Creation Research Society Quarterly

Haec credimus:
For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh. — Exodus 20:11

VOLUME 30 JUNE 1993 NUMBER 1

CREATION RESEARCH SOCIETY

ISSN 0092-9166

VOLUME 30 JUNE 1993 NUMBER 1

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Cover Photograph

This is a view of the headwaters of the Colorado River in Kawuneeche Valley, Rocky Mountain National Park (September 1992). It is thought that the Colorado River Glacier carved the Valley to its present U-shape from a previous V-shape. It is conjectured that the glaciation filled the valley with rock debris causing the gradient of the river to be low for the volume of water in the stream. Thus the river meanders across the valley as can be observed. Some meanders have been eliminated leaving oxbow lakes which are clearly visible. When one sees the Colorado River in the bottom of the Grand Canyon and up in the Rockies, it seems as if you are viewing two different streams. Caption and Photograph by Emmett L. Williams.

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Instructions to authors can be found in June Quarterly.

Creation Research Society Quarterly **is indexed in the** *Christian Periodical Index.*

Creation Research Society Quarterly **is published by the Creation Research Society, P.O. Box 28473, Kansas City, MO 64118.**

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CREATION RESEARCH SOCIETY

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and over 1100 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as the outstanding publication in the field.

Activities The society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. The Society operates two Experiment Stations, the Grand Canyon Experiment Station in Paulden, Arizona and the Grasslands Experiment Station in Weatherford, Oklahoma.

Membership Voting membership is limited to scientists having at least an earned Graduate degree in a natural or applied science. Dues are $18.00 ($22.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 28473, Kansas City, MO 64118. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at $18.00 ($22.00 foreign) per year and includes a subscription to the Quarterlies. All others interested in receiving copies of all these publications may do so at the rate of the subscription price for all issues for one year: $21.00 ($25.00 foreign).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan Publishing House, Grand Rapids, Michigan 49506. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

See current *CRSQ* for book offers

QUOTE

If isotopic ratios are to be used as a basis for geologic dating, then presently accepted ages may be too high by a factor of 10,000, admitting the possibility that the ages of the formation are to be measured in millenia.

Kazmann, Raphael G. 1979. Time: in full measure. *Transactions, American Geophysical Union* 60(2):22.

Editor's Comments

This issue begins the thirtieth year of the Quarterly. The maturing of our Quarterly has mirrored the modern creation science movement; certain healthy trends are evident. For example, much creation research is moving into narrow, technical areas of study. Our Quarterly will continue to publish this data, as well as the broader survey articles.

A second Quarterly trend is an increase in short, user friendly items; book reviews, give-and-take letters to the editor, quotes, and panorama notes. Such material is always welcome from readers, whether full manuscript or short quotation (please include full reference).

This June edition of *CRSQ* is loaded with helpful information. May it encourage you with the excitement and progress of creation studies. As with previous Quarterlies, it will remain useful with the passing of time. Our collection of Quarterlies is a growing treasure!

Dr. Hoffman discusses evolutionism from a unique philosophical standpoint. Dr. Faulkner presents an educational discussion on stellar population types in his continuing series on the development of a creationist astronomy. Adapted or preadapted is an interesting treatise by Dr. Vorpahl about his clinical work on animals. Jerry Bergman's article on "man's ancestors" follows a continuing thread of creationist thought that has been the subject of many Quarterly papers.

A report of some Society field work initiates a research series to continue throughout this volume. Comments on the concept of dam breaching as a mechanism that results in rapid erosion are given in this issue. Your remarks on any subject are welcome. Please consider writing notes and articles for publication. Also you could encourage a wider distribution of the Quarterly among creationists as well as in university libraries. Your help and input are desirable and appreciated.

Don B. DeYoung

QUOTE

If we contemplate the generation that preceded Eliot's (he was born in 1888), it will be clear that the triumphs of deterministic science had already begun the process of subverting the authority of sacred scripture and of the Christian Church, which had for millennia organized and directed the lives of generations in the West. Modern astronomy had propounded a deterministic theory of the universe, according to which the cosmos was, in the words of Laplace, a *mécanique céleste* already doomed to entropic extinction in the cooling process of the sun. In biology Huxley and Darwin had demoted man from his privileged estate—as the special creation of God's divine plenitude—to that of an evolutionary product descended from furry arboreal quadrupeds: his social organization—including his religious rites and ethical codes—contained merely naturalistic transformations of the gregarious instinct. The impersonal mechanisms of natural selection were said to have no discernible teleology.

Tuttleton, J. W. 1987. T. S. Eliot and the crisis of the modern. *Modern Age* 31:275.

INSTRUCTIONS TO AUTHORS

1. Manuscripts shall be typed and double spaced.
2. An original plus two copies shall be submitted to the editor of the Quarterly.
3. All submitted articles will be reviewed by at least two technical referees. The editor may or may not follow the advice of these reviewers. Also, the prospective author may defend his position against referee opinion.
4. The editor reserves the right to improve the style of the submitted articles. If the revisions of the editor and referees are extensive, the changes will be sent to the author. If the changes are not suitable to the prospective author, he may withdraw his request for publication.
5. Due to the expense involved, manuscripts and illustrations will not be returned to authors.
6. All references (bibliography) must be presented in the style shown in the Quarterly. If a prospective author is not familiar with the CRSQ format, the editor will furnish an example reference page.
7. All figures and drawings must be prepared professionally. No sloppy hand drawings or freehand lettering will be accepted. The editor reserves the right to approve submitted figures. Unacceptable illustrations will result in rejection of the manuscript for publication. Do not send slides.
8. Any manuscript containing more than 25 pages is discouraged. If a topic cannot be covered to the author's satisfaction in this length of pages, the author *must* divide his material into separate papers that can be serialized in the Quarterly.
9. The Quarterly is a journal of original writings. Only under unusual circumstances will we reprint previously published manuscripts. Never submit an article to two or three journals, including ours, hoping all of them will publish your work. When submitting an article, please state if the material has been published previously or has been submitted to other journals.
10. Book reviews should be limited to 500 words or less.

ADAPTED OR PREADAPTED: A CLINICAL PERSPECTIVE

P. V. VORPAHL*

Received 17 February 1992; Revised 30 October 1992

Abstract

The examination of more than seven years of veterinary medical records indicates that the environment is overtly antagonistic to the species with which it interacts. Preadaptation to the environment rather than adaptation would seem more consistent with survival, even within the narrowly defined niche of domestication.

Introduction

Williams (1990, p. 144) writes,

> Evolutionists feel that nature (natural selection) operates on an organism and it evolves a solution to an environmental problem and survives in a particular niche of the natural world. A creationist believes that an organism present in a harsh environment is 'preadapted' to survive. The omniscient Creator designed the particular creature to be successful in its intended niche.

Just how the environment impacts organisms, what types of problems it presents to them, and the intensity with which it makes its demands can be ascertained by examining morbidity and mortality in animal groups. The medical records of my verterinary practice on the northern plains provided the data which follow. The distribution of animal types is roughly 50% companion animals, 40% food animals, 10% equine, with a few wildlife and exotic patients. My study of 5,763 cases began with those animals presented in the summer of 1971, and covered the following 87 months. Only those cases involving treatment or diagnosis were considered. Elective and prophylactic procedures were not counted.

Conduct

Each case was considered with respect to etiology and the body system or systems affected. Disease was categorized into congenital, degenerative, endocrine, immunologic, metabolic, neoplastic, non-specific (opportunistic) infections, parasitic, physical influences (climatic stress, trauma, competition/predation) and specific infections.

Body systems used were alimentary, circulatory, endocrine, urogenital, lymphoreticular, integumentary, musculoskeletal, nervous, respiratory, and special senses. For example, a neonatal diarrhea of calves (calf scours) caused by a coronavirus would be listed under specific infections and the alimentary tract. Conditions of multiple etiology or those affecting more than one body system were listed accordingly.

Results

Categories of Disease

Physical influences	31.6%
Specific infections	26.0%
Non-specific infections	13.6%
Immunologic	2.9%
Metabolic	1.9%
Degenerative	1.9%
Neoplastic	1.2%
Endocrine	0.6%
Congenital	0.3%

Body Systems

Alimentary	46.6%
Integumentary	19.9%
Respiratory	10.0%
Urogenital	8.4%
Musculoskeletal	6.9%
Endocrine	3.4%
Circulatory	3.0%
Lymphoreticular	0.7%
Nervous	0.7%
Special senses	0.6%

Discussion

It is immediately apparent that 91.2% of the causes of clinical disease are not the result of the failure of internal homeostatic mechanisms, but are found in the animals' environment: physical influences, specific and non-specific infections, and parasitism. Even the remaining 8.8% contains conditions indirectly due to such factors, such as squamous cell carcinomas arising from actinic lesions and degenerative joint disease secondary to trauma.

Regarding the body systems affected, 84.7% of clinical disease occurred in tissues that were in direct contact with the environment (integument) or communicating with it by way of body orifices (respiratory, alimentary, and urogenital). The keratinized integument with its dense microbial flora, the respiratory tract's mucociliary blanket and locally secreted antimicrobial agents (e.g. interferon), and the unidirectional flow (wash-out) of the urinary tract are just a few of the many extraordinary barriers to invasion displayed by these systems.

These partitioning and excluding mechanisms cannot exist in some semi-developed state while the organism's genetics "experiment" with a solution to an environmental challenge. The real challenge is survival, and an animal whose mucociliary blanket is compromised becomes pneumonic. The urinary tract with either stasis or reflux becomes nephrotic.

Conclusion

This particular study utilized domestic animals almost exclusively. Domestication includes at least some protection from the climate, the widespread use of parasiticides, immunization against specific infectious agents, management of competition and predation, and an uninterrupted food supply. The significance of this is that, without husbandry (or under less intensive husbandry) the percentages of disease caused by environmental factors would be even greater proportionally.

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The likelihood of a species being successful without preadaptation would be even less under these proposed "primitive Earth" conditions than within the limits of modern animal husbandry from which these data were derived. Even here, the sum of edaphic, climatic, microbial, and competitive factors is clearly antagonistic towards the survival of the species involved.

Regarding the question of adaptation vs. preadaptation, the testimony of animal populations is that their existence can best be explained in terms of God's having created them in all their unfathomable intricacy, each kind perfectly fitted by Him at creation to survive the challenges of life on Earth. Perhaps the phrase, "survival of the fittest," should be replaced by "survival of the fitted," and appropriated by creationists?

Reference

Williams, Emmett L. 1990. Possible variability in living organisms—a review of CRSQ writings. *Creation Research Society Quarterly* 27:144-149.

Educational Column

THE ROLE OF STELLAR POPULATION TYPES IN THE DISCUSSION OF STELLAR EVOLUTION

DANNY R. FAULKNER*

Received 5 May 1992; Revised 15 September 1992

Abstract

Stars can be grouped into two general types called population I and population II. The criteria for classification include space velocity, location in the galaxy, composition, differences in distribution on the Hertzsprung-Russell diagram, integrated color, and the presence of nearby dust and gas. The current evolutionary theory of stellar evolution and galaxy formation succeeds in giving a qualitative explanation for the population types. In establishing a creation model of stellar (and galactic) astronomy, it is important to keep in mind the two different populations. If an alternate model is to be taken seriously, then the observed population types should be explained in a very plausible fashion.

Introduction

In a recent paper Faulkner and DeYoung (1991) briefly surveyed the state of creationist astronomy. It was noted that most work to date has been primarily concerned with the ages of solar system objects or with criticism of the current standard (Big Bang) model of the universe. This trend has overlooked the middle scale of stellar astronomy between these two extremes. For several decades astronomy has been dominated by the concept of stellar evolution which has achieved some success in giving a natural and totally physical explanation for a great number of observed properties of stars. Not much of this has been challenged by creationists and it was the purpose of the paper of Faulkner and DeYoung to call attention to this deficiency and spark discussion on these matters. To this end that paper presented a very brief discussion of stellar structure and its relation to the development of stellar evolution. The Hertzsprung-Russell (H-R) diagram was described, as well as its importance in interpretation of stellar evolution. Several predictions of theoretical stellar evolution and purported observational evidences were presented without comment in that paper as well. This included the coincidence in location and age of planetary nebulae with white dwarfs and the coincidence in location and age of supernova remnants with neutron stars.

In addition the previous paper briefly discussed the differences in observed H-R diagrams of globular and open star clusters. These differences qualitatively agree with the predictions of stellar evolution for young clusters (open clusters) and for old clusters (globular clusters). Armed with the results of stellar evolution it is generally argued that certain features of the H-R diagram, such as the turn off point can be used to determine the age of a particular cluster.

This paper will develop the differences between the two types of clusters further and expand those differences to all stars. The parlance for this is stellar populations, and the two populations will be defined and examined. Very little creationist criticism or commentary will be provided here: the purpose of this paper is to inform readers interested in developing a creationist astronomy of some of the stellar features that should be kept in mind with the goal of explaining them from the creationist perspective.

Stellar Populations

The Milky Way galaxy is believed to be a disk with a fainter, but massive, roughly spherical halo that is concentric with the disk (see Figure 1). The galaxy has a total mass of at least 100 billion, and perhaps as much as 250 billion, times that of the sun. The luminous disk appears to contain most of the brightest stars and is about 100,000 light years across, while it is only a few thousand light years in thickness. There is a thickening of up to perhaps 10,000 light years at the center of the disk, a feature called the nucleus. Most of the hotter and brighter stars in the disk are found in spiral arms that extend from the nucleus, and the Milky Way, along with other similar appearing galaxies, are thus called spiral galaxies. The halo is a fainter, roughly spherical distribution of stars that is concentric with the disk as well. Despite being fainter, the halo does

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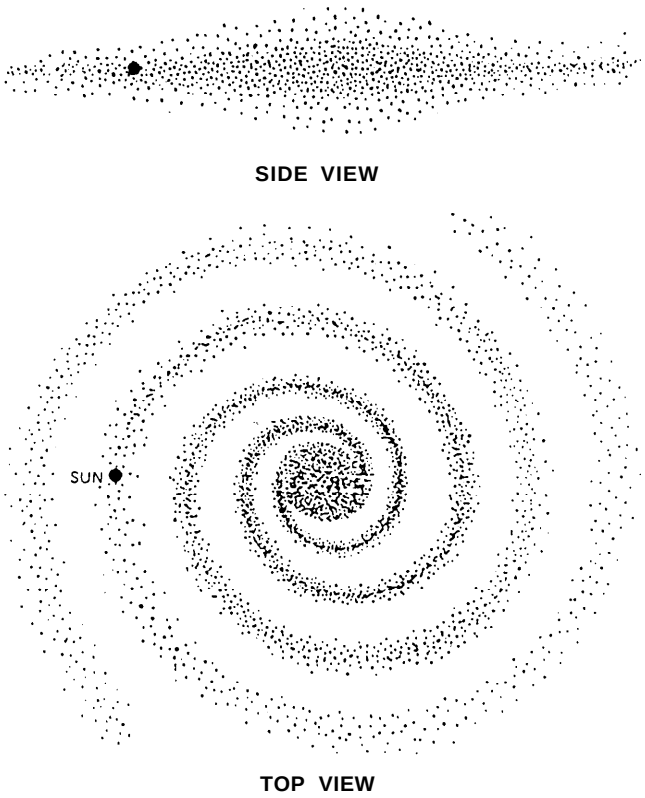

Figure 1. Schematic side and top views of the Milky Way galaxy. The diameter of the luminous disk is about 100,000 light years across and a few thousand light years thick. The nuclear bulge is about 10,000 light years across. The sun is located in the disk about half or two thirds the distance out from the center. The halo is a spherical distribution of stars concentric with the disk (DeYoung, 1989, p. 84).

contain a substantial portion of the galaxy's mass. This is particularly indicated from velocity profile studies of the Milky Way and other spiral galaxies. These show that there must be a large amount of mass located beyond where we see most of the stars and other visible mass. Since this inferred additional matter is not visible, it has been termed "dark matter," and though a number of theories have been put forth about its source, its identity is still a mystery.

One of the most important considerations in deducing the structure of the galaxy is the study of stellar kinematics, or the motions of stars. A star's space velocity can be expressed in terms of two component velocities with respect to the the solar system: the radial velocity in the line of sight to the star, and the tangential velocity perpendicular to the radial velocity. The radial velocity is easily measured by using the Doppler shift observed to occur in the spectral lines of stars, and can be determined at any distance, as long as the star is bright enough. Unfortunately the tangential velocity is more difficult to determine. Over time the tangential velocity will cause a gradual change in a star's position in the sky, and generally two photographs made many years apart are carefully measured to determine a star's change in position. The change in position is divided by the time interval to obtain an annual change, which is called the proper motion and is measured in arc seconds per year. Obviously, the proper motion and the tangential velocity are directly related, but the distance is also involved. The three quantities are related to each other by the equation

$$v_T = 4.74\mu d$$

where v_T is the tangential velocity in km/sec, μ is the proper motion and d is the distance in parsecs. The distance can be directly measured by the method of trigonometric parallax, which entails the determination of the annual slight change in the apparent positions of stars that occurs because of the earth's orbital motion around the sun. If π is the parallax, in seconds of arc, then the distance is given by

$$d = 1/\pi,$$

where the distance is measured in parsecs (1 pc = 3.26 light years). It is often stated that this method of distance determination works accurately up to a distance of 100 parsecs (roughly 300 light years). Actually, at 100 parsecs the error in the measurement is equal to the measurement itself, and this method is only reliable (errors within 10 percent) to about 20 parsecs (65 light years) (Mihalas and Routly, 1968; Smart and Green, 1977). Beyond this distance other, indirect, methods must be used.

As would be expected, the nearest stars have the largest proper motions, while distant stars have small proper motions. Since parallax measurements are very difficult and tedious, it is only profitable to attempt measurements of stars which we guess are nearby. Proper motion studies have been conducted for the entire sky, and parallax studies have generally used proper motion surveys to identify candidates for measurement by searching for stars having large proper motions. It is probable that a few faint, nearby stars have been missed this way because they happen to have small proper motions or are very faint, but the sample of nearby stars is otherwise nearly complete.

The space velocity of a star can be determined by knowing its two components, the tangential and radial velocities. It was discovered several decades ago that stellar kinematics naturally divide stars into two classes: those with large space velocities (high velocity stars) and those with small space velocities (low velocity stars). In the original and classic paper on the subject Baade (1944) proposed that there are two types, or populations of stars, population I being the low velocity stars and population II being the high velocity stars. Additional discussion of stellar populations may be found in Mihalas and Routly (1968); Mould (1982); Sandage (1986); Binney and Tremaine (1987). From a creationist perspective Steidl (1979) has briefly described populations as well.

The kinematic differences between the two populations are caused by their different orbits about the galactic center. Space velocities are actually velocities of stars relative to that of the sun. The low velocity or population I stars must then have orbits similar to that of the sun. This suggests that the sun is a population I star, and that population I stars orbit the galactic center in roughly circular orbits confined to the galactic plane. On the other hand, high velocity, or population II, stars must have elliptical orbits that are highly inclined to the galactic plane, while population II stars are found throughout the halo.

There are other differences that Baade noted between the two stellar types. One was the amount of heavier elements present. Chemistry is very simple to astronomers: There is hydrogen, helium, and then there is everything else. Astronomers do, of course, note the complex chemical makeup of interstellar gases and molecules. For stars, however, a gross view may be taken using X, Y, and Z, where X stands for hydrogen abundance, Y for helium abundance, and Z for the abundance of elements above helium. Since many of the other elements are metals, all of these other elements are collectively called "metals," even though some, such as carbon, nitrogen, and oxygen, are not actually metals. The metalicity, Z, is the fraction of mass that is comprised of the metals. Most of the universe and the stars in it are primarily made of hydrogen and helium, with only a few percent of metals. Generally the abundances of the heavier elements increase in about the same proportions to one another, so the measurement of a few elements is sufficient to estimate the abundances of all.

The metalicity can be measured from spectra, but it can be determined more easily and efficiently by using Stromgren (intermediate band) photometry. A good discussion of this technique can be found in Henden and Kaitchuck (1982). Photometry is the precise measurement of star light, and is usually accomplished by using a photosensitive detector with colored filters on a telescope. Each filter has a certain wavelength interval, called the band pass, through which light is transmitted to the detector. The band passes are carefully selected to measure particular spectral features. For example, in the spectra of most stars the near ultraviolet contains numerous absorption lines due to metals. This causes the spectrum to be depressed there, leading to the phenomenon called line blanketing. One of the four filters of the Stromgren system is in this part of the spectrum (the u filter), while a second nearby filter in the violet part of the spectrum (the v filter) does not suffer from line blanketing. The difference in the brightness in the u and v filters is therefore a measurement of the amount of line blanketing present. This measurement also depends upon the stellar temperature, but the temperature can be independently measured by using the two other filters, which are in the blue and yellow (the b and y filters). All of these measurements can be combined in various ways to form several indices, one of which is a metal index. The metal index has been well calibrated with the amount of metals determined from detailed study of stellar spectra. Such studies show that population II stars have a low metal abundance, while population I stars have a high metal abundance. The difference in metalicity between the most metal rich and the most metal poor stars is on the order of about 100.

There is also a difference in the H-R diagrams of typical population I and population II stars as well. Population I stars have an H-R diagram similar to those for open star clusters, while the H-R diagram of population II stars resembles that of globular clusters. More specifically, upper main sequence stars are not found among population II stars, while though they are rare among population I stars, they are among the brightest population I stars. Kinematic and chemical abundance studies of clusters show that the other properties of the two stellar populations are shared with the two types of star clusters. Globular clusters have low metalicity and are found in the halo, and so are considered to be population II. Open star clusters have high metal abundances and are found near the galactic plane, and so are recognized as population I.

Population I stars generally have clouds of dust and gas around and near them, while population II stars generally are found in dust free and gas free environments. This last characteristic is not independent of the others in that most of the gas and dust in the galaxy is found near the galactic plane.

Baade (1944) was working with the most extreme examples of stellar populations, and so it is not surprising that many stars are found somewhere in between the population classifications. It is now recognized that the stellar populations represent a continuum in properties, rather than two distinct bins. Extreme, or halo, population II stars are found high in the halo, possess high velocities, and are very low in metals. Intermediate population II stars are found closer to the galactic plane, have smaller space velocites, and are even higher in metalicity. Old population I stars (in which the sun is included) are found very close to the galactic plane and have high metalicity. Extreme population I stars are the highest in metals and are found in the galactic plane. Extreme population I stars have space velocities that are slightly less than older population I stars. Generally population I stars have a very patchy distribution, being found along the spiral arms in the galactic plane. On the other hand population II stars are found to have a very smooth distribution.

The Evolutionary Explanation for the Stellar Populations

Most current cosmological theories are predicated upon the assumption that the universe began with only the elements hydrogen and helium. All other elements are assumed to have been synthesized in the cores of stars. Certain isotopes up to iron can be synthesized by successive alpha capture by nuclei that results in an energy source for stars. Other isotopes, especially those more massive than iron can be produced by the slow or rapid neutron capture processes. The heavier elements particularly can be synthesized in violent processes such as supernova explosions. Most nucleosynthesis occurs in or around cores of stars, and since convection is usually not present throughout stars, heavier elements that are synthesized remain deep in stellar interiors. Therefore the composition determined from spectral analysis or inferred from photometric measurements must reflect the initial composition of stars.

The cosmology popular today supposes that early in the universe large clouds of gas began to form. These clouds were millions of light years across and slowly condensed to form galaxies. It is recognized that a perfectly smooth Big Bang cannot give rise to these structures, so it has been hypothesized that the early universe contained small inhomogeneities that acted as gravitational seeds to produce the structure in the universe that we see today. The purpose of the COBE satellite has been to look for these inhomogeneities as temperature variations in the background radiation. However, the very subtle and questionable variations

recently announced from COBE measurements are far less than had been predicted. Let us set this difficulty aside, and grant that somehow these large clouds, usually termed proto-galaxies, did form. As the Milky Way protogalaxy collapsed, it would have assumed a roughly spherical shape, and parts of the cloud would have subfragmented, and in some locations the density would have increased so that the very first stars would have formed. The process of star formation would have continued as the galaxy collapsed, with most of the leftover gas flattening into a plane. Today virtually all of the remaining gas is confined to the plane. Early in the galaxy's history star formation would have occurred anywhere in the original sphere of gas, but in later times star formation would have only occurred near or in the disk. Since the collisional cross sections of stars are so tremendously small compared to the size of the galaxy, stars would generally continue to follow the orbit about the galactic center that they possessed when they formed.

The first stars to form would consist entirely of hydrogen and helium, with heavier elements being produced in their cores. The more massive stars among the first generation would quickly end their life cycles and explode in violent supernovae that would spew the heavier elements that they synthesized into the gas then present in the galaxy. This would cause the next generation of stars to have a higher metal content. The more massive stars of each generation would repeat the process of synthesizing heavier elements in their cores and then spreading their material into the interstellar medium. Such a process is referred to as chemical enrichment and would cause a gradual increase in the metal content as stars form progressively later.

All together, this theory suggests that the oldest stars generally should be found far from the galactic plane, though a few will be found near the plane if they are in the portion of their orbits where they cross the plane. Such stars would also be expected to be low in metalicity. The youngest stars should be in the galactic plane and have the highest metalicity. There should be stars of intermediate age with intermediate metalicities and locations in the galaxy. Thus the extreme population II stars are identified as the oldest stars while extreme population I stars are the youngest. The differences in the H-R diagram between the two populations discussed earlier are also reflected in the differences of supposed ages as discussed in the previous paper of Faulkner and DeYoung. The properties of the two populations are reiterated in Table I.

Since current cosmological theories demand that the universe began with a composition entirely of hydrogen and helium, it is believed that the very first generation of stars should have had no metals. Such a primordial generation has been dubbed population III, and a vigorous but unsuccessful search for these stars has been conducted. Even though the most extreme population II stars have only one percent of the metal content of population I, the fact that all stars have some metalicity is somewhat embarrassing for the standard theory. There have been several suggested explanations. One is that the Big Bang produced some of the heavier elements, so that even the earliest stars contained some metals. Another is that there was a brief intense period of star formation just before the collapse of the galaxy.

Table I. Properties of the Two Stellar Populations.

Property	Population I	Population II
Space velocity	low	high
Location	disk	halo
Metalicity	high	low
Color	blue	red
Dust	yes	no
Supposed age	young	old

These stars are supposed to have been massive, which would have caused them to have synthesized the elements and seeded the interstellar medium very rapidly. Because of the short lifetimes of massive stars, this primordial generation would no longer exist. How or why such a primordial generation would have formed is not known.

Conclusion

The current theories of stellar and galactic evolution can qualitatively explain the differences between the two population types. This agreement has been put forth as evidence of the correctness of the theory. This topic has not been discussed in the creationist literature until now, and it is hoped that this paper will spark interest and discussion of it. The observed differences between the two types is important information that must be considered in developing a comprehensive stellar theory. The evolutionary theory qualitatively explains the types in a plausible and natural way. A creationist alternative must be able to do as good a job in explaining the differences. To that end it is hoped that the previous paper of Faulkner and DeYoung and this paper have provided useful information and direction. The author encourages correspondence with interested parties.

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Philosophical Essay

EVOLUTIONISM: AN OXYMORON

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Received 24 July 1992; Revised 25 September 1992

Abstract

The concept of evolutionism—creation by evolution—is an illusion of the intellect and an exercise in illogic. It is a fundamental contradiction, an oxymoron. For creation means genesis from nothing, from nothingness, from the void, whereas evolution means that there must be a starting point, a point of reference or point of departure, from something. This paper attempts to expose this logical contradiction.

Introduction

The philosophical arguments about creation versus evolution are joined within the recesses of the mind rather than fought over hard evidence. As the saying goes, a fact is not the truth. It is here, therefore, and further afield, that the controversy is to be pursued. It is as well an issue involving the ignorance and bias of the media, who are captivated by the aura of intellectualism, call it humanism, secularism, relativism, rationalism, or scientism. And who believe that everything can be solved by reason, by the intellect, only to find out that there is no such thing, for it is all only in the mind.

To state the obvious, it is first and foremost an ideological *embrouillement*, a confrontation in perspectives and worldviews. Such scientific arguments as there are, are only incidental, and are subject to the limitations and validity inherent in science and logic. Nevertheless, these same limitations lie at the crux of the controversy and its resolution.

The term evolution is, in general usage, generalized to mean evolutionism. In the ordinary sense of the word, however, evolution merely denotes *change* in something. It is of common everyday occurrence. Simple evolution, therefore, is a given, for everything *evolves.*

It is with changes in what we call species that the trouble begins. By species the macro-view is hereby adopted, that a species denotes a grouping of specimens which interbreed or are presumably capable of interbreeding. A species group may be further divided into subspecies, kinds, varieties, races, or yet other appellations. Are these species changes to be regarded as time-continuous, or regarded as time-discrete? That is, do discontinuities occur with time? And furthermore, are there time gaps in the fossil record? We find in fact that minor discrete changes-called speciation—may occur within a species group, and be referred to as a mutation, natural or induced. Between species which are not too dissimilar, or not too diverse, there may be a limited interbreeding—i.e., hybridization. This is aside from the more major issues of biogenesis and abiogenesis which, nonetheless, must still be referenced to some starting point.

There is no doubt, as is continually reinforced, that evolutionism is the "politically correct" mode. The proponents cannot know why they believe, but know they had better. The rhetoric is self-sustaining and the semantics nonending. But what we are concerned with here is *genesis,* period, from nothing or nothingness.

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Evolutionism Properly Stated

In the strict sense of the word, what is meant by the term *evolutionism* is creation by evolution. As such, the term forms a fundamental contradiction or oxy*moron.* Creation pertains to genesis from nothingness, from the void, whereas evolution requires a starting point, a point of departure. Thus creation and evolution are mutually exclusive and irreconcilable. A philosophical way of saying it is that evolutionism, or creation by evolution, is an inadmissible or nonallowable proposition or judgment.

In the many forays into creationism versus evolutionism, the arguments in favor of the latter viewpoint generally revolve around inferences and conjectures. It is perhaps the supreme example of Platonism, where the idea is judged more important than the facts. The counter view, successfully reinforced by such organizations as the Creation Research Society and the Institute for Creation Research, is that the evidence is quite to the contrary, which is conveniently ignored by the major media. The experimental observations in nature simply are not supportive of evolutionism. In requiring that inference and conjecture be replaced by hard data, the subject becomes what is called *cladistics,* or "I'm from Missouri, so show me."

The proper business of science should be to report only what is seen or evidenced. The interpretation is the proper domain of the metaphysical, theological, or religious. These criteria are akin to the philosophical bent known as Positivism.

This contrary viewpoint is set forth by no less than Oswald Spengler who, in *The Decline* of *the West,* asserts that "There is no more conclusive refutation of Darwinism than that furnished by palaeontology" (Spengler, II, p. 32). The paleontological record is simply that species emerge, exist largely unchanged, then disappear. This is followed in turn, after gaps in time, by the emergence of new and distinct species. These assertions by Spengler remain as definitive today as yesterday, in spite of the popular use of such verbal and symbolic prestidigitations as missing links and punctuated equilibria. These are in essence merely semantic devices used in the futile attempt to explain the unexplainable. The use of the expression "abrupt" disappearance or appearance, can be interpreted as an indirect way to admit creation without actually saying so. We might better speak of the

evolution of created species, a perspective which will probably appeal to no one.

The Economic Basis for Darwinism

It has been advanced, but not publicized, that Darwinism is rooted in economics. Thus Spengler noted the latent political element in Darwinism (Spengler, I, p. 369). Jeremy Rifkin, in Algeny (p. 31), observed that the on-going mal-distribution of wealth during the industrial revolution was justified by Darwinism. This is echoed in the title of Darwin's exercise, *On the Origins of Species by Means of Natural Selection, or the Preservation of FAVOURED RACES in the Struggle for Life* (capitals added). F. A. Hayek, in *The Fatal Conceit* (p. 24), has commented that "Darwin got his basic idea from economics," courtesy of reading Adam Smith. Even Bertrand Russell regarded Darwin's theory as but the application of laissez-faire economics to the animal and vegetable kingdom. Furthermore, it promoted a belief in racism, evidenced in British and American anthropological circles, as described more fully by Roger Lewin in *Bones of Contention* (pp. 54-55).

There were still other echoes. Will Durant, in *The Story of Philosophy* (1961, p. 302), remarked that the growing military and industrial might of Germany prior to World War I found a philosophy and a voice in Darwinism and in Nietzsche. Whereas Christianity could not justify the arbitrariment of war, Darwinism could, along with Nietzsche's "will to power." The concept of evolutionism, to say the least, has some dirty linen.

The Requirements To Be Called "Science"

There is the attempt to categorize evolutionism as "science." But as recognized by Emmett L. Williams in *Thermodynamics and the Development of Order* (p. 13), evolutionism is not science, indeed cannot be. For again, in the strict sense of the word, science is more than just classification and systemization. For to be called science, the experiments and observations must be *repeatable* and *reproducible*. That is, the experiments or phenomena must be repeatable, and the observations or results or data must be reproducible. This requirement was enunciated by Friedrich Georg Juenger in his book translated as *The Failure of Technology* (p. 109).

This requirement of repeatability and reproducibility is in fact basic to natural philosophy, now referred to as mathematical physics. It is embodied in planetary motion, which is reproduced in the form of Kepler's Laws of Planetary Motion. In turn, the mathematical transformation of Kepler's laws will yield the various other forms for the laws of motion, including the Lagrangean and Hamiltonian forms, and the energy functions. The mathematics is detailed by E. J. Hoffman in *Analytic Thermodynamics: Origins, Methods, Limits, and Validity*. Similar statements apply to the relationships of thermodynamics whereby a change in temperature with respect to pressure, the Joule-Thomson effect, can be used to generate heat functions, also called enthalpy functions, in terms of temperature and pressure.

Contrarily, experiments and phenomena which cannot be repeated and the data reproduced, are *not* science. This includes everything of a historical nature—the entire historical, archeological, and paleontological record. (Unless we choose to think that some tricks can be played with time—such as that time can be reversed and repeated.) Subjects such as geology and astronomy are science only in the sense of their immediate experimental observations, which can be repeated and reproduced. Reflections, inferences, and conjectures about the historic and prehistoric past are *not* science. As Voltaire quipped, history is only a trick we play on the dead. And as Will Durant (1931, p. 106) once ventured, in his paraphrase of Spengler, science like history, is *une fable convenue*, a fable agreed upon.

There is another thing about science which should be considered, and that is the fact that its terms or terminology cannot be defined absolutely. Thus, as cited by Max Jammer in *Concepts of Space* (p. 184), Hermann Grassmann's words, written in 1844, have not yet been disproved:

> The concept of space can in no way be produced by thought, but always stands over against it as a given thing. He who tries to maintain the opposite must undertake the task of deducing the necessity of the three dimensions of space from the pure laws of thought, a task whose solution presents itself as impossible.

And similarly for such fundamental concepts as mass and time: they can be measured but not explained. The fact that genesis or creation cannot also be "scientifically" explained either should come as no surprise.

Tautologies versus Error

These various mathematical manipulations produce tautologies, which are merely a different way to say or express the same *exact* thing. This is true, providing that the mathematics or calculus used is in itself tautological. Thus, as Eric Temple Bell noted in his *Men of Mathematics* (p. 155), the Lagrangean forms for the equations of motion have been called but platitudes, a perfect example of getting something out of nothing. It is similar with the energy forms, yet another way to express the results of experiment, in this case the laws of motion or Kepler's laws.

The well-known Pythagorean theorem is an example of a tautology, denoting but a different way to arrange the parts (triangles) of a square. Euclid's geometry carries the notion of tautologism: is a straight line the shortest distance between two points, or is the shortest distance between two points a straight line? This subject is revived by Davis and Hersh in *The Mathematical Experience* (p. 218). Archimedes' principle, that the weight of fluid displaced by a body is equal to the weight of the body, is also being but a different way to measure the specific gravity of the fluid.

Aristotle's famous tripartite syllogism of major premise, minor premise, and conclusion is tautological, as has long been noted, a fact recorded by Will Durant (1961, p. 50). That is, the conclusion is buried in the premise, or vice versa.

Tautologisms also occur in the use of words, for instance in William James' comment that we are afraid because we run. Here, "run" and "afraid" are

used tautologically. "It's not over till it's over" is another example.

The fundamental axioms of arithmetic, also called the counting process, merely constitute a set of tautologies. Thus writing, say, that 3 + 2 = 5 or 1 + 4 = 5, only states two different ways to arrange five objects or entities, whatever "five" is.

As to the rest of mathematics, itself, the subject is in disarray, as embodied in the title of Morris Kline's book *Mathematics: The Loss of Certainty* (1980). Once accepted as infallible, the operations and exercises of mathematics have become suspect. Richard von Mises has observed that pure mathematics is nothing more than a system of tautologies and conventions (von Mises, p. 125). This is reinforced by the work of the logician Ludwig Wittgenstein, who found that many of the famous theorems of mathematics are but tautologies, being but another way to state the very same exact thing. Moreover, to speak of meaning is to speak of context; that is, meaning is conveyed by context. Wittgenstein's work, now famous, is discussed by Anthony Quinton and Bryan Magee in Magee's *Men of Ideas* (pp. 96-115), and by John Searle and Magee in the latter's *The Great Philosophers* (pp. 320-347).

If a statement does not constitute a tautology, then it must constitute error or approximation, and vice versa. Thus in any chain of "logical" reasoning, error will always be introduced. Otherwise we are saying the same exact thing, and thereby committing circularities or redundancies, also called truisms, being a circumstance where the subject is the predicate and vice versa.

This inadequacy is embedded in what is known as Gödel's incompleteness theorem, or proof or construction. In any system of logic diverse enough to be of interest, there will always occur inconsistences or contradictions. The gist of Gödel's work is reviewed in Morris Kline's *Mathematics: The Loss of Certainty* (1980). More fully, there is *Gödel's Theorem in Focus* (1988), contributed to and edited by Stuart G. Shanker, who also wrote *Wittgenstein and the Turning-Point in the Philosophy of Mathematics* (1987). That is, the very system of logic itself can never be demonstrated to be true, nor can the original propositions or statements. Thus all arguments become suspect. A set of logical propositions or elements of logic *must* be inconsistent or contradictory, otherwise they would only be tautological with one another, and merely state the same exact thing.

Perhaps the classic example of a tautology is "survival of the fittest." As has been pointed out by naturalist Joseph Wood Krutch and others—notably by Arthur Koestler in *Janus* (pp. 168-171, 173)—what we have is that the fittest are those which survive. Krutch further remarked in *The Great Chain* of *Life* (p. 183) that whatever happens is, by definition, called progress, and that modern animals are higher than more ancient ones since higher here means more recent. While Krutch was certainly well versed in the platitudes of evolutionism, in *The Voice of the Desert* (p. 87) he also philosophized that anyone who will believe in evolution will believe anything.

In effect, anything can be reasoned. That is, starting with an *a priori* assumption, the process of reasoning may take off in any direction. Moreover, the errors will be cumulative. Not to mention that the initial assumption cannot be reasoned or demonstrated to be true or correct, and can be regarded as arbitrary or man-made. The descriptor "capricious" is appropriate.

The distinction has long been known, starting with Plato, in the *Phaedo,* who speaks of absolute equalities. In I John 4:6, "Hereby know we the spirit of truth, and the spirit of error." St. Thomas Aquinas used the terms *intellectus* and *ratio,* the one to denote that which is intuitive or visionary and of the heart, the other referring to reason. Blaise Pascal wrote, in *Pensées,* no. 72, *Le coeur a ses reasons que la raison ne connâit point,* which can be translated as "The heart has its reasons which reason does not know." The world-famous mathematician Gottfried Wilhelm Leibnitz (or von Leibniz), who uncovered the calculus independently of Newton, spoke of "accurate knowledge" as distinguished from "adequate knowledge." There were the analytic and synthetic propositions or judgments of Immanuel Kant, the former being tautological, the latter in error. Oswald Spengler spoke of understanding *(Verstund)* and reason *(Vernunft),* the former tautological, the latter in error. Thus reason or synthesis, the ways by which we think, are inherently in error.

And if not either tautological or in error, if not one or the other, then precisely what is the resolution? Can a resolution even exist, that is, is it allowable? The answer lies in the landscape of language. For the one term is defined only in terms of the other. That is, a tautology is *not* "in error." Conversely, "in error" is that which is *not* tautological. There is no built-in compromise or antinomy. The two expressions, the two extremes, in still other words are mutually exclusive and, paradoxically, the explanation is in itself tautological. Strictly speaking, therefore, a tautology has also been committed in trying to explain what a tautology is or is not. Such it is with tautologies. Nothing more is known than before, absolutely; it is merely wrapped in different attire.

Assumably, these conclusions can be applied to the above statements, or any other statements, as well. Presumably, therefore, every person or idea of this world must be suspect and Truth, by default, must lie in the domain of the religious, theological, or metaphysical. In essence, Truth requires Authorizaton, or Sanctification, a thesis set forth by Julian Jaynes in his now-classic study *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (pp. 317-338). That is, Truth is otherworldly or supernatural—or divine if you please—a necessity not at all surprising to some. For instance, in the Preface of *Visions and Memories of Paradise,* Richard Heinberg, for one, makes the leap that absolute truth, or Truth, is tautological with Myth. This may be distinguished from mythology, a word used to designate that which is man-invented.

It may be added that the particular divine source for Truth will depend upon the particular culture. What we call biblical Truth, however, is tautological with Compassion as embodied in the New Testament—a preemptive position. But these words and terms can be given no further meaning other than to say, simply, Truth is a Person.

If the above statements are challenged, then the challenge may in turn be challenged, *ad infinitum.* A

resolution may be provided of course by decree—which is in turn challengeable. It is why, ultimately, words and symbols must fail, and why, in Christianity, absolute truth or Truth is a Person. This is as far as the argument can be carried.

Logic and Illogic

As we so indicate, there are limitations to language and articulation. Thus MIT's Marvin Minsky recognizes that logical language can be used to describe illogical thought. Furthermore, our arguments and conclusions are formulated in logical terms *after* having been reached in other ways. "Logic no more explains how we think than grammar explains how we speak; both can tell us whether our sentences are properly formed, but they cannot tell us which sentence to make" (Minsky, pp. 186, 196).

There are in fact things we may wish to say which cannot be formulated in any language. For after all, what is a thought? In an exchange between linguist Noam Chomsky and Bryan Magee in Magee's book *Men of Ideas* (p. 213), this facet is emphasized, that there are impossibilities which will occur in every known language; some things simply cannot be said. Even so in the language of mathematics, as set forth by Davis and Hersh in *Descartes' Dream: The World According to Mathematics* undercuts the use of formal mathematical reasoning to solve humankind's problems.

The inversion of conclusion to argument is expressed most succinctly in *Alice's Adventures in Wonderland:* "Sentence first—verdict afterwards." Or, first the verdict, then the trial. For in any chain of reasoning, the conclusion is reached first, and the arguments are then provided. As Plato said in the *Meno,* if we do not know the solution to a problem then we do not know what we are looking for, but if we do know the solution then there is no problem. And as the great mathematician Karl Friedrich Gauss wrote, my solutions come first, the proofs can be filled in later (Koestler, 1964, p. 117).

Speaking of proofs, a proof or derivation is not a tautology and hence is intrinsically in error. A tautology, on the other hand, is not "proven"; it simply "is."

We may further distinguish tautologies from synonyms or definitions. Thus a synonym says *almost* the same thing, but not quite. Definitions talk around the subject, surround it, compare it against a background of other words and meanings, in so many words stating what the subject is not—embedded in the meaning of the term definition.

The renowned French mathematician/scientist Henri Poincaré wrote of the role of the subconscious and the flashes of insight which would occur at odd times *(e.g.,* in *Science and Method,* Chap. III). This has been expressed in other ways, for instance by the bisociations of Arthur Koestler, in *The Act of Creation,* where, figuratively, two independent or orthogonal (or perpendicular) planes of thought converge. Let it be said, however, that if these "Eureka's!" do not constitute tautologies, then they are in error.

The Infinite

The idea of infinity or the infinite is often proclaimed as a means of explaining the unexplainable. This gives rise to the monkey and the typewriter business, whereby with enough monkeys and typewriters and time, the Bible could be composed, or Shakespeare's works. And with enough time, therefore, evolutionism becomes an incontrovertible fact.

The game plan is that of explaining everything in terms of yet something else, backwards and forwards, *ad infinitum* and *ad nauseam.* The trouble is, nobody knows what infinity is, absolutely. The mathematician Georg Cantor started the trouble, by showing that infinities could exist within infinities. The circumstances are described by Eric Temple Bell (pp. 555-579). Rudy Rucker, in *Infinity and the Mind* (pp. 10-54), comments on this disparity in annotating the different kinds or levels of infinities. He addresses the problem of time, moreover, about this extrapolation back to the beginnings or origins, and the logical difficulties so incurred.

Now, enter the problems with numbers, real or imaginary. The real number system is composed firstly of the rational numbers, which are integers or the ratios of integers, and secondly, of all those other numbers which are not. The latter are variously called the irrational and transcendental numbers. They are allied with the idea of converging infinite series, but can never be shown to reach an absolute or exact value, and instead are compelled to wander, randomly and forever, throughout the interstices of the number system. The most famous, or infamous irrational number is π or "pi." Even if pi were exact—that is, rational—it would still be only another way to say the same identical thing, namely the ratio of the length of the circumference of a circle to the diameter.

We can but conclude that the ways of science and logic are inadequate to the task of demonstrating that evolutionism is an exact, absolute, and incontrovertible fact. For the workings of the mind are arbitrary and capricious, not absolute, and if there is one attempt at explaining the existence of life in the terms of evolutionism, or evolution mechanics, then there should be an infinity of other explanations, as speculated by Poincaré in *Science and Hypothesis* (p. 222).

The Denouement

The denouement is, and forever will be, that evolutionism is a creature of reason, whereby mankind attempts to explain himself and all other things—which is a logical impossibility. It is a chase in futility. Reason can only regurgitate tautologies, or else it is in error. Thus the mechanics of thought and articulation are inadequate to the task of absolute explanation. The limitations are built-in, inherent in the very logic or illogic which must be used.

The genesis or origins of all things is instead the proper domain of the Spiritual, has always been so, and so remains. The cyclic intrusions of intellectualism do not alter this central fact. The penultimate ascension of intellectualism was the Enlightenment, culminating in the Reign of Terror. Perhaps no one has had more scorn for the intellectual, the *philosophe,* than Oswald Spengler. Will Durant provides the appropriate quote in his *Great Men of Literature* (p. 97), as excerpted from Spengler (II, p. 16): "A whole world separates the purely living man . . . from the man who is destined either by the power of his mind or the defect in his blood to be an "intellectual" . . ."

It can be further remarked, in closing, that as far as academic instruction is concerned, the time would be better spent in examining the limits to logic and reason rather than in espousing the inferences of evolutionism.

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PANORAMA NOTES

Archaeopteryx Was A Bird

When evolutionists have their back to the wall trying to produce a transitional fossil, *Archaeopteryx* is the first to be presented. This can be observed at debates and in popular books, but behind the scenes there has been a battle raging between paleontologists and ornithologists. Most paleontologists believe *Archaeopteryx* was a feathered dinosaur that spent most of its life on the ground. According to John Ostrem its wings were used to trap insects. However, ornithologists believe *Archaeopteryx* is just an extinct bird, descended not from dinosaurs, but a common ancestor of dinosaurs and birds. In the mid 1980s it appeared the paleontologists had won the dispute (Morell, 1993).

Now the ornithologists, led by Alan Feduccia (1993), have made a strong comeback. Feduccia compared the curvature of the foot and wing claws of *Archaeopteryx* to the claws from 500 specimens of modern birds. He found a strong correlation between claw arc and preferred habitat. The birds with the least curved claws were ground dwellers, those with intermediate curvature were tree dwellers, and the birds with strongly curved claws climbed trees. The foot claws of *Archaeopteryx* fell within the range of the three strongest perching birds. The foot claws were also unlike dinosaurs, including the theropods, which *Archaeopteryx* was said by paleontologists to most resemble. The wing claws of *Archaeopteryx* were strongly curved and more difficult to interpret, since they were unlike the foot claws. The wing claws suggest that it used them to climb tree trunks. Feduccia concludes:

> Paleontologists have tried to turn *Archaeopteryx* into an earth-bound, feathered dinosaur. . . but it is not. It is a bird, a perching bird. And no amount of 'paleobabble' is going to change that (Morell, 1993).

He adds that its claws would have been a tremendous obstacle if it ran on the ground. Some paleontologists dispute the new evidence, but Ostrem accepts Feduccia's data as a strong argument that *Archaeopteryx* was a bird (Morell, 1993).

This new research adds to a slowly-gathered pool of data that indicates *Archaeopteryx* possessed advanced aerodynamic morphology (Feduccia, 1993, p. 792). For instance, its wing feathers conform to the asymmetric pattern of modern flying birds (Feduccia and Tordoff, 1979). As a bonus, Feduccia (1993) shows that the morphology of *Archaeopteryx* is similar to such modern birds as touracos, chachalacas, and the large cuckoos of the genus *Centropus.* In view of its bird feathers, wings, hollow bones, broad tail, aerodynamic design, bird morphology, and bird claws, Feduccia concludes: "*Archaeopteryx* was, in the modern sense, a bird."

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A Plant that Produces Wax as Protection from Arid Conditions

A previous study (Howe and Williams, 1990, pp. 86-91) presented the candelilla plant (Figure 1) from the perspectives of providence, design and typology.

Figure 1. A cluster of leafless candelilla stems that resemble little candles from which it derives its common name. Photograph by Glen Wolfrom.

Also the commercial importance of the wax extracted from the plant was explored. This plant, *Euphorbia antisyphilitica*, grows very well (actually thrives) in seemingly very barren areas of Big Bend National Park in Trans-Pecos Texas. Maxwell (1968, p. 96) noted:

> It commonly grows in the lowlands on limestone gravel slopes, in limestone ledge areas like the Sierra del Carmen and Mesa de Anguila and, to a lesser extent, on some igneous rock peaks and on lava flows.

Figure 2 shows prolific "patches" of the plant growing on a flat outcrop of limestone with essentially no soil content (Figure 3). This "tough" plant seems to "relish" such a harsh environment as it produces a wax that apparently protects it from the arid conditions. Interestingly the plant grows well in regions where there is a greater annual rainfall but it does not produce much wax. As Maxwell (1968, p. 97) stated:

Figure 2a. Clusters of the candelilla plant on barren ground with the Chisos Mountains in the background. Photograph by Glen Wolfrom.

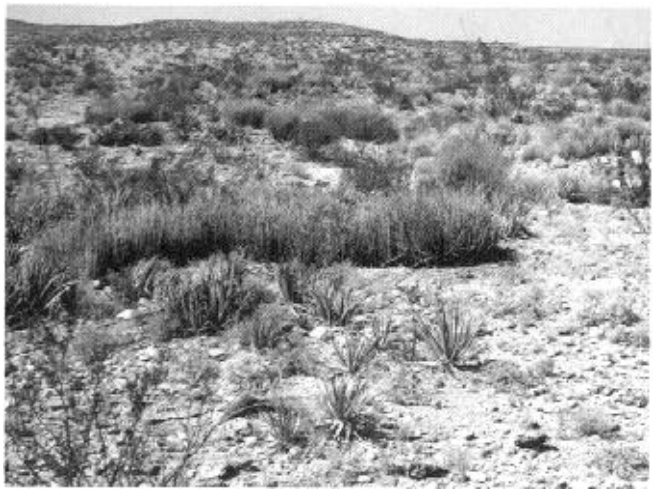

Figure 2b. "Patches" of the plant can be seen scattered over the limestone outcrop. Photograph by Emmett Williams.

> . . . in the Austin area of Central Texas, where the normal rainfall is about three times as great as that of West Texas, the plant grows rank but produces very little wax.

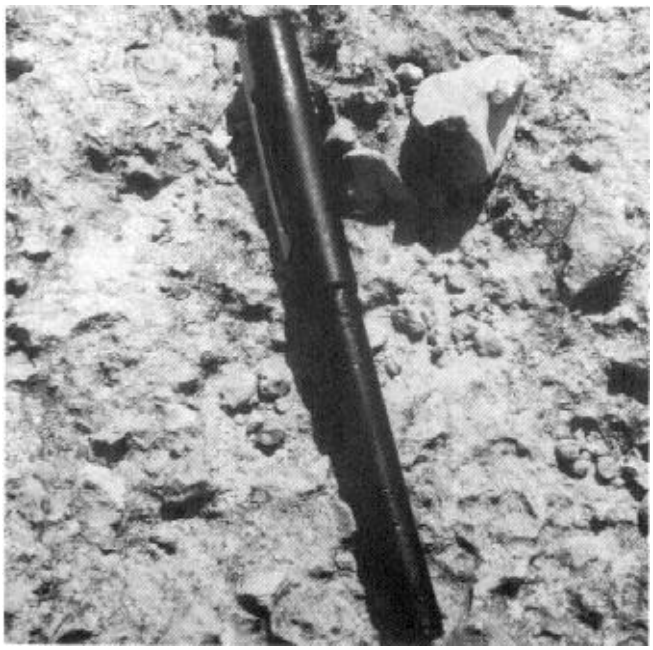

Figure 3. Typical "soil" where the candelilla thrives—an outcrop of limestone. Photograph by Glen Wolfrom.

It appears that the candelilla plant is *preadapted* to survive an arid climate on barren ground by producing a protective wax. When the plant does not need the wax, i.e., growing in regions with more rainfall, it does not produce much of the protectant.

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Water is More than a Drink

Water is a common chemical with very uncommon properties (DeYoung, 1985). Recent findings add further to the evidence of creative design in water. A survey article brings out the following three points (Pennisi, 1993):

1. Instead of being merely a solvent for proteins, water actually helps shape and bind protein structure. Water molecules also influence the function of proteins in unexpected ways. For example, water may act as a barrier to the binding of drugs by proteins. The role of water is of growing importance in organic chemistry.
2. Hot water partially dissociates into positive hydrogen and negative hydroxyl (OH-) ions. Hence the water simultaneously becomes acidic and basic, and hence very reactive. "At 300°C, water acts like the organic solvent acetone at room temperature . . . it can act as a solvent, it can act as a catalyst, and it can act as a reagent" (p. 124).
3. Heated ground water is a catalyst for the rapid formation of oil from organic matter. Water could wreak havoc on established ideas about oil formation. The results suggest that oil can mature faster than previously thought . . . [this may] require the revision of time parameters in computer programs now used to predict locations of new reserves (p. 125).

A popular article explains how design in nature is being studied and exploited for new products (Nash, 1993). Sea shells are stronger than advanced ceramics; the structure of rhinoceros horn is similar to the wings of Stealth aircraft! Spider silk is stronger than steel, stretchier than nylon, and tougher than Kevlar (bullet-proof vest material). And how are these cobwebs made?

> [The] incredible material starts out as a solution in water, and all the spider does is squirt it out through a small hole. In the process, proteins that were soluble turn into insoluble fibers. Now isn't that amazing? (p. 58).

See Williams (1988) for more information on spider webs.

We are just beginning to understand the importance of water to all parts of the Creation. The deeper we look into materials, the more clearly we see creation evidence.

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Modern Medicine Is Not So Modern

The earliest evidence we have of sound public health and sanitary practices is found in the first five books of the Bible, the Pentateuch (Burton, 1983, p. 7). In these writings the Israelites were instructed to isolate, and, if necessary, quarantine those who were sick. They were to destroy contaminated objects, to burn used dressings, and to bury fecal waste outside of the camp. The Israelites were prohibited from eating animals that had died of natural causes. They were also admonished to practice personal hygiene by hand washing and keeping clean, and to take certain precautions when touching the infected or deceased.

> When a man hath a running issue out of his flesh, because of his issue he is unclean. . . . Every bed, whereon he lieth . . . is unclean. . . . And whosoever toucheth his bed shall wash his clothes and bathe himself in water . . . And if he who hath the issue spit upon him that is clean, then he shall wash his clothes and bathe himself in water . . . And whomsoever he toucheth who hath the issue, and hath not rinsed his hands in water, he shall wash his clothes and bathe in water . . . (Lev. 15:2, 4-5, 8, 11).

These same regulations applied to a woman for a specific number of days following childbirth. Furthermore, it was clearly forbidden for Israelites to engage in any sexual relationships outside of marriage. Sexually transmitted diseases are avoided when the family unit consists of the biblical plan of two, husband and wife (see Genesis 1:27 and 2:23-24).

If Israelites obeyed the Word, they would enjoy great health. If they disobeyed, they would not.

> If thou wilt diligently hearken to the voice of the Lord thy God, . . . I will put none of these diseases upon thee (Ex. 15:26).

Unfortunately, during the Middle Ages the importance of the Bible was de-emphasized as the superstitious philosophies of Aristotle, Plato, and others became the chief authority. As a result of setting aside biblical practices of hygiene and infection control, medieval humanity was plunged into centuries of untold misery, suffering, and death from disease (Table I).

Finally, the Protestant Reformation in Europe loosened the grip of superstition and allowed a renewal of scientific investigation and exact description. As men returned to the authority of the Scriptures (which was the cornerstone of the Protestant movement), a great new era began: the era of modern science. Sir Francis Bacon, a devout Protestant philosopher, statesman, and formulator of the "scientific method" of research, summarized the beginning of this new era best when he declared:

> Let no man . . . think or maintain that a man can search too far or be too well studied in the book of God's Word, or in the book of God's works; divin-

Table I. Health and Sanitary Practices Listed in the Pentateuch.

Practice	Reference
Wound, Skin and Discharge Precautions	Lev. 15:2-11, 17:11
Postpartum Precautions	Lev. 12:2, 3
Interment Precautions	Num. 19:11, 14-16, 19, 22 Lev. 11:24-28, 40
Isolation and Quarantine	Lev. 13:1-14:57 Num. 5:2-4 Deut. 23:10
Waste Disposal	Deut. 23:12-14 Lev. 11:33, 13:47-48, 15:12
Unlawful Lifestyles	Ex. 20:14 Lev. 18:22, 20:10-16

> ity or philosophy; but rather let men endeavor an endless progress or proficience in both (Graham, 1986, p. 336).

It is generally accepted that modern **medical** science began in 1876 when Robert Koch and Louis Pasteur demonstrated (almost simultaneously and unknown to each other) the idea of contagion passing from one individual to another. The discoveries made by these men, however, were ignored and even scornfully rejected by virtually the entire medical establishment. Medical scientists and practicing physicians fiercely defended the age old Greek philosophy that microbial life could be generated "de novo" under certain conditions. Through careful experimentation, Koch and Pasteur were able to demonstrate irrefutably that not even the simplest of living things can arise spontaneously from non-living matter. More importantly, this discovery clearly proved that particular kinds of microbes were responsible for particular kinds of maladies. While presenting his ingenious "swan-neck flask" experiment, Pasteur spoke triumphantly (Dubos and Hirsch, 1965, p. 3):

> I have taken my drop of water from the immensity of creation, and I have taken it full of the elements appropriate to the development of microscopic organisms. And I wait, I watch, I question it!—begging it to recommence for me the beautiful spectacle of the first creation. But it is dumb, dumb since these experiments were begun several years ago; it is dumb because I have kept it sheltered from the only thing man does not know how to produce; from the germs which float in the air, from Life, for Life is a germ and a germ is Life. Never will the doctrine of spontaneous generation recover from the mortal blow of this simple experiment!

Louis Pasteur, a deeply religious man (Morris, 1982, p. 60), had demonstrated that life arose only from life. His experiments destroyed the evolutionary myth that the first life arose from non-living matter; a belief still held by evolutionists today. The refutation of spontaneous generation and the establishment of the germ concept of disease was undoubtedly the greatest contribution ever made to the saving of human lives. Had this not been done, physicians would still be devoting their efforts toward combating disease-producing organisms that were thought to have arisen spontaneously **from within** the patient's body. Today, physicians know that pathogens do not arise spontaneously, but are the lineal descendants of parent organisms that were originally transmitted **from outside** the body. Equipped with this evidence, Pasteur and others prevailed on surgeons and medical practitioners to adopt health and sanitary procedures that are strikingly similar to those that were recorded in the Pentateuch 4,000 years earlier! The results were spectacular; millions of lives were and are saved.

It is clear that the true facts of modern medicine agree marvelously with the Bible. For example, the Mosaic regulations pertaining to childbirth, sexual relationships, hand washing, wound and discharge care, quarantining, interment precautions, and waste disposal are examples which seem to indicate that diseases are communicable, and that the best protection against them is to prevent their spread. Furthermore, the germ concept of disease harmonizes perfectly with Genesis 1:24-25 in that God has commanded all living things (which would include microbes) to reproduce "after their kind." Preventive medicine becomes possible with this truth alone! Although the Bible is not a science text, whenever it speaks of scientific matters, it speaks truly and accurately. The most logical explanation of this phenomenon is that the Bible is what it claims to be: **the inspired Word of God.**

What is certain, in any case, is that no constructive progress in medicine was possible until the ancient evolutionary doctrine of spontaneous generation was discarded. The fierce battles to destroy this superstitious myth regarding the origins of microscopic life is one of the most exciting sagas in the long development of modern medicine. For today's scientists, however, to hold to similar evolutionary philosophies regarding the origins of human life is a retreat to the stagnation and superstition of the Dark Ages.

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QUOTE

This modernity seemed to me to be a great civilizational decision to repeat the original sin in the Garden. The serpent had said: "You shall be like God." Was this not the point of the modern project, that man the creature would become his own creator, that nothing would exist that is to him in a relationship of giveness which can only be accepted? *Homo sapiens,* the man who is *wise* because he can come to understand his place in the created order willed to become *homo faber,* man the *maker,* who knows himself only in his technological mastery over his world.

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Advanced Placement Coordinator Questions Evolution

Last spring, when Advanced Placement Examinations had almost concluded, I received from the College Entrance Examination Board (CEEB) various *Advanced Placement Course Descriptions,* including one for biology. Eight percent of the Biology Exam is on evolution, and "Evidence for evolution" is one of the six rubrics under the biology heading.

Being an evolutionary skeptic, I looked through Neil A. Campbell's textbook, *Biology* (1990), and also consulted *Life: The Science of Biology* by Purves, Orians and Heller (1992). Both are listed by CEEB as acceptable.

Campbell's book purports to be scientific but steps over scientific boundaries into metaphysics. It labels as "myth" the notion "that organic molecules are products of supernatural vital forces" (p. 17) and affirms the notion "that life developed on Earth from nonliving materials" (p. 513). It further states, "The history of life is not a story of immutable species individually created on a conservative planet . . ." (p. 9). These statements, however, cannot be supported by science. No human scientist was present in the beginning, and no modern scientist can replicate anything that comes near to the creation of life from inorganic materials. Even if he or she could, it would point in the direction of intelligence being required rather than randomness.

Campbell's textbook is inconsistent; it lists as one of the properties of life the "axiom known as biogenesis," that "Life comes only from life" (p. 4). If life comes only from life, how can the author say that "life developed . . . from nonliving materials" and imply that "supernatural vital forces" should be excluded?

The Purves, Orians and Heller textbook is more guarded: "The initial energy source for life's evolution is not known, but volcanic vents were probably important sites for the evolution of protolife" (p. 397).

I am appalled that one of the greatest biologists of all time, Louis Pasteur, is excluded from the 24 page index of Campbell's text. Pasteur established the Law of Biogenesis and perhaps should be regarded as the father of modern bacteriology as well as being a major contributor to the developments of vaccination and immunization. He contributed more to world health than perhaps any other modern scientist.

Since Campbell's textbook worships the notion of evolution—"the one biological theme that unifies all others: evolution" (p. 117)—one wonders if Pasteur was excluded from the index because he demolished the then-prevalent and naive evolutionary notion of spontaneous generation. The Purves et al. textbook describes him as "the great French scientist" and credits him with obtaining "results that finally convinced most people that spontaneous generation does not occur" (p. 386). Authors Purves, Orians and Heller are apparently not among the "most," however, because their text goes on to assert that "life *did* arise by . . . a form of spontaneous generation—under conditions much different from today's" (p. 397).

The evidences for evolution given in Campbell's textbook (pp. 434-437) are extremely weak. They include conjectures about biological distributions, misleading information about fossils, arguments from taxonomy, comparative anatomy, embryology, and molecular biology.

Regarding fossils, the text says that the "record of past life is incomplete even today, although . . . many of the key links are no longer missing" (p. 435). The only example in context, however, is *Archeopteryx,* and we have known about this extinct animal for many decades; moreover, fossils of birds predating *Archeopteryx* have recently been uncovered, disqualifying *Archeopteryx* as a "key" link.

Niles Eldredge, interviewed in the text, refers to "the fundamental observation that there are few good examples of slow, steady, gradual transformations within species in the fossil record through time" (p. 421) and adds that "a hundred years (after Darwin) there still weren't many satisfying examples of gradual transformations." How does this harmonize with the statement, "many of the key links are no longer missing" (p. 435)? Time and space do not permit delineating other weaknesses.

In conclusion, metaphysical evolution presuppositionally rules God out of the picture, and the manifold wisdom and design we see throughout creation is offered as the product of blind chance. The notion that a computer could have come into existence without intelligence is absurd—how much more the human brain!

Evolution should not be taught to students unchallenged, at least in science. Arguments against its validity should be encouraged and alternative approaches considered. Moreover, this approach should not be viewed as being inimical to science. Isaac Newton, perhaps the greatest of all modern scientists (gravitation, laws of motion, calculus) had no problem with the concept of God. In his *Principia,* he wrote of the "Lord over all."

Many other scientists, including Robert Boyle (regarded as the father of modern chemistry and an apologist for theism), George Cuvier (credited with being the founder of the science of comparative anatomy), Michael E. DeBakey (famed heart surgeon who said, "I still have almost religious sense when I work on the heart. It is something God makes."), John Ambrose Fleming (considered the father of modern electronics and first president of the Evolution Protest Movement), Johann Kepler (viewed as the founder of physical astronomy, the one who thought "God's thoughts after Him"), Carolus Linneaus (judged to be the father of biological taxonomy, relating "species" and "kinds"), Joseph Maxwell (also one of the greatest of modern scientists and strong opponent of evolution), Gregor Mendel (the father of genetics and one who rejected Darwin's evolutionary notions), Samuel F. B. Morse (telegraphed, "What hath God wrought!"), John Ray (referred to as the father of English natural history and author of *The Wisdom of God Manifested in the Works of the Creation),* and many others likely would have concurred.

To the question, "What other forces do you see leading us to the humane holocaust?", Malcolm Muggeridge responded in 1986:

> I think that after the story's told, when the history of our time is written, we will see that the theory of evolution—which has invaded every single discipline within the whole structure of Western thought which is itself based upon this theory—

was one of the most brilliant coups of the devils. Of course it's complete nonsense, but it has captivated the Western mind. The belief that this theory is absolutely true is so borne in upon the educated that you can't reach them. I find it incredible. (See Brooke and Muggeridge, p. 37.)

Several years ago, I received in my school mailbox a personal letter from the then Surgeon General C. Everett Koop, M.D. He wrote, "It has been my conviction for many years that evolution is impossible, just on the basis of mathematics alone." I agree. As far as I am concerned, students would make better use of their time if they were required also to know the evidence *against* evolution. The biological establishment, I believe, opposes this, but considering opposing evidence is good science.

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An Interesting View of Extinction (Quote)

Whatever the nature of the altithermal, wet or dry, drought cannot be advanced as an explanation for the extinction of large mammals 8,000 to 10,000 years ago. The circular argument that drought caused extinction and that the presence of extinct animal bones is proof of wet climates can be discarded on empirical grounds. Extinct animal bones are to be found in sediments representing either pluvial (wet) or postpluvial (dry) environments.

Some anthropologists and paleontologists may dispute my insistence that large mammals disappeared not because they lost their food supply but because they became one. At first the suggestion that the *earliest invaders of the New World were culturally so advanced and technically so skillful* that they managed to destroy more native species of animals than have fallen victim to the onslaught of western civilization seems preposterous. It violates our notion of cultural progress and our tendency to view Paleo-Indians as a part of the balance of nature. Perhaps we have underestimated the population size and technical ability of the early hunters. Admittedly, our knowledge of Early Man is not terribly revealing . . . From the continent-wide distribution of the diagnostic projectile points Mason . . . has inferred a cultural homogeneity and a common base of subsistence based on fulltime hunting of large mammals. In the absence of any convincing alternative explanation the indictment of Early Man is unavoidable.

Following extinction of the large mammals the early hunters probably suffered economic depression and a population crash. Under a climate similar to the present and with the existing biotic zones in place, the early hunters were obliged to begin their 7,000-year experiment with native plants, leading in the altithermal to increasingly skillful techniques of harvesting and gathering, to the domestication of certain weedy camp-followers, and, within the last 1,000 years, to the widespread adoption of flood plain agriculture. Many clues along the trail remain to be detected by pollen analysis and other paleoecological methods. [Emphasis added.]

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Reprinted CRSQ Volume 12

Introduction

The *Creation Research Society Quarterly* has been published since 1964 (29 complete volumes). In an effort to make these volumes available, many of the missing issues have been reprinted. Brief synopses have been written on volumes 1-11 and have appeared in the previous 11 quarterlies. In each synopsis, major articles are reviewed to give a person interested in scientific creationism a general idea of the contents of that volume. Many of the articles are of continuing interest and value.

Young Earth and Solar System

The theme of many of the articles in the June 1975 Quarterly was the young earth and solar system. Walter Lammerts, in an unique study (1975, pp. 3-6) on Yosemite Valley, used botanical and geological evidence to claim that the Valley is youthful in age. Employing radiation pressure on micrometeoroids and the existence of micrometeoroids, Samec (1975, pp. 7-10) concluded that the solar system must be young. Barnes (1975, pp. 11-13) determined the energy of the earth's magnetic field and showed by the yearly loss of energy from this field that it must have originated recently. Henry Morris (1975, pp. 19-22), using 74 "dating" methods and uniformitarian assumptions, showed that the age of the earth could be found to be from "too small to calculate" to 260 million years in age. About 33% of the methods yielded "ages" of less than 10,000 years. Obviously there is no such thing as a scientific dating method. This interesting article deserves serious study. Meteoritic evidence for a young earth was presented by Steveson (1975, pp. 23-25). Then Ingram (1975, pp. 32-33) considered that a young universe is a theological necessity.

Mathematics

In a series of articles, David Rodabaugh (1975a, pp. 14-18; 1975b, p. 107; 1975c, pp. 173-175) using statistics and probability arguments, demonstrated that the improbability of the occurrence of molecules-to-man evolution is so great that it can be considered scientifically impossible. He noted that to extrapolate present observational data into the remote past (4 billion years ago) is unfeasible because of the error involved. Considering population statistics and examining human population growth figures it was shown that predictions based on the creation model are reasonable but the evolution model leads to absurd conclusions. Applying probability arguments to the fossil record and the gaps involved, one realizes that for all practical purposes, molecules-to-man evolution is impossible.

Physical Sciences

Giannone (1975, p. 53) briefly compared the ark with modern ships and stated that ". . . the Master

Architect knew precisely what He was doing when He gave explicit instructions to Noah, the world's first shipbuilder." Harold Armstrong (1975b, pp. 103-106) formulated arguments with the macroscopic form of the second law of thermodynamics to show that supposed evolutionary development definitely could not have been a spontaneous (natural) process. The first and second laws of thermodynamics were discussed in a unique manner by Hubert (1976, pp. 192-193) in his presentation on creation, creativity and degeneration. Larry Helmick (1975, pp. 156-164) discussed optical activity of living organisms within a teleological model. He claimed that:

> Optical activity is a fundamental physical property of all living organisms. Therefore, anything used to account for the origin of life on earth must account for this amazing phenomenon. The mechanistic theory, involving chance and natural selection, is inadequate to explain the origin and maintenance of optical activity which is presently observed in the biosphere. However, a teleological theory based upon a recent, highly ordered divine creation, followed by degeneration, will account for this phenomenon. Moreover, such a theory is in agreement with the Genesis account of creation, the laws of thermodynamics, modern chemical theory, and chemical, biological, and geological data (p. 156).

A theory of gravitation was developed by Barnes and Upham (1976, pp. 194-197) with the same type of equations as employed in electrical field theory. The so-called three Einstein effects were deduced by the authors without reference to the general theory of relativity and the 10 field potentials required in that theory. In a very detailed article, Courville (1976, pp. 201-210) explained the uses and abuses of astronomy when dealing with Egyptian chronology. He concluded:

> . . . claims of error in Scripture can be met head-on; and it is found that the error is not in Scripture, but rather in the conventional interpretation of archaeology and chronology (p. 209).

Earth Sciences

Erich von Fange (1975, pp. 131-138) in a treatise entitled "Strange Fire on Earth" outlined several instances in earth history of violent conflagrations and the damage wrought by such events. Burdick (1975, pp. 155-156) briefly discussed thrust faults near Loch Assynt, Scotland and compared them with the Glarus formation in Switzerland. In the first of a series of research reports (Williams, et al., 1976, pp. 211-212), the data concerning rapid precipitation of dripstone-like formations in a laboratory situation were given. In these experiments, it was hoped to find the conditions under which rapid formation of $CaCO_3$ structures could be achieved and to compare them to actual cave situations.

Personalities

"Darwin's Last Hours" written by Rusch (1975, pp. 99-102) examined the claims of the so-called death bed conversion of Charles Darwin. This article is a chapter in the book *Did Charles Darwin Become a Christian?* which is devoted to an investigation of Darwin's views on Christianity. Davidheiser (1975b, pp. 164-166), in discussing the Charles Lyell centennial, pointed out the deceptive nature of some of Lyell's claims.

Biology

Botany

George Howe (1975, pp. 47-51) thought that conducting vessels in plants presented problems for both evolutionists and creationists but he suggested that the creation model best fitted the available data. Tinkle (1975, p. 52) continued his research on the reduced viability of mutant plants. Differentiation in the vascular cambrium into xylem and phloem was presented as evidence for teleology in botany by Thompson (1975, pp. 59-61). An interesting thesis developed by Ferguson (1975, pp. 108, 127) noted that plant dormancy is evidence of skillful design. A well-done field study by Howe (1976, pp. 184-190) on how two different chaparral shrubs grow after fires will be of interest to botanists. Such patterns of regrowth were considered evidence of the providence of God. Lammerts (1976, pp. 190-191) briefly outlined speciation in two shrubs. He noted that the evolutionary model did not satisfactorily explain his observations. Cornell (1975, pp. 139-140) showed how the moccasin flower *(Cypripedium acaule)* had to be designed.

Zoology

Smith (1975, pp. 54-58) discussed body temperature regulation in reptiles, birds, and mammals. Such factors as heat production, blood flow, evaporative water loss, behavioral and physiological mechanisms were examined. The author concluded that God designed animals so that they could live in their respective niches. Cow and horse brains were compared (Davidheiser, 1975a, pp. 88-89) and it was explained how the evolutionary hypothesis fails to account for the physical realities. The remarkable skull of a woodpecker was shown on the cover of the March 1976 Quarterly and Sunderland (1976, p. 183) related how the tongue of this bird had to be designed and could not have evolved.

Genetics

Quinn (1975, pp. 62-65) discussed the conversion of codons into analogous conformers and the assembly of conformers into polypetides. Then he illustrated how models could be constructed to aid students. Homoeotic mutants in light of evolutionary claims were examined by Ouweneel (1975, pp. 141-154). He explained the importance of homoeotic mutants to creationists and presented various interpretations of the experimental findings. This detailed treatise is well worth reading.

General

Armstrong (1975a, p. 31) gave an unusual interpretation of natural selection. Gish (1975, pp. 34-46) reviewed creationist research of the past decade. This article is a chapter in the book, *Creationist Research (1964-1988)* written by him. Wolfrom (1975, pp. 84-88) developed a thesis that evolution is a poor scientific theory and must be believed religiously. The canopy theory of the early earth was examined from a Scriptural standpoint by Udd (1975, pp. 90-93). Tinkle (1975, pp. 94-95) explained some errors in scientific methodology as related to the evolutionary concept of gradual development. Holroyd (1975, pp. 95-98) carefully noted that

chance events cannot produce symmetry and design. Writing in a novel format, Bass (1976, pp. 197-200) revealed the superstition of stochastic succession. This volume of the Quarterly also contains technical notes, book reviews and letters to the editor on many subjects that deal with the creation/evolution controversy. A wide range of creationist scientific work can be found within its pages.

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Emmett L. Williams*

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MINUTES OF 1992 CREATION RESEARCH SOCIETY BOARD OF DIRECTORS MEETING

On Thursday, 9 April 1992, a meeting of the Executive Committee was held from 2020 to 2250 hours to set the agendas for the committee meetings on Friday. On Friday, 10 April 1992, between the hours of 0800 and 1700, the Constitution/Bylaws, Financial, Publications, Quarterly Editorial, Research and Temporary Fund Raising Committees held meetings each of approximately two hours. The Chairman of each committee recorded the business in preparation for the Saturday business meeting.

The official annual meeting of the Society was opened at 1900 hours by President Frair. Present were E. Chaffin, D. DeYoung, W. Frair, D. Gish, G. Howe, D. Kaufmann, L. Lester, J. Meyer, W. Rusch, E. Williams, G. Wolfrom, P. Zimmerman and 220 visitors. The President welcomed everyone to this meeting of the 29th year of the Creation Research Society. This was followed by silent prayer. Dr. Ted Aufdemberge, Professor of Science, Concordia College, welcomed CRS members and guests to the College. President Frair expressed gratitude from the CRS to the Creation Science Association of Detroit for providing refreshments.

Meyer gave a report on the latest developments of the CRS Grand Canyon Center near Chino Valley, Arizona. Wolfrom gave a report on CRS work at the Grand Canyon. Howe gave a report on a study of the Haymond Formation. Williams gave a report on the status of CRS publications. Howe introduced the speakers of the Mini-Symposium: New Developments in Creation Science. DeYoung spoke on "New Developments in Astronomy" Frair spoke on "Baraminology in Action." Gentet spoke on "Early California Gold Diggers." Humphreys spoke on "Young Earth Cosmology." Lester spoke on "Life—The Changing Creation." Rusch spoke on "The Law and Origins." Gish spoke on "How the Universe Began—An Update." The meeting was ad-journed at 2145 hours for refreshments and social discourse.

On Saturday, 11 April 1992, the closed business sessions of the Board were called to order at 0800 hours. Present: D. Boylan, E. Chaffin, D. DeYoung, W. Frair, R. Gentet, D. Gish, G. Howe, R. Humphreys, D. Kaufmann, L. Lester, J. Meyer, W. Rusch, E. Williams, G. Wolfrom, P. Zimmerman. The minutes of the 1991 meeting were read and accepted. Secretary Kaufmann

reported that the following were elected to the Board for a three-year term: D. DeYoung, D. Gish, R. Humphreys, D. Kaufmann, E. Williams, P. Zimmerman. The following were elected to the Board of a one-year term: D. Boylan, R. Gentet.

The Financial Secretary's report was given by Zimmerman. It was passed that the CRS Board adopt an investment policy permitting the purchase of investment-grade industrial bonds of a no load mutual high grade corporate bond fund. The value of these holdings shall not exceed 20% of the total investment portfolio. The Treasurer's report by Meyer was given as follows: Total expenses for 1991 were $86,189.36. The membership report by Wolfrom was given as follows: total membership for 1991-1992 was 1774 (672 voting, 729 sustaining, 336 subscribers and 37 students). Editor DeYoung reported that we published 49% of submitted articles, 80% of submitted book reviews, 95% of Panorama notes and 68% of letters to the editor for a total of 74 items published. The research report was given by Williams. It was passed that $9500 be approved for research projects for the 1992-93 year. The constitution/bylaws report by Boylan was given as follows: a detailed position description for the Director, Van Andel Research Center, was presented and approved by the Board.

The publications report by Howe was given as follows: it was passed that up to $100 per month be used to rent additional storage space for Quarterly overruns and back issues. It was passed to publish Wolfrom's CRSQ Index, 1984-1991. The Publications Committee will solicit short, well-illustrated, readable manuscripts for a series of readers on selected origins subjects. Williams, DeYoung and Chaffin were authorized to revise and update Mulfinger's *Design and Origins in Astronomy*. Chaffin, Howe and Lester will cooperate with J. Read to develop a video cassette on supposed overthrusts in Virginia. Frair now has the plates and rights to our Biology textbook which CRS will handle. It was passed that the cost of the storage of Quarterlies at Kansas City will hereafter come from the publications fund instead of the general fund.

It was passed to have a 1992 appeal for funds to support the operation of the Research Center to be directed by Chaffin and the Director of the Research Center.

It was passed to nominate the four incumbents (Boylan, Frair, Gentet, Howe) and T. Aufdemberge for the 93/94-95/96 Board. The meeting was adjourned at 1145 hours and reconvened at 1315 hours. D. Gish and J. Meyer were unanimously elected to the status of fellow. It was passed to send the old IBM computer to the Secretary and authorize him to purchase a printer for up to $300. It was passed to leave membership fees the same for the coming year. The following were elected as officers: President—W. Frair, Vice President—E. Chaffin, Secretary—D. Kaufmann, Treasurer—R. Gentet, Financial Secretary—P. Zimmerman, Membership Secretary—G. Wolfrom.

It was passed that the Board meet in Grand Rapids in 1993, Chino Valley, Arizona in 1994 and Kansas City in 1995 with the exact dates for 1993 to be determined by J. Meyer. It was passed to send a resolution to the Van Andel Foundation stating our appreciation for their recent financial grant. The meeting was adjourned at 1400 hours.

David A. Kaufmann, Secretary

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QUOTE

It is the religious view that each individual *encapsulates* some portion of the divine, and thus there is a sacredness about him. The sacredness of the person is translated into politics as his "rights," which are, as the Declaration puts it, endowed by the Creator. Abandon the idea of a Creator, regard the human being as just another by-product of natural and social forces, and he has no more "rights" than any other facet of nature. The State will of course protect him along with other forms of wildlife, and otherwise use him for its own ends when necessary. And so will psychologists like B. F. Skinner, who informs us that "the issue of personal freedom must not be allowed to interfere with a scientific analysis of human behavior."

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Historical Perspectives

THE HISTORY OF *HESPEROPITHECUS HAROLDCOOKII HOMINOIDEA*

JERRY BERGMAN*

Received 10 June 1992; Revised 5 October 1992

Abstract

The discovery and controversy surrounding ***Hesperopithecus huroldcookii*** *and its importance in proving evolution is recounted. An extensive review of the statements of its supporters reveals the role that preconceptions played in interpreting the evidence. The account provides an important lesson today for the need of neutral observers to carefully evaluate the empirical evidence for new ideas, especially those that are related to the field of origins.*

Introduction

One of the most well-known examples of misidentification in the history of physical anthropology is Nebraska Man, technically labeled *Hesperopithecus haroldcookii.* This incident was of special importance because Henry Fairfield Osborn, a prominent paleontologist and head of the American Museum of Natural History, planned to use it as prime evidence of human evolution at the Scopes trial. The events which surrounded the discovery and the statements of many internationally prominent anthropologists and evolutionists made about the find are instructive of the influence of belief structures and preconceptions on evaluating empirical data. In Cattell's words:

> This discovery . . . in addition to being important scientifically, has a timely interest because of the attacks that during the past few months have been launched at the ground work of science through the zeal of opponents of the fact of evolution of man, and has a dramatic or comic aspect in that it comes from the home state of William Jennings Bryan (1922, p. 588).

The Evidence

Nebraska man was based on a single molar tooth discovered in early 1922 by Harold J. Cook. This 10.5 X 11 mm tooth was no ordinary tooth, but as Blinderman (1985, p. 47) states, "was the answer to American anthropologists' prayers." Cook was an Agate, Nebraska consulting geologist who had experienced some success in discovering fossils. *Hesperopithecus* was found on the ranch of Harry Ashbrook, 20 miles south of Agate, on Olcott Hill in a quarry near Snake Creek, a small town about 400 miles west of Omaha, Nebraska (Gregory and Hellman, 1923a). The site contained fossils

> of a fauna so Asiatic in its characters that it is necessary to suppose that when these beds were laid down, or before they were deposited, America was united to Asia, thus making it possible for early precursors of man or ape to make their way from the Old World to the New (Keith, 1925, pp. 474-475).

He no sooner discovered his soon to be famous tooth than he sent it to Harry Fairfield Osborn, the President of the American Museum of Natural History in New York. On February 25, 1922 Harold Cook wrote to Osborn the following about the tooth:

> I have had here, for some little time, a molar tooth from the Upper, or Hipparion phase of the Snake Creek Beds, that very closely approaches the human type. . . . In as much as . . . you and [your colleagues] are in the best position of anyone to accurately determine the relationship of this tooth . . . I will gladly send it on to you, should you care to examine and study it (Osborn, 1922a, p. 463).

Osborn received the actual tooth himself on March 14, and with what Gould (1991, p. 334) states was "his usual precision" he telegraphed Cook to tell him that the "tooth just arrived safely. Looks very promising. Will report immediately." Osborn concluded that the tooth "looks one-hundred per cent anthropoid" and added that in consultation with Dr. Mathews we concluded that it is "the last right upper molar tooth of some higher Primate" (Osborn, 1922a, p. 464). The tooth was determined to be in a Pliocene deposit, and was evaluated to be over a million years old (Hitching, 1982). After "careful studies" Osborn named the genus and species. *Hesperopithecus Haroldcookii* which means *western world ape-man* (literally ape of the land where the sun sets) with Harold Cook's name as the species (Osborn, 1923a, p. 464). This naming system set the pattern for other finds, the most well known example being *Australopithecus africanus* "southern ape of Africa" (Reader, 1981). Gregory and Hellman (1923a, p. 13) after extensive evaluation of the tooth concluded that the evidence furnished, "fairly conclusive proof of the Lower Pliocene age of the *Hesperopithecus* tooth. There is no reasonable doubt as to its age." And Grafton Elliot Smith (1929) stated of Osborn and his find:

> The earliest and most primitive member of the human family yet discovered . . . one would regard so momentous a conclusion with suspicion if it were not for the fact that the American savants' authority in such matters is unquestionable.

Although the crown was extensively "worn down by use nearly to the base so that the cusps had entirely disappeared" the roots were broken, and the tooth was "rolled and polished" and was "cracked and fissured," Osborn, using drawings and casts of other tooth findings, formally concluded that "it was the second right molar of a primate similar to apes and humans, yet distinct from any known species" (Blinderman, 1985, p. 47; Keith, 1925, p. 476). Examinations by other paleontologists, including William Kane Gregory of the American Museum, a leading authority on the evolu-

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tion of dentition, and his colleague, Milo Hellman, both concluded that the tooth differed from any known ape molar, and far more closely resembled those of modern man (Gregory and Hellman, 1923b, Keith, 1925, p. 475). It was judged to be very similar to the primitive Java man teeth. Its evenly concave surface of wear was "strikingly similar to the worn-down surface of one of the upper molar teeth" of Java man (Gregory, 1927, p. 580).

Gregory (1927, p. 580) also concluded that since the Nebraska tooth "had a very wide root on the inner side, which was similar to the wide root on the inner side of the upper molars of *Pithecanthropus* and of many teeth of American Indians" that it was evidence of the missing link between men and their primate ancestors. While some scientists concluded that the upper molar resembled a man similar to that of an American Indian, others felt it was a *Homo erectus* more similar to Java Man. Disagreements involved all of the other missing links as well, and even the status of *Pithecanthropus*, now called *Homo erectus*, was then and is still today being debated (see Linton, 1925; Milner, 1990). Sir Grafton Elliot Smith, a renown University of London scholar who has published much on the evolution of the brain, wrote in June of 1922 that, "The tooth found in the [Miocene] beds of Nebraska is really that of a primate member of the human family" (Blinderman, 1985, p. 49; Bowden, 1977, p. 46). The tooth was judged by many of the leading scientists as clear evidence for a creature about half way between the apes and modern man, the perfect missing link needed to prove Darwin's theory:

> The anatomical, palaeontological, and other evidence already accumulated tends to show that man, *Pithecanthropus, Hesperopithecus*, and the various anthropoids form a natural superfamily group, which may now be named the **Hominoidea,** in contrast with the **Cercopithecoidea,** or Old World monkeys (Gregory and Hellman, 1923a, p. 140).

Osborn was exuberant over the find which he regarded as not only the long awaited proof of evolution, but also evidence of the first anthropoid ape in America. Wilder (1926, p. 157) concluded:

> Judging from the tooth alone the animal seems to be about half way between *Pithecanthropus* and the man of the present day, or perhaps better between *Pithecanthropus* and the Neandertal type, and is assumed to represent a very early migrant from the Old World, passing over land bridges, which then quite possibly existed. It thus revives again a hope, long since abandoned, that the human stem may have had its beginning in the New World.

The tooth was brought to light just in time to provide Osborn with evidence to use against his long time nemesis, William Jennings Bryan, whom he had just written to advise him to read Job 12:8 which states, "Speak to the Earth and it shall teach thee." Osborn felt that the Earth "spoke to Bryan" by the discovery of this tooth because this "irrefutable" evidence for evolution was by a "humorous coincidence" discovered in Bryan's home state of Nebraska (see for example Osborn, 1922a). Osborn soon wrote an article and then a book with this title on this theme.

The *Hesperopithecus* was believed by many paleontologists to be the oldest then known humanoid fossil, found in a ten million year old Miocene fossil bed. Cro-Magnon, the many Neandertal fossils, and Java man were even then considered far too modern, and today are judged as simply different races of modern man (Shackley, 1980). Nebraska man also had a great patriotic significance because it was the first evidence, according to Osborn,

> after seventy-five years of continuous search in all parts of our great Western territory of a [higher] primate. Evidence of this anthropoid ape-man was also proof that some primitive humans lived in America, and some speculated that it may even prove that mankind in North America predated European and African humans. We have all eagerly looked forward to such a discovery (quoted in Blinderman, 1985, p. 48).

Having found evidence of primitive man in America, the next question was to explain how he got here. Osborn hypothesized that Nebraska man had migrated across the Bering Straits land bridge which he believed existed 10 to 15 million years ago during the Miocene era. He also concluded that Nebraska man must be as ancient as the prehistoric animals unearthed nearby, a conclusion based upon the fact that the tooth was found in the same strata as several primitive horses, old world antelopes, hornless rhinos and other animals all dating from the Miocene era.

Soon vivid drawings of the reconstructed body of *Hesperopithecus haroldcookii* appeared in popular press publications throughout the world and even in some scientific journals. In the *Illustrated London News* of June 24, 1922 was a picture of a stooping Negroid featured ape-man and his wife spread over two pages complete with a vivid prehistoric background of horses and camels. Under the picture painted by Amedee Forestier the text said:

> The poise of the head should be noted, large muscles from the occiput [back of the head] to the back and shoulders having to counteract the weight of the prognathous [jaws extended forward] and heavy jaw—a simian [monkey-like] character (p. 943).

The level of confidence that Osborn had in the validity of his conclusion are vividly revealed in his own words:

> The world-wide interest aroused by the discovery in Nebraska of *Hesperopithecus,* "the ape of the western world," is in widest of possible contrast to the diminutive and insignificant appearance of the single grinding tooth of the right side of the upper jaw, which speaks of the presence of the higher or manlike apes in our western country at a time when the ancient "Territory of Nebraska" was in close touch with the animal civilization of Asia and of western Europe. This *Hesperopithecus* tooth is like the "still small voice;" it is by no means easy to hear its sound. Like the hieroglyphics of Egypt, it requires its Rosetta Stone to give the key to interpretation. Our Rosetta Stone is [a]

> comparison with all the similar grinding teeth known, collected from all parts of the world, and described or figured in learned books and illustrations. By these means this little tooth speaks volumes of truth,—truth consistent with all we have known before, with all that we have found elsewhere. The evidence is strongly supported by many other and more complete fossil specimens that speak of a fresh tide of migration from the Old World to the New perhaps a million years ago. . . . What shall we do with the Nebraska tooth? Shall we destroy it because it jars our long preconceived notion that the family of manlike apes never reached the western world, or shall we endeavor to interpret it, to discover its real relationship to the apes of Asia and the more remote Africa? . . . Certainly we shall not banish this bit of Truth because it does not fit in with our preconceived notions and because at present it constitutes infinitesimal but irrefutable evidence that the man-apes wandered over from Asia into North America (Osborn, 1925b, pp. 800-801).

Its importance was so enormous that it became known as the million-dollar tooth in 1925:

> . . . because of an accident which occurred while it was being X-rayed. The tooth, which had been guarded like so much radium, was taken to a dental laboratory. Professor Gregory handed it to a laboratory assistant and said: "Now be mighty careful. That tooth is worth a million dollars. The laboratory assistant began to tremble all over, the tooth slipped from his fingers, fell to the tiled floor and was shattered. There was boundless consternation for a time. The fragments were recovered and with the help of some cement the tooth was reconstructed and X-rayed. A great library of X-ray photographs of this and other teeth and studies of all kinds went eagerly ahead. It was found that the tooth, its crown being considerably worn, closely resembled a tooth of *Pithecanthropus,* the Java ape-man *(New York Times,* Feb. 20, 1928, p. 8).

Bryan's response to the discovery was that the *Hesperopithecus* tooth "is interesting not because it has any value or because it disproves the Bible, but because it shows that Darwin's hypothesis can paralyze the brain in an otherwise intelligent man" (Quoted in Blinderman, 1985, p. 48). He also stated that Osborn's:

> . . . latest "newly discovered evidence" is a long lost witness captured in Nebraska. He would probably have declared it "irrefutable" . . . —but the fact that it was found in Nebraska, my home State for a third of a century, greatly multiplied its value. Some one searching for fossils in a sand hill came upon a lonely tooth. . . . The body of the animal had disappeared, and all the other pieces of "imperishable ivory" had perished; not even a jaw bone survived to supply this Samson of the scientific world with a weapon to use against the Philistines of today. But a tooth in his hand is, in his opinion, an irresistible weapon.
>
> The finder of this priceless tooth, conscious that it could impose upon but a few, even among those who prefer speculation to reason, wisely chose Professor Osborn. He hastily summoned a few congenial spirits, nearly as credulous as himself, and they held a postmortem examination on the extinct animal, which had at one time been the proud possessor of this "infinitesimal" and "insignificant" tooth. After due deliberation, they solemnly concluded and announced that the tooth was the long looked-for and eagerly longed-for missing link which the world awaited.
>
> The Professor's logic leaks at every link, but is no worse than that of his boon companions who, having rejected the authority of the word of God, are like frightened men in the dark, feeling around for something that they can lean upon. True science is classified knowledge and is of incalculable use to man. Give science a fact and it is invincible. But no one can guess more wildly than a scientist, when he has no compass but his imagination, and no purpose but to get away from God. Darwin uses the phrase "we may well suppose" eight hundred times and wins for himself a high place among the unconscious humorists by his efforts to explain things that are not true. For instance, he assumed that man has a brain superior to woman's brain, and tried to explain it on the theory that our ancestors were brutes, and that the males, fighting for the females, increased their brain power. He also assumed that our ancestors were hairy animals, and tried to explain the disappearance of the hair on the theory that the females selected their companions, and, because of a deep-seated and universal preference, selected the least hairy and thus, in the course of ages, bred the hair off (Bryan, 1925, p. 105, 106).

As Blinderman (p. 49) concluded, the creationists then saw the "spat of recent hominid findings as a display of scientific quackery. They were not willing to accept fossils like Nebraska man and Java man as ancestral ape-men. They held that God created each creature [and that] . . . there could be no intermediate forms."

Although many of the leading paleontologists supported the validity of the hominid conclusion, or at least the conclusion that it was an anthropoid, some disagreed. Sir Arthur Keith, after evaluating the tooth carefully, concluded that its wear and crown pattern would not be expected in a primate, and that this evidence strongly argued against its being one (Keith, 1925, p. 476). He also notes Schlosser concludes the tooth is from an extinct horse (Keith, 1925, p. 476). Other anthropologists, such as Arthur Smith Woodward, curator of geology at the British Museum, pointed out other problems with the primate interpretation:

> It [is] difficult for one who has not seen the tooth to understand why Prof. Osborn even refers it to a Primate; and the published figures are not very helpful. The crown may be described as nearly triangular in shape, with bluntly rounded angles, a slightly raised and partially crimped rim surrounding a gently concave surface. The root is very massive, and at a considerable distance below the crown it becomes bifid, the smaller portion extended beneath one margin of the crown, the larger portion beneath and inclined towards the

> opposite apex. On one side of the root, between the bifurcation and the crown, there is an irregular indentation, from which Prof. Osborn supposes a third root-fang has been broken away. No stump of this third fang, however, is shown in the drawing. In determining the tooth to be an upper molar, Prof. Osborn regards the edge with the smaller portion of root as external, and the tapering opposite end with the larger portion of root as internal. The hypothetically restored piece of root thus becomes posterior. It is, however, equally reasonable to interpret the so-called external border as anterior and the tapering end as posterior. If, then, the indented lateral portion of the root never bore another fang, the tooth becomes a lower molar. If this interpretation be admitted, comparison should be made not with any Primate tooth, but with the last lower molar in the primitive bears. In general appearance and shape the crown is very suggestive of that of the last molar in the lower jaw of some species ascribed to Hyaenarctos and related genera. . . . The root of the last lower molar of Hyaenarctos unfortunately appears to be unknown; but in the modern Ursus, in which the tooth in question is extremely variable, the root is often bifid, as in the new fossil from Nebraska, while between the bifurcation and the crown there is a hollowing of its outer face. There is, indeed, some reason to suspect that *Hesperopithecus* has received an inappropriate name (Woodward, 1922a, p. 750).

Osborn, though was adamant: calling Woodward's criticism great incredulity (Osborn, 1922a, p. 281) and that:

> In the whole history of anthropology no tooth has ever been subjected to such severe cross-examination as this now world famous tooth of *Hesperopithecus*. Every suggestion made by scientific skeptics was weighed and found wanting (quoted in Reader, 1981, p. 110).

Gregory and Hellman (1923, p. 526) also reviewed extensively the criticism, concluding that the *Hesperopithecus* identification is valid:

> Professor Osborn's determination of the type of *Hesperopithecus* as a new genus of anthropoid apes has not been universally accepted. The following possible identifications of the type have been made by various persons.
> 1. Upper molar of an anthropoid ape, probably a new genus (American Museum staff).
> 2. Lower molar of *Hyaenarctos* or allied genus of ursid.
> 3. Upper molar of the same.
> 4. A "bear's tooth."
> 5. A molar of an otherwise wholly unknown type of carnivore.
> 6. An upper or lower molar of some carnivore allied with *Aeloropus*.
> 7. An upper molar of gigantic relative of the procyonid carnivore *Potos*.
> 8. An upper molar of a gigantic relative of such South American monkeys as *Pithecia* and *Lagothrix*.
> 9. The first upper deciduous premolar of a Pliocene horse.
> 10. An incus bone of a gigantic mammal.
> We have considered each of these with unbiased minds and compared the type with the various specimens suggested, as well as with many others, but have returned with more confidence to the conclusions set forth above.

Eventually, Osborn, Harold Cook and others endeavored to quiet their critics by digging for more evidence. In 1925 they located several objects which they concluded were likely the ancient tools used by Nebraska man. Two years later, more such objects were found, many of which caused them to question the claims that they were human artifacts. Albert Thomson of the American Museum of Natural History staff collected samples at the Snake Creek beds in the summer of 1925, and in 1926 another anthropologist collected many new specimens, all which led scientists to doubt the identification of *Hesperopithecus* as an upper molar of an extinct primate (Reader, 1981, p. 110). The numerous teeth that they uncovered there were very similar to the original find, only in much better condition. They finally concluded that *Hesperopithecus* was "an upper premolar of a species of *Prosthennops*, an extinct genus related to the modern peccaries" (Gregory, 1927, p. 580).

This conclusion was based on the lower teeth which the field evidence indicated were associated with the upper premolars that were previously concluded to be *Hesperopithecus* but were "unquestionably the same or nearly the same as the corresponding lower teeth of *Prosthennops*" (Gregory, 1927, p. 581). The excavations in 1927 found a number of scattered upper and lower premolar and molar teeth, and every one appeared to be *Prosthennops* which were almost identical to the *Hesperopithecus* except that they were far less damaged. These enabled a more accurate identification to be made, eventually resulting in the almost universal conclusion that the tooth type was an upper premolar of an *Prosthennops*, a genus related to the modern peccary, a wild pig thought to be extinct. Peccaries are members of the family *Tayass-vidae*, the new world type of *suidae*. In 1972 Ralph Wetzel discovered a herd of the animals similar to the extinct peccary found in Nebraska by Harold Cook, named *Catagonus wagneri* (Wetzel, et al., 1975). The animals were consigned to the genus *Catagonus ameghino*.

An article in *Science* served as the formal obituary of *Hesperopithecus* (Gregory, 1927). The case along with Piltdown man is now often used as an example of the results of an attempt to impress one's preconceived ideas into the evidence. The infamous tooth which Bowden (1977, p. 46) calls "a classic case of excessive imagination" is now safely locked in the storage vault of the American Museum of Natural History, largely forgotten except to historians of science. As to the conclusion of the story, Reader summarizes some of the contemporary comments:

> 'An ancient and honourable pig no doubt, a pig with a distinguished Greek name,' commented *The Times* in a leader when the news was released, 'but indubitably porcine.' *The Times* wondered whether the worshipers who had so eagerly proclaimed themselves made in the image of *Hesperopithecus* were now left desolate; and concluded:

> 'If there is a place where the spirits of forsaken gods congregate . . . to condole with one another on ruined temples and smokeless altars, there also, aloft in the branches of a monkey puzzle tree overlooking the asphodel meadow, . . . conscious of his own distinction as one who has received the offering of unsuperstitious science, should sit the spirit of the Evening Ape.' Paleontologists had been badly bitten by the Nebraska tooth, Elliot Smith remarked later (Reader, 1981, p. 110).

The London Times also had this to say:

> The zeal for the discovery of ancestors, which is so often observed in the newly ennobled, has been carried to its highest pitch by that new-comer to the aristocracy of science, the anthropologist. . . . One of the most notable examples of his skill was given to the world some six years ago, when a single tooth, which had been dug up in Nebraska, was identified as that of the founder of the family of Man. . . . From the one surviving molar science drew a complete portrait of the patriarch. He proved to be powerfully built; of homely countenance; a little heavy in the jowl, and not very wide of brow; and . . . he was "marvelous hairy "about the face." . . . What more auspicious beginning for the human family than the union of his daughter and heiress with the *novus homo,* Eoanthropus?
>
> It is true that there were some who doubted. . . . A few, greatly daring, contended that the single tooth from which all had been derived was not quite sufficient evidence of the precise accuracy of every detail. But the skeptics were overruled: the creative imagination of the artist must be allowed to overlap gulfs that seemed impassable to more pedestrian minds. Let them but have faith in comparative morphology, accept their inheritance, recant their heresies, and be reconciled to the communion of the orthodox. And so all might have been well for them and for comparative morphology, if it had not occurred to one of the devotees that *Hesperopithecus* must have possessed other teeth. Accordingly he set out to find them, not being impelled by lack of faith, but moved rather by the pious desire to obtain further hagiological relics. Teeth . . . were found, and unmistakably from the same jaw as the first; but unhappily it was equally unmistakable that there were the teeth of a pig—an ancient and honourable pig no doubt . . . but indubitably porcine. Are the worshipers then, who so eagerly proclaimed themselves made in the image of *Hesperopithecus* left desolate? It is hard to believe that their devotion can be wholly barren. *Hesperopithecus* may not have, may never have had, a body, even a tooth; nevertheless by some process of emanation his adorers, out of their own vital force may conceivably have created for him a soul (quoted from *The London Times,* Feb. 25, 1928, p. 13).

Williams, in an article in the Feb. 20, 1928 *New York Times,* discusses what he believes may be the future significance for society, and specifically religion, due to dethroning *Hesperopithecus.* Writing as if he was living a few hundred years from 1928 and looking back at the 1928 events, he writes:

> Science in its proper sense: [was] the disinterested search after demonstrable Facts in all the fields of human thought. . . [but] became idolized and was set up as a Religion; a popular religion; supposedly one that was the rival and drastic opposite in all respects of the supernatural religion of Christianity. Long before the year 1928 by far the greater part of the Press was devoted to its service. 'Evolution' was the great shibboleth of this vast popular religion, the end of which was dogmatically asserted. . . .
>
> More especially, the 'descent' of mankind from monkeys was the popular test of orthodoxy. How or why there was anything at all possessing life, or having existence, this popular science religion never bothered about: its sole preoccupation, its fundamental doctrine, was simply that 'there was (however it happened to be) something called 'matter,' which was simple in the beginning ('protoplasm' was its popular name); which then became somehow or other differentiated; passing into 'higher' and still 'higher' forms, till at last the monkey tribe appeared, out of which came man.
>
> . . . The enormous efforts put forth by the American Museum of Science to establish the *haroldcookii* tooth as that of an ape-man, then, should be studied in their relations to the popular religions of 1928. No newspaper in the world, it may be added, had done more for the spread of the religion of Science than *The Times*. . . . on that historic Monday, February 20, 1928, was simply an isolated bubble of the great wave of mirth which finally did away with so many of the humbugs of an age which so proudly loved to call itself enlightened, but which now appears so pathetically mistaken (1928a, pp. 310-311).

The Bryan-Osborn Controversy

The whole Bryan-Osborn controversy over the tooth played a role in the history of the Scopes trial even though none of the scientific evidence was formally admitted, nor were the scientific expert witnesses allowed to testify. The judge concluded the only question was whether the law was violated, not the validity of any theory. As Gould (1991, p. 432) notes,

> The main bout may have pitted Bryan against Clarence Darrow at the trial itself, but a preliminary skirmish in 1922, before any state legislature had passed an evolution law, had brought two equally formidable foes together—Bryan again, but this time against Henry Fairfield Osborn, the head of the American Museum of Natural History. In some respects, the Bryan-Osborn confrontation was more dramatic than the famous main event three years later. One can hardly imagine two more powerful but more different men; the arrogant, patrician, arch conservative Osborn versus the folksy, 'Great Commoner' from Nebraska. Moreover, Darrow maintained a certain respect, based on genuine affection for Bryan . . . I detect nothing but pure venom and contempt from Osborn.

Although Darrow selected Osborn as an expert witness in the Scopes trial, his primary strategy was, according to Gould, to show that it was possible for a religiously devout scientist to accept evolution. Osborn, a dedicated theist who viewed evolution as the finest expression of God's intent, wrote extensively about his views. This line of testimony, Darrow felt, would blunt Bryan's attack on evolution as intrinsically Godless (Gould, 1991, p. 433). Of course, Bryan's concern went far beyond this. He was much concerned with the effect of evolution on racism, human rights and the equality of man. And from our vantage point today, we now recognize that Osborn "advocated as Haeckel did, a racist view of Human Evolution" (Krishtalka, 1992, p. 405).

The skirmish resulted in the publication of their articles in various papers which argued for their respective viewpoints. Bryan, for example, in his *New York Times* (Feb. 26, 1922) article, according to Gould, showed, "some grasp of the tradition parries against Darwin . . . rested his case upon a supposed lack of direct evidence for the claims" of the evolutionist, asking the question,

> The real question is, Did God use evolution as His plan? If it could be shown [that man], instead of being made in the image of God, is a development of beasts, we would have to accept it, regardless of its effect, for truth is truth and must prevail. But when there is no proof, we have a right to consider the effect of an acceptance of an unsupported hypothesis (Bryan, 1925, p. 375).

Osborn's response to Bryan's article was published in the *New York Times* on March 5, and then reissued on June 8, 1923 as a book called *Evolution and Religion.* Osborn called Bryan's article "able and carefully prepared" and notes that "the movement started by Mr. Bryan has become nation-wide . . ." (Osborn, 1923a, p. vii). He argued for evolution on the basis of the fossil and geological evidence, as well as the incompatibility of the theory with religion. He claims here that evolution is not part of modernism, but "goes back to the wise, learned, and observant founders of Christianity in Western Europe" (p. viii). Osborn also concluded that "man, instead of being made in the image of God, is a development of beasts" (p. 2). This view was a major concern of Bryan and the primary aspect of evolution that he objected to (Bryan, 1922). Osborn acknowledges that Bryan

> has familiarized himself with many of the debatable points in Darwin's opinions, such as the theory of Sexual Selection, and it is not at all surprising, not being a specialist in biology, that he is extremely confused—as, in fact, many evolutionists are—by the radical differences in opinion as to the power of Natural Selection itself, expressed by recent writers such as John Burroughs and Professor Bateson. If it is difficult for biologists to think straight on this very intricate subject of evolution, how much more difficult must it be for the layman?" (1923, p. 3).

Osborn then adds that, in his opinion "Natural Selection is the only cause of evolution which has thus far been discovered and demonstrated" (1923, p. 4) and that "no living naturalist, however, so far as I know, differs as to the immutable truth of evolution in the sense of the continuous fitness of plants and animals to their environment, and the ascent of all of the extinct and existing forms of life, including man, from an original and single cellular state" (pp. 4-5).

This response, although it was likely intended to refute Bryan, merely fueled Bryan's conclusion that great disagreement about the theory existed among biologists, and yet a common *faith* in evolution existed among them. He was specifically concerned about natural selection, which, according to Osborn, was the only cause so far discovered that has been shown that could cause evolution. It was this theory that Bryan was very concerned about because of his opposition to social Darwinism, racism and eugenics in general.

Osborn further supported Bryan's concern with such statements as ". . . while the shifting sands of human opinion are swept hither and thither both in Theology and in Science. Wrecked on these sands of opinion are many great names, both in Theology and Science" (Osborn, 1925b. p. 6). Osborn's argument that many devoutly religious persons have accepted evolution did not assuage Bryan's concern relative to the racism of natural selection, and the effects of the survival of the fittest theory, especially relative to the weak, Blacks and others.

Osborn also argues here that evolution should be taught in the schools, but only if it is "entirely separated from the opinions, materialist or theistic, which have clustered about it" (pp. 16-17). Of course, Bryan did not argue that it should not be taught as fact, only that the evolution of mankind, specifically atheistic evolution, should not be taught as fact (Bryan, 1922). Osborn used both Piltdown and Neandertal man as evidence for evolution, concluding that they "constituted the missing link between man and the lower order of creation" (1923a, p. 21). Many of his ideas here reflected his "old master, Huxley" the British "bull dog" of Darwin (Osborn, 1910, p. 5). Osborn (1910, p. 12) here again cited the Job 12:8 passage "Speak to the Earth, and it shall teach thee." He later expanded this part of his work which was published under the title *The Earth Speaks to Bryan* as a take off on this Scripture in Job. When the tooth was revealed to be that of a pig, Straton said,

> I am writing to President Henry Fairfield Osborn respectfully suggesting in view of this fiasco, that he put this tooth in a handsome glass case in the Hall of the Age of Man at the Museum of Natural History, but change the name from *Hesperopithecus haroldcooky*, bestowed in honor of Harold Cook, discoverer of this miraculous tooth, from which a whole race of prehistoric men were created by fervid imagination of scientific enthusiasts, to *Hesperopigdonefoolen osbornicuckoo* in honor of Mr. Osborn himself, who defended the tooth heatedly and, cookoo-like said "Me too" after gleeful dogmatic opinions of Cook, Gregory and others.
>
> I am also mildly and good naturedly suggesting to Mr. Osborn that he now apologize to Bryan's memory and to me for having called us jointly "bigots," demagogues of conduct, "foes of science,"

etc., in his Forum magazine article and book because we refused to reject the Bible teaching and kowtow to and swallow his pig tooth at the time he was serving that dish of pork camouflaged under an overwhelming Greek name, and trying to cram it down our throats willy-nilly in the awful name of science. (Straton 1928, p. 19).

The Meaning For Us Today

This case was not an aberration, but a pattern in the history of paleontology which, in Fix's (1984, p. 11) words was:

> Possibly the most singular such case involved a creature that had been named *Hesperopithecus* by the discoverers of a solitary molar tooth [which] . . . , these experts decided, was close enough to man's to signal the presence of one of the legendary missing links. As usual, scientists and artists conspired to reconstruct the full creature, and portraits of the new species, male and female, brutish and slope-browed, were published in the *Illustrated London News.* With this favorable publicity heightening his significance, *Hesperopithecus'* tooth was introduced as evolutionary evidence in the Scopes "monkey trial" in Dayton, Tennessee, in 1925. But *Hesperopithecus'* career as a missing link was short-lived. In 1927 other parts of his skeleton were uncovered, a discovery paleoanthropologists are reluctant to celebrate: the molar had come from an extinct pig.
>
> It has not been just an occasional opportunistic radical who has behaved in this way, but broad reaches of the profession. I am joined in this assessment by Sir Solly Zuckerman, a leading British scientist. Sir Solly complained that with the discovery of almost every new primate fossil the discoverer has attempted to present it as the chief ancestral link between the animals and man. Applying as much sarcasm as is possible in a technical paper, Sir Solly remarked, "It is . . . unlikely that they could all enjoy this distinction. . . ."

Many more examples of this exist in the attempts to prove human evolution (Reader, 1981). Fix (1984) summarizes some of the major examples of this pattern as follows: See Table.

> This history vividly illustrates Gould's words as follows:
>
> No myth deserves a more emphatic death than the idea that science is an inherently impartial and objective enterprise; objectivity has, after all, been battered by everything from Thomas Kuhn to Watergate. Yet it continues to thrive among working scientists because it serves us so well. It works within our profession by inspiring our students and sustaining us through inevitable periods of self-doubt; more crucially, it is the hallmark of our effort in public relations—a self-serving statement that enhances the social prestige and political clout of scientists. It also provides the rationale for America's scientific priesthood: The National Academy of Sciences (Gould, 1978, p. 344).

Proposed ancestors of mankind:	Discovered or proposed in:	Promoted by:	Career as missing link:
Neandertal	1856	Most early evolutionists	Abandoned as ancestral species by anthropologists in 1960s and 1970s.
Homo erectus (Java man, Peking man)	1891	Eugene Dubois Teihard de Chardin Franz Weidenreich	Ancestral status made highly questionable by discovery of skull in 1972.
Piltdown	1912	Arthur Keith and most evolutionists	Exposed as hoax in 1953
Hesperopithecus	1922	Harold Cook, Harry Fairfield Osborn and others	Found to be an extinct pig in 1927.
Australopithecus africanus	1924	Raymond Dart Robert Ardrey Maitland Edey	Disqualified by the discovery of skull 1470 in 1972
Australopithecus robustus	1938	Robert Broom	Disqualified by discovery of *Homo habilis* in 1960s
Gigantopithecus	1946	Franz Weidenreich	Dropped by most anthropologists as too improbable by 1950.
Zinjanthropus	1959	Louis Leakey	Displaced by Leakey's discovery of *Homo habilis* in 1960s
Homo habilis	1960	Louis and Richard Leakey	Ancestral status still indeterminate
Ramapithecus	1964	David Pilbeam and Elwyn Simons	Found to be the ancestor of Orangutan in 1979
Lothagam man	1967	Bryan Patterson	Disqualified by new measurement in 1977.
Australopithecus afarensis "Lucy"	1979	Donald Johanson Timothy White Maitland Edey	Beset by many problems and mounting controversy in early 1980s

A major reason for the problem identified in this paper in the field of human origins is, as Fix (1984, p. 23) concludes:

> Defenders of the tribe will no doubt protest that no one is infallible and that every profession has its share of embarrassments. But we are dealing here with more than an unfortunate minority who imbibe too deeply this heady mixture of enthusiasm and one-sided imagination. If we include not only those who produce the extrapolation but those who swallow it, then it would seem that most of the profession is similarly addicted. At least this is what we must conclude unless anthropology boasts a silent majority, because it is a matter of record that not a few, but most, of the ancestors of man endorsed by eminent students over the years have later had to be recalled.

Osborn specifically was guilty of this sin. Although a leading evolutionist, he "tailored the palaeontological evidence to fit . . . [his] views and values in his voluminous writings and in the enormous museum exhibitions and dioramas" (Krishtalka, 1992, p. 405—see Osborn 1923a, 1925c).

The method of arriving at the conclusion is detailed by Gregory (1927). After noting that there is extreme natural wear of the crown, they compared the chief characteristics that the *Hesperopithecus* tooth shared with both man and the anthropoid. They then utilized measurements of similar data for molars of chimpanzees and American Indians, "concluding that the *Hesperopithecus* type on the whole came nearest to the second upper molar of a chimpanzee." Of course taking measurements of a structure like a tooth, and deter-

mining that it falls in between a chimpanzee and an American Indian does not mean that the creature from which the tooth came likewise falls in between these two creatures structurally, evolutionarily or any other way. There are many structures and physiological processes which fall between two animals, but the animal they came from may be either much higher or much lower on the hypothetical evolutionary scale than either of the animals with which they are being compared.

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ARTICLE REVIEWS

From Beyond the Laboratory: A Theologian Looks at Science by Michael Bauman. 1992. Faculty Dialogue *(Journal of the Institute for Christian Leadership)* No. 17:131-145.

Reviewed by Don B. DeYoung*

Michael Bauman is Associate Professor of Theology and Culture at Hillsdale College, Michigan. This article gives an insightful look at modern science from the viewpoint of an outsider. Bauman's four points echo the same cautions that have been expressed for years in this *Quarterly.*

The first point compares the history of science with theology: Clearly, science answers are not secure and lasting. In theology, in contrast, the Apostles' Creed has endured for 15 centuries, in spite of liberal theologians of every age who have tried to erase it. Not so with science! The parade of scientific revolutions is endless: Ptolemaic, Copernican, Newtonian, Einsteinian, Post-Einsteinian. The false finality of science is clearly illustrated by the theory of evolution, "which gets treated almost universally not as theory but as established and unassailable fact requiring, at most, not proof, only further nuance" (p. 134). Shame on zoologist Richard Dawkins for a quote showing his ignorance of science history: "It is absolutely safe to say that, if you meet somebody who claims not to believe in evolution, that person is ignorant, stupid, or insane" (p. 131).

Bauman's second point, also reflected in the Dawkins quote, is that current science theories often become

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unduly entrenched. There is an unrecognized dogmatism in science against change; too many scientists are "proof-proof." Dogmatism may be fine in theology, but for science, the track record shows the harm done by stagnant, false scientific ideas.

Third, the laboratory is neither a philosophy-free nor a theology-free zone. Purely empirical science simply does not exist, because all research proceeds according to certain presuppositions. For example, contemporary science has taken the position that God is altogether irrelevant, if not entirely absent (agnosticism and atheism respectively). This approach by no means limits God, but it *does* show the blindness and perhaps the self-destruction of modern science. "The fool has said in his heart that there is no God and too many scientists permit themselves to operate as if the fool were right" (p. 139). Bauman, a nonscientist, laments over the inevitable result: "The earth was not designed; the universe has no purpose; humans result from mindless natural processes" (p. 140). Perhaps this is a reason for the modern rejection of scientific integrity.

The fourth point concerns the tentativeness and limitations of all scientific models. Nature is imperfectly translated into numbers or categories, then manipulated by the experts. One of Bauman's examples concerns taxonomy: "While the beings that populate such categories most emphatically do, families, orders, classes and phyla, as such, *do not exist outside the taxonomist's mind"* (p. 141). Such artificial constructs may be useful, but we must beware of exchanging "useful" for "true" or for "real."

Bauman concludes that scientists would have greater success if they were more humble. He believes they desperately need to look outside their technical discipline, to theology, for guiding moral principles. "Science, to be kept serviceable and humane, must be kept humble, must be kept teachable" (p. 144). This article is an encouragement and compliment to the established work of the Creation Research Society.

Hydrothermal-Vent Communities of the Deep Sea by Verena Tunnicliffe. 1992. *American Scientist* 80: 336-349.

Reviewed by Jacqueline S. Lee*

Deep sea hydrothermal vents are the sites for a unique assortment of creatures, whose peculiarities both confound and fascinate the biologists who study them. Verena Tunnicliffe's article (1992) reveals some of the oddities of these communities and the evolutionary puzzle they present, a puzzle whose pieces may make more sense when rearranged in a creationist framework (Lee, 1992).

The earth's crust is very thin at deep sea spreading ridges, and seawater circulating through the fractured basaltic rock interacts with heat from magmatic energy, causing venting of mineralized, heated water at places along the ridge. Tunnicliffe, a professor at the University of Victoria, British Columbia, has written many articles on the unique biological communities that have been discovered around these hydrothermal vent systems.

One of the fascinating things she reveals is that the vents may not be as rare and isolated as once thought. Evidence of venting, such as chemical and temperature anomalies and dredged sulfides, has been found in every ocean. Only a few sites have been intensively investigated, because of the difficulty and expense of deep sea submersible diving.

Even so, the creatures recovered from dives were so new to scientists that specimens often had to be shipped from place to place before someone could properly identify them. New families, superfamilies and orders had to be created in order to classify over 40 percent of the species found.

One of these organisms, the giant tube worm *(Riftia pachyptila),* has been established as an entirely new class, a level of classification equal to the vertebrates. In my mind, this creature poses the most severe challenge to evolutionists, because it exists in a symbiotic relationship with chemosynthetic bacteria so unique and precise that there is no way the relationship can function unless every one of the components is present.

The chemosynthetic bacteria live in the tissues of the tube worm and produce organic carbon from oxygen-hydrogen sulfide reactions. They are supplied with carbon dioxide, oxygen, and hydrogen by the tube worm's special transport mechanism, which keeps the molecules from spontaneously reacting with each other, and also prevents the worm from being poisoned.

It is obvious that such a mechanism could not be evolved through a series of hit-or-miss "experiments." The danger of poisoning to the tube worm, or of molecular reaction, and possibly even combustion, before the molecules reach the bacteria, would eliminate any individuals who were "experimenting" with transport.

Another puzzle is that juvenile tube worms have a complete gut, then lose it to form the trophosome tissues that house the chemosynthetic bacteria. Why would an animal develop, through total random chance, such a complex and potentially dangerous feeding system as symbiosis with chemosynthetic bacteria, when gut feeding was already available?

The same question might well be asked about some of the other ingenious adaptations that Tunnicliffe examines. For example, some animals have metal-binding proteins that neutralize the toxic interference of dissolved heavy metals. Several worms exude mucus, apparently to cleanse their bodies of harmful particles and compounds, and some workers have suggested that one worm, which has filament-form bacteria growing in its skin, uses the bacteria to detoxify heavy metals or sulfides.

At the end of her article, Tunnicliffe devotes much space to the evolutionary problems of when these vent animals diverged from ancestral organisms to acquire the special adaptations necessary for survival at the vent sites. She does not, however, ponder the "why" or the "how" of the problem. After all, given the extraordinarily hostile conditions for life at the vents, including poisonous waters, high temperatures, and frequent lava flows, why would organisms move into these areas at all?

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As a creationist, I find it much more believable that the living beings of the vent communities were specially created by the loving hands of a Maker, who gave them the "tools" they would need to survive at the vents. Why He chose to place life in such a harsh, seemingly desolate environment is not a question that I can readily answer. Perhaps to confound the evolutionary geologists who would someday find them during their quest to explore every niche and cranny of the earth, perhaps to show creationists that He is capable of infinite variety and adaptation, or perhaps to give us a living parable about life; that it can survive and even thrive in the harshest of environments, when formed and guided by the hand of the Maker of Life.

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ADDITIONAL INFORMATION ON THE FREIBERG HUMAN SKULL COMPOSED OF COAL

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Received 18 May 1992; Revised 9 January 1993

Abstract

Information available on the Freiberg East German skull is summarized. There is no evidence that this artifact contains fossil bone. The skull is not a fossilized human head; nor is it a carving. It was molded by somebody using particles of brown coal and other materials probably prior to the summer of 1813. Therefore it has little or no significance in creation/evolution considerations. There even is a suggestion that it was a late eighteenth or early nineteenth century hoax sculptured as "evidence" that humans existed before the Genesis Flood.

Introduction

The presence of a human skull composed of coal in Germany was brought to public attention by Whitcomb and Morris (1961, pp. 175-176). After a study of literature dealing with this artifact, Frair (1969) reported evidence indicating that the skull was an artistic fabrication. A review of this 1969 paper written by Anon. (1969, p. 4) left open the possibility that the artifact could be a "genuine skull."

Since 1969 some authors desiring to direct attention to the "puzzling human skull" have referred to material found in the Whitcomb and Morris (1961) book which includes a quotation from Stutzer (1940, p. 271). See Anon. (1975), Anon. (1982, p. 2), Bartz (1982, p. 1, 1985-1987), Beierle (1979, p. 33, 1980, p. 90), Daly (1972, p. 192), Jochmans (1979, p. 3), Mulfinger (1975, p. 3), Pearcey (1984, p. 6), Petersen (1990, pp. 130-131), Sharp (1986, p. 10), Tanner (1975, pp. 312-313), Taylor (1984, pp. 102-103, 448), von Fange (1974, pp. 16-17, 1981, p. 30), Wysong (1976, pp. 373,378). Some authors have embellished somewhat the primary source material but most have demonstrated some restraint in considerations of the significance of this skull as an "out of place fossil" with regard to dating and creation-evolution issues.

Certain authors have been somewhat less supportive of the idea that the skull could be genuine. For example in the 1977 German translation of the Whitcomb and Morris' 1961 book, Joachim Scheven wrote a footnote (p. 204) indicating that according to Roselt, the Freiberg skull clearly (or incontestably; Ger. *einwandfrei)* is an artificial product of unknown significance. Another more recent report (Williams, 1991, p. 29) indicates that the skull has been reported to be a fake; and Snelling (1991-1992, pp. 29-30) did not feel that the skull conclusively was a human fossil.

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In four of the above publications (Whitcomb and Morris, 1961; Daly, 1972; Tanner, 1975; Snelling, 1991-1992) there is reference to a suggestion that the skull could be a carving. However, the primary source literature on the skull does not specify "carving," but rather has terms like "artistic product," "falsification," or "skull molded from brown coal . . ."

Personal Observation of the Skull

During July, 1979, science teacher Helen Martin from the Unionville High School in Pennsylvania and I along with a German friend, Hermann Dybeok, visited the Royal Mining Academy in Freiberg. Here Martin and I spent about one hour in the office of Gerhard Roselt where we held the skull, macroscopically examined it carefully, and discussed it with Roselt. However, no photographs were permitted.

At that time I intended to write another paper about the skull, but Roselt strongly requested that I withhold doing so until after his forthcoming detailed report (Roselt, 1988). I agreed to abide by his desire and merely wrote a short note about previous unsuccessful attempts to get into the East German Freiberg museum and the fact that during the 1979 visit while examining the skull we were unable to find any indications of bone. See Anon. (1980).

Current Understanding

The best single source of information about the coal skull is Roselt's (1988) paper, "Regarding the coal skull in the Freiberg collections — conclusions until now and recent investigations." While preparing the following chronological series of important events relating to the skull, I relied upon Roselt's paper and personal communications from him. Also used to a lesser extent were papers by Stutzer, Kersten, and Frair.

1. The skull was in the estate of a Freiberg (southeastern Germany) apothecary named Loescher who died in 1813.
2. A mining engineer, Leschner, showed this skull at a meeting of the local Freiberg Mining Society. Leschner had found the skull in Loescher's estate but without any information about the origin of the skull. The date of the meeting was some time before Kersten's (1842) report of the event.
3. In the earliest available written report on the artifact, Kersten (1842) referred to it as a "human head." No trace of bone tissue was observed under a magnifying lens, but Kersten conjectured that chemical changes had caused partial petrification in a coal mine or similar location.
4. In the 1859 catalog of the petrification collection in the Royal Mining Academy of Freiberg the skull was listed under I. Fossil Animal Remains #331/l (running number 1). The notation read, "Interior filling of a human skull by a mass of coal (probably from Bohemia);" see Roselt (1988). Bohemia now is in western Czechoslovakia.
5. Otto Stutzer (1923, p. 274) in a footnote referred to the item as "a puzzling human skull" whose "original location is not known."
6. Stutzer (1927) wrote that close examination revealed the skull to be a "skillful fake." According to Stutzer this opinion was confirmed at the ethnographic department of the Zwinger Museum in Dresden whose report said that this human skull had been molded using brown coal mixed with other materials.
7. In 1940 Stutzer's German book (1923) with the footnote appeared in English translation (Stutzer, 1940, p. 271) without correction which would be expected in light of the 1927 report. Both author, Stutzer, and chief translator, Adolph C. Noe, died during preparation of the American edition; so apparently the 1927 paper was not available to editor Gilbert H. Cady and his associates who prepared the final draft of the 1940 edition.
8. Roselt's (1988) publication indicates that:
   a. No bony substance could be identified.
   b. The material of the skull is not the same in different regions.
   c. The skull is of brown coal which is composed of various size dark shiny particles called duxit. The duxit is believed to have been formed by volcanic heating of resin and wax in brown coal seams. In these seams, the melted wax-resin mixture solidified in layers and was named duxit because it first was discovered in the town of Dux (northern Czechoslovakia). Also the skull contains yellow resinous kernels and remains of plants including grass and seed.
   d. Fossil and other resins bind the entire mass together.
   e. The skull apparently was heated thus melting some of the skull mass which caused adhesion of the various materials. Heating also accomplished some exterior polishing of the skull.
   f. The skull is not of natural origin but rather is an artistic product. See Figures 1 and 2 from Roselt (1988, p. 347).

The most recently published data regarding the skull is by Herbert Bach, an anthropologist, who along with

Figure 1. The Freiberg coal skull from the front. Maximum length of the skull is 157 mm and maximum width 137 mm.

Roselt has written, "'The Freiberg coal skull' from an anthropological and historical viewpoint" (Bach and Roselt, 1991). The main factual data and speculations in this paper are:

1. The general form of the skull, including dimensions and ratios which are listed, resembles that of a child or a juvenile female. However, there are no teeth, residues of bone, or fine surface structures as expected for a genuine fossil skull.

Figure 2. Left side of Freiberg coal skull. Note the damaged region caused by Kersten's removal of material for his 19th-century analysis.

2. Carl Emanuel Loescher, who was born in 1750 and died 21 March 1813 of typhoid fever, apparently was a highly gifted man who had considerable experience with mining. He likely had access to duxit as well as to resins used in pharmacies. So he could have been the originator of this skull some time between 1785 and his death in 1813.

3. Because the skull was constructed of such unusual materials, it is suggested that it is a falsification which was produced to "prove" the pre-Genesis-Flood existence of humans. To my knowledge this speculation has not been mentioned in any previous literature. The following is a translation of the final paragraph in the paper.

> It may be suggested, however, that there is a connection with the "Genesis Flood Theory," which still was quite popular during the period in question, and the endeavors connected therewith to prove with concrete objects that man already had existed before the "Genesis Flood." Let me simply cite the efforts of Blumenbach and Cuvier regarding the so-called "anthropolite" [petrified human remains] (see Bach, 1957). These make it appear quite possible that the "Freiberg coal skull" was fabricated as "evidence" for the "pre-Genesis-Flood" existence of mankind. The use of brown coal, which is suitable as material for making a durable sculpture only after appropriate binders are added, certainly was not done without a purpose. The unusual material would be difficult to explain if the "skull" merely were intended to be a model. Therefore, a sensible suggestion is that the "Freiberg coal skull" is a falsification not revealed by its originator. (pp. 498-499)

Summary and Conclusions

So far none of those, including myself and Martin, who have examined the intact skull macroscopically or the material of which it is composed microscopically have been able to identify bone. So apparently this artifact was formed some time prior to the summer of 1813 by somebody who brought together various pieces of brown coal,* resins and plants.

The coal mass was molded to resemble a human skull. This object then was heated thus melting some of the component resins and consequently causing particles in the solid mass to adhere together so that the molded shape was retained. The artifact is not a carving; nor, especially considering that it was discovered in the early 19th century, is there a suggestion that it is an "evolutionary" hoax. However, it may have been a type of hoax made to be used as "proof" for pre-Flood humans.

The skull formerly has been used as evidence regarding human ancestry, but now we must recognize it not as a fossilized skull but rather a product of human endeavor, and possibly a hoax.

Acknowledgments

Claude A. Foster, Jr. aided in arrangements for visiting the Freiberg museum in 1979. Friedhelm Radandt helped with the German including translation of Roselt's (1988) paper. Gerhard Roselt provided original photographs of the skull and made suggestions for this manuscript including information about some words (for example *Duxit; Copal*, a resin; and *Nichterze*, certain minerals) in his own 1988 report. Joachim Scheven and Kurt Wise gave encouragement as well as aid with references. Andrew A. Snelling and Trevor J. Major read and commented on the manuscript. Betty-Jane Kelley, Sandra Vasconez, Darlene Woods and Elizabeth Frair aided with references and manuscript preparation.

*Note that there now is recent evidence that some uniformitarian understandings of early coal formation are subject to more question than previously had been thought. See Major (1990), Snelling and Mackay (1984), Taylor (1989, pp. 45, 109).

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COMMENTS ON THE BREACHED DAM THEORY FOR THE FORMATION OF THE GRAND CANYON

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Received 21 October 1992; Revised 14 December 1992

Abstract

A post-Flood breached dam theory for the formation of the Grand Canyon requires greater amounts of precipitation than at present. This requirement is likely met by a rapid Ice Age model following the Flood. Although the dam breach theory may be correct, at least five geological problems challenge its validity.

Introduction

The formation of the Grand Canyon is a mystery that confounds both evolutionist and creationist alike. Based mainly on geological relationships around the Grand Canyon, evolutionary geologists have come to the startling conclusion that the Colorado River is recent. They believe the river carved the canyon in only one or two million years, beginning about six million years ago. Lucchitta (1990, p. 331) states: "More likely, it began to cut shortly before five million years ago and was nearly as deep shortly after four million years ago as it is today." Even within the uniformitarian time frame, a mile deep canyon cut in only one to two million years is better labeled **catastrophic.** At the present time, solid uniformitarian theories to account for such rapid cutting are hard to find. This is why R.J. Rice (1983, p. 292) lamented: "After a century of study, we seem, if anything, to be further than ever from a full comprehension of how the Grand Canyon has evolved." Formation of the Grand Canyon, by whatever means, not only has significant geological implications, but also important biological effects as well (Meyer, 1985, 1987: Meyer and Howe, 1988).

As with other mysteries found in the rocks, uniformitarian assumptions most likely cause the enigma. Unfortunately, creationists also have difficulty explaining the formation of the Grand Canyon. However, I believe our paradigm is on the right track. A recent series of articles in the *Creation Research Society Quarterly* has reviewed uniformitarian and creationist theories and suggested that the catastrophic breaching of two or three large post-Flood lakes rapidly cutting the canyon is reasonable and plausible (Williams, Meyer, and Wolfrom, 1991, 1992a, b). These authors suggest the breaching of the dam possibly occurred at some point in the period from the end of the Flood to well within post Flood time. Austin et al. (1991, p. 87), who developed the breached dam hypothesis, favor a dam failure possibly several hundred years following the Genesis Flood. It may have taken several hundred years for the enclosed basins of the Colorado Plateau to have filled sufficiently from a wetter post-Flood climate—that is if they were empty following the Flood.

In this article, I will speculate on the post-Flood climate, especially the amount of precipitation, that would he expected on the Colorado Plateau based on my Ice Age model (Oard, 1990). I also suggest five possible geological problems for a dam breach theory a few hundred years after the Flood.

The Post-Flood Climate

According to my Ice Age model, the climate would have been much different after the Flood than at the present. Trapped volcanic dust and gases, left over from the enormous volcanism of the Flood, would have reflected a large portion of solar radiation back to space. Less sunshine at ground level would have resulted in cooler temperatures over land areas, especially the interiors of mid and high latitude continents. Volcanism would have continued at a more or less catastrophic pace for awhile after the Flood. Thus, post-Flood volcanism would have reinforced the initial cooling.

Extensive ash beds and lava flows commingle with "Pleistocene" sediments, both on land and in the ocean (Charlesworth, 1957, p. 601). Pleistocene sediments in the evolutionary time frame generally correspond to the time of the Ice Age. Izett (1981) has discovered at least 68 large ash falls just in the western United States that apparently occurred mostly during the immediate post Flood period. These ash falls dwarf the ash fall from the 1980 eruption of Mount St. Helens. Also during this period, dust from large eruptions of Taupo, New Zealand, and Toba, Sumatra, would have blocked out all sunlight for weeks over large areas of the earth (Froggatt et al., 1986: Rampino, Self, and Stothers, 1988; Rampino and Self, 1992). Rampino, Self, and Stothers (1988, p. 90) state: "If only 10% of this dust [from Toba] were injected into the stratosphere, conditions of total darkness could have existed over a large

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area for weeks to months . . .” This is just the dust cloud, which coagulates and falls to the ground in a matter of weeks to months. The above scenario does not consider the sulfur gases and aerosols that would have remained trapped in the stratosphere for years. These gases and aerosols would have cooled the land surface, with little effect in the oceans because of the high heat capacity of the water and its circulation.

A universally warm ocean from Antarctica to the North Pole and from the bottom to the top of the ocean would have existed following the Flood. The Arctic Ocean probably was warm enough to swim in comfortably—at least for several years following the Flood. The warm ocean would have resulted from hot water added to the pre-Flood ocean by the fountains of the great deep (Genesis 7:11) and abundant lava flows during the Flood. Widespread tectonism and ocean tides would have mixed the heat, although small pockets of cool water could have existed locally. So immediately after the Flood, cold mid and high latitude continents would have been juxtaposed against warm oceans. A unique climate would have resulted. One of the by-products of this climate would have been a rapid Ice Age (Oard, 1990).

A second climatic consequence would have been a much different hydrology over unglaciated land. After the Flood waters drained, lakes would have been left within enclosed basins in now dry areas of the world (Whitcomb and Morris, 1961, p. 313-317). These lakes are called pluvial lakes and were abundant worldwide. Figure 1 shows the pluvial lakes in the southwestern United States, believed to have existed between 10,000 and 25,000 years ago in evolutionary time (Smith and Street-Perrott, 1983, p. 191). The easternmost lake is ancient Lake Bonneville, 285 meters deeper than and 17 times the size of Great Salt Lake. Pluvial lakes during the Ice Age would have lasted much longer than the current climate would allow because of a shortage of sunlight and a wetter, colder climate (Oard, 1990, pp. 78-80). Pollen and plant fossils from ancient (post-Flood) packrat middens from the southwestern United States support this cooler, wetter climate in the recent past (Spaulding, Leopold, and Van Devender, 1983).

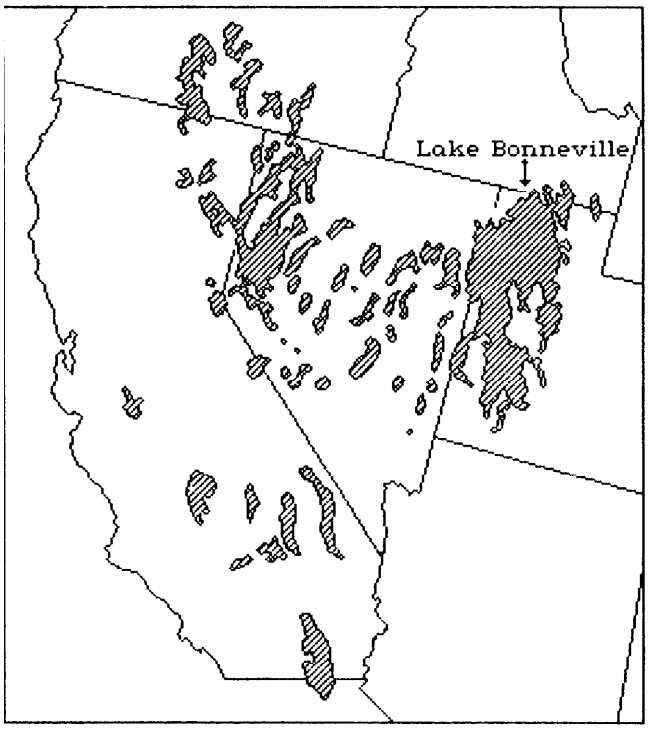

Figure 1. Pluvial lakes in the southwestern United States, 10,000 to 25,000 yr BP according to the evolutionary time scale (Redrawn from Smith and Street-Perrott, 1983, by David Oard).

Even the Sahara Desert appears to have had a radically different climate during early post-Flood time. In the eastern Sahara, abundant evidence exists below the sand for deep lakes and large rivers not long ago (McCauley et al., 1982; Kröpelin and Soulié-Märsche, 1991). This area presently receives rain once every 30 to 50 years! Among the many types of fossils recovered are the remains of hippopotami and crocodiles (Kerr, 1984; Pachur and Kröpelin, 1987). That this unusual climate occurred in the recent past is demonstrated by the existence of degenerate crocodiles that survived to modern times in isolated lakes of the western Sahara Desert (Charlesworth, 1957, p. 1113). Of interest also are countless human artifacts unearthed in the Sahara Desert. Rock pictures and carvings depicting long vanished animals are well preserved (Nilsson, 1983, p. 342). People obviously lived in the Sahara at this time. Consequently, pluvial lakes and rivers must have been maintained for hundreds of years following the Genesis Flood, because man did not spread over the earth until after the Tower of Babel debacle.

It may take a sophisticated climate model on a super computer to simulate the general features of the post-Flood climate. But even the best climate model may be limited because of the rough estimation of some variables and the inability to adequately describe the initial conditions of the post-Flood climate. Nevertheless, a climate simulation would add valuable quantitative knowledge of post-Flood climatology and hydrology. This climate simulation is in the planning stages (Larry Vardiman, personal communication).

Hydrology of Post-Flood Lakes in the Southwest U.S.

Three pluvial lakes have been proposed within the western Colorado River Basin [Austin et al., 1991]: 1) Hopi Lake, 2) Grand Lake, and 3) Vernal Lake (Figure 2). The Kaibab Plateau at the east end of the Grand Canyon is responsible for damming the first two lakes. Either at the end of the Flood or sometime within several hundred years afterwards, a breach in the Kaibab Plateau caused about 3,000 cubic miles of water from these lakes to catastrophically erode the Grand Canyon.

The question I want to address is whether these large lakes could even have existed several hundred years after the Flood in an Ice Age climate? This question has two parts, depending upon the history of the Kaibab Plateau during the Flood. First, if the Kaibab Plateau upwarped at the end of the Flood and trapped the water in these lakes, would the lakes still exist several hundred years later? Or would they dry up quickly? Second, if the Kaibab Plateau rose after the Flood waters drained from the Colorado Plateau, would enough water be impounded in the three lakes to later

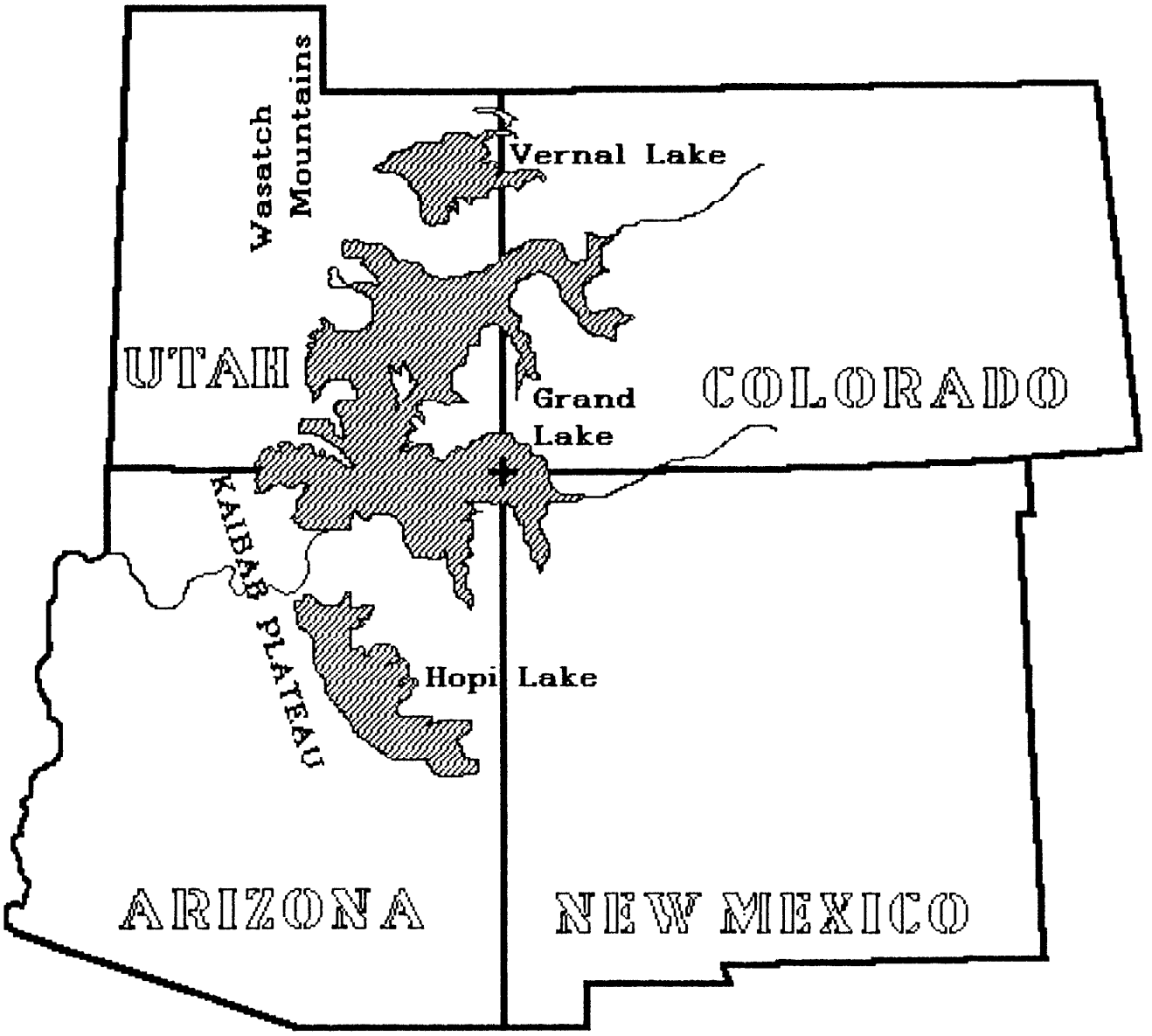

Figure 2. The three postulated lakes in the western Colorado Plateau (Redrawn from Austin et al., 1991, by Dale Niemeyer).

erode the Grand Canyon? I will speculate on these questions by comparing the Colorado Plateau lakes to ancient Lake Bonneville to the west of the Colorado Plateau (Figure 1). Then I will estimate whether an Ice Age climate following the Genesis Flood could potentially meet the hydrological requirement.

For ancient Lake Bonneville to either grow from tiny Great Salt Lake or to maintain its maximum size, investigators have estimated anywhere from two to 10 times the current basin runoff (Smith and Street-Perrott, 1983). The estimates vary widely because many interrelated variables influenced the size of these ancient lakes. The size of the lake depends upon the balance between runoff and evaporation. Runoff is not simply correlated to precipitation in the drainage basin. It also depends upon the seasonal distribution and intensity of precipitation, the proportion of snow and rain, the nature of the vegetation and soil cover, the topographic relief, the soil moisture, and the annual variation in temperature and precipitation. Lake evaporation depends upon the lake and air temperature and their difference, lake salinity, wind speed, relative humidity, cloud cover, solar radiation, atmospheric stability, and the amount of lake ice.

Smith and Street-Perrott (1983, p. 195). assuming a cool Ice Age climate, calculate a runoff of six times the present value to maintain Lake Bonneville:

> With the largest estimate of evaporation reduction [45%] and with precipitation on the lake offsetting 35% of the remaining evaporation, inflow requirements would be reduced to about 36% of apparent volumes, and this would reduce the input requirements to about 6 times present river volumes.

So to fill Great Salt Lake to the level of ancient Lake Bonneville, the present climate requires about 18 times the current runoff. But because of reduced evaporation during an Ice Age climate, the requirement is reduced

to six times the current runoff. The inflow could be slightly reduced, perhaps to five times current values, if the presently dry tributaries were flowing during the Ice Age. Five to six times the current runoff is considered a minimum value. This large increase in runoff over the present inflow into Great Salt Lake is a strain on the uniformitarian principle, even during an Ice Age climate.

We can extrapolate the results for Lake Bonneville to the three proposed lakes on the Colorado Plateau. If Hopi Lake, Grand Lake, and Vernal Lake were at an elevation of 5,700 feet before their breach (Austin et al., 1991, p. 79), then these lakes would have been about 700 feet higher than Lake Bonneville. Therefore, evaporation during an Ice Age climate would have been less than that from Lake Bonneville. The reason for less evaporation is because of cooler air and lake temperatures, higher relative humidity and cloudiness, greater lake ice, and less solar radiation caused by higher elevation. Runoff into the three lakes would also have been higher than in Lake Bonneville because the three lakes are mostly surrounded by high mountains. Similar to today, these high mountains would have received a much greater amount of rain and snow than the Lake Bonneville drainage basin. Except for the western Wasatch Mountains, Great Salt Lake is surrounded by terrain that receives light annual precipitation. If the above considerations are taken into account, two to three times the current precipitation during a cool Ice Age climate is likely all that would be required to either maintain the three lakes or fill them from nothing.

The question now reduces to how much precipitation the upper Colorado River Basin received for the first 200 years in the post Flood climate. There is no way to estimate this quantity accurately, since it was not observed and recorded by the ancient Indians and depends upon many unknown variables. However, a crude qualitative estimate can be derived. For a 500-year period of ice buildup. I roughly calculated the precipitation rate for land areas north of 40°N at 1.4 meters / year (Oard, 1990, p. 99). This is close to three times the present average for this area (Peixoto and Oort, 1992, p. 168). If I simply include the Colorado Plateau in this estimate, there is likely enough precipitation to maintain the three lakes on the Colorado Plateau for 500 years. However, I will attempt a more quantitative estimate.

Cool season precipitation over the Colorado Plateau comes predominantly from storms that move east to southeast into the area from the eastern Pacific. These storms mostly gather their moisture from the northern Pacific Ocean. A minor amount of precipitation falls from summer thunderstorms, which would be rare in a cool Ice Age climate because of greater atmospheric stability. Since thunderstorms mostly occur in hot weather, their hydrological impact for lake storage is diminished. Most of the runoff that would fill an ancient lake, therefore, is due to cool season precipitation. With much cooler summers on the Colorado Plateau as a result of volcanic dust and gases in the stratosphere, we can assume a cool-season atmospheric circulation pattern even in summer. Thus, the amount of precipitation during an Ice Age climate would depend on the number of storms that impact the region each year and the amount of water vapor these storms would carry compared to today.

Mid and high latitude storms are generated in areas of moderate to strong horizontal temperature difference in the troposphere, the lower three fourths of the atmosphere. They more or less propagate in a direction parallel to the isotherms with the colder air on the left in the Northern Hemisphere. In the post-Flood climate with warm oceans and cold continents, the lower tropospheric isotherms would parallel the shorelines of mid and high latitude continents (Figure 3). This temperature pattern would remain all year with only small seasonal changes. It would also have a tendency to force itself into the upper troposphere and form a jet stream that parallels the isotherms. Because of terrain effects and the tendency for storms to be stronger and more frequent in a southwesterly jet stream, the storms that impact western North America would have been weaker and less frequent than storms along eastern North America.

For western North America at the beginning of the Ice Age, storms would have tended to develop south of Alaska and move southeastward into southern British Columbia or the northwestern United States, as depicted by the thick arrow in Figure 3. After crossing the Rocky Mountains, these storms would have turned more eastward and passed south of the Laurentide ice sheet, which covered central and northeastern North America. As the Cordilleran ice sheet of western North America developed, storms would have tended to track farther south as the temperature gradients shifted slowly southward. Since these storms would have covered large areas, many storms would have collided with the Colorado Plateau during the Ice Age.

Storms develop frequently within a strong horizontal temperature gradient. In the stormy northern North Pacific 3 to 5 storms of varying intensity can impact an area each week. At present, these storms move eastward into either the northern, central, or southern portions of western North America. If they move into northwestern Canada, the central and southern areas of western North America normally do not receive any precipitation. An average of 1.8 storms a week bombard the Colorado Plateau during the cool season. This is based on a survey of weak, moderate, and strong storms for the years 1980 to 1984 from the *Daily Weather Maps* series. September 15 to May 30 was the period sampled for each year, since large-scale storms during summer are weak and cause little precipitation over the Colorado Plateau. Since the average storm track during the Ice Age (thick arrow in Figure 3) would have favored storms to move into southern and central portions of western North America, one would expect more storms slamming into the Colorado Plateau than today.

Fifty percent of the time today, the area is influenced by a dry upper ridge. During the Ice Age the area would be dominated by a permanent upper trough. So, twice as many storms as at present likely impacted the area during the Ice Age due to this factor alone. The number of storms during the Ice Age would correspond more to the number of present-day storms that move eastward through the northern North Pacific Ocean. Therefore, a minimum estimate of the number of storms that would move into the Colorado Plateau

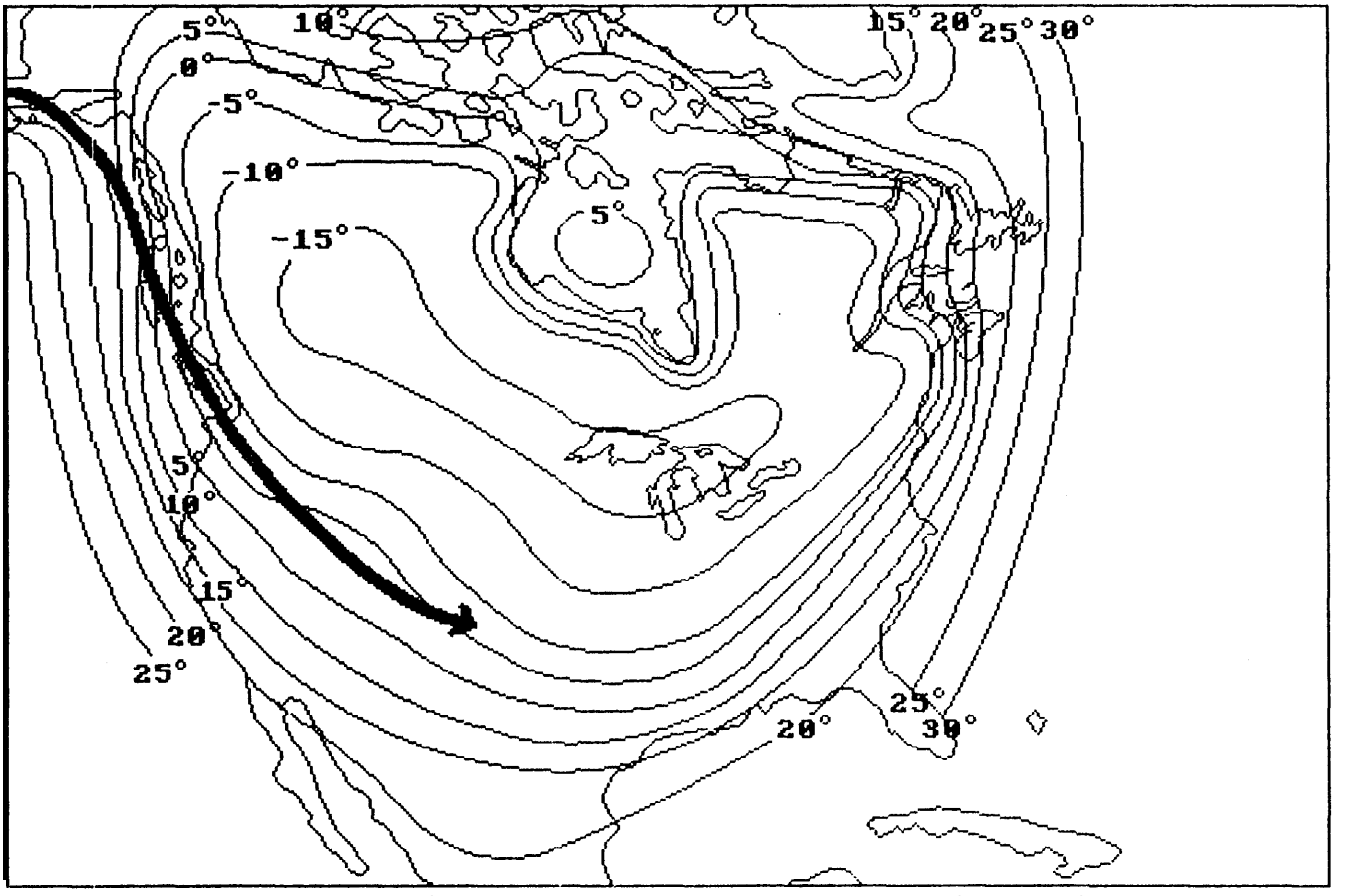

Figure 3. Postulated annual temperature (°C) for North America early in the Ice Age. Thick bold line from south of Alaska southeast into the central United States represents the postulated average storm track (Drawn by David Oard and Dale Niemeyer).

during the Ice Age would be two storms a week—all year. A maximum number would be five storms a week. This totals a minimum of 104 and a maximum of 260 storms per year. These figures are 1.6 and 4 times, respectively, the number of storms that move into the area at present.

The amount of precipitation from these storms mostly depends upon their intensity and the amount of available water vapor. Due to the strong temperature difference between North America and the eastern Pacific Ocean (Figure 3), storms moving into western North America should be more intense than today. To be conservative, I will assume that Ice Age storms average the same intensity as today. The amount of available water vapor in each storm depends mainly upon how much evaporation occurred in the northern North Pacific. Therefore, the precipitation in each storm will depend upon the difference between the evaporation over this area during the Ice Age as compared to today.

Neglecting any differences in the salinity, solar radiation, and cloudiness over the northern North Pacific during the Ice Age as compared to today, the bulk aerodynamic equation for oceanic evaporation is (Bunker, 1976, p. 1122):

$$E = \rho\, C_E(Q_S - Q_{10})U_{10} \qquad (1)$$

where E is the average evaporation, ρ is the air density, C_E is the empirically derived exchange coefficient for water vapor, Q_S is the saturation mixing ratio corresponding to the sea surface temperature, Q_{10} is the average mixing ratio at 10 meters above the ocean, and U_{10} is the average wind speed at 10 meters, usually the ship anemometer level. The mixing ratio is the actual amount of water vapor present in the air per unit mass. C_E can be considered a constant in an Ice Age climate (Bunker, 1976, p. 1126). Equation 1 indicates that evaporation is mainly proportional to the wind speed and the difference between the air and sea surface mixing ratio.

If relative humidity, wind speed, and atmospheric stability remain the same, the air-sea surface difference in the mixing ratio (Q_S - Q_{10}) is proportional to the sea-surface temperature. In my Ice Age model, I assumed a rough initial ocean temperature of 30°C following the Flood (Oard, 1990). This would also be the surface temperature in a uniformly warm ocean at mid and high latitudes immediately after the Flood. With all other variables remaining constant, evaporation at the initial Ice Age sea surface temperature would be more than three times the evaporation at a sea-surface temperature of 10°C and seven times more than at a sea surface temperature of 0°C (Oard, 1990, pp. 55-61). However, the ocean would not have remained at 30°C during the entire Ice Age, but would have gradually cooled, mostly by evaporation. After 500 years in my model, the average ocean temperature cools to 10°C, at which point the ice buildup reverses.

However, sea surface cooling is likely more rapid at the beginning because of higher evaporation, tapering off with time (Figure 4). Therefore precipitation over the Colorado Plateau would have been higher at the beginning of the Ice Age.

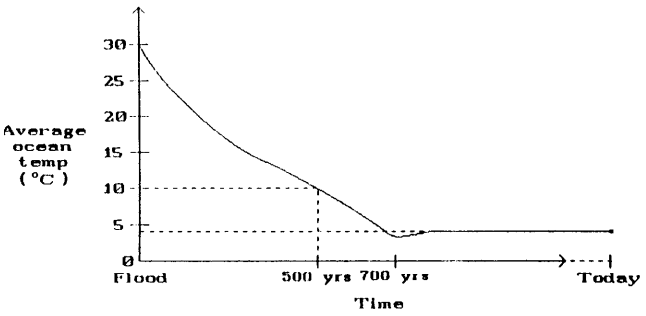

Figure 4. Graph of the postulated average temperature of the ocean following the Genesis Flood (From Oard, 1990, p. 112, drawn by David Oard).

Based on Figure 4, the sea-surface temperature for the North Pacific Ocean during the first 200 years of the Ice Age would have averaged about 24°C. The current annual average for the North Pacific Ocean north of 30°N is about 14°C (Peixoto and Oort, 1992, p. 178). If all other variables in the evaporation equation remain constant, post-Flood storms would carry a little less than twice the moisture of today.

Therefore, with a range of 1.6 times to 4 times the number of storms, each of which drops twice the precipitation, about three times to eight times more precipitation would occur on the Colorado Plateau during the first 200 years of the Ice Age as compared to then present. Although the approximations are rough, it seems that enough precipitation would occur for the first 200 years of the Ice Age to either fill or maintain Lakes Hopi, Grand, and Vernal.

In conclusion, the three postulated lakes likely would have existed for several hundred years after the Flood. They would have been available to be breached and to possibly form the Grand Canyon at that time as Austin et al. (1991) and Williams, Meyer, and Wolfrom (1992b) postulate. Two other ancient lakes in the western United States likely were breached during the Ice Age period. Lake Bonneville was catastrophically lowered 100 feet by a breach in southeast Idaho, according to J. Harland Bretz (1969, p. 531). It is also believed that glacial Lake Missoula was impounded by an ice lobe in the Purcell Trench of northern Idaho. When the ice dam collapsed, 500 cubic miles of water rushed over eastern Washington in three days (O'Connor and Baker, 1992).

Some Geological Problems with the Dam-Breach Theory

However, just because lakes could have existed on the Colorado Plateau for several hundred years following the Flood does not mean the dam-breach theory is correct. I see at least five potential geological problems with the dam-breach theory occurring well after the Flood. This does not mean that my mind is made up against the theory—it is not. Further geological data is needed.

First, if ancient lakes on the Colorado Plateau existed for several hundred years, the evidence should be abundant. However, the evidence appears to be skimpy. Austin et al. (1991, p. 80) suggest the laminated silt and mud from the "Miocene/Pliocene" (post-Flood?) Bidahochi Formation, located at about 6,000 feet above sea level in the eastern Little Colorado River Valley, is a relic of ancient Lake Hopi. But this formation is severely eroded. Further evidence in the Colorado River drainage basin is speculative. If these lakes existed for any length of time, shorelines etched into the rock should be evident. The shorelines of ancient Lake Bonneville are readily visible in some areas (Bretz, 1969, p. 533). River and stream deltas should also be found relatively high up along the sides of the ancient lakes. Clay, salt, and sand turbidites should cover the basin floor. This pattern should especially be true during a time of much higher sedimentation rates on the Colorado Plateau during the Ice Age.

During the Ice Age, pro-glacial lakes south of the ice sheet periphery would have formed in some areas. One of these lakes is glacial Lake Missoula, which filled the low mountain valleys of western Montana. The depth of this lake depended on the thickness of the blocking ice. Only as the Ice Age peaked would glacial Lake Missoula have been at its highest level. At this point, rapid melting of the ice would have catastrophically released the water from this lake. I have presented evidence, based on the energy balance over a snow and ice surface, that the southern periphery of the post-Flood ice sheets in North America would have melted rapidly within 100 years (Oard, 1990, pp. 114-119). Consequently, the highest wave-cut shorelines of glacial Lake Missoula would likely have been produced in a brief time. The highest wave-cut shorelines of this lake, although small, are readily seen on the slopes of Mount Sentinel just east of Missoula, Montana, and elsewhere in western Montana. If the highest wave-cut shorelines of glacial Lake Missoula were cut quickly and can still be seen, how much more should shorelines be notched along the edge of the three postulated lakes on the Colorado Plateau?

A second geological question I have is if the three postulated lakes on the Colorado Plateau burst. I would not expect a long, thin canyon. After breaking through the Kaibab Plateau, the water would have at first spread out horizontally upon the relatively flat Coconino Plateau, unless the water was constrained by a fault. The water should have slowed and ponded. As the water level rose in small basins, it would have eroded small notches between basins, all the while flowing to lower elevations as a large braided stream. The water should have flowed at times along the strike of the monoclines and down the dip of the other plateaus. It seems doubtful the water would have flowed along the current route of the Grand Canyon. When glacial Lake Missoula was catastrophically breached, sending 500 cubic miles of water across eastern Washington, it spread out over a width of 100 miles before ponding in the Quincy and Pasco Basins of central Washington (O'Connor and Baker, 1992). In this case, the water did not flow across a flat plain, but cascaded downhill through various low channels at an estimated speed of up to 100 mph. I would not expect the water from the breached dams to erode a thin, deep canyon with a

length of 277 miles (not including Marble Canyon) over relatively flat terrain.

Third, it is hard to envision that the flow from these ancient lakes could cut such a deep canyon well after the Flood. The rocks very likely would have been consolidated by this time. If the rocks of the Grand Canyon remained partially unconsolidated for several hundred years, abundant flow structures should be seen in the rock layers. It is likely rocks hardened rapidly during and immediately after the Flood because traction currents and debris flows during the Flood picked up and redeposited sedimentary rocks of various lithologies. These sedimentary rocks likely were laid down in a previous sedimentary cycle of the Flood and were already well indurated.

The estimated volume of water released from the three lakes is 3,000 cubic miles, while the amount of rock removed was about 1,000 cubic miles. That seems like too much rock to remove with too little water. The canyons cut by the breaching of glacial Lake Missoula and the mudflow erosion at Mount St. Helens were caused by fluid flowing downhill at rapid speeds. The water from the breached lakes would have flowed over either flat terrain or terrain sloped in the opposite direction. Besides, the lakes very likely would not have been breached at the same time. If Lake Hopi were breached first (Austin et al., 1991, pp. 86, 87), it would very likely have completely drained in a matter of days. Glacial Lake Missoula, a complex meandering lake, is believed to have emptied in three days, based on the height of the flow through Spokane and the Wallula Gap, near Pasco, Washington (O'Connor and Baker, 1992). It would have been awhile before Grand Lake burst due to the mechanism of piping. The same can be said for Lake Vernal. Therefore the water would have flowed over the Coconino Plateau in pulses, separated by a fair amount of time. Less water would have reduced its eroding capacity. Cavitation erosion would not be much help because cavitation is effective in water depths of only several meters moving at more than 30 m/s (Holroyd, 1990).

A fourth geological problem is that if the Grand Canyon were formed rapidly from a breached dam well after the Flood, why do some of the tributary valleys, like the long Havasu Creek Valley, descend gradually down to the bottom of the Grand Canyon? These long tributary valleys, which are either dry or contain small creeks at present, should be hanging valleys, like those seen in Yosemite Canyon. Tributary valleys to the catastrophically eroded Grand Coulee of central Washington are hanging valleys (Baker and Nummedal, 1978). This evidence implies that whatever mechanism produced the Grand Canyon concurrently eroded all the side canyons. A similar relationship of tributaries being cut to the same depth as the main channel can be seen within other rapidly eroded canyons (Thomas, 1990). This means that a considerable amount of water drained into the Grand Canyon from the north and south, which does not favor the dam-breach hypothesis.

A fifth geological difficulty is that a huge delta should exist just west of the Grand Canyon. Assuming the dam breach occurred after the rocks of the Colorado Plateau hardened, the water from the breached dams should have started as a gigantic waterfall from off the top of the western Colorado Plateau. As the Grand Canyon was rapidly eroded, much of the sediment, especially the coarse fraction above silt size, should have been deposited in the slacker water to the west of the canyon. The delta sediments should taper with distance from the Grand Wash Cliffs. Farther downstream from the delta, thick layers of silt and clay would be deposited. These may or may not exist, depending upon the interpretation of the downstream formations. Near the end of the event, the waning flood should have cut a canyon through the soft delta sediments.

Summary and Discussion

The formation of the Grand Canyon is a mystery to all. From geological evidence, partly based on dating assumptions for geological formations, uniformitarian geologists believe the canyon was cut in less than two million years. Although uniformitarian geologists have been stumped, creationists are just beginning to study the evidence and formulate theories. One theory, the dam-breach theory, has recently been proposed. This theory depends upon the existence of three lakes trapped in basins of the western Colorado Plateau. One version of the theory proposes that the dam breach may have occurred several hundred years after the Flood, during the period of the Ice Age. Based on my model of the Ice Age, the precipitation required to either fill or maintain these lakes likely was met in the post-Flood climate.

Five geological problems were presented. Ancient shorelines and hanging stream deltas appear to be nonexistent along the edge of the proposed lakes. Water spreading out over a long, relatively flat plateau should not have eroded a deep canyon. The volume of water, which should have spread out over the plateaus in pulses, does not seem sufficient to cause the erosion. If Grand Canyon were rapidly eroded, why are several long tributary valleys also eroded down to the bottom of the Canyon? Why is not there a large delta west of the Grand Wash Cliffs?

I am not against the dam-breach theory and will await further evidence before making up my mind. However, the geological evidence does not seem favorable to the dam-breach theory. A mechanism of rapid cutting in soft sediments seems more likely. This condition likely would be met only near the end of the Flood or immediately afterwards. It is possible that briefly ponded water in the western Colorado Plateau provided extra water to continue the digging of the deep canyon.

Draining Flood water that changed from sheet flow to channelized flow seems more plausible. Westward-moving sheet flow could have removed the 1,000 feet or more of sediment that existed above the Coconino Plateau, as indicated by the deposits on Red Butte (Austin et al., 1991, pp. 69, 70). The Muddy Creek Formation, including the Hualapai limestone, was deposited west of the Grand Canyon before the canyon was cut. This formation could have been deposited during the end of sheet flow. Alternately, there could have been sediments on top of the Muddy Creek Formation that were eroded away at the same time as sediments were eroded from off the Coconino Plateau.

After the sheet erosion was completed, or nearly so, the flow may have become more channelized, digging the Grand Canyon and its long tributary canyons in a short time. It seems to me that the erosion of the Grand Canyon must have begun at the **west** or downstream end and not the east or upstream end. The westward moving channelized flow would then have eroded the soft sediments headward or eastward, and downward. This could have occurred as the area was being uplifted and the Flood water draining westward from the Colorado Plateau at the end of the Flood. A good analog for this process would be the erosion of the lower Palouse River Canyon of southeast Washington during the breaching of glacial Lake Missoula (Baker and Nummedal. 1978). During this event, floodwaters in the Palouse River Valley overtopped a ridge between it and the Snake River Valley. A waterfall rapidly cut headward through soft loess and hard basalt below the loess. After the flood the Palouse River was diverted through this new canyon and the last vestiges of the waterfall can be seen at Palouse Falls.

Acknowledgements

I thank Dr. Emmett Williams for suggesting this paper and for commenting on an earlier draft of the manuscript. I appreciate the work Peter Klevberg provided in editing the English and providing provocative questions. Dr. Larry Vardiman's comments on the meteorology part of the manuscript were helpful. Finally, I thank the three reviewers who added valuable comments.

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QUOTE

Sir Francis Bacon, Thomas Hobbes, John Locke, Jeremy Bentham, John Stuart Mill and the other formulators of the new ethos did not refute Anselm or Aquinas, they merely ignored them. Someone has quite truly said that "intellectual progress," as it is called, takes place not because of what we learn but because of what we forget. The great project of the 17th and 18th century bourgeoisie was not to understand existence but to make a living in it. The cultural focus shifted sharply toward the physical world. Anselm's ontological argument does not do much for the trade in spices or tobacco, but navigation certainly does. Metaphysical ultimates, at least in the short run, proved to be irrelevant to the economic enterprise. The empirical and utilitarian philosophies which reflected the dominance of this culture were designed not so much to understand the world as to control and possess it, and, at least in the short run, they were triumphantly successful.

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FOSSIL WOOD OF BIG BEND NATIONAL PARK, BREWSTER COUNTY, TEXAS: PART I—GEOLOGIC SETTING

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Received 25 February 1993; Revised 15 March 1993

Abstract

Fossil wood was collected from the Dawson Creek area of Big Bend National Park with the intent of performing certain chemical tests on the material. The geologic formations in which the wood was found are described in this part of the report. A model based on the Flood is offered for the origin of these formations. The importance of bentonite in the preservation of the silicified wood is discussed. Applications to a catastrophic model are suggested throughout the paper.

Key Words: Javelina Formation, Aguja Formation, Bentonite, Charcoalized Wood, Silicified Wood, Catastrophism.

Introduction

While on a field trip in Big Bend National Park during the summer of 1990, George Howe, William Waisgerber, and Emmett Williams observed logs, limbs, and smaller pieces of silicified and charcoalized wood in the upper Cretaceous Gulfian Series of rocks in the western end of the Park near Study Butte, Texas. In 1991 and 1992 specimens of the various fossil woods were collected from the Dawson Creek area (29° 18'N, 103° 31'W, Terlingua, Texas quadrangle USGS topographic map) with the permission of the National Park Service in order to study the materials. The purpose of the project was to determine if radiohalos were present in any of the samples, to conduct C-14 age studies on the charcoalized woods, to ascertain the silica content of the petrified specimens and to study the structure of the woods using optical and scanning electron microscopy techniques.

Although we employ conventional geologic terminology in this paper such as Cretaceous, Paleocene, Mesozoic, etc., we do not subscribe to the standard geologic timetable.

Javelina and Aguja Formations

All samples were collected either from the lower Javelina or from the upper Aguja formations (Gulfian Series). Maxwell, et al. (1967, p. 1) stated that "Gulfian rocks are flaggy, argillaceous limestone, chalk, marl, clay, bentonitic clay, and sandstone." A brief description of the lithology and standard stratigraphic placement of the Javelina and Aguja formations is given in Table I. A complete description of several sections of these formations in Big Bend National Park can be found in Maxwell, et al., 1967. Also sections of the Aguja formation are mapped and discussed in Hopkins, 1965. For brief descriptions of the Aguja and Javelina formations outside the National Park, see Yates and Thompson (1959, pp. 14-16); Moon (1963, pp. 170-173).

A suggested origin for these formations is presented in Appendix I and possible correlation with other Cretaceous formations is given in Appendix II for interested readers. Concerning these two formations in the Dawson Creek area (where we collected our samples), Maxwell, et al. made the following observation, "Although the base is covered, nearby exposures indicate that there is no marked lithologic difference between the basal Javelina and the upper Aguja" (p. 94). In 1972, Paleocene mammal bones were found in the upper part of the Javelina formation (Pause and Spears, 1986, p. 58), thus it is now considered "late Cretaceous—Paleocene" by some investigators. For instance Rigsby (1986, p. 111) and Schiebout (1986, p. 129) showed stratigraphic charts with the upper Javelina formation in the Paleocene. However some recent publications (Nelson, 1992, p. 6; Spearing, 1991, p. 295) still show the complete Javelina formation as upper Cretaceous.

Since all of the permineralized (petrified) and charcoalized wood samples were found in bentonitic clay deposits (Figures 1 and 2), we will concentrate our discussion on the importance of these mounds in the preservation and petrification of wood.

The Importance of Bentonite in the Silicification of Wood

Bentonite is defined by Ross, Miser, and Stephenson (1929, p. 185) as:

> . . . a rock composed predominantly of clay and formed by the alteration and devitrification of glassy volcanic material usually a tuff. It generally contains differing proportions of igneous-rock phenocrysts and admixed detrital debris. Most bentonites contain montmorillonite* as their characteristic clay mineral . . .

When it erodes, bentonite forms badlands which cannot be farmed. It has the property of absorbing water and swelling considerably so that water does not penetrate deeply into the clay.

Murata (1940, p. 586) noted that bentonite is the decomposition product of water laid volcanic ash which is rich in silica (SiO_2). During the alteration of volcanic ash by water, large amounts of SiO_2 are liberated (p. 587). Then he claimed:

> Therefore it seems reasonable to believe that the chance for woody materials to become silicified would be greatly enhanced if they were buried, under conditions of minimum decay, in volcanic

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*Kingery (1960, p. 18) gives the composition of montmorillonite as

$$\left(Al_{1.67}\ \begin{matrix}Na_{0.33}\\Mg_{0.33}\end{matrix}\right)(Si_2O_5)_2(OH)_2$$

The mineral has various applications in ceramic industries.

Table I. Sequence of Strata in Big Bend National Park.

			ROCK UNITS			
			GROUP	FORMATION	THICKNESS (feet)	LITHOLOGY
CENOZOIC	QUATERNARY	RECENT and PLEISTOCENE		Alluvial deposits	100-500	Clay, silt, sandstone, and conglomerate
CENOZOIC	TERTIARY	OLIGOCENE or YOUNGER	Big Bend Park	South Rim Formation	1,000-1,500	Thick ledge-forming lava flows exposed high in Chisos Mountains, ash beds, tuff, flow breccia, irregularly bedded sandstone and conglomerate
CENOZOIC	TERTIARY	EOCENE, Upper	Big Bend Park	Chisos Formation	1,500-2,600	Indurated tuff interbedded with clay, mudstone, tuffaceous sandstone, ash beds, lavas, sandstone, and conglomerate
CENOZOIC	TERTIARY	EOCENE, Middle	Big Bend Park	Canoe Formation	1,170	Base is a massive yellow cross-bedded ledge-forming sandstone overlain by tuff, mudstone, tuffaceous sandstone, indurated tuff, and lavas
CENOZOIC	TERTIARY	EOCENE, Lower	Tornillo	Hannold Hill Formation	356-770	Soft, gray, and yellowish-gray conglomeratic sandstone and varicolored and mottled clay
CENOZOIC	TERTIARY	PALEOCENE	Tornillo	Black Peaks Formation	850	Varicolored clay interbedded with ledge-forming cross-bedded, yellow, buff, and gray sandstone and lenses of conglomerate
MESOZOIC	CRETACEOUS	GULFIAN	Tornillo	Javelina Formation	350-850	Gray, dull green, blue, red, yellow, purple, brown, black, and white clay, with thin layers of sandstone. Clay commonly bentonitic; contains fossil wood and dinosaur bones
MESOZOIC	CRETACEOUS	GULFIAN	Tornillo	Aguja Formation	800-1,300	Upper part, 300-700 feet thick. Nonmarine dark-gray carbonaceous clay and some silt and layers of coal interbedded with brown and yellowish-brown sandstone. Contains fossil wood and dinosaur bones Lower part, 500-706 feet thick. Marine sandstone and clay, a shelly sandstone generally present at the base
MESOZOIC	CRETACEOUS	GULFIAN	Terlingua	Pen Formation	220-600	Dark grayish-blue gypsiferous marl and clay that weathers yellow, with concretionary limestone and layers of calcareous sandstone.
MESOZOIC	CRETACEOUS	GULFIAN	Terlingua	BOQUILLAS FORMATION, San Vicente Member	330-400	Gray and bluish-gray chalk and gray to buff argillaceous flaggy limestone
MESOZOIC	CRETACEOUS	GULFIAN	Terlingua	BOQUILLAS FORMATION, Ernst Member	475	Gray, buff, and yellowish-brown flaggy limestone interbedded with gray and buff marl
MESOZOIC	CRETACEOUS	COMANCHEAN		Buda Limestone	100	Whitish, dense, brittle limestone and nodular limestone interbedded with marl
MESOZOIC	CRETACEOUS	COMANCHEAN		Del Rio Clay	1-125	Light gray and yellow clay, clay-shale, and thin-bedded limestone
MESOZOIC	CRETACEOUS	COMANCHEAN		Santa Elena Limestone	750-850	Mostly massive, thick-bedded, dense, cherty, ledge-forming limestone, with thin-bedded marly limestone near base
MESOZOIC	CRETACEOUS	COMANCHEAN		Suc Peaks Formation	75	Shale, marl, and thin marly, nodular limestone ledges
MESOZOIC	CRETACEOUS	COMANCHEAN		Del Carmen Limestone	350-450	Massive, heavy-bedded, dense, cherty, ledge-forming limestone
MESOZOIC	CRETACEOUS	COMANCHEAN		Telephone Canyon Formation	40-130	Thin, nodular, marly limestone and marl
MESOZOIC	CRETACEOUS	COMANCHEAN		Maxon Sandstone	10	Medium-grained, calcareous sandstone
MESOZOIC	CRETACEOUS	COMANCHEAN		Glen Rose Formation	600	Dense limestone interbedded with calcareous shale, erodes to form step-like benches, conglomerate and coarse sandstone at base
PALEOZOIC				Paleozoic sedimentary rocks (undifferentiated)	Unknown	Strongly folded rocks, including slightly metamorphosed shale, chert, novaculite, and limestone
PALEOZOIC				Metamorphic rocks	Unknown	Fine-grained schist, metaquartzite, phyllite, and marble

Figure 1a. Collecting area for charcoalized and silicified wood samples. This view is looking northwest from the Badlands Overlook at Painted Desert Junction. Note bentonitic clay mounds in the center of the photograph where samples were obtained. Maverick Mountain is in the background. Note the extensive erosion evident along the "badlands" (Dawson Creek, north of Park Road). Photograph taken in March 1991.

Figure 1b. Same area as seen in Figure 1a except viewed from Park road looking north. The closest bentonitic mound is in the center of the photograph to the right of the long "column." Maverick Mountain is to the left front, not in the photograph. This photograph was taken in March 1992. Many of the perminerlized logs that were exposed in 1991 were missing from the collecting site in 1992. Again note the evident erosion.

Figure 1c. Bentonitic clay mounds south of Park road (looking northwest) from where some fossil wood samples were collected. Maverick Mountain can be seen at the left rear (horizon) of the photograph. Note the similarity of appearance between the clay mounds in a-c and the bentonitic clay mounds shown in Figure 8 of Rosnau, et al., 1989a, p. 46. Interestingly this area in Big Bend is within one mile of a road junction formally known as the Painted Desert Junction.

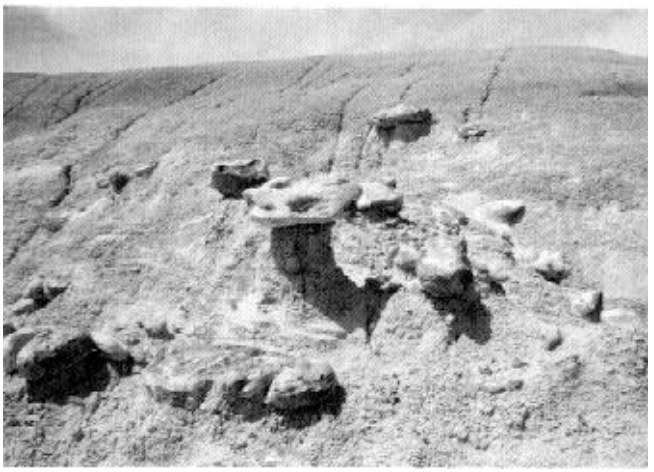

Figure 2a. Concretions in bentonitic clay mounds shown in Figure lc. Rosnau, et al. (1989b) observed numerous similar appearing concretions in the Kayenta of Arizona. See Figure 29, page 92 of that article.

Figure 2b. A small and a large concretion in same area (Figure 1c). Hammer rests on the two concretions.

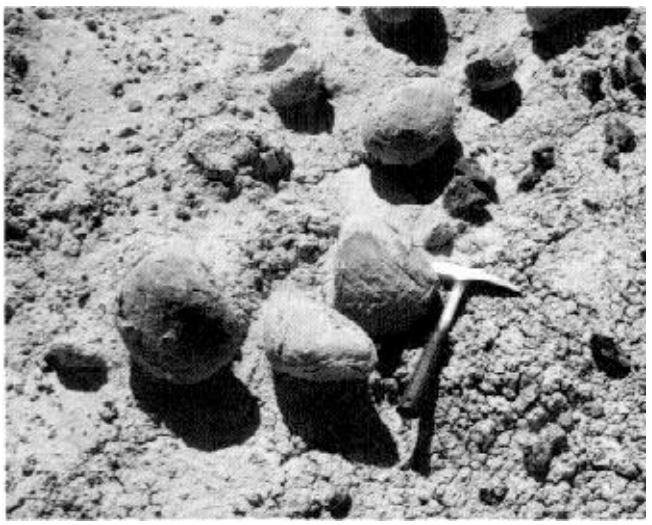

Figure 2c. Several smaller concretions.

> ash or in sediments rich in volcanic ash. Actually a great many occurrences of silicified wood in volcanic ash are known. Silicification by percolating waters is also conceivable in a porous stratum, like coarse sandstone, that is under or overlain by a deposit of volcanic ash (p. 589).

Considerable Volcanic Activity in the Western U.S. in the Past

Clark (1966), Peters (1973, p. 89), and Rosnau et al. (1989b, pp. 85-86) discussed the presence of bentonite in the western United States from the perspective of catastrophism. Many bentonitic formations are indicative of the vast extent of volcanic activity in the past.

Decker and Decker (1981, p. 116) noted:

> Huge deposits of pyroclastic flows that cover thousands of square kilometers and are tens to hundreds of meters thick exist in Japan, New Zealand, Central America, the *western United States*, and many other volcanic regions of the world. Some of these deposits give every indication that they were poured out in a single enormous eruption that would dwarf Krakatau. The volume in these deposits is on the order of 100 to 1000 cubic kilometers compared to the 18 cubic kilometers of Krakatau (emphasis ours).

Kauffman (1977, p. 87) in discussing interior western United States bentonite formations, particularly the volcanic eruptions that released the ash, stated that "These ashes settled widely over the Cretaceous seaway in a short period of time, . . ." Some of the bentonite deposits extend outward for over a thousand miles from the source areas and are used as marker beds. Again immense, widespread volcanic activity in the past is consistent with a catastrophist interpretation.*

In relation to this volcanic activity, Hopkins (1965, p. 107) commented concerning the Aguja formation as follows:

> The large percentage of bentonitic claystones in the upper part of the [Aguja] formation suggests that at times the streams were choked with mud, or that the ash falls in the source area increased in later Aguja time. As previously mentioned, the red color of many of the Aguja claystones suggests a change to a humid climate.

This volcanic activity, particularly the ash falls, produced conditions that were favorable for the silicification of wood which was covered by settling volcanic material. It is possible that immediately after the Flood, the Big Bend region had a climate with abundant rainfall. See Oard, 1990 for a discussion of possible post-Flood climatic conditions, particularly in the western United States. If the woody material in the Dawson Creek area were transported to its burial site, then covered with volcanic ash and if there was ample rainfall, these conditions would have been favorable for the silicification of buried plants.

*Camp (1930) in discussing the Chinle formation (Jurassic) in Arizona. which contains considerable bentonitic clay, made the following observations which could be interpreted within a catastrophist framework:

> Occurrences of fossil wood and bone in the Chinle are so distributed that they might be taken to indicate periods of cataclysmic extinction. From the presence of great volcanic ash deposits and the frequent occurrence of pure charcoal lumps and charcoal encrusted logs in these deposits, it would seem at first thought that the bone beds and fossil forests may have been due to sudden destruction of life by volcanic outbursts, accompanied by fire and flood (p. 8).

Summary

The formations in which the fossil wood was found were described briefly. Hopefully, other creationist studies on deposits of petrified wood can be compared with this setting and a common catastrophic mechanism or mechanisms suggested. The relationship of bentonite to silicified wood deposits has been discussed. Extensive post-Flood volcanic activity has been suggested as a source for the tuff needed to form bentonite. Abundant rainfall immediately after the Flood could have encouraged silicification of the buried wood. This possibility will be explored in Part II of this series. The chemistry of the fossil wood will be presented in Part III and microscopic characteristics of the material will be discussed in Part IV.

Appendix I
Suggested Origin of Javelina and Aguja Formations

Maxwell, et al., 1967, p. 92 state that:

> The Javelina Formation has all the characteristics of a continental deposit. Lack of sorting and lack of structure in the clay suggest deposition from suspension in lakes whose currents were intermittent and local. Periodic oscillations drained or shifted the water bodies and caused channeling . . .

Also they (p. 81) consider that "The nonmarine Aguja is continental detritus, lacustrine and lagoonal . . ." Hopkins (1965, p. ii) noted that ". . . mottled maroon and green claystones, limestone-pebble conglomerates, and sandstone beds and channel-fillings in the upper part of the [Aguja] formation suggest deposition in coastal river flood plains." He explained (p. 1):

> The [entire] Aguja formation in Big Bend National Park, Texas, furnishes a revealing record of shifts in the paralic environments of deposition concomitant with the withdrawal of the western interior sea from the area during late Cretaceous time.

Again Hopkins (p. 109) stated:

> The lower Aguja formation records a possible beach environment and the various sub-environments associated with tidal flats. The middle part of the formation records estuarine, lagoonal, and swamp environments, and the upper part, a coastal-plain fluvial environment.

Likewise he noted:

> The upper part of the Aguja formation contains fewer features that are diagnostic of specific environments than are found in the lower part. It does, however, contain many features that are suggestive of deposits of low gradient streams and estuaries.
>
> The presence of non-marine fossils and the absence of marine forms argues in favor of a fluvial environment of deposition. The fresh water gastropod *Campeloma vetulum* (?) dinosaur remains, dinosaur tracks, and abundant petrified wood and fossil logs have already been mentioned . . .

> The lithology of the upper part of the Aguja formation is predominantly silty claystone. These rocks may have been laid down as overbank deposits . . .
>
> Other sedimentary structures, such as trough-type cross-bedding, fit a fluvial-estuarine environment, but are present in other environments as well. The red and green color of upper Aguja claystones are also characteristic of continental deposits.
>
> Although there is no positive proof of fluvial estuarine deposits in the upper part of the Aguja formation, the agreement of all evidence argues strongly for such an interpretation (pp. 101-103).

Maxwell (1968, p. 16) showed the extent of the "Mesozoic Sea" in North America (Figure 3). Also see Williams, et al., 1992, p. 141. Lonsdale, et al., 1955, p. 40 noted that "As the Aguja sea oscillated back and forth across the Big Bend area it left a record of marine, near-shore, estuarine, and continental deposits."

Then they postulated that:

> The coal beds at the base of the first Aguja sand indicate a period of continental deposition marking a withdrawal and transgression of marine waters. The basal part of the Aguja is characterized by zones of marine fossils with oysters, gastropods, clams and ammonites (p. 39).

Hopkins (1965) speculated that:

> . . . the Aguja is a regressive sequence with records of some very minor transgressions, and that there was no significant break in sedimentation during deposition of the Terlingua and Aguja formations (p. 10)

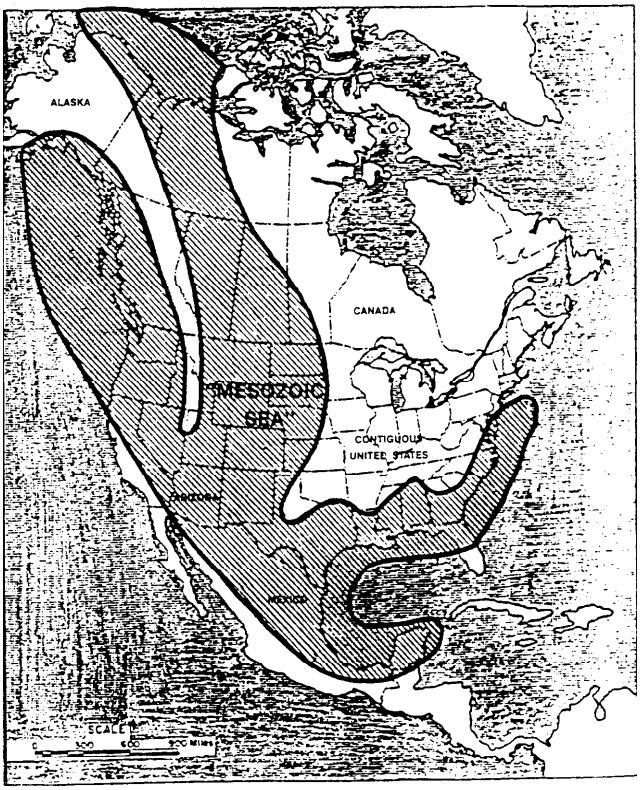

Figure 3. Map of North America showing the extent of the "Mesozoic Sea." Drawing by Martha Smith.

More recently Lehman (1984) discussed the fluvial sedimentology of the Aguja and Javelina formations and claimed:

> Late Campanian and Maastrichtian fluvial sediments of west Texas and northern Mexico were deposited following the final regression of the western interior seaway . . .

He felt that there ". . . were four or five successive episodes of re-occupation and incision" during late Cretaceous times. "Forestation and soil formation as well as local pond deposition, occurred during periods of abandonment." He also discussed possible climate changes during this postulated time interval. Lehman (1985) discussed the deposition of coal and lignite in the upper Cretaceous Aguja formation and related this deposition to the transgression-regression cycles of the "Cretaceous Sea" as proposed by Kauffman (1977) for the western United States interior Cretaceous basin. See Figure 4 for a visual model of sedimentation possibilities during a transgressive-regressive cycle.

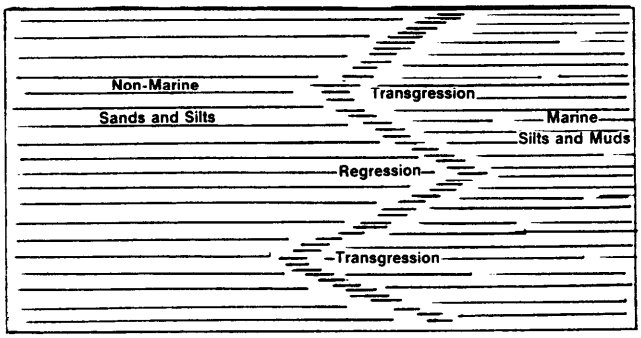

Figure 4. Idealized representation of the facies of the depositional sequence where continental and marine sediments interfinger as a result of transgressions and regressions of the sealevel at a shoreline (after Press and Siever, 1986, p. 313).

We propose a tentative, very speculative model for the deposition of the Javelina and Aguja formations based on a Flood model. Possibly as the Flood receded from the western United States, considerable water from the west Texas region flowed into and through the Big Bend area toward the Gulf of Mexico. (For a sketch of events from a uniformitarian perspective, see Moore, 1989.) The lower Aguja was one of the last sediments deposited under marine (Flood) conditions. The recession of water was almost complete in "lower Aguja times." Also inland, possibly many fresh-water lakes existed and rivers flowed toward the retreating Flood water as a postulated high precipitation climate could have provided ample surface water to erode recent deposits. Flowing fresh water, laden with erosional debris, moving generally toward the southeast began to deposit the upper Aguja formation.

During the withdrawal of the marine water and during the inland post-Flood erosive process, considerable tectonic activity was affecting the Big Bend country as the crust of the earth adjusted to the removal of water. (The Ouachita, Laramide, and Basin and Range orogenies were active in Big Bend.) With this crustal movement, there might have been transgressions of the marine water during deposition of the Aguja causing interfingering of the marine and continental sedi-

ments along the shifting shoreline. The uplift of a land mass offshore in the marine water possibly could have caused retreating Flood water to surge toward the shore. Also a local subsidence along the shore could have caused a transgression of marine water. Later, regression of the water would continue with the deposition of "continental material."

Evidence of considerable volcanic activity, similar to what Austin studied in the John Day Country of Oregon (Nevins, 1974), can be observed in Big Bend. (See Price and Henry, 1988; Henry, et al., 1989; Henry and Price, 1989; Moore, 1989; Henry, et al., 1991; James and Henry, 1991.) Many ash falls could have occurred in "Javelina and Aguja times" covering various waterlogged plant matter that was deposited behind the regressing water. More study and field work are necessary to elucidate or correct any details of this speculation and it is offered only as a framework for future reference. Also a more recent occurrence of the conjectured events is postulated based on the catastrophic nature of the creationist model.

Rosnau, et al. (1989b) experienced a similar geologic situation in the Kayenta of Arizona. They postulated the following catastrophic scenario:

> . . . volcanic ash may have fallen . . . to mix with existing flooded streams on broad flood plains. Ash could have been washed into the sediments by contemporaneous overflowing rains as volcanism is usually attended by rains. Altered volcanic ash (bentonitic clay) is found surrounding the previously described freshwater molluscs, *Unio* species which likely came from overflowing lakes.
>
> Living organisms could have experienced a catastrophic demise from drowning, ashfall, and poisonous gases . . . (p. 86).

Appendix II
Suggested Stratigraphic Correlations for Javelina and Aguja Formations

Lonsdale, et al. (1955, pp. 25-28) suggested the following stratigraphic correlations for the Javelina and Aguja formations in Big Bend National Park with other Cretaceous formations in the continental United States (Table II).

Later Maxwell, et al., 1967, p. 96, made the following statement concerning correlation of the Javelina formation with other Cretaceous formations.

> The Javelina Formation in Big Bend National Park may be a nonmarine equivalent of part of the Navarro Group rocks in southwest, central, and northeast Texas, but a definite correlation is not possible. The Javelina is more nearly comparable to the nonmarine Escondido Formation of Navarro age in the Rio Grande Embayment (Maverick County) . . . *Alamosaurus* sp. bones were collected . . . from the Javelina and support a Maestrichtian age. *Alamosaurus* has also been found in the Hell Creek Formation of late Cretaceous age in Petroleum County, Montana.

Concerning the Aguja formation, Maxwell, et al., 1967, p. 97, suggested correlation as follows:

San Juan Basin New Mexico — Ojo Alamo sandstone
Lower Aguja formation correlations
Bofecillos Mountains — Boquillas formation
Buck Hill, Agua Fria, and Tascotal Mesa Quadrangles — Boquillas formation
Barrilla Mountains — Taylor Group

Another correlation of the two formations with other Cretaceous strata is given below (Maxwell, et al., 1967, p. 30) in Table III.

Table II. Regional Correlation of Javelina and Aguja Formations (after Lonsdale et. al., 1955).

Big Bend National Park Area	Reference Sequence for Western Interior	Petroleum County Montana	Southwest Texas	Northwest Texas	Northwest Louisiana
Javelina Formation*	Fox Hills Sandstone	Hell Creek Formation	Escondido	Kemp Clay	Arkadelphia Chalk and Marl
			Olmos	Corsicana Marl	
			Upper San Miguel	Nacatoch Sandstone	Nacatoch Sandstone
	Pierre Shale	Bearpaw Shale	Lower San Miguel	Neylandville Marl	Saratoga Chalk
		Judith River Formation			
Aguja Formation	Eagle Sandstone		Anacacho Limestone	Pecan Gap Chalk	Marlbrook Marl
				Wolf City Sandstone	Annona Chalk (restricted)
					Ozan Buckrange Sandstone

*Referred to as Tornillo (restricted).

Table III. Correlation of Javelina and Aguja Formations (after Maxwell et al., 1967).

Big Bend National Park Area	Reference Sequence for Western Interior	Rio Grande Embayment of Southwest Texas	Central Texas	Northwest Texas
Javelina Formation	Fox Hills Sandstone	Escondido Formation	Kemp Clay	Kemp Clay
		Olmos Formation	Corsicana Marl	Corsicana Marl
		Upper San Miguel Formation		Nacatoch Sandstone
Upper Aguja Formation	Pierre Shale	Lower San Miguel Formation	Bergstrom Formation	Neylandville Marl
		Anacacho Limestone	Pecan Gap Chalk and Clay	Pecan Group Chalk
				Wolfe City Sandstone
Lower Aguja Formation		Upson Clay	Sprinkle Formation	Lower Taylor Formation
	Eagle Sandstone ⇩			⇩ Gober Chalk

⇩Eagle Sandstone and Gober Chalk are correlated with lower formations also.

Hopkins (1965, p. 10), in evaluating the Aguja formation, suggested that it "fits roughly into the stratigraphic interval represented in central Texas by the Taylor group . . ." Also he postulated correlation of the Aguja with the Judith River formation of Montana and the Belly River formation of Alberta as did Maxwell, et al., 1967, p. 87. Hopkins (p. 102) speculated that the Aguja may correlate with upper Cretaceous formations in the San Juan Basin of New Mexico. Lehman (1985; 1986) noted that exposures of the Javelina and Aguja formations in Presidio, Hudspeth and Jeff Davis counties, Texas as well as in adjacent Mexico have been assigned to the El Picacho and San Carlos formations respectively.

Glossary

Argillaceous — containing clay

Devitrification — to change the properties of glassy material to those of nonglassy substance

Estuarine — formed in an estuary (where a river current meets the sea tide)

Fluvial — pertaining to a river such as deposits produced by a river

Lacustrine — pertaining to a lake such as strata formed at the bottom of a lake

Lithology — description of rocks, generally megascopic

Marker Bed — distinctive stratum that is fairly easily identifiable and can be traced over wide area (useful in correlations) or a stratum chosen as a reference for structure mapping

Paralic — pertaining to the seacoast, often in geology referring to interfingered marine and continental deposits

Phenocryst — a crystal significantly larger than the crystals of surrounding minerals and ordinarily conspicuous

Pyroclastic — fragmented rock of igneous origin such as ash, tuff, etc.

Acknowledgments

Glen Wolfrom graciously constructed Tables II and III for which we are most appreciative. The following people offered helpful comments on the manuscript; Robert Gentet, Peter Klevberg, John Meyer, Henry Morris, Michael Oard, and Wilbert Rusch, Sr. The opinions expressed in this paper remain solely those of the authors. The authors thank the many donors to the Creation Research Society Research Fund, interest from which financed a portion of these studies.

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