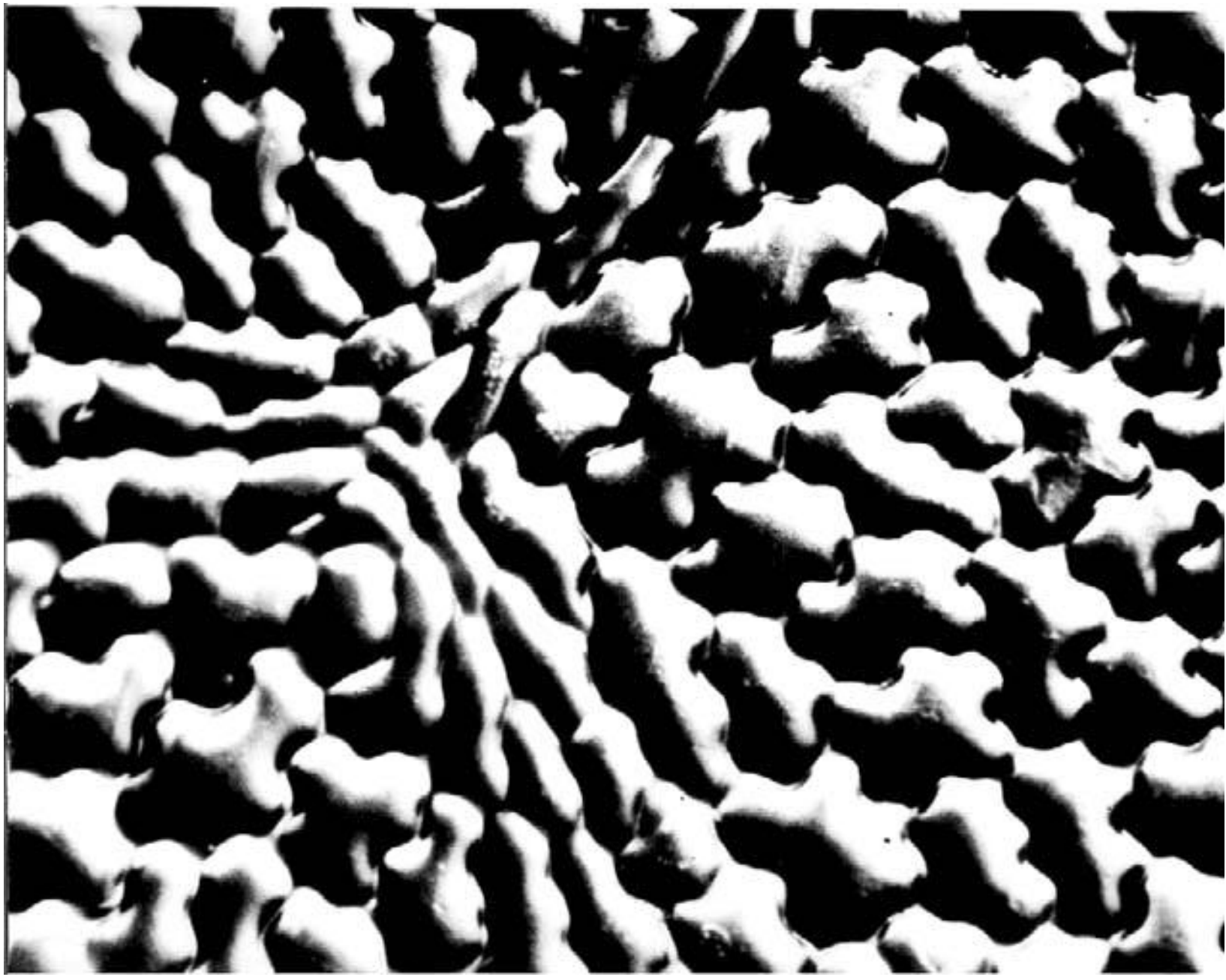
Creation Research Society Quarterly

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 32 **SEPTEMBER 1995** **NUMBER 2**



LEAF LENSES OF *OXALIS*

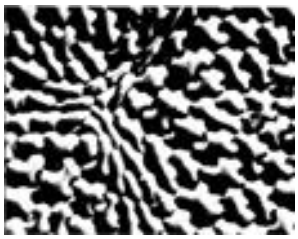
CREATION RESEARCH SOCIETY

ISSN 0092-9166

VOLUME 32 SEPTEMBER 1995 NUMBER 2

ARTICLES

PANORAMA NOTES



Cover Photograph

The curved, transparent, outer cell walls of the *Oxalis* epidermis help to focus light for photosynthesis. Learn more about this on page 70. Macro photograph by Willis E. Keithley.

DEPARTMENTS

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 969, Ashland, OH 44805-0969.

Editor's Address: Eugene F. Chaffin, 715 Tazewell Ave., Bluefield, VA 24605.

Book Review Editor: Don B. DeYoung, 200 Seminary Dr., Winona Lake, IN 46590.

Printed in United States of America.

Editors' Comments

The First Amendment to the Constitution of the United States of America reads:

> Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

In effect, many public schools in America have established a state sponsored religion in the classroom, a religion in which evolutionism is accepted and creationism rejected. Many scientists actively promote this religion. For example, *Science* recently published a letter to the editor (McInerney, 1995) protesting the use of a headline titled "Did Darwin get it all right?" The Evolutionist who wrote the article expressed the fear that "Creationists will distort the headline to meet their needs." Although the letter writer claimed "I do not propose censorship," the views expressed in the letter seemed to advocate suppression of any remarks which question Darwin or his modern equivalents. Through the use of the peer review process, editorial discretion, and other means, we avoid distortions in CRSQ.

