affects the nervous system at the brain directly and does not use the normal auditory channels. No disturbance in the visual senses was found, although a search was made. Possibly the visual senses are shielded more by the head.

The sound seemed to come from about a meter or two above the head. This varied somewhat with individuals. Placing the fingers in the ear to cut out ambient sound made the source seem to come down to the very top of the head,

.....

Persons with defective hearing were taken to the radar location. Some of these could hear the radar and some could not. It seemed to depend on the type of hearing loss and the frequencies involved.

.....

Other radars were used, and it was found that it was possible to "hear" radars at approximately 1-, 3-, and 10-giga Hertz. (R4)

X2. A curious phenomenon possibly re-

lated to "radar hearing". The time is 1901; the place South Africa.

A curious phenomenon occurred to some volunteers while on outpost duty on the Delagoa Bay Railway in the Transvaal. A search-light was fixed up in the station, which was used nightly in scanning the wide stretches of veldt. We were on solitary outpost duty about three miles from the station, and on the still silent nights which are frequently experienced in the clear atmosphere of the high veldt we distinctly heard a low "purring" sound as the ray of light of the station passed over us. As the light approached us one could hear the sound gradually increasing, being loudest as it switched over us and passing away into the nothingness of the silent night. We were too far off the station to hear any vibrations from the mechanism of the search-light, and we all came to the conclusion (being a collection of unscientific men) that the high velocity of the light waves created a sound audible to our ears. On other nights when there was only a slight breeze no sound could be detected. (R1)

X3. 1960s. A.H. Frey's experiments. Some of the earliest investigations of "radar hearing" were undertaken by A.H. Frey. A summary of one of his papers follows:

The intent of this paper is to bring a new phenomenon to the attention of physiologists. Using extremely low average power densities of electromagnetic energy, the perception of sounds was induced in normal and deaf humans. The effect was induced several hundred feet from the antenna the instant the transmitter was turned on, and is a function of the carrier frequency and modulation. Attempts were made to match the sounds induced by electromagnetic energy and acoustic energy. The closest match occurred when the acoustic amplifier was driven by the transmitter's modulator. Peak power density is a critical factor and, with acoustic noise of approximately 80 db, a peak power density of approximately 275 mw/cm^2 is needed to induce

the perception of carrier frequencies 425 mc and 1,310 mc. The average power density can be at least as low as $400 \mu\text{w/cm}^2$. The evidence for the various possible sites of the electromagnetic energy sensor are discussed and locations peripheral to the cochlea are ruled out. (R2)

Another key paper by Frey (with R. Messenger, Jr.) can be found in Science, July 27, 1973. The Abstract is reproduced below:

A psychophysical study of the perception of "sound" induced by illumination with pulse-modulated, ultra-high-frequency electromagnetic energy indicated that perception was primarily dependent upon peak power and secondarily dependent upon pulse width. The average power did not significantly affect perception. Perceived characteristics of pitch and timbre appeared to be functions of modulation. (R6)

X4. The British "hum". During the late 1980s, a lively debate was conducted in British newspapers and the scientific press as to the origin of a mysterious humming or throbbing noise heard over wide areas of the British Isles. Not everyone could hear the hum, nor was it present everywhere. From abundant testimony, the hum frequency seemed to be between 20 and 100 Hertz. The two prime suspects were electromagnetic devices (radars, microwave transmitters) and turbines in the extensive underground network of high-pressure pipelines carrying natural gas. (R10)

X5. Possible mechanisms for converting electromagnetic energy into perceived sound.

R. Coghill believes that radar waves excite the hair cells in the inner ear, which then generate nerve signals perceived as sound. (R10)

Closely related to Coghill's idea is that of H.C. Sommer and H.E. von Gierke, who, though laboratory experiments, have determined that biological tissue in the head is set into vibration by electrostatic forces. These vibra-

tions are perceived as sound. (R3)

J. Lin prefers a mechanism whereby absorbed microwave energy dumps heat energy into the brain tissue. This results in thermal waves propagating down through the bone to receptors in the inner ear. (R9, R10)

C.-K.. Chou et al suppose that microwave energy is converted into acoustic energy in the skull and then conducted to the ear's receptors via the bone. (R7-R9)

Obviously, there is no consensus as to the precise mechanism by which the electromagnetic waves are converted into the nerve signals humans interpret as sound.

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- R3. Sommer, H.C., and von Gierke, H.E.; "Hearing Sensations in Electric Fields," Aerospace Medicine, 35:834, 1964. (X5)
- R4. Ingalls, Clyde E.; "Sensation of Hearing in Electromagnetic Fields," New York State Journal of Medicine, 67:2292, 1967. (X1)
- R5. "Can They Really 'Hear' Radar?" New Scientist, 36:582, 1967. (X1)
- R6. Frey, Allan H., and Messenger, Rodman, Jr.; "Human Perception of Illumination with Pulsed Ultrahigh-Frequency Electromagnetic Radiation," Science, 181:356, 1973. (X3)
- R7. Frey, Allan H., and Coren, Elaine; "Holographic Assessment of a Hypothesized Microwave Hearing Mechanism," Science, 206:232, 1979. (X5)
- R8. Chou, C.-K., et al: "Holographic Assessment of Microwave Hearing," Science, 209:1143, 1980. (X5)
- R9. "Audible Radar," Scientific American, 247:113, September 1982. (X5)
- R10. Fox, Barry; "Low-Frequency 'Hum' May Penetrate the Environment," New Scientist, p. 27, December 9, 1989. (X4, X5)

BHT13 Hearing under Anesthesia

Description. The ability to hear, understand, and remember words spoken while under anesthesia.

Data Evaluation. The evidence for this phenomenon is primarily anecdotal, since scientific investigation is rather difficult. In addition, few doctors and scientists have taken any interest. Three of the four papers in our files are authored by the same individual. Rating: 2.

Anomaly Evaluation. Apparently the ears and their associated nerves are among the last to be affected by chemical anesthetics, but why this is so is unknown. True, it is surprising to discover that hearing is retained under lighter degrees of anesthesia, but other senses, such as pain itself, are likewise affected to different degrees by varying depths of anesthesia. The phenomenon is primarily curious rather than anomalous. Rating: 3.

Possible Explanations. None offered.

Similar and Related Phenomena. Hypnotic trances and even normal sleep are of variable depths and affect bodily and mental functions to different degrees.

EntriesX1. General observations.

The surgically anesthetized patient is able to hear and remember meaningful sounds after all reflexes and other sensory perceptions are gone. Most surgical procedures today are done with relatively superficial anesthesia and, therefore, care should be taken that frightening conversation is not carried on in the presence of the patient. Helpful suggestions regarding behavior during surgery and in the postoperative period can be given by the surgeon and the anesthetist to the seemingly unconscious patient. Evidence is accumulating that the unconscious state in human beings, regardless of cause, evokes behavior similar to that found in deep-trance states achieved through hypnosis. (R1)

X2. Case history #1. The case histories giving credence to the idea that people under anesthesia can perceive and understand what the doctors and nurses are saying are startling, to say the least. D.B. Cheek reports on one case history:

From the evidence so far available, it seems true that the hearing sense is maintained to depths of chemical intoxication beyond that at which all other perceptions and all commonly tested reflexes are suppressed. Bernard Galston of Skokie, Illinois, in discussing the writer's first report of memory, told of a patient he had anesthetized for a gastrectomy. As the stomach was being lifted out of the abdomen he noted cessation of respiration and heart beat. Before cutting down on the heart for massage, the surgeon asked that the husband be notified of the emergency. Nobody knew where the husband could be found. At this point the patient aroused and whispered around the endotracheal tube, "John's in the lobby." (R1)

X3. Case history #2. Careless remarks during surgery can adversely affect the patient, as in this case, also related by D.B. Cheek:

...a stage hypnotist, in a personal communication in 1961, told the author of a patient he had been asked to treat in 1947 after removal of her gall bladder. The patient had been vomiting before her surgery because of gall stones. The surgeon wondered why she continued to vomit after surgery. In deep hypnosis the patient ascribed her reaction to the words, "She'll never be the same." The vomiting stopped when the surgeon explained that he had really said, "She won't be doing that (vomiting) any more now." The patient had literally been trying to remain the same." (R4)

Hypnosis is sometimes employed to discover what a patient has heard while under anesthesia. Evidently, the words heard are often kept in the subconscious but still can affect the patient's bodily functions and recovery.

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- R2. Brunn, John T.; "The Capacity to Hear, Understand and to Remember Experiences during Chemo-Anesthesia: A Personal Experience," American Journal of Clinical Hypnosis, 6:27, 1963.
- R3. Cheek, David B.; "Surgical Memory and Reaction to Careless Conversation," American Journal of Clinical Hypnosis, 6:237, 1964.
- R4. Cheek, David Bradley; "The Meaning of Continued Hearing Sense under General Chemo-Anesthesia: A Progress Report and Report of a Case," American Journal of Clinical Hypnosis, 8:275, 1966. (X3)

BHT14 Variability and Sophistication of Human Tone Perception

Description. The surprising variability in tone perception from one person to another, and even from one individual's ear to the other. Of special interest is the apparent advanced nature of the human ability to interpret and identify pure tones and combinations thereof.

Data Evaluation. Our file of data is scant here and consists of material from popular science magazines. Rating: 3.

Anomaly Evaluation. The variability in human tone perception is no different than differences in other human faculties; i.e., sight. However, the phenomena of tone perception, perfect pitch in particular, suggest that some human brains somehow store tone standards for pitch identification and analysis of incoming sounds. This capability may be another example of "evolutionary overshoot", which seems to have had no survival value in the past and is useful today only in a cultural setting. Such precocious developments are rated as highly anomalous, since it is difficult to explain their origins and retention with current evolutionary theory. Rating: 1.

Possible Explanations. Evolution is directed toward some unperceived goal.

Similar and Related Phenomena. Human capabilities in mathematics, science, and artistic expression (BHB14).

Entries

X1. Tone perception varies from one ear to the other.

In some individuals the sensations in one ear differ from those of the other. Everard Home has cited several examples, and Heidmann of Vienna has treated two musicians, one of whom always perceived in the affected ear, during damp weather, tones an octave lower than in the other ear. The other musician perceived tones an octave higher in the affected ear. (R1)

listeners hear the second tone as higher in pitch than the first. Other people, hearing the same tones, insist that the second tone appears to be lower in pitch. (R3)

The experiments by Deutsch imply that most people have a "pitch-class circle" that is somehow recorded in their memories. Tones in one region of the circle are usually heard as higher while tones in the opposite region seem lower. However, the orientation of the circle is different for different people. (R3)

X2. Tone perception varies among individuals. Evidently the perception of music depends upon how the listener's brain is wired.

The discovery, made by psychologist Diana Deutsch of the University of California at San Diego, concerns pairs of tones that are a half octave apart. When one tone of a pair, followed by a second, is played, some

X3. Perfect pitch. Some individuals are blessed with "perfect pitch"; that is, the ability to identify a tone without hearing a second tone for comparison. The implication is clear that such people have a mental representation of standard tones etched into their memories. Those without this representation have "relative pitch"; which means that they have to hear other tones in succession

and compare them to identify a specific tone. (R2)

As in X2, above, this phenomenon suggests that some human brains have evolved complex, sophisticated circuitry for interpreting sound. It is difficult to see where such capabilities would have any survival value in primitive times. When did these faculties evolve and why? (WRC)

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- R2. "A Note on Perfect Pitch," Scientific American, 250:82, June 1984. (X3)
- R3. Peterson, I.; "Do You Hear What I Hear?" Science News, 130:391, 1986. (X2)

COMMUNICATION

BHT15 Anomalous Communication in Children

Description. The development in some children of nonstandard forms of communication, not necessarily vocal, that depart radically from the normal progression from vocal babbling to normal speech.

Data Evaluation. The scientific literature reviewed to date is rather silent on this phenomenon. In fact, we have only a single scientific reference. Rating: 3.

Anomaly Evaluation. The fact that infants can develop nonstandard forms of communication displaying most of the structures of standard human languages, implies that human language structure is encoded in the human brain, whether vocal, signed, or using some other sort of transmission. In other words, human language seems to be an inherited trait. The phenomenon is anomalous because language is usually considered to be acquired by learning-through-listening and advancing as an infant's vocal tract and nervous system develop. Rating: 2.

Possible Explanations. Human communication, in all its forms, is an inherited capability.

Similar and Related Phenomena. The discontinuity in the evolution of mammal communication (BHT16).

Entries

X1. Babbling with the hands. Human infants normally babble unintelligibly before they begin to use recognizable words. This vocal babbling seems to be continuous and compatible with the gradual development of speech. Scientists

currently see this progression from babbling to normal speech as controlled by the anatomical development of the vocal tract and the nervous system.

A different viewpoint was brought forward in 1991 when L.A. Petitto and

P.F. Marenette showed that deaf children reared by deaf parents, using the American Sign Language and their first language, babbled in signs rather than words. In fact, these deaf children went through the same progression from babbling to full-fledged "speech" that hearing, vocalizing children do. The implication here is significant. (R2, R3)

These observations challenge the widespread assumption that babbling requires normal hearing and an ability to speak aloud, the investigators argue. The brain apparently possesses some type of unified capacity for learning both signed and spoken language, they propose. (R3)

X2. The private language of identical twins. Rather frequently, identical twins converse with each other in words and sentences that represent a private language. K. Cassill provided an example in her book Twins with the Kennedy twins. At about the time that most children start saying "mommy" and "daddy", the Kennedy twins started babbling to each other in their own language---in words that were largely unintelligible to their family. To communicate with their parents and grandmother, they used a variety of nonverbal signals plus a few English and German words. (Their grandmother spoke only German.) The twins were classified as retarded and were enrolled in a special school. There, they amazed everyone with their fast learning. They were obviously not retarded; but what language were they using with each other? A speech specialist was called in. He discovered the private language of the Kennedy twins.

Now, as experts patiently analyze

tapes made of the Kennedy girls' conversations, they are finding that the speech consists in part of German words, with about as many English words or sounds, and a very great many phonological coinages---substitutions of sound in patterns that are fundamentally like the English and German that the children have heard from their elders. Their sentences seem to have syntax, tenses, qualifiers and other parts of speech needed to make their meanings clear, at least to each other. Whether they invented the syntax and other refinements or abstracted them from what they heard around them is the question---and we can only guess at the answer. The Kennedy twins and a few others like them have accelerated scientific interest in idioglossia (sometimes called cryptophasia), the private languages that many twins develop to communicate with each other, at least for a limited time. (R1)

Apparently, nearly 40% of identical twins develop their own private languages.

References

- R1. Cassill, Kay; "Exceptional Twins: The Ultimate Sharing Experience," Twins: Nature's Amazing Mystery, New York, 1984, p. 164. (X2)
- R2. Petitto, Laura Ann, and Marenette, Paula F.; "Babbling in the Manual Mode: Evidence for the Ontology of Language," Science, 251:1493, 1991. (X1)
- R3. "Hands-On Babbling," Science News, 139:205, 1991. (X1)

BHT16 Discontinuity in the Evolution of Communication

Description. The great gaps between human communication capabilities and those of the other mammals, particularly the primates and cetacea.

Data Evaluation. Anthropologists and mammalogists have long studied primate communications, both intraspecies and interspecies. Similar research with the cetaceans is well underway but still in its infancy. Rating: 2.

Anomaly Evaluation. The existence of human communication apparatus (vocal tract, language, large brain) that is far in advance of the other primates is highly anomalous. This capability seems to greatly exceed that required for survival and reasonable competitive advantage in a primitive milieu. Other hunter-gatherers are highly successful without sophisticated communications. The coordinated development of the different parts of our communication system seems to be beyond the reasonable capacity of random mutations. (The double use of the word "reasonable" is of course a subjective call.) Rating: 1.

Possible Explanations. The coordinated, progressive accumulation of chance mutations. Or, more controversially, purposeful development shaped by influences as yet unrecognized by science.

Similar and Related Phenomena. Anomalous communication in children (BHT15); the enigma of human culture (BHB14); the nature of the human brain (BHO); mammalian communication (BMT).

Entries

X0. Background. Our human capacity for communication via the spoken word sets us off from the other mammals even more sharply than our bipedalism and use of tools. It is true that chimps and birds can be taught a few signs and/or words, but their talents are severely limited. The cetaceans (whales and dolphins), on the other hand, do seem to transmit rather complicated messages via sound. Unfortunately, we really know very little about the sophistication of their languages. Apes and the cetacea do communicate easily among their own kind and to a very limited extent with us. The communication discontinuity between humans and the rest of the mammals is not deep or profound. After all, all species can communicate in one way or another, not only with each other but also, in more limited ways, with other species. Nevertheless, human communication capabilities are different enough to warrant further inquiry.

Although humans do send visual signals from one to another, our primary channel is sound. The other primates can howl, growl, and scream; they can even be taught to say a few human words, but sound is not their primary communication channel. E. Morgan has written:

But between primates, especially anthropoids, visual communication is the channel that has been developed to the highest degree of precision. Through the medium of a great variety of gestures, postures, movements, facial expressions, and the management of spatial relations between individuals, they can convey to one another with considerable subtlety their feelings and wishes, their immediate intentions, and their social relationship. (R3)

Quite obviously, the different communication channels used by humans and the other primates do imply an important discontinuity---perhaps one of evolutionary significance. The cetaceans, though, employ the same primary communication channel that humans do: sound. What is the significance here?

X1. Communication channels. Most scientists focus on the communication gap between humans and the other primates.

Is there a human-cetacean connection? The proponents of the Aquatic Ape Hypothesis would have us believe that humans went through an aquatic phase in their evolution.

X2. Comparative anatomy. Comparing again humans with the other primates, the human vocal tract does have one feature absent in other primates: the movable velum, which gives us the ability to open or close the nasal passages while speaking. This characteristic, though, is really only a trivial difference. The anatomy of the apes' vocal tract is so much like that of humans that they can produce many of the sounds necessary for a spoken language. But the apes do not speak in the wild, and in captivity can be trained to make only a few of the sounds common in human languages. (R3) Anatomically speaking, apes might be able to converse surprisingly well, but not in anything that sounds like human language. P. Lieberman stated:

Living nonhuman primates lack the anatomic apparatus that is necessary to produce the full range of sounds of human speech. Monkeys and apes could not produce 'articulate' human speech even if they had the requisite mental ability. (R2)

The sound-making apparatus of the cetaceans, on the other hand, is radically different from that of humans, despite the fact that they also communicate via sound waves. (See BMT, in another volume.) To answer the question posed in X1, there is no close anatomical relationship between humans and cetaceans in the methods of sound production, but there is one between humans and the apes.

X3. Language. Experiments with both chimpanzees and dolphins demonstrate that they can comprehend some aspects of human language. Chimps, for example, can put signs together to ask for bananas. Chimps also have their various visual and vocal signals, but their language is rudimentary in comparison to that of the most primitive peoples. As for the fantastic array of cetacean clicks, whistles, and "songs",

we know virtually nothing about them in the context of language structure, if indeed the concept of language is applicable to them! All we can say is that human languages appear to be more advanced than those of the whales and dolphins

X4. The brain. Humans apparently excel all other animals in communication. We have a good sound transmitter, many sophisticated languages, and above all a large brain with which to frame and comprehend messages. It is our brain in the end that creates the apparent great discontinuity between ourselves and the other primates in the matter of communication. (In this Catalog, the brain-as-an-organ is classified in BHO, in another volume.) It is sufficient to state here that not only is the human brain unusually large for our size, but it is more complex than those of the other mammals. D.W. Cheek attributes the following quote to G. Walker:

...the mechanisms of the brain reveal a deep physiological division between man and ape, deeper than the superficial physical differences of most distant origin. (R2)

Cheek goes on to point out experiments that showed that, contrary to the human situation, monkeys show no evidence of hemispherical dominance. This leads him to the following pertinent paragraph:

If Noam Chomsky is correct in his analysis of deep structures [in the brain] which are manifested in surface structure in generative grammar, then neurobiologically this would call for the view that aspects of this structure are wired-in to the brain with certain cortex connections programmed in such a way as to make the emergence of language inevitable and uniquely human...These capacities for symbolic language depend upon neural mechanisms which develop only in the dominant cerebral hemisphere rather than bilaterally. It is hard to conceive how such an arrangement could have evolved successfully from the cerebral organization of the chimpanzee or other primate. (R2)

Cheek wisely restricts his analysis to the primates, for we understand very little about how the brains of the cetacea work. We do know that the brains of whales and dolphins are, like ours, large and complex. They may also be very different.

X5. Possible origins of the communication discontinuity.

The human-ape language gap. This gap exists because: (1) Humans employ mainly the sound channel rather than the visual channel for real-time communication; and (2) Human languages are rich and complex in comparison with those of the apes.

The mainstream explanation of the human use of the sound channel for real-time communication is that speech is much more efficient than visual signs during hunting and tool-using. This is a debatable explanation because many animals, such as lions, hunt silently and very well in groups. Also, the use of tools seems best taught by visual demonstration. Swimming against the mainstream is E. Morgan, who proposes that humans now use sound because they had to acquire this channel during an aquatic phase of their evolution. (R3) Admittedly, sound communication is more efficient in the water than visual signals, but humans cannot generate sound effectively underwater after the fashion of the cetaceans.

The rich and complex human languages are said to be possible only because of our large, sophisticated brains. Of course, the advanced nature of the human brain is an evolutionary problem in its own right. (BHO) But if given a brain adequate for speech, why would humans need anything more than a few simple words to survive quite well? The quantum jump from ape-talk to Shakespeare is colossal change without

easily demonstrated survival value in a hunting-and-gathering society. The advanced character of human communications may represent another overshoot of evolution. (WRC)

The human-cetacean discontinuity. In assessing the magnitude of this discontinuity, we are hampered by ignorance. The cetaceans use the sound channel, as we do; their brains are likewise large; and they seem to have a language of sorts, as in the long, information-rich songs of the humpback whales. (BMT) Instead of the great, difficult-to-explain evolutionary quantum jump in communication capability from ape to human, the gap between humans and cetaceans apparently exists because of different evolutionary paths taken. Nevertheless, in spite of their radically different environments and evolutionary histories, the whales and dolphins have also acquired big brains and "spoken" languages. Just why the cetaceans acquired such capabilities along with their large brains could also be a matter of evolutionary overshoot. Fish, for example, do very well without large brains and sophisticated communication; what "forces" are responsible for the cetaceans' "excessive" talents?

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- R2. Cheek, Dennis W.; "The Creationist and Neo-Darwinian Views Concerning the Origin of the Order Primates Compared and Contrasted: A Preliminary Analysis," Creation Research Society Quarterly, 18:93, 1981. (X4)
- R3. Morgan, Elaine; "Speech," The Aquatic Ape, New Yor, 1982, p.89. (X1, X2)

HUMAN SENSITIVITY TO MAGNETIC FIELDS

BHT17 The Ability to Sense and/or Detect Magnetic Fields

Description. The ability of the human body to consciously sense steady-state and/or varying magnetic fields. The sensations may be rendered as light signals, sounds, or other biological effects. The human body may also generate, in response to magnetic fields, signals that are not consciously perceived but which still affect bodily functions, such as mental states and even sleep.

Background. The human body's interactions with magnetic fields is closely related to the purported human ability to locate points of the compass and perform other feats of navigation (BHT18). However, the sensing of a magnetic field is not necessarily associated with navigation (as in the pineal gland's activity), nor does navigation absolutely require a magnetic input. For these reasons, the sensitivity to magnetic fields is separated from navigation.

Data Evaluation. Many of the biological effects blamed on magnetic fields are poorly supported by scientific observations, being in fact merely anecdotal and of dubious quality. Only the so-called "magnetic phosphenes" (X4) are reasonably well documented. Rating: 3.

Anomaly Evaluation. That the human body should react somehow to imposed magnetic fields is not surprising, because our nervous system is electrical in nature. Even the existence of a dedicated sensor of magnetic fields, such as those apparently possessed by birds and other animals, would occasion little surprise. Why should humans be different? Even so, some of the bodily sensations generated in response to magnetic fields reported below are on the strange side, assuming they are real. Rating: 3.

Possible Explanations. Strong magnetic fields interrupt the proper functioning of the human nervous system.

Similar and Related Phenomena. Human navigation senses (BHT18); "electrical" and "magnetic" people (BHC).

Entries

X1. Early experiments on human sensations experienced in steady magnetic fields. It is of importance to the investigation of human navigation skills to establish whether or not humans are able to detect in any way the presence and absence of magnetic fields.

Vague sensations reported by "sensitives". Some of the early work in this field was carried out by the English Society for Psychical Research in connection with mesmerism and "magnetic cures." In the case that follows, a claim that some persons could indeed sense

the presence of a steady magnetic field was tested by W.F. Barrett at the Royal College of Science, Dublin. First, a resume of the Society's tests:

The sectional Committee of that Society intrusted with this and cognate work has published a preliminary report, which contains a fragment of evidence pointing in the direction of the existence of a magnetic sense in certain individuals. Three persons have been found by the Committee, who, when their heads were placed near the poles of a powerful electro-

magnet, could tell by their sensations when the magnet was excited or not. One of these "sensitives" told the investigating Committee accurately twenty-one times running whether the current was "on" or "off" from a peculiar and unpleasant sensation he alleges that he experienced across his forehead. Every precaution that suggested itself was taken to prevent the subjects gaining any information through the ordinary channels of sensation of what was being done at the contact-breaker placed in another room. (R1, R3)

Now, the testimony of Barrett:

Two or three months ago one of the gentlemen who appeared to have this magnetic sense was in Dublin and I took the opportunity of repeating with care in my own laboratory the experiments previously made at the Society's rooms in London. The result satisfied me that this individual did in general experience a peculiar sensation, which he describes as unpleasant when his head was held within the field of a powerful magnet. Nevertheless the keenness of his magnetic sense, if such it be, varied considerably on different days, and sometimes he stated that he could detect little or no sensory effect. Usually the effect was felt most strongly when the forehead was in the line joining the two poles; but one day, when he was suffering from facial neuralgia, he found that his face was the most sensitive part, and complained of a sudden increase in pain whenever the magnet was excited, his face being near the poles. (R1, R3)

Obviously, direct physical sensations experienced in magnetic fields are highly variable from individual to individual and even change with time for those who are sensitive.

Effects of a magnetic field on sleep. A magnetic field may have an even more vague effect on a sleeping person. Perhaps the geomagnetic field somehow induces a restlessness in some people that is just below the level of overt sensation.

In connection with this subject, it may be of interest to note the idio-

syncracies of some individuals, who affirm that they can only sleep well when their bed is in a definite direction with regard to the magnetic meridian. Dr. W.H. Stone has mentioned his own inability to sleep soundly in a north and south position. Baron Reichenbach, however, states that in the sensitive temperaments he examined he invariably found that the most refreshing sleep was obtained when the head was to the north and the feet to the south, positive discomfort being experienced by several of his subjects when the east and west position was assumed. (R1)

X2. Sensations felt in the presence of magnetic fields by hypnotized subjects.

In the 1800s, the sensitivity of human subjects to magnetic fields was thought to be affected by their mental state, particularly when they were in a hypnotic trance. Many of the old reports are difficult to accept, as is this account from a Dutch experimenter, P.G. van Ghert:

Today, when I arranged some experiments with the magnet, while the patient was in a room upstairs, and I was below, so that she could not see what I did, she immediately came down, and said that she did not know what was the matter with her, but that it was impossible for her to resist the influence.

I put her to sleep in the usual manner...I held the magnet a few inches from her knee; but she immediately besought me to take it away. I requested her to touch it with her hands. At first she would not do this, but finally took hold of it, and held it for a considerable time in her hand without experiencing any inconvenience. I made passes with it from the head to the knee which produced a strong influence. She said she saw a blue glow proceed from it, which penetrated into herself. (R1)

Van Ghert goes on to describe more vague sensations experienced by his subject, as well as additional luminous phenomena. These are obviously at odds with most people's experiences with magnets, as well as being inconsistent with modern laboratory results.

A more sober report on hypnomagnetics. This is by an anonymous writer in Science from 1887.

Among the oldest claimants to scientific recognition in this field is the statement that a magnet has a peculiar effect upon hypnotic subjects. Sometimes the application of a magnet causes trembling and tingling; again it is said to produce contractions of limbs, and cause such contractions to pass from one side of the body to the other; and so on. Professor Delboeuf, a successful observer in this field, has very ingeniously tested these claims, and made much progress towards showing their falsity. He experimented upon a boy of fourteen, an experienced hypnotic subject susceptible to 'magnetic' influence... Professor Delboeuf had three steel bars made exactly alike, two of which were strongly magnetized, and the third not. He gave the boy a real magnet, and asked him whether he felt anything. After an exploring glance of from thirty to forty seconds, the boy felt tingling sensations, then pain and the usual symptoms. The same was done with the other hand, and he was shown that the bar was a real magnet. Professor Delboeuf then drew the false magnet from his pocket and gave it to the boy; no effect followed. Then the third (true) magnet was given to him, with the request that he should say whether it was a magnet or not. No contraction followed; and from now on, the boy had no clue as to the true or the false magnet. (R2)

Hypnosis apparently has no demonstrable effect upon a person's ability to perceive a magnetic field.

X3. Direct sensing of magnetic disturbances. Auroras are associated with intense solar storms and powerful changes in the earth's magnetic field. It is remotely possible that the following account of physical sensations coincident with auroral activity may represent the human sensing of rapid variations of the earth's magnetic field.

On several occasions, before I was aware of the happening of a particular Sun disturbance or auroral dis-

play, I have felt peculiar numbness in my hands and body, an extraordinary chilly creeping sensation over my entire flesh, sometimes accompanied by a headache or an internal gripping, shrinking feeling, quite distinct from the action of a low temperature. Shortly after I learned that a Sun disturbance was in progress. During certain auroral displays on perfectly calm nights, I have felt in addition, when turned in the direction of the display, a distinct pulsation, like the glow from a fire, beating on my face, with a tingling all over my body. This has occurred so often that I am compelled to believe it to be an undoubted fact that I am actually affected as if by an electric shock, however impossible it may seem to others. (R4)

No one else has reported such sensations during auroral activity. One sees here, however, a possible connection with those reports of disturbed human behavior correlated with solar activity. (BHB3)

X4. Visual effects during changing magnetic fields. Alternating or suddenly changing magnetic fields cause the sensation of light in most people. In contrast to most of the biological effects of magnetic fields reported in this Catalog entry, the "magnetic phosphene" is a well-established phenomenon. The description below is from a paper by R.O. Becker:

The primary biological effect associated with this [alternating or interrupted] type of field application is the production of magnetic phosphenes (by definition: phosphene, a sensation of light produced by physical stimuli other than visible light). The magnetic phosphenes are uniformly described as colourless or occasionally light blue tinted, shimmering luminosities appearing in the borders of the visual fields. They are reported to be produced by the application of 10 to 100 cps alternating fields to the temporal areas of the human head. Magnusson and Stevens noted that the intensity as well as the character of the sensation is strongly frequency-dependent. The intensity is greatest (for any

given field strength) between 20 and 30 cps. Below 25 cps the individual flashes of the phosphene are seen to be synchronized with the field frequency, while above 30 cps interference and standing wave patterns are present. Above 90 cps the phenomenon becomes much less evident, and field strengths many times over threshold values produce only minimal increases in luminosity. (R5)

E.E. Ketchen et al state that magnetic phosphenes are observable only when an alternating magnetic field is applied near the eyes. They mention frequencies of 10-90 cps with a field strength of 300 G being effective in generating the effect. The retina seems to be the site where the effect is produced, but this is still a matter of controversy. (R7)

X5. The effect of magnetic fields upon brain waves. Obviously we do not perceive variations in our brain waves as primary sensations, such as light or sound, but they are instead associated with altered states of consciousness and perhaps reaction times and other aspects of behavior and information processing. The only reference on hand that addresses this phenomenon refers to some Russian research:

Seven years ago V.M. Mikhailovsky and others (Proceedings of the Ukrainian Academy of Sciences, 1969, no. 10, series B, p. 929) noted that a 1000 gamma magnetic field (about 1 per cent of the normal magnetic field on the surface of the earth) varied at frequencies of 0.1-12 Hz caused a "measurable reaction" to the EEGs of three of 10 people studied. In one case, the field caused a "radical change in the character of the EEG", producing a new rhythm of 0.4-0.7 Hz. The magnetic wave also caused increased pulse rate, cold sweat, and headaches for this person. (R6)

The implication is that low-intensity, low-frequency magnetic impulses, perhaps naturally generated, can modify human brain activity and, possibly, alter behavior and performance. The initiation of epileptic seizures has been suggested as a potential effect. This

would be analogous to the effect of flashing strobe lights upon epileptics. (R6)

X6. The pineal gland as a magnetic-field detector. The pineal gland secretes melatonin which is thought to be the source of our body's circadian rhythms. Part of the retina's output signal is, in fact, conveyed to the pineal gland, so that our biological cycles can be synchronized with the outside environment's day-night cycle.

More recently, it has been shown that the pineal is also sensitive to the daily cyclic pattern in the Earth's magnetic field. Melatonin secretion in human subjects may be changed at will by exposure to steady magnetic fields of the same strength as the geomagnetic field. Apparently, nature determined that biological cycle activity was too important to be left to one environmental signal alone. (R9)

The pineal gland, then, represents at least one biological sensor of magnetic fields, although we are not immediately conscious of its output signal, as we are with the magnetic phosphenes of X4.

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Sens? La Perception du Champ Magnétique," La Recherche, 15:114, 1984.
(Cr. C. Maugé)

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(X6)

BHT18 Human-Navigation Senses

Description. The ability of humans to point out compass directions and/or the directions of fixed points, such as their homes, without the aid of instruments or environmental clues.

Data Evaluation. The anecdotal and experimental literatures are substantial but inconclusive. The latter, in particular, are both positive and negative regarding the reality of the phenomenon. Some navigation experiments are considered suspect because of the lack of controls aimed at preventing cheating and the detection of environmental cues. The reality of a human navigation sense remains questionable. Rating: 3.

Anomaly Evaluation. Other animals find their ways home and migrate accurately over immense distances. Since human evolution is considered to be consistent and even continuous with all animal evolution, it would not be surprising if humans possessed some talent for navigation. This capability might be only vestigial or noticeable only in select individuals. In this sense, any human navigation senses of direction or homing is not anomalous, although most scientists doubt that it exists. However, in a larger context, the biological and physical mechanisms forming the basis of navigation sense(s) are matters of great ignorance for all species. In sum, if a human navigation sense does exist, it would be both surprising and highly anomalous. Rating: 1.

Possible Explanations. As proposed for other animals, humans may secrete magnetite particles which may form the basis of magnetic-field sensors.

Similar and Related Phenomena. Human sensing of magnetic fields (BHT17); the remarkable navigation capabilities of other animals (BMT, BBT, BRT, etc.)

Entries

X0. Introduction. In this section, we divide human navigation into two types of phenomena: (1) The apparent ability of some persons to orient themselves with respect to either the compass points or some fixed grid; and (2) The apparent ability of some to point out the direction of "home," either their real home or a fixed point from which they started. These two talents may be

related in the sense that the geomagnetic field may be the primary reference in both cases.

That humans can sense and use the geomagnetic field for navigation is not impossible, but less exotic references, perhaps employed unconsciously, are always possible. The sun, the wind, odors, and distant landmarks are just a few of these. Also, blindfolded subjects

may "peek down the nose" or cheat in some other way in navigation experiments. To foil all of these possibilities, navigation experiments must be designed very carefully. Furthermore, anecdotes about navigational prowess must be examined skeptically.

X1. The orientation sense. All of our information here is anecdotal.

A mental map. Probably most people carry in their heads mental maps of the rooms of their home and workplace. Nearby roads, trails, and topography are often added to such maps. We use these maps for orientation, but usually they are of very limited geographical extent. In some, though, the mental maps cover prodigious areas in great detail, as in this testimony by M.L. Comstock:

I refer all objects to two rectangular co-ordinate axes which agree with the cardinal points. In all places where I feel at home, these lines are consciously present, and all roads running north and south, or east and west, coincide with, or seem to be parallel to these axes. All places which I have visited, from Massachusetts to Nebraska, are, with few exceptions, connected together in one system.

The principal origin of this system is in the northwest corner of a schoolhouse in Hamilton county, O. There, when a boy, I sat under the direction of a teacher to study geography. With face toward the north, I looked through a window along the meridian. I could at pleasure see east or west, or, if need be, south, through opposite windows. A thorough course in geography fixed in my mind the axes of my system, which have been present with me ever since, a secondary origin going with me everywhere. All places with which I am familiar form parts of this system, and any new place visited is immediately referred to its proper location. (R1)

Comstock's impressive mental map failed in several locations. One of these was Washington, DC.

Washington City is another place which is entirely out of my system. I entered the city after nightfall. Somewhere between Baltimore and Washington, I lost my co-ordinate axes, so that, when I came to consider directions, Pennsylvania Avenue was turned half round, east was west, west, east; and I had not and have not the least sense of north or south. No study of maps, and no thinking over the subject, has the least effect in arranging things properly. (R1)

A "magnetic" sense of direction. The following anecdote was related by H.C. Warren in the Psychological Bulletin:

A friend of mine recently informed me that his son, T.D., aged 5, is able at all times to tell direction. My friend's attention was called to this during a summer trip by the boy's remarking that the street on which they lived at home ran a certain way, which he indicated. As a matter of fact the street runs nearly due north and south. Finding by compass that the boy was right, he has since tested him from time to time in various places, at night, blindfolded, etc., with uniformly correct results. I had an opportunity to test the boy several times with a compass, walking him around blindfolded each time before the test, so that he would lose all direct notion of present orientation. All the results were correct to within a few degrees. When the question is put to him, he motions with his hand in the right direction instantly and without hesitation or taking observations. He also distinguishes correctly north (the direction of the railroad station at home) from south. On account of the boy's bashfulness I was unable to prolong the tests or vary them sufficiently for scientific accuracy. They led me, however, from an absolutely skeptical attitude to one of inquiry.

The problem is offered to those interested in child study as a matter worthy of investigation. If such a sense has been developed in the phylogenetic scale (as suggested by the migration of birds) it may still appear in a rudimentary form in man, and distinct traces may be discover-

ed in childhood which are lost later in life. (R3)

Some 23 years after Warren reported on the boy with a "magnetic sense," H.R. De Silva contacted him and discovered that he no longer possessed any unusual sense of orientation.

De Silva continued his report with results of his own tests of a boy also supposedly capable of compass orientation.

With the cooperation of the parents I tested the boy in our psychological laboratory. I took him into a dark room, blindfolded him and confused him by revolving him (without, however, making him dizzy) in a noiseless rotating chair. After a few correct judgments he began to make large errors, and soon lost all absolute orientation. He oriented himself immediately as soon as he was permitted to see. I convinced myself that he possessed no genuine "magnetic" sense of direction. (R5)

X2. Instinctive homing: a lost talent transcended. An anonymous writer in the Eclectic Magazine set the stage well for the next phase of our inquiry into the presence or absence of human navigational talents; namely, can humans instinctively find home?

Now, what is the reason why, if man really inherits the physical, mental, and moral powers of the other animals, as the theory of evolution maintains, his exceptional powers seem always to be distinctively and emphatically human, and never in any way modelled on the highest of the exceptional powers of the animal world? The most wonderful of the instincts of the lower creatures appear to be extinguished by the advance of reason, instead of to be stimulated by it. The lost child cannot find its home as the carrier pigeon finds it. The born explorer carries no instinctive compass in his breast, though the swallow seems to carry one... Man transcends humanity, not in those respects in which he has inherited most from the races beneath him, but in those respects in which he has inherited the least. The stra-

tegist who is a strategist almost from boyhood, betrays no affinity with any of the instincts of the creatures whose instincts are most wonderful. The deaf musician who composes harmonies which he never even hears, inherits nothing from the inferior tribes. The mechanic who contrives in his infancy new ingenuities of science, shows a precocious insight into the principles of science, and betrays no trace of the architectural instincts of the bee or the bird. All the extraordinary faculties of our race connect man specially with the future rather than the past; with the race to come, not with the races whose experience we are supposed to inherit. (R2)

In the light of these musings, it is perhaps not surprising that it is very difficult to prove satisfactorily that humans have retained any of the navigational capabilities of the other animals. Humans find their way home by building gyroscopes and radars instead of emulating the migrating birds and fish! (WRC)

X3. Instinctive homing: an anecdote. But perhaps our homing sense is not, as implied in X2, completely lost. It may resurface in emergency situations. W.H. Hudson provides a pertinent anecdote:

My case was this. I was in a forest and in the middle of a thick wood covering an area of several miles, with dense thickets and bogs and streams on its borders. I had been in it for several hours, watching some woodland birds I was interested in. Absorbed in my occupation, night surprised me, and a sudden darkness, caused by a cloud, overspreading the sky, I realized that I was lost, since I did not know in which part of the wood I was or which direction to take, and could not see on which side the sun had gone down. I feared, too, that if I tried to get out, I should most probably get among the bogs and streams and dense thickets. And it was getting cold, as I was in the thinnest summer clothes and had been perspiring profusely. Suddenly, while standing there peering into the

thick blackness all around me and feeling keenly distressed, relief came, and it was as if I had been captive and was unexpectedly set free. I did not know where I was and where the feared bogs were, but I knew in which direction to go. There was no hesitation, no shadow of a doubt. Off I went, rejoicing, where my supernatural faculty, as it then almost seemed to be, commanded, and after walking for half an hour came upon a blacker blackness where the undergrowth was so dense that it was extremely difficult to force my way through it. Again and again I came to places like that, yet dared not attempt to get round these thickets, fearing that if I varied the least bit from the bee-line I was making, I might lose the sense of direction that guided me. I must, I felt, keep the line. Eventually I got free of the wood, and coming into an open space, I dimly discerned a dwarf tree with a stout, malformed trunk, which I recognized as one of my landmarks on the borders of the wood, and there saw that I was actually making a bee-line for my destination. Now I knew where I was, and remembered that another smaller wood lay before me, then a mile or so open grass-land to the lonely farmhouse I was making for. (R4)

Hudson went on at length concerning the transcendental nature of his experience. His emotion upon his acquisition of his directional sense was "one of intense elation"; it was "a strange experience". Thinking further on the phenomenon, he wondered:

...if this sense is so feeble in or so lost to us, how came it to revive and function so perfectly on this one occasion?

I can only suppose that it is not actually obsolete in us, that it still exists and continues to function feebly---so feebly, indeed, that we rarely or never become aware of it. (R4)

Scientists are not impressed by such testimony. If a vestige of the homing sense resides in human, it should surface in carefully controlled experiments. (WRC)

X4. The R.R. Baker experiments. The most ambitious human-navigation experiments took place in England, beginning in the late 1970s, under the direction of R.R. Baker.

The Manchester series.

The whole thing began with a series of experiments carried out between 1976 and 1978 using as subjects third-year zoology students from Manchester University. On each trip students were blindfolded and displaced in a van over a complex and winding route to sites between 6 and 52 km from the university. On arrival at the destination, the students were removed singly from the van and asked to do three things. Without removing their blindfold, each person was asked first to state as north, north-east, etc., what direction they thought they were from the university and secondly to point toward the university. Finally, they were asked to remove their blindfold and once again point toward the university.

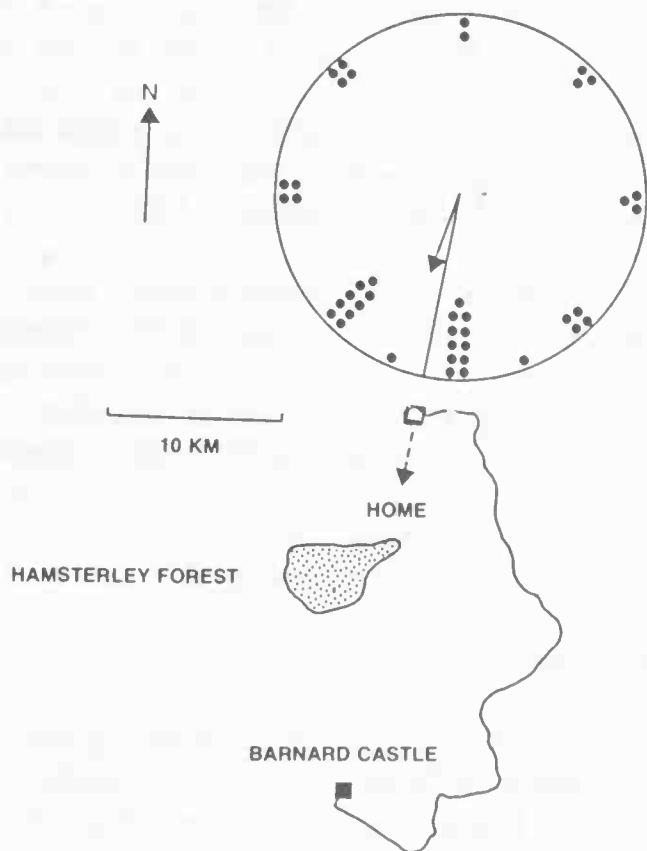
We expected that the students would estimate the "home" direction randomly while blindfolded whereas estimates made once the blindfolds were removed would be well-oriented toward home. The first surprise came when the converse was found to be true. While still blindfolded, the estimates of home direction, particularly the descriptive estimates of north, north-east, etc., were unusually highly accurate, but when the blindfolds were removed the subjects often became disoriented. This meant that somehow the students had managed while blindfolded to follow the twists and turns of the outward journey and maintain an awareness of the direction of home, but that as soon as they were allowed to see their surroundings they were often confused. (R6)

The first Barnard Castle experiments.
We use here R.O. Becker's summary.

On June 29, 1979, R. Robin Baker, a young University of Manchester researcher into bionavigation, led a group of high school students into a bus at Barnard Castle, near Leeds, England. Baker blindfolded and ear-

muffed them, then gave them all headbands. Half of the headgear contained magnets and half contained brass bars that their wearers thought were magnets. As the volunteers leaned back to concentrate, Baker wove a mazelike course through the town's tangled streets, then traveled a straight highway to the southwest. After a few miles the coach stopped while the students wrote on cards an estimate of the compass direction to the school. Then the driver turned through 135 degrees and continued east to a spot southeast of the school, where the students again estimated their direction. When the cards were analyzed, it turned out that the persons with brass bars by their heads had been able to sense the proper heading quite reliably, while those wearing magnets had not. (R11)

Details of this particular experiment can be found in Baker's book (R10) and his article in Science. (R7)



(Bottom) The route taken in the first Barnard Castle experiments. The open square indicates the test site. (Top) Each solid circle represents an individual's estimate of the direction home. (Adapted from R7 and R10, X4)

The second Barnard Castle experiments. The bar magnets used in the first experiments had caused difficulties because they tended to slip from their holders. They were replaced with helmets that could, in effect, cancel out most of the geomagnetic field with Helmholtz coils. In the actual experiments, some coils were activated and some were not. Baker considered these tests very successful, concluding:

Speculations concerning a "sixth" sense in humans have been rife for just about a century and during that time a magnetic sense has always been one of the main contenders. During the nineteenth century the common view was that although such a sense may be active in aborigines and perhaps in children it was atrophied in adult industrialists. The Manchester and Barnard Castle experiments have shown not only that the sense exists but also that apparently we can all make use of it. (R6)

Not all scientists concurred with Baker's assessment. J. Randi, for example, was shocked at the poor security arrangements in the Baker experiments. The blindfolds used, according to Randi, were "rudimentary at best", and sunlight could have been sensed by the subjects, giving them directional fixes. (R12)

X5. The Princeton attempts at replication. The Princeton tests utilized the advice of J. Randi. The experimenters, J.L. Gould and K.P. Able, employed peek-proof blindfolds and eliminated the solar radiation clues. Otherwise, they followed Baker's approach closely. The results were emphatically negative. (R8, R9, R12)

In attempting to explain the failures of Gould and Able to replicate his work, Baker suggested that the results might have been thrown off by geomagnetic storms, by weak magnetic gradients inside the bus, and by the greater magnetic contamination of the Princeton area in comparison to rural England! (R11)

X6. The Australian experiments. Not to be outdone by English and American experiments on human navigation, a team of Australian researchers at the University of New England, at Armidale, New South Wales, carried out a modified version of Baker's experiments. Using a total of 35 subjects, D.J. Walmsley and W.R. Epps drove them in a minibus on circuitous routes around the city. The subjects were blindfolded and environmental clues were strictly controlled. At various points, the blindfolded subjects were asked to point to their place of residence rather than the starting point of the journey.

Walmsley and Epps, apparently unaware of the Princeton failures at replication, fully accepted Baker's claim that he had proven the existence of a navigational sense in humans. The Australians concluded:

This note extends [Baker's] work by describing an experiment which showed that blindfolded humans, deprived of environmental cues, also have an ability to estimate accurately the direction of their place of residence within a town, even when driven around that town in such a way as to render them unable to identify where they are. The experiment throws into question the explanation usually offered for the existence of an innate sense of direction, namely, its value to the species, in an evolutionary sense, in facilitating a return to the starting point of exploratory journeys. (R13)

Walmsley and Epps also comment to the effect that women generally score better than men in navigation experiments, and that this, too, argues against the evolutionary explanation offered above, since the males are usually supposed to be the explorers and hunters.

X7. The University of Tulsa Experiments. Another failure at replication was reported by L. Zusne and B. Allen in 1981. Here, a novel variation of the Baker-type of navigation experiment was carried out after "rethinking" the problem:

If the laboratory is thought of as the "release site" to which a subject has gone from his home, with all

directional clues eliminated, subjects when orienting themselves in the laboratory would be performing exactly the same task as they were performing outdoors even though they knew exactly where they were

Accordingly, 12 male and 18 female undergraduates were tested under such conditions. Subjects were met outside the laboratory and checked on whether they knew which way was north. A peekless cardboard box blindfold was placed on their heads, and they were led into the windowless, totally dark and unfamiliar room along a path involving three turns. Subjects were led to a swivel chair and seated, each approaching the chair from a different direction. They were spun around, the experimenter moving around the subject in an unsystematic fashion as well. Instead of asking each subject to point to his "home," the task was made easier by asking all subjects to position themselves to face north. The position of the chair was recorded from a circular scale attached to its base. Each subject was given 12 trials. Fifteen subjects were thus tested one day, five the next. On the third day, 10 subjects were tested alternately, five with and five without a bar magnet (300 gauss at poles) attached to the top of the blindfold. The N pole was over the subject's forehead, but they were not told of the magnet. (R14)

All subjects gave directional responses that were scattered randomly in all directions. Zusne and Allen concluded that humans could not naturally orient themselves using the geomagnetic field.

References

- R1. Comstock, Milton L.; "Sense of Direction," Science, 3: 31, 1884. (X1)
- R2. "Lost Instincts and Rare Faculties," Eclectic Magazine, 47:400, 1888. (X2)
- R3. Warren, H.C.; "'Magnetic Sense' of Direction," Psychological Bulletin, 5:376, 1908. (X1)
- R4. Hudson, W.H.; "On the Sense of Direction," Century Magazine, 104:693, 1922. (X3)
- R5. De Silva, Harry R.; "A Case of a Boy Possessing an Automatic Direc-

- tional Orientation," Science, 73:393, 1931. (X1)
- R6. Baker, R. Robin; "A Sense of Magnetism," New Scientist, 87:844, 1980. (X4)
- R7. Baker, R. Robin; "Goal Orientation by Blindfolded Humans after Long-Distance Displacement: Possible Involvement of a Magnetic Sense," Science, 210:555, 1980. (X4)
- R8. Gould, James L., and Able, Kenneth P.; "Human Homing: An Elusive Phenomenon," Science, 212:1061, 1981. (X5)
- R9. "Americans Can't Find Their Way" New Scientist, 90:835, 1981. (X5)
- R10. Baker, R. Robin; "A New Human Sense: the Compass in the Head," Human Navigation and the Sixth Sense, New York, 1981, p. 51. (X4)
- R11. Becker, Robert O., and Selden, Gary; "Breathing with the Earth," The Body Electric, New York, 1985, p. 254. (X4, X5)
- R12. Randi, James; "Homing Abilities of Bees, Cats, and People," Skeptical Inquirer, 11:186, 1986. (X4, X5)
- R13. Walmsley, D.J., and Epps, W.R.; "Direction-Finding in Humans: Ability of Individuals to Orient towards Their Place of Residence," Perceptual and Motor Skills, 64:744, 1987. (X6)
- R14. Zusne, Leonard, and Allen Barbara; "Magnetic Sense in Humans," Perceptual and Motor Skills, 52:910, 1981. (X7)

BHT19 Exposure to Low-Frequency Electromagnetic Field Lengthens Reaction Time

Description. The lengthening of human reaction time in response to exposure to very-low-frequency electromagnetic waves. This effect is seen both in the laboratory and in correlations between geomagnetic activity and accident rates.

Data Evaluation. The data acquired so far are limited to one experimental report and a literature survey. The phenomenon is not adequately studied. Rating: 3.

Anomaly Evaluation. No one knows precisely how very-low-frequency electromagnetic waves affect reaction times, but the hypothesis offered is quite reasonable. Since the nervous system is electrical in nature and some of it operates at very-low-frequencies, electrical interference from external fields of like frequencies is very likely. The anomaly level here seems quite low. Rating: 3.

Possible Explanations. See above discussion.

Similar and Related Phenomena. Disturbed human behavior correlated with solar activity (BHB3); human sensing and detection of magnetic fields (BHT17); human navigation senses (BHT18).

Entries

X0. Introduction. In BHB3, disturbed human behavior is seen to be correlated with solar activity. An often-suggested link between the two diverse classes of

phenomena is the geomagnetic field. Can the geomagnetic field, which is admittedly modulated by solar activity, really affect human behavior? In this Catalog

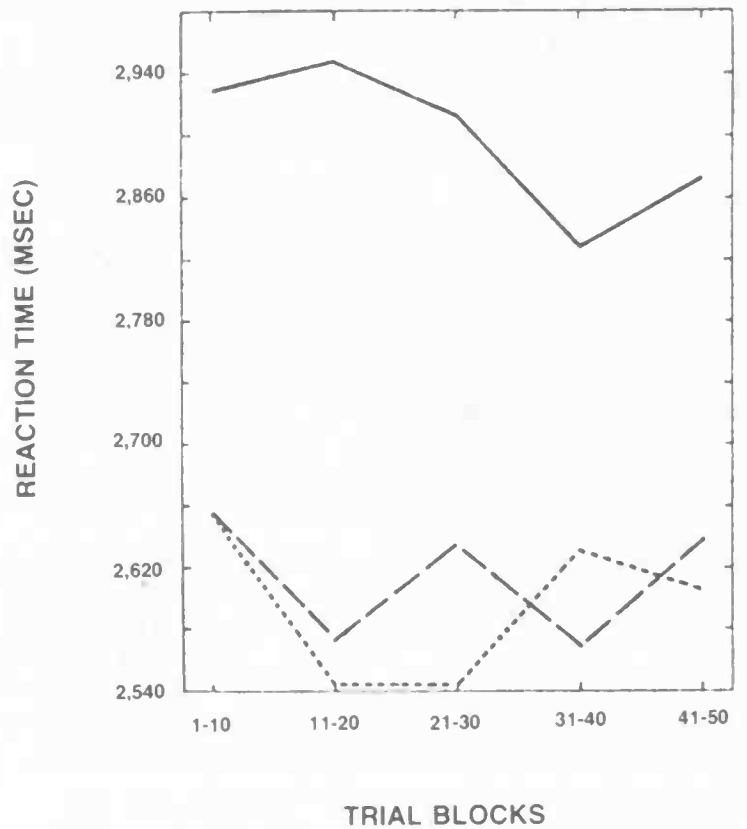
entry, human reaction time is chosen as a well-defined, measurable performance parameter. Do fluctuations of the geomagnetic field worsen human reaction times? If so, the anomaly lies in our ignorance of the biological mechanism involved.

X1. 1973. A laboratory experiment. The principal investigator in this experiment was H. Friedman, who also explored the effect of the geomagnetic field upon psychiatric hospital admissions. (BHB3-X1)

In previous investigations, we indicated some significant empirical relationships between selected geophysical parameters and gross measures of human behavior. The present investigation attempts to demonstrate the effects of artificially produced magnetic fields on a standard, relatively uncomplicated psychomotor task: simple reaction time.

In our initial attempt, twin Helmholtz coils, 14.5 in. in diameter, were mounted in a concealing wooden frame to provide an 11.5 in. coil interspace. The frame vertically movable, was attached to a wooden chair so that seated subjects, using a chin rest, could have the cerebrum approximately at the centre of the transverse magnetic fields. A gaussmeter probe was mounted in the wooden frame so as to monitor constantly the magnetic field at 1-2 in. above the centre of the subject's head. In a darkened room, each subject was instructed to press and promptly release a telegraph key, mounted on a lapboard, as quickly as possible after the appearance of an eye-level red light 7 ft. away. (R1)

The other experimental details are too voluminous to reproduce here in full. In a typical test, 30 normal subjects were exposed to a sinusoidally modulated magnetic field of 5-11 gauss, which is 5-10 times the maximum geomagnetic field at the earth's surface. The field was modulated at 0.1 and 0.2 Hz. From the figure, it is seen that at 0.2 Hz human reaction times are adversely affected. Such data allowed Friedman et al to conclude:



Reaction time as a function of blocks of trials for male subjects. (Solid line = 0.2 Hz; dashed line = 0.1 Hz; dotted line = control) (X1)

In general, then, the findings indicate that experimentally produced modulated magnetic fields can significantly affect reaction time performance. (R1)

X2. An overview of the effects of electromagnetic fields on reaction time. M.A. Persinger et al, after reviewing the extant literature on the psychophysiological effects of extremely low frequency electromagnetic (ELF) fields, stated:

The ELF-effect seems to involve timing behavior in mammals. Consequently, disturbances in reaction time in primates, ambulatory behavior in rats, circadian variations and time perception of human beings, along with electrical changes in the parts of the brain involved with these changes have been observed. (R2)

Obviously, this is simply a confirmation that others have observed the basic phenomenon and reported it in the literature.

References

- R1. Friedman, Howard, et al; "Effect of Magnetic Fields on Reaction Time Performance," Nature, 213:949, 1967. (X1)
- R2. Persinger, M.A., et al; "Psychophysiological Effects of Extremely Low Frequency Electromagnetic Fields: A Review," Perceptual and Motor Skills, 36:1131, 1973. (X2)

SWIMMING AND DIVING

BHT20 Human Drowning Proneness

Description. The nearly unique human lack of a natural ability to swim and survive for long periods in the water. Some other primates share this defect. Surprisingly, human infants under 10 months do seem to take to the water naturally.

Data Evaluation. The human inability to swim without training, as contrasted with the natural capabilities of most other animals, is common knowledge.

Rating: 1.

Anomaly Evaluation. It is remarkable that humans are naturally clumsy and often helpless in the water, considering how valuable to survival the swimming capability is. This deficiency is also incompatible with the many pro-aquatic human biological features adduced by proponents of the Aquatic Ape Hypothesis.

Rating: 2.

Possible Explanations. The evolution of humans, particularly the big brain and capability of speech, led to design compromises that are unfavorable to human aquatic activities. (See BHA4.) Even so, with training humans can become very proficient in the water!

Similar and Related Phenomena. Humans poorly designed for swimming (BHA4); the human diving reflex (BHT21); the Aquatic Ape Hypothesis (See Index.).

Entries

X0. Background. It is an easily observable fact that most animals swim naturally, even though some do not relish the water. On the other hand, humans generally have to be taught to swim and, even then, do not fare well in the water. This performance flaw sets us apart from most of the other animals.

But, curiously, human infants (up to about 10 months) escape this deficiency!

X1. Humans badly designed for swimming. Remarking that some 140,000 humans drown accidentally each year, Jan Wind observed that:

Because most animals are able to survive much longer when in water than most humans and apes, it is likely that at some time during human phylogeny the---innate---ability to swim like the animals has been lost. (R1)

Wind's elaboration of this theme is presented in more detail in BHA4 in connection with some unique features of human anatomy. But there is an interesting exception to Wind's generalization.

X2. The natural swimming ability of infants. Opposing Wind's thesis in X1 is the fact that infants seem to take quite readily to the water, as maintained by E. Morgan:

In fact, it is not true that human beings would not acquire the art of swimming unless they were taught. Anthony Storr describes the experience of one group of doctors in London: "The pioneer doctors who started the Peckham Health Center discovered that quite tiny children could be safely left in the sloping shallow end of a swimming bath. Pro-

vided no adult interfered with them they would teach themselves to swim, exploring the water gradually and never venturing beyond the point at which they began to feel unsafe.

.....

One Los Angeles swimming instructor said that at a very early age swimming comes naturally to babies, whereas if they have to learn it after they are over ten months old "...it is as if they had forgotten how to do it." (R2)

It seems possible that the common human fear of water and swimming incompetence may be conditioned rather than innate. (WRC)

References

- R1. Wind, Jan; "Human Drowning: Phylogenetic Origin," Journal of Human Evolution, 5:349, 1976. (X1)
- R2. Morgan, Elaine; "Swimming and Diving," The Aquatic Ape, New York, 1982, p. 68 and p. 79. (X2)

BHT21 Human Diving Reflex Unique among Primates

Description. The automatic severing of the blood supply to most of the body upon immersion of the face in water. Humans are unique among the primates in possessing this trait, while only diving mammals and birds have this capability otherwise.

Data Evaluation. A brief description of the phenomenon in a popular book.
Rating: 3.

Anomaly Evaluation. That humans display the diving reflex, and are unique among the primates in this regard, implies a radically different evolutionary path from the primates---perhaps one involving an aquatic phase. Since the Aquatic Ape Hypothesis is emphatically rejected by mainstream science, this phenomenon is very anomalous. Rating: 1.

Possible Explanations. Humans went through an aquatic stage in their evolution.

Similar and Related Phenomena. Humans poorly designed for swimming (BHA4); human proneness to drowning (BHT20); the Aquatic Ape Hypothesis (See Index.).

Entries

X1. General observations. E. Morgan, who enthusiastically promotes the Aquatic Ape Hypothesis, describes the diving reflex in her book The Aquatic Ape in these words:

It has been found experimentally that man has the remarkable adaptation which is found only among mammals and birds that dive under water. It is called the diving reflex and now solves the puzzle of how sponge and pearl divers can remain below so long. It only happens if a man's face is submerged; it won't occur if he wears a mask. If he dives under water and his face exposed, there is an immediate reaction cutting down the blood supply to most of the body,

but leaving a good supply to both the brain and the muscles of the heart. This reaction is typical of whales, seals, penguins, and even diving ducks: I cannot believe that it could have been evolved by natural selection unless man had taken to diving under water some considerable period of his past history. (R1)

References

- R1. Morgan, Elaine; "Appendix 2," The Aquatic Ape, New York, 1982, p. 152. (X1)
 R2. Watson, Lyall; "The Water People," Science Digest, 90:44, May 1982. (X1)

CONSCIOUSNESS

BHT22 The Paradoxes of Consciousness

Description. Paradox 1. Consciousness could not have evolved unless it had survival value, but to have survival value it must have a physical basis, which it apparently does not; Paradox 2. If consciousness is denied physical reality, as it is by the reductionists, the very reasoning process whereby the reductionist's position is argued is also denied reality.

Data Evaluation. A great deal has been written on consciousness, although it is difficult to even define, much less investigate, scientifically. Only a few relevant items have been selected here. Rating: 1.

Anomaly Evaluation. The paradoxes stated above are profound; they seriously challenge the positions of both the reductionists and those who believe in a separate non-physical consciousness. Beyond this, the existence of the paradoxes reveals deep ignorance about the workings of the human (and other) biological organisms. Rating: 1.

Possible Explanations. Quantum mechanics "may" link consciousness to the physical world.

Similar and Related Phenomena. Consciousness and the evolution of the brain (BHO); the subconscious and other mental phenomena (Series-P Catalogs).

Entries

X0. Introduction, Consciousness is defined here as a person's composite awareness of his (or her) surroundings, himself, and his mental operations. I know I have consciousness, but I cannot be certain that you do, or whether my dog does, or whether an amoeba does. I "believe" that my mind and its workings are more than the sum of all my perceptions; in other words, that I am not an automaton. Consciousness is valuable to me because with it I can plan ahead, create, and work out strategies. Unfortunately, I may be wrong in all this!

Reductionists insist that humans and all other animals are automatons, and that consciousness is merely an illusion ---just the sum of all our sense perceptions and mental-computer operations. This position leads to the two paradoxes outlined below. Believers in the reality of consciousness, however, also figure in these paradoxes. It is the existence of these paradoxes that makes consciousness anomalous. Basically, we do not know whether consciousness really exists and, if it does, what it is, and how it evolved.

Assuming that consciousness or "mind" truly does exist, it would seem to be a useful faculty; that is why it is cataloged in this chapter along with sight, hearing, and the other senses. Obviously, we must also meet consciousness again in the Catalog sections on the brain's biology (BHO) and the operations of the mind (Series-P Catalogs).

X1. The evolutionary paradox of consciousness. In the literature examined, we have found two good expositions of the evolutionary paradox, which, as indicated in X0, is at the heart of the anomalousness of consciousness.

R.L. Gregory's exposition:

Why, then, do we need consciousness? What does consciousness have that the neural signals (and physical brain activity) do not have? Here is something of a paradox, for if the awareness of consciousness does not have any effect---if consciousness is not a causal agent---then it seems useless, and should not have been

developed by evolutionary pressure. If, on the other hand, it is useful it must be a causal agent: but then physiological description in terms of neural activity cannot be complete. Worse, we are on this alternative stuck with mentalistic explanations, which seem outside science. To develop science in this direction we would have to reverse the direction of physical explanations which have so far proved so successful. It might be argued that the "inner" world of consciousness is essentially different from the physical world; but then it seems strange that the physical signals of the nervous system are so important. (R2)

N. Humphrey's exposition:

Biologists who have thought, but not thought enough, about consciousness will be found toying with two contradictory ideas. First---the legacy of the positivist tradition in philosophy ---that consciousness is an essentially private thing, which enriches the spirit but makes no material difference to the flesh, and whose existence either in man or other animals cannot in principle be confirmed by the objective tools of science. Second ---the legacy of evolutionary biology ---that consciousness is an adaptive trait, which has evolved by natural selection because it confers some (as yet unspecified) advantage on those individuals who possess it.

Put in this way, the contradiction is apparent. Biological advantage means an increased ability to stay alive and reproduce; it exists, if it exists at all, in the public domain. Anything which confers this kind of advantage---still more, anything whose evolution has greatly depended on it---cannot therefore remain wholly private. If consciousness is wholly private it cannot have evolved. (R3)

X2. The logical paradox. P. Davies advanced this paradox in his Cosmic Blueprint:

If mental events [consciousness] are denied reality, reducing humans to

mere automata, then the very reasoning processes whereby the reductionist's position is expounded are also denied reality. The argument therefore collapses amid its own self-reference. On the other hand, the assumption that mental events are real is not without difficulty. If mental events are in some way produced by physical processes such as neural activity, can they possess their own independent dynamics? (R4)

X3. Does a quantum-mechanical bridge exist between the mental and physical worlds? It may well be that the mind is not separate from the body. Quantum mechanics, which leads to "spooky" predictions in other matters, maintains its reputation here. The writer is E.H. Walker.

In this paper the existence and nature of consciousness as a distinct phenomenon is considered in the framework of current scientific philosophy. It is contended that consciousness properly exists as a distinct entity; however, it apparently is an immeasurable quantity. As a consequence, we postulate that consciousness is a real, nonphysical entity, as these terms apply in modern physics.

A consideration of the possible types of equations relating the variables of the physical world, P_i , to the variables of consciousness, C_i , suggest that there should exist certain quantities common to both the physical equations and the equations of the conscious reality. It is therefore postulated that conscious reality is coupled to physical reality through a single fundamental physical vari-

able. Since consciousness is apparently associated in some way with the electrochemical processes occurring in the brain and since the pertinent physical equations are very satisfactorily understood today, it should be possible to discover the nature of the interaction between the C_i and P_i variables. The connection should be such as to unify into a single conscious experience the data processing events taking place throughout the brain, yet excluding the many data reduction and chemical processes that do not form part of our consciousness.

A study of this problem indicates that the interaction is quantum mechanical. Thus there must exist a quantum mechanical process operating within the brain that is ultimately involved with the data processing functions of the brain. (R1)

It seems that the practitioners of quantum mechanics are very sure of themselves! (WRC)

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- R3. Humphrey, Nicholas; "Consciousness: A Just-So Story," New Scientist, 95:474, 1982. (X1)
- R4. Davies, Paul; "Mind and Brain," The Cosmic Blueprint, New York, 1988, p. 189. (X2)

MISCELLANEOUS FACULTIES

BHT23 Anomalous Skin Adhesive Power

Description. The ability of some individuals to suspend objects weighing several pounds employing only the adhesive power of the skin of their fingers.

Data Evaluation. A single, but thorough and careful, series of experiments conducted by a professional scientist, published in Science. The report is over a century old, yet nothing similar has been found. Rating: 2.

Anomaly Evaluation. The cause of the anomalous (and somewhat amusing) adhesive power of one person's skin is not readily apparent. Whatever the explanation is, it is likely to be rather prosaic, since other examples of remarkable adhesion are known. Highly polished, flat metal surfaces, such as those of hoke blocks, are surprisingly adhesive. With such analogous examples as guides, adhesive fingers would seem to be only curiosities. Rating: 3.

Possible Explanations. Intermolecular forces exerted across smooth surfaces.

Similar and Related Phenomena. The adhesive characteristics of other very smooth surfaces.

Entries

X1. General observations. Here follows a report from Science by a Baltimore doctor, W. Simon:

A very singular case of adhesive power has come under my notice lately, and the results of an investigation made with the view of establishing its nature are recorded in the following lines.

Mr. Louis Hamburger of Baltimore, sixteen years old, and of rather delicate build, noticed for the first time, about the middle of November last, that a cane would, as he expressed it, "stick" to his fingers, and that wiping off the cane and washing his hands would not prevent this occurrence. Laying his fingers on other light articles, such as lead-pencils, penholders, etc., he found that he could lift them up simply by placing his fingers upon them, the objects adhering firmly to the skin. Not being able to explain these phenomena, Mr. H. came to see me on Nov. 19, and surprised me by performing a few of the experiments which he had learned to execute, and which consisted in the raising of various objects by their adherence to his fin-

gers. The heaviest of these articles did not weigh twenty grams.

At a loss to understand the nature of these phenomena, I began a series of experiments, which, in the course of a few weeks, brought to light a number of facts more interesting, and even more startling, than those which had been observed by Mr. H. himself up to the time he first called upon me. The experiments performed were made with the view of determining: (1) the quality and nature of the adhering substances, i.e., their chemical composition and texture; (2) the quality or weight of adhering masses, and their relation to the hand's surface brought into play in a given experiment; (3) the exact points or surfaces of the fingers or other parts of the body which exhibit this adhesive power; (4) the length of time during which the substances will adhere.

Before stating the results of the various experiments made, I will mention that it was soon found that the hands had to be carefully cleaned by washing with soap and water, and then with alcohol and ether, in order

to attain the highest degree of adhesive power; and that the surface of the articles experimented upon had likewise to be well cleaned, and rubbed absolutely dry. Particles of dust or moisture greatly interfere in all experiments where the highest power is demanded.

In regard to the first point of inquiry, the nature of the material which would adhere, it was easily proven that chemical composition had nothing whatever to do with the adherence. Metals, stone, glass, rubber, wood, etc.,---all probably adhere equally well, provided their surfaces possess the same degree of smoothness. As a general rule, it may be stated that the adhesive power increases with the degree of smoothness of surface. It is for this reason only that well-polished metals or glass show the highest degree of adhesion. The latter substance answers especially well, because it can be cleaned easily. In proportion as the surface becomes less even, the adhesive power diminishes; and porous substances, such as paper, cloth, etc., or articles covered with them, cannot be made to adhere at all.

The second question, regarding the determination of the extreme limit of the weight of matter adhering, was found more difficult to answer. A number of factors influence the results of experiments made in the direction. It was found that not only the shape of the adhering mass had to be considered, but also the position of the hand itself. Cylindrical forms seem to be preferable, while flat surfaces adhere but poorly; and a much larger weight may be attached to the fingers while the hand is held perpendicularly than when in a horizontal position. In order to reach some definite results, glass rods of different diameters were used. They were so arranged as to allow an increase of their weights by attachments, and so that the hand might be applied in a perpendicular position. When first examined, on Sept. 22, it was found that the extreme limit of weight which could be made to adhere, by means of a glass rod of 10 millimetres diameter, to the surface of the front part of the four fingers of the right hand, when held perpendicularly, was 1,450 grams. A

glass tube of 20 millimetres diameter was next substituted, and would adhere when its weight had been increased to 1,900 grams.

When the experiments were repeated on subsequent days, the same glass tube could each time be loaded heavier, and Mr. H. can now lift the comparatively enormous weight of 2,610 grams, after having pressed his fingers tightly to the glass rod, which stands in a perpendicular position upon a metallic disk in which it is fastened, and which also carries the weights.

I ought to state that the thumb is never used to cause the adhesion, and that, in commencing a series of experiments, Mr. H. can never at the beginning lift the greatest weight. It appears that the power of adhesion increases during a series of experiments made within a period of fifteen or twenty minutes. So far, the power has continued to increase almost from day to day, but appears to have now reached its maximum. Following are the results of a few of the experiments made as described above; the first figure representing the diameter of the glass tube (in millimetres), and the second the maximum weight suspended (in grams): 5, 1,530; 10, 2,120; 15, 2,400; 20, 2,610; 25, 2,200; 30, 1,860.

.....

When the investigation was first begun, Mr. H. not only firmly believed in his utter inability to use his left hand as he did his right, but also looked for the seat of the adhesive power only in the front part of his fingers. It has now been demonstrated that the left hand does all the work equally as well as the right one, and that the surface of adhesion extended, though different in intensity, over almost the whole of the inner part of the hands.

.....

The length of time during which substances adhere depends chiefly upon their weight. Light objects, such as test-tubes, will remain suspended even horizontally for ten minutes or longer, and can then be removed only by the application of some force, when a slight click, caused by the concussion of air, can be heard. Very heavy articles will

fall off sooner; but whether in consequence of a diminution in the adhesive power of the surface, or in consequence of the strain exerted upon the muscles, it is difficult to say. Another cause of the falling-off is to be found in the perspiration which at times oozes freely from the pores, and interferes greatly with the experiments.

It may be added that neither the shape of Mr. H.'s hands nor the

structure of the skin, even when examined under a magnifying-glass shows any thing abnormal, though the skin is very soft and smooth. (R1)

Reference

- R1. Simon, W.; "A Peculiar Case of Adhesion," Science, 14:427, 1889. (X1)

BHT24 Chicken-Sexing Faculty

Description. The ability of some well-trained individuals to separate newly born chicks by sex, when there are no obvious, discernible physical differences.

Data Evaluation. Chicken-sexing is an important, well-recognized occupation, but so far we have found only a brief mention of its potentially anomalous aspects in a popular science book. Confirmation and details are needed. Rating: 3.

Anomaly Evaluation. The rationale of chicken-sexing remains a mystery, even to the chicken-sexers themselves. Although the naive observer can see no outward differences between male and female chicks, the chicken-sexer does--apparently subconsciously. On the other hand, it is an easily verifiable fact that an expert ornithologist can identify different birds in the field that look very much the same to an untrained observer. It is the same in other tasks involving sorting and identification---training and expertise produce results that baffle the casual observer. Chicken-sexing is very likely in the same category, although the chicks' field marks are not in handbooks. We assume that accurate chicken-sexing also requires only knowledge of subtle, unadvertised clues. Rating: 3.

Possible Explanations. See above.

Similar and Related Phenomena. There are many analogous examples of identification and selection via very subtle clues in natural history, food and material processing, detection of counterfeit currency and art, etc.

Entries

X1. General observations. Day-old chicks seem identical to the casual observer; males and females cannot be detected and separated by any known external characteristic. Yet, some individuals do sex chickens, as L. Watson related in his Beyond Supernature:

The male and female genitalia in

birds of this age are indistinguishable, even to trained biologists. There are no apparent distinctions in size, weight, body shape, voice pitch, beak length or skin and feather colour---nothing about the chicks that gives any obvious clue as to their sex. Nevertheless, there are people who can separate the sex-

es and who earn substantial salaries from an industry that has no interest in wasting money on rearing unproductive male poultry.

Most of these experts are Japanese, so I went recently to visit the centre near Osaka where many of the best chicken-sexers are trained. I was hoping, as a biologist, to learn something from them, to uncover the secret cues. But I found no obvious answer. All arts in Japan are learned by example, by living with and working alongside a sensei, a teacher, for long enough to master the art--- and chicken-sexing turned out to be no different. Novices learn by looking over the shoulders of experienced workers, and go on doing so

until they acquire the skills, almost by a process of osmosis. The experts themselves cannot explain how they do it. But they do, and so eventually do the trainees, without hesitation and with a success rate of over 99 per cent. (R1)

To Watson, observing the chicken-sexing process, the skill was unconscious, intuitive, and unfathomable.

Reference

- R1. Watson, Lyall; "Process," Beyond Supernature, New York, 1988, p. 65. (X1)

BHT25 The Ability to Perceive Established Information

Description. The detection and/or interpretation of cryptic images and messages whose meanings are known elsewhere by other individuals. The more individuals who know the meanings, the easier it is for naive persons to detect and/or interpret them.

Background. Obviously, it is difficult to define this phenomenon clearly in a few words. See X0 below for elaboration. The phenomenon, also called "morphic resonance," resembles telepathy but is actually much broader in scope. In this Catalog entry, discussion is limited to the transfer of information between individuals. The stimulus for this Catalog entry is R. Sheldrake's Hypothesis of Formative Causation.

Data Evaluation. Several fascinating tests of the Hypothesis of Formative Causation have demonstrated, to the satisfaction of some, that morphic resonance does indeed prevail. Much of the experimentation has been conceived and directed by Sheldrake himself. It would be helpful if the scientific community would take an interest and either confirm or reject Sheldrake's hypothesis. At the moment, mainstream science studiously avoids this purported phenomenon, and most research is conducted in amateur circles. Rating: 3.

Anomaly Evaluation. Scientists vehemently reject the idea of the morphogenetic fields conceived by Sheldrake. Any evidence that they might exist is profoundly anomalous. Rating: 1.

Possible Explanations. Morphogenetic fields do exist; or, the Sheldrake tests are flawed somehow. We have not seen any scientific critiques of the experiments.

Similar and Related Phenomena. Mammal learning experiments (BMB); convergent evolution (BX); telepathy and clairvoyance (Series-P Catalogs).

Entries

X0. Introduction. R. Sheldrake's Hypothesis of Formative Causation has been roundly condemned by many scientists because it departs so radically from mainstream thinking. Basically, Sheldrake maintains that the forms of things (including such things as crystals, life forms, and information), as well as the behaviour of organisms, are all influenced by "morphogenetic fields" emanating from these entities and activities. For example, convergent evolution, wherein human eyes resemble the eyes of squids, might be explainable using his hypothesis. Even telepathy, if it really exists, could be accounted for by Sheldrake's mysterious morphogenetic fields.

Sheldrake has been testing his hypothesis through some intriguing experiments. We catalog two of the genre here, reasoning that the purported success of the tests indicates that humans must therefore have a faculty that is sensitive to morphogenetic fields!

X1. A hidden-image test. One of Sheldrake's experiments involves the accompanying illustration containing a hidden image. Once the solution of this illustration is revealed, it is hard to forget; but few people see the answer right off. The Hypothesis of Causative

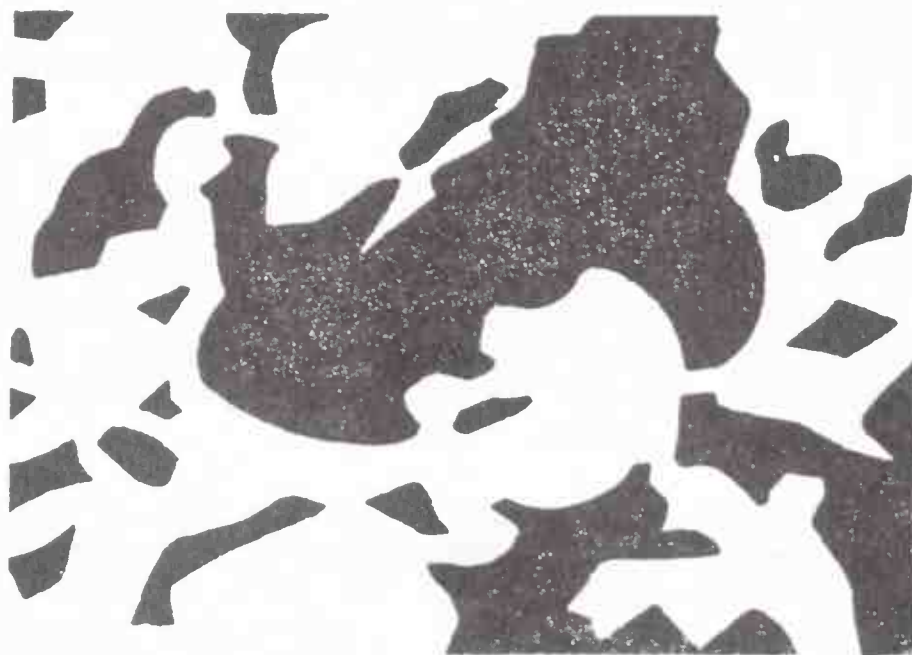
Formation insists that once one or more persons learn the drawing's secret, it will be easier for others to see the solution. In other words, the morphogenetic fields emanating from the brains of those who know the solution is conveyed to the brains of naive individuals.

Actual tests employing this drawing consisted of broadcasting the illustration and its solution (that is, the hidden image) on British television combined with before-and-after checks elsewhere in the world well outside of TV range. The results strongly supported the hypothesis! It was far easier for people outside Britain to identify the hidden image after the broadcast. (R1)

X2. Tests using Japanese poems. R. Sheldrake reported a similar but more complicated experiment in his book The Presence of the Past:

A leading Japanese poet, Shuntaro Tanikawa, kindly supplied me with three rhymes for this purpose: one is a genuine nursery rhyme known to generations of Japanese children, and the other two were specially composed to resemble it in structure. One of these is meaningful and the other meaningless in Japanese.

In a series of experiments with



One drawing used in testing the Hypothesis of Causative Formation. Problem: Find the hidden face. (X1) (See page 287.)

groups in Britain and America who learned the rhymes by chanting each of them a fixed number of times (without knowing which was which), 62% of those tested found the genuine rhyme easiest to recall half an hour later. This result was far above chance expectation: if the rhymes were of equal difficulty, by chance about 33% of those tested would have been expected to recall the genuine rhyme better than they recalled the new ones. In another experiment in which people were supplied with the rhymes in written form 52% found the genuine rhyme easiest

to learn, again a highly significant result. (R2)

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- R2. Sheldrake, Rupert; "Morphic Resonance in Human Learning," The Presence of the Past, New York, 1988. (X2)

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