This September 1995 issue (Volume 32, Number 2) contains two very clear but technical treatises covering geological research. Carl Froede, Jr. lays a solid foundation upon which to develop a creationist time scale as a counterpart to the uniformitarian eras, periods, etc. Michael Oard reviews a vast body of literature concerning "fossil floras" (beds of fossil plants) which have been interpreted widely as support for long periods of climatic change in the Cenozoic Era. Oard shows severe problems relating to the uniformitarian interpretations involved.

In addition to its delightfully readable shorter features such as letters, reviews, Copy-n-Share, and Panorama Notes, this issue contains two somewhat nontechnical articles. Jerry Bergman describes a fascinating and convincing correlation between UFO citings and the rise of the evolutionary worldview. Trevor Major reintroduces readers to Matthew Fontaine Maury, a God-fearing and biblically-oriented scientist whose statue is on Monument Avenue in Richmond, Virginia. A photograph of that statue was featured on the cover of the September 1982 issue of *CRSQ*. Maury was a pioneer in the science of oceanography as well as a significant personage in the history of Virginia and the United States.

Note the new CRS Book addition, p. 67. We hope this first item in the series of CRS Readers will encourage other authors to produce short, "user friendly" volumes on creation themes for students. Authors should send manuscripts for such books to the new Publications Committee Chairman, Dr. Robert Goette, 215 Karen Court, Niceville, FL 32578-2613.

In the June 1995 issue of *CRSQ* (p. 6), we communicated a need for members to promote and widely circulate the journal. Adding to that thought here, we wish to note that *CRSQ* is not only one of the "best kept secrets" of creationist publication but it is also a monumental bargain. A member pays $5.00 for each issue of *CRSQ*. But it costs about $3.75 to print that copy and then additional charges for mailing. This means that the membership fee covers very little more than the actual cost of printing and circulating the quarterlies. Other expenses of running the society (such as the conduction of the board meeting, secretarial wages, and the like) are largely covered by direct contributions to CRS. We hereby encourage readers to view CRS as a worthy investment in the balanced representation of true science in the context of biblical knowledge. When you renew your membership or when you write for books, consider sending a generous contribution to the General Fund of CRS.

Eugene Chaffin
George Howe

Reference

McInerney, J. D. 1995. Darwin in the headlines. *Science* 268: 624.

MEMBERSHIP/SUBSCRIPTION APPLICATION FORM
CREATION RESEARCH SOCIETY

See current *CRSQ* for membership information

ORDER BLANK FOR PAST PUBLICATIONS

See current *CRSQ* for ordering information

CREATION RESEARCH SOCIETY

History The Creation Research Society was 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 Chino Valley, Arizona and the Grasslands Study Site 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 $20.00 ($24.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 969, Ashland, OH 44805-0969. 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 $20.00 ($24.00 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: $23.00 ($27.00 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.

Cover Illustration: Leaf Lenses of *Oxalis*

Oxalis is a genus of herbs containing trifoliate leaves which resemble clover. The cover photograph of the upper surface of an *Oxalis sp.* leaf was taken by Willis E. Keithley. It reveals the epidermal design by which the transparent upper wall of each epidermal cell bulges. This curvature creates a lens which beams light rays inward to the palisade cells and spongy cells, tissues underneath that need light energy for photosynthesis.

Epidermal cells in most plants also lack chloroplasts. This conspicuous absence of chloroplasts allows light to penetrate deeply, reaching the buried photosynthetic tissues more effectively.

Figure 1 (opposite column) shows the small heart-shaped leaflets and the delicate yellow flowers of *Oxalis corniculata,* growing together with grass in a lawn. *Oxalis* leaves contain oxalic acid which gives them a tart flavor, useful in making natural salads. *Oxalis* leaves must not be consumed in large quantities, however, as excess oxalic acid in the body can cause the level of calcium ions to decrease in the blood.

Figure 1. Closeup of trifoliate *Oxalis* leaf and one tiny flower. The leaf is at left (center) and the flower is at lower left. Portion of a wallet at upper right gives perspective. Photo by George Howe.

LETTER TO THE EDITOR

Would The Oceans Have Boiled in A Global Flood? A Further Answer to Mr. Yake

> Yake comment: The heat generated during the Flood event by volcanic activity and the spreading action of the earth's plates is estimated to have been 3.65 octillion calories, which would have raised the ocean temperatures to 2706 degrees centigrade. (Yake, 1995, p. 12).

This point, raised by Yake, is probably the most subjective because too many unknown factors would go into its calculation. We do not know the original water temperature, the temperatures for the falling rain, or the heat generated during the breakup and spreading of the Pangaean supercontinent. However, it has been recognized by creationists that the earth's oceans would have heated up considerably following the Flood (Oard, 1990; Vardiman, 1993; 1994).

Uniformitarians also propose warmer past climates and oceans than at present, based on paleontological data. Exact temperatures of the paleo-ocean temperatures cannot be determined. A paleo-temperature for the Flood waters can be approximated using foraminifera (known as "forams") and they support a warm ocean environment, as Vardiman (1994) has noted. Some catastrophists believe that the warm oceans initiated a single ice age (Oard, 1990). The ice age as such is not reported in the Biblical record.

Forams along with other marine fossils are also found within the previously mentioned continental seaways. Uniformitarians invoke tectonics to create conditions necessary to explain how these warm shallow seas existed on the continents. Young earth creationists invoke the Flood. The choice is yours to make, based on the same data. Either you select a young earth and invoke the catastrophic physical processes necessary to explain and defend that model or you choose the uniformitarian model of semi-infinite time in which the "present is key to the past" in terms of physical processes. However, it should be noted that uniformitarians themselves invoke "catastrophic" events in the formation and development of much of the stratigraphic record (Ager, 1993; Dott 1983; Einsele, Ricken and Seilacher, 1991; Seilacher, 1984).

References

CRSQ—Creation Research Society Quarterly.

Ager, D. V. 1993. The nature of the stratigraphical record. Third edition. John Wiley. New York.

Dott, Jr., R. H. 1983. 1982 SEPM presidential address: Episodic sedimentation—How normal is average? How rare is rare. Does it matter? *Journal of Sedimentary Petrology* 53:5-23.

Einsele, G., W. Ricken and A. Seilacher. 1991. Cycles and events in stratigraphy—Basic concepts and terms. Springer Verlag. New York.

Oard, M. J. 1990. An ice age caused by the Genesis Flood. Institute for Creation Research. El Cajon, CA.

Seilacher, A. 1984. Storm beds: Their significance in event stratigraphy. In Seibold, E. and J. D. Meulenkamp (editors). Stratigraphy Quo Vadis? American Association of Petroleum Geologists Studies in Geology No. 16. Tulsa, OK. pp. 49-54.

Vardiman, L. 1993. Ice cores and the age of the earth. Institute for Creation Research. El Cajon, CA.

_____ 1994. Out of whose womb came the ice? Impact No. 254. Institute for Creation Research. El Cajon, CA.

Yake, B. 1995. Objections from science to global flood. *CRSQ* 32(1):12.

Carl R. Froede, Jr.
2895 Emerson Lake Drive
Snellville, GA 30278-6644

THE ACCEPTANCE OF EVOLUTION AND A BELIEF IN LIFE ON OTHER PLANETS

JERRY BERGMAN*

Received 25 April 1994; Revised 3 August 1994

Abstract

Our belief structure highly influences our explanation and conclusions concerning ambiguous stimuli. When it was accepted by most Westerners that humans and all life were direct creations by God, if other worlds existed and had life, it must have also been created by God. Acceptance of non-theistic evolution indicated that if life evolved on earth, it could likewise have evolved elsewhere. This life could be either a "lower" or "higher" level than humankind, or an entirely different kind based on a non-carbon molecule. If many kinds and types of life exist elsewhere in the universe, their visits to earth became a real possibility.

Today, some exobiologists such as Carl Sagan and others have postulated that it is highly probable that life exists in many far off places in the universe. This paper hypothesizes a relationship between public belief in evolution and the number of modern claimed sightings of UFOs. Before the late 1940s there were almost no reports of UFOs. The acceptance of evolution, the first famous claimed sighting in 1947, the American space program, and the fear of invasion from foreign powers with advanced technology (especially the former Soviet Union) have all contributed to the phenomenal number of claimed UFO sightings since 1947.

Introduction

The topic of Unidentified Flying Objects (UFOs) has been awarded a tremendous amount of publicity in the last 40 years. Thousands of books and magazine articles have been devoted to it, most of which are written from the premise that many UFOs are objects from other planets controlled or flown by living non-earth creatures (Edwards, 1966, 1967; Tralins, 1974; Von Daniken, 1969, 1972; Menzel and Boyd, 1963; Chambers, 1967; Lorenzen, 1966; and Michel, 1956). Unfortunately, much of the material is not objective, well researched or adequately documented.

Widespread popular belief in the existence of UFOs, here defined as physical "spaceships" either from another planet or possibly from the inside of this planet, is quite recent (for a discussion of UFOs as a manifestation of demons, see Segraves, 1975; Wilson, 1972, 1974, 1975; Jansma, 1981; Allnutt, 1978; Weldon, 1976; Wells, 1975; Downing, 1968). As UFOs are usually believed to come from other solar systems, such phenomena could be accepted only when it was believed that other large earth-like planets existed in other solar systems. For much of history, most humans did not share our current world view that the earth was one of nine planets arranged in a heliocentric solar system. Except for God, angels, devils or other spiritual beings which did not need to travel in material machines, few persons in the Christian era in the West believed beings from other planets existed. As Sagan and Leonard (1972, p. 19) state "The world, as . . . [people who lived at the dawn of history] saw it or understood it, was a small patch of land bounded by distant hills and perhaps by the blue line of the sea." Although it is difficult to discern exactly how most ancients perceived the universe, the common people as well as many scholars generally saw the universe as only what it appeared to be from earth: the planets were fast moving stars, and the stars were often assumed to be fairly small objects which hung in the sky not too far away from the earth.

While widespread claimed UFO observations are a very recent phenomenon, people have been speculating about extraterrestrial intelligence (called the "plurality of worlds view") since at least the time of the ancient Greeks. The more important supporters of the concept of "many inhabited worlds" includes the Pythagoreans, the stoics such as Epicurus and his follower Lucretius and Plutarch, and the many atomists, including Democritus. Tipler (1981, p. 134) concludes that these individuals were "the most important supporters of the many inhabited worlds concept in antiquity." Many of these thinkers speculated that the size of the universe was enormous, and reasoned that we could not be the only beings in it, just as an ocean must have more fish than those that we see on a clear day.

Since relatively few manuscripts have survived from this period, it is difficult to speculate on the amount of concern and importance that these thinkers gave to this idea. Tipler (1981, p. 134) feels that the evidence allows the conclusion that "the most brilliant Greek thinkers were . . . opposed to the idea of a plurality of worlds." Those he cites include Plato and Aristotle, who both argued strongly against the view on a number of grounds. Because of the importance of Aristotle, Tipler (1981, p. 134) concludes that this belief "dominated thought until the time of Copernicus, and though the doctrine of a plurality of worlds . . . was occasionally discussed, it was rejected by most scholars, both pagan and Christian, in this period."

The Theological View

To Christian thinkers, the most important concern about the plurality-of-worlds idea was theological, especially related to sin and redemption. If other worlds exist with life and if this other Adam sinned, Christ's redemption would be required. If these humans never sinned, no redemption was needed, and this would seem to negate the Scriptures which stress that all humankind had sinned, presumably all referring not just to the earth, but to all humans everywhere. If this Scripture refers only to humans on the earth, and if beings elsewhere also required a Savior, this would negate the words of 1 Peter 3:18 where the saving work of Christ was believed to be unique (Armstrong, 1970). Influential early Christian thinkers from Augustine to

*Jerry Bergman, Ph.D., Northwest State College, Archbold, OH 54502.

Aquinas resolved the quandary by totally rejecting the plurality-of-worlds belief. They taught that the universe and the earth were created for humans only, and that we have no reason to believe that God has created other races of humans elsewhere (Steneck, 1976). In addition, many Christian scientists, including both Kepler and Galileo, opposed the plurality-of-worlds view, Galileo even denouncing it as "false and damnable." One of its few advocates during this period, Bruno, was executed for heresy (Singer, 1950).

Tipler (1981, p. 136) concludes that it was the Copernican revolution which gave a major boost to the plurality-of-worlds concept. In spite of the many arguments by most Christian thinkers against the concept of extraterrestrial intelligence, some, such as the influential St. Bonaventure, contended that "God could make a hundred worlds if He wished. He could suspend Aristotelian physics . . . and create one in a place which is beyond the fixed stars." In addition, Nicholas of Cusa, whose De docta ignorantia (1440) was the most influential book on cosmology until the seventeenth century accepted the plurality of worlds possibility (Tipler, 1981, p. 135).

It was not until the Renaissance in the fifteenth century that the western world began to seriously comprehend the basics of how our solar system of planets functioned. Although the heliocentric view of the universe was not totally new, but was postulated centuries previously by Eratosthenes, Aristarchus and others, most people, even the most learned, did not accept this view until the 1700s (Sagan and Leonard, 1972). One of the first researchers to scientifically defend a system with a sun at the center and the then known planets traveling around it in circular orbit was Nicholas Copernicus. Copernicus' 1543 book, *On the Revolution of Heavenly Bodies,* was a major step in comprehending the universe as we know it. Men such as Galileo, Kepler and others, although they did not agree with Copernicus in many areas, provided many details for the heliocentric view. As Tipler reasoned:

> . . . the telescope disclosed mountains on the moon and satellites around Jupiter. These observations suggested that the planets were similar to the Earth in gross structure. Second, the Earth was demoted from the status of being an enormous body in the center of the Universe to just one of six planets. To minds conditioned by the discovery of America in the previous century to see unknown lands on this planet inhabited, it took but a small application of the principle of plenitude [the assertion that what can exist, must exist somewhere, and if worlds like ours exist elsewhere in the Universe, they must be inhabited by intelligent beings since no genuine potentiality of being can remain unfulfilled] to envision the planets—regarded as distant lands—as inhabited also. Further, the telescope had revealed innumerable stars, which were regarded as Suns like our own (1981, p. 136).

Although a few thinkers had correctly addressed the shape and even the approximate size of the earth (e.g. Erathosthenes) most of the ancients entertained a view of our universe vastly different from our modern day picture. Thus Reichen argued:

> In a century and a half, from Copernicus to Newton, man's image of the universe had been totally transformed. It was far larger universe, far more complex, and far more remote from the earth (1963, p. 53).

It is not true that no one speculated about an infinite universe before this: "As early as 4 B.C., Metrodorus discussed an "infinite space," and Lucretius even wrote that "there are infinite worlds both like and unlike this world of ours" (Ferris, 1988, p. 369). These ideas, though, were pure speculation, and not widely accepted. Along with the modern realization that there were other "worlds" far away from the earth came the possibility that living beings may exist on these planets. This in itself, though, did not influence widespread belief in UFO phenomena for one important reason: until the turn of the century, it was almost universally believed that God had directly created humans and all life. Hence, if life existed on other planets, God must have created it. Consequently, the life there must be similar to that on earth. Further, because God was believed to be a loving heavenly Father, it was incomprehensible that He would create physical creatures on other planets which were grotesque, cruel, or naturally malicious towards the earth as often implied in early science fiction. The life on these other worlds would likely be more like Spielberg's E.T. in personality, but not physical appearance.

Those pre-Darwin scientists and church leaders who entertained the possibility of life on other inhabited planets concluded that, if other worlds exist, they "must have been created to be the abodes of other intelligent beings, just as the Earth had been created for human beings" by God (Tipler, 1981, p. 136). During this period, the major arguments and discussions about the plurality-of-worlds concept focused on the purpose of other worlds, and the theological problems that this concept created. The arguments against this view included: 1) either earth humans were the only physical creatures that God created; or if God created others, those on earth were the only ones to fall from grace. Some reasoned that since, aside from the angels, humans are the only creatures that God created which we know anything about, speculation is fruitless. Actually, a belief in the plurality of worlds produced so many serious theological difficulties for Christianity that many writers used it as an argument against Christianity as a whole. As Thomas Payne in his famous *Age of Reason*, a diatribe against Christianity, stated:

> . . . from whence then could arise the solitary and strange conceit, that the Almighty, who had millions of worlds equally dependent on His protection, should quit the care of all the rest, and come to die in our world, because they say one man and one woman had eaten an apple! And, on the other hand, are we to suppose that every world in the boundless creation had an Eve, and apple, a serpent, and redeemer? In this case, the person who is irreverently called the Son of God, and sometimes God himself, who would have nothing else to do than to travel from world to world, in an endless succession of death, with scarcely a momentary interval of life (Quoted in Tipler 1981, p. 139; interestingly, Payne's book, *Age of Reason*, is commonly reprinted by various atheistic associations, and all editions that I was able to locate omitted this quote).

The increasing acceptance of the evolutionary theory in the middle of the 1800s, spurred on by such workers as Darwin, Huxley, Haeckel and others, brought with it the belief that just as life on the earth evolved, life on other planets could have also developed on its own, only in different ways, depending on the environmental conditions there. In this world view, humans and animals were no longer seen as the product of an intelligent designer with a loving purpose, but as a result of natural law, chance and the brutal forces of competition which occurred in the impersonal natural world. And "If intelligent life has evolved on this planet it may have done so elsewhere" (Ferris, 1988, p. 368). As Buskirk (1979, p. 2) stated:

> . . . most who believe in life in outer space suppose it on the theory of evolution. An evolutionist would reason: If life evolved after millions of years on this planet, why couldn't it have done so elsewhere in the universe?

Ridpath argued that "Religions which contend that God made man in His own image could be severely shaken if we found another intellectual race made in a different image" (Quoted in White, 1988, p. 38).

Popularization of the Other Worlds Theory

Literature, especially science fiction, served to popularize this new view of the cosmos (see for example Verne, 1878). The first popular work about life from other planets was H. G. Wells' *War of the Worlds* (1895) which told of the story of grotesque monsters with tremendous powers that came to earth from Mars. These monsters were eventually destroyed, but not by human power. The Martians lacked immunity to earth's bacteria, and thus were "slain by the humblest things that God in His wisdom had put upon this earth." This book, although science-fiction, clearly conveyed the possibility of life on other planets. H. G. Wells' major interest in college was biology and evolution, a subject which he planned to teach. He reasoned that if life evolved by natural law on the earth, it likewise could have evolved on other planets, and this view played an important part in many of his novels. The evolutionary hypothesis is obvious throughout this internationally known classic (Bergman, 1993).

The possibility that living beings were inhabiting other planets became accepted to the extent that a 1938 radio dramatization of *War of the Worlds* by Orson Wells was mistakenly understood by many listeners as a genuine news report! The broadcast claimed that a meteor which had landed near Princeton, New Jersey proved to be hollow and men from Mars emerged from it. Armed with a horrible death ray gun, they slew all of the humans they came across as they marched to New York. The result of this broadcast was, as one newspaper stated, America became "convulsed by panic and hysteria." Many people believed the broadcast was real—so much so that hundreds of doctors and nurses called hospitals to volunteer their services. Men in the armed forces offered their help, and city officials began to work out mass evacuation plans (Cantril, 1966).

Because this scare was nationwide, the fervor was not due to local population peculiarities: Meetings were held in many places in America and Canada to make plans for defense. Some people actually poisoned themselves, preferring to die by their own hands than from the Martians' ray guns Cantril, 1966). A few years later in Mexico, the same broadcast caused a level of pandemonium that made the original broadcast events appear minor. This incident conveys the fact that many people in 1938 strongly believed in the possibility of intelligent life on other worlds—and that it could be malicious, and in some way very harmful to earth's people.

Stories such as *War* of *the Worlds* and *The First Men on the Moon* were openly influenced by evolutionary theory. Many other stories about space travel featuring odd, often malicious creatures from other planets soon became popular, including the Buck Rogers and Flash Gordon books and their later television series. With the realization that the universe is much larger than previously supposed, and the belief that life could evolve due purely to the forces of time and natural law, one's imagination was freed to create bizarre worlds in the huge unknown expanse that existed outside of the earth. Motion pictures with multi-million dollar budgets such as *Close Encounters of the Third Kind, Star Wars, E. T.* and others continued to popularize the idea that life evolved elsewhere in the universe.

Although the possibility of life on other planets and possible earth visits were occasionally discussed in literature prior to 1947, almost no one claimed to actually have seen what today would be called a UFO. The UFO phenomenon is generally thought to have begun in 1947 when businessman Keith Arnold, while flying his private plane near Mt. Ranier, Washington, claimed that he saw a cluster of several bright "metallic objects" dodging around the nearby mountain peak. Arnold somehow concluded that the objects had traveled between 1,200 and 1,500 miles per hour (Goeringer, 1979, p. 11). Since Arnold's report, scores of thousands of claimed sightings have occurred—some even accompanied by photographs—although the majority have proved to be fakes (Goeringer, 1979, p. 14). Later Arnold was credited with describing these unknown objects as resembling "pie plates," traveling like "saucers being skipped over water." Although, the phrase "flying saucer" attributed to Arnold is evidently a misquote (He said only that the objects flew and appeared wingless.) the phrase caught on and the terms "flying saucers" and "unidentified flying objects" (UFOs) are now universal.

Arnold's matter-of-fact way of conveying his story convinced so many people that within weeks, and for the first time in history, "flying saucer" reports started flooding in from all parts of the world. As a result, Evans (1973, p. 140) notes, "So widespread, and often so convincing were these reports that the American Air Force launched a full-scale investigation into them."

The few pre-1947 reports of such claims often discuss "ships in the air" or "ships in the clouds," Wilkins (1955, 1967) lists several accounts of "ships in the skies" dating back to 22 BC. Flying saucers as discussed in contemporary accounts are generally not described as anything like "ships in the skies" but considerably different. The objects described in ancient accounts appear to be natural astronomical phenomena such as shooting stars. At best, the limited evidence suggests that pre-1947 sightings were not perceived in the same way as flying saucers and similar objects are understood today. Some

were only stories relating various moral principles. Many investigators have concluded that the attempts to document many historical UFO sightings, such as by Von Daniken (1969, p. 1972), are all unconvincing.

Another factor which has influenced public acceptance of UFOs was the cold war. At the time of Arnold's sighting, the United States and the Soviet Union were involved in an active "psychological war." The development of the V-2 and later rockets was also frightening to many people (Menger, 1967). Some Americans feared that the Soviets may have some type of super intercontinental ballistic missile that could demolish us. The detonation of the atomic bomb, still fresh in people's minds then, caused a tremendous fear in many relative to the increased technology in this area (Rublowski, 1962). The United States was at this time in a state of constant alert and could not afford anything but maximum interest in unidentified flying aircraft stories, no matter how far-fetched. Consequently, an extensive research investigation of UFO citings was completed. Evidently, top-ranking officers in the Pentagon were fearful at one stage of their UFO investigation that the Soviets were testing some spectacular new super weapon. As the Air Force progressed in its 22-year-long investigation though,

> . . . the less inclined it was to the view that saucers were real craft of incredible performance, and the more readily they subscribed to prosaic explanations such as that the UFOs were weather baboons, meteorological phenomena, conventional aircraft whose distance and speed had been incorrectly judged, and so on (Evans, 1973, p. 141).

This extensive research, called "Project Blue Book," culminated in the 1968, 1,500 page Condon Report which is considered by many to be the final fatal "expose" of the UFO belief myth. In the report's words, "Further extensive study of UFOs probably cannot be justified in the expectation that science will be advanced thereby" (Quoted in Stacy, 1994, p. 56). These "official" denials, though, often only reinforced the conclusions of many UFO true believers (Ruppelt, 1956; Rublowski, 1962). The Blue Book project found most all UFOs were likely atmospheric phenomenon, weather disturbances, hoaxes, weather balloons, airplane lights, planets, or other explainable phenomenon. Although researchers were not able to explain fully many claims, this is understandable when all that exists are eye witness accounts from untrained observers. Nonetheless, not one case was determined to be a verified case of physical beings from other planets.

Arguments Against the View that Life from Other Solar Systems Could Visit Earth

The closest star which Evans (1973) describes as "rather freakishly close." Alpha Centauri, is about 25-quadrillion miles or 4.2-4.3 light years away. Traveling at 186 thousand miles a second, a round trip to it would take earthlings over 9.2 years. The fastest known space craft does not travel even close to this speed, but only a few thousand miles per hour. At present day speeds, it would take about 100,000 years to reach the three stars in this area, and we have no clear evidence that the closest star (or any other) has any planets. The most optimistic "dream" estimate of the shortest time ever possible is about 150 years or about five generations, which would equal 300 years for a round trip.

By using two or three stages, some estimate that chemical rockets may achieve, at most, a speed of 2,000 miles per second (Lunan, 1974, p. 22). Bolin estimates that possibly as much as 60% of the speed of light could be achieved in the distant future but, as measured from earth, a ship traveling at this speed would still require something like 18 years to travel the 10 light years needed for a trip to the second closest star! Unfortunately, a tremendously large amount of supplies must be included to make the round trip of 36 years, including food, oxygen, and something to prevent the crew from going insane (How many persons could live in a small rocket ship traveling in space for 35 or more years?).

Although it is possible that rockets could be developed to travel at immense speeds, and that some superscientific civilization might have developed such, we have no evidence that this is the case. As Clarke (1968) stated, we will have to settle for space-age fliers that putter along at a mere tens of thousands of miles per hour. Our knowledge of physics, chemistry and space travel is such that it seems improbable that we will ever reach speeds significantly greater than that presently obtained. Edwards adds:

> May not some super-scientific civilization have developed a method of travel which transcends our puny knowledge of the laws of space and time so that their craft can leap across the stellar waste in a twinkle of an eye? This, of course, is conceivable in the sense that all things are theoretically possible, but here the UFO protagonist has moved. . . into the swamp of pure guesswork . . . (1966, p. 3)

Einsteinian theory has demonstrated that time slows down and mass increases as we approach the speed of light. Thus, it would take an infinite amount of energy to travel the speed of light, making it impossible to travel faster than the speed of light (Landau and Rumor, 1966, p. 83; see also Good, 1968; Gardner, 1965; Coleman, 1954). The warp drive, arc-cutting and warped space theories are all attempts, so far inadequate, to overcome this distance problem. Many other scientific arguments against the extra-terrestrial view exist (Barrow and Tipler, 1986).

Thus, because of tremendous distances—Andromeda, the nearest galaxy to the Milky Way galaxy, is over 2,000,000 light years away from the earth—a space craft could not reach the earth unless it could travel many times the speed of light. A space craft from here would have to begin its trip long before life ever existed on the earth, and might not arrive until long after life ceased to exist here. And, given the vastness of space, how would the visitors know where and when to go? Thus, it seems highly improbable that UFOs could ever reach earth from outside of the solar system. UFOs cannot exist if there is nowhere that they could come from in time to experience life on earth. The problem is illustrated by Ferris as follows:

> One might search for life beyond the solar system by traveling to the stars, but to do so within any reasonable amount of time is a very tall order indeed. The stars are just too far away: A spacecraft capable of traveling a million miles per hour—and this would be a stunningly fast ship, one that

> could fly from Earth to Mars in less than an hour-would take nearly three thousand years to reach Alpha Centauri, the nearest star. If the expeditionaries proceeded to the next promising star—Delta Pavonis, spectral class F8, would be a reasonable choice—and then hastened on to, say, Beta Hydri, and then kept going to Zeta Tucanae before stopping for a well-earned rest, they would have succeeded in visiting about one one-hundred billionth of the stars in the galaxy—a sample statistically less significant than attempting to understand all Shakespeare's writings by examining only two letters from one of his sonnets (1988, p. 371).

The origin of UFOs is sometimes attributed to areas within the solar system, including such planets as Mars, Venus, and sometimes even Neptune and Uranus (Michel, 1956; Bernard, 1979). The recent space probes though, have provided no evidence whatsoever that life does and a tremendous amount of evidence now exists to support the position that life does not and cannot exist on these planets (Wells, 1975). Mars, Venus, Jupiter and Saturn have all been found to contain either extremely poisonous gases or almost no life supporting gases in their atmosphere.

Another explanation for the source of UFO spaceships is the belief that earth has a "sister" planet. Proponents of this idea propose that a planet equal in size to the earth traveling at the same speed, but directly on the other side of the sun. It is for this reason that it has never been seen from the earth. If it existed, though, it would cause a gravitational pull not only upon the earth, but also on the other planets. This gravitational pull has never been detected. The discovery of Pluto was partly due to the assumption that Neptune's "improper" orbit may be explained by the presence of another planet farther out. Although it is now known that this influence would be small, scientists hypothesized where this planet should be, and in time found it (Hoyt, 1981).

If material, physical UFOs exist that are not figments of the imagination garnered to create publicity or pecuniary remuneration, nor such things as sunspots or weather phenomena, they must be some type of aircraft developed by governments or individuals. Consequently, if UFOs exist as material objects, they probably come from the earth—a far less exotic and exciting hypothesis than the perception that they are real extraterrestrial spaceships. And, indeed, some UFOs have been found to be ingenious aircraft developed by enterprising inventors.

Many writers have noted the connection between UFOs and theology (Evans, 1973; Wilson, 1972, 1974; Downing, 1968; and Freeman, 1969). One of the more recent brief reviews of UFOs and religion, completed by Goeringer (1979), concludes that UFOs have to some degree replaced religion by (1) giving comfort from the belief that we are not "alone" in the universe; (2) the possibility that these advanced forms of life may be willing to help us deal with our technological limitations—in other words, to "save us"; or (3) that flying saucers are here to help us, but in a covert, indirect way such as to save us from our own destruction by preventing a nuclear holocaust, or forcing us to live together as brothers in the way that H. G. Wells in his *War of the Worlds* suggested (for a theological response to this, see Klewin, 1981). Another concern relates to abduction accounts recalled under hypnosis, most of which relate far more to psychological concerns than evidence for UFOs.

A review of many works written to support UFOs argue strongly in their favor on the basis of speculative biological evolution. Given the vast universe, they reason, there must be many planets that could support life and, given the likelihood of a spontaneous origin and evolution of life, many inhabited planets must exist. Sagan—one of the chief popularizers of this view—speculates as to the kind of life found on these planets: "The cosmos may be densely populated with intelligent beings, but the Darwinian lesson is clear: There will be no humans elsewhere . . . in one-billion galaxies, you will not find another . . ." (1980, p. 339). Sagan does admit that,

> Planets may be rarer than we think. Perhaps the origin of life is not so easy as our laboratory experiments suggest. Perhaps the evolution of advanced forms is improbable. Or it may be that complex life forms evolve readily, but intelligence and technical societies require an unlikely set of coincidences—just as the evolution of the species depended on the demise of the dinosaurs and the ice-age recession of the forests in whose trees our ancestors screeched and dimly wondered (1980, p. 298).

Whether life exists on other planets is still speculation based on numerous hypotheses and assumptions (Cousins, 1970). Scientists have no direct evidence of physical life elsewhere in the universe, and belief that life must exist in some of the many places that they believe may be hospitable is a conclusion based on faith and assumption, not empirical evidence (Tipler, 1981, p. 143; Simpson, 1964a). There is much that we do not know, and likely many surprises still exist in the universe. The fact that life exists on the earth certainly indicates that whatever occurrences caused it to exist here could cause it to exist elsewhere. Some scientists are optimistic as to life existing elsewhere because of their belief structure—as are many theologians for many of the same reasons. Some theologians reason that because God created life on the earth by no means precludes Him from creating it elsewhere. In addition, they note that since the Scriptures are categorically silent on the question of material life elsewhere, we have no grounds from this source one way or the other. White concludes that ". . . the main reason so many people believe in life on other planets in the universe is that they think that believing this is evidence against a creation world view . . ." (1988, p. 38).

The Science of Exobiology

Although estimates vary widely, A. G. Cameron speculates that about 100,000 planets may exist within our galaxy that could sustain some form of life. If life can evolve of its own accord by natural law, then life can exist where time, chance and chemistry are favorable (McDonough, 1991). Drake estimates that "there may be 10 million extraterrestrial technical societies within our solar neighborhood capable of radio communication beyond their own bio fields" (Thomas, 1971). A new science—exobiology—has arisen to study

life on other planets; its small band of practitioners includes Carl Sagan and Willy Ley (Sagan, 1993; Sullivan, 1990; Drake, 1992; Eberhart, 1989; Lawren, 1990). Interestingly, this whole new "science" has developed to study something for which no empirical proof yet exists (Simpson, 1964; White, 1988). As Abell concluded:

> Today most scientists are highly skeptical of hypotheses of an extraterrestrial origin of UFOs, on the ground that convincing hard evidence for it is lacking. But do not confuse skepticism with narrow-mindedness. It would be hard not to find a scientist who would not be terribly excited if such hard evidence could be found; for what could be a more monumental discovery than proof of life beyond earth? (1976, p. 34).

Although some scientists have concluded that extraterrestrial life must be common in the cosmos, recent evidence is causing many to seriously question this assumption. Long held beliefs that life exists on Mars, Venus, the Moon and elsewhere have been disproved, dashing hopes in finding life in the only places in the universe where we could regularly study and interact with extraterrestrial life (White, 1988). Astronomers have been trying in vain for nearly three decades to detect radio signals originating from outside of the earth which would indicate the existence of another civilization. So far, not one confirmed signal that indicates the existence of an extraterrestrial civilization has been detected. The results, as Klewin notes have dashed:

> . . . the dogged hope that life might exist somewhere else in our solar system . . . [and] the speculation that the pseudo-scientific theories regarding the origins of life can be substantiated by what is found on some other planet. So undoubtedly the search will turn outward to the myriad other stars like our sun, any of which, according to the scientists, could have a similar planetary system. In a sense, it will be a search similar to the one now going on for proof of UFOs that are supposedly either visiting the earth now or that have landed on earth in prehistorical times, made and run by creatures with intelligence from outside our solar system. Or it may be the continuing attempt to bounce radio signals into space in the hope that some intelligent life existing elsewhere in the universe will respond (1981, p. 26).

Newer studies have found that the conditions which are necessary for life to exist are far narrower than was previously believed. Using computer analysis, Jansma (1981, p. 89) concluded that they are so small that it is very likely that ". . . ours is the only advanced civilization in the universe and almost certainly the only one in our galaxy to have life. . . ." (See also Dobzhanski, 1973; Simpson, 1964b; Mayr, 1978.) Recent studies show that even earth just barely qualifies as a suitable abode for life. If the planet earth had been placed in an orbit only five percent closer to the sun, a runaway greenhouse effect could by now have turned the planet into a hothouse—with surface temperatures close to 900° F, the condition that now exists on the planet Venus (Barrow and Tipler, 1986). On the other hand, if the earth was only about one percent farther away, runaway glaciation would by now have enveloped the earth with ice and the planet would now be a barren "desert" similar to Mars. In other words, if the glaciation and melt ratios were changed only slightly, the effect would produce glaciations that would increase until the entire earth was covered by ice. The freezing and melting ratio is now almost perfectly balanced.

Although some scientists have become excited about the discovery of small amounts of amino acids in some meteorites, the jump from such simple organic compounds (called organic only because they are carbon based) to life is incredibly remote. Jansma (1981, p. 90) concludes that ". . . science has still failed to fathom this process, and we cannot assume life would be easily or automatically evolved from simple nucleotides." Even an eminent scientist such as Carl Sagan, long a champion of the position that life exists in outer space, has reluctantly concluded that recent discoveries have reduced the probability of life occurring elsewhere in the universe.

Interestingly, Tipler (1981, p. 140) concludes ". . . the great evolutionists have always been united against ETI. The biologists who have supported ETI have generally been biologists with the viewpoint of a physicist." Biologists generally argue that the enormous complexity of life, and the fact that the ". . . likelihood of the evolution of an intelligent species . . . [is] essentially zero . . . ," strongly argues against the evolution of life elsewhere (Tipler, 1981, p. 140; and see also Faulkes, 1991). This view, though, is not held by large numbers of people, nor by many biologists who specialize in other areas. Many science discoveries which became popular, such as the claim of "canals" on Mars made by Percival Lowell, and the origin-of-life experiments by Stanley Miller, have fueled a belief both in lay persons and scientists that life could have evolved elsewhere in the universe (Sagan, 1980).

Summary

No direct evidence for life on any planet within or outside of our solar system except on earth has been found. Much evidence exists in support of the conclusion that within our solar system, life can exist only on earth, and we can only speculate if it can or does exist elsewhere. The physical laws of the universe, according to our present level of scientific understanding, prohibit traveling the tremendous distances necessary to reach earth from places where it may be possible for life to survive. Further, no evidence exists that an advanced technological society other than our own is either in the earth, in our solar system, or on some place elsewhere. Nor is there any evidence in support of the theory that earth has a sister planet. Therefore, the contention that physical non-natural or human constructed unidentified flying objects exist is largely without foundation.

In the absence of an explanation of where they come from, and in view of the evidence against a source of UFOs, all UFO reports must be critically evaluated. Hypothesizing the purpose of UFOs, as a number of authors have tried, is premature until it can first be proven that they exist. Most of the evidence that has purported to prove UFOs (such as photographs, tape recordings, and eyewitness reports) is not without problems, although not all of this evidence has been conclusively disproved. A number of prominent indi-

viduals accept the existence of UFOs and many eyewitness reports seem to be credible. This in itself, though, does not prove their existence, but only that there is much that we do not know about the universe.

Belief in UFOs also seems to be highly related to the development in the past several hundred years of a new view of the universe as well as, importantly, the development of evolutionary naturalism. Ferris 1988, p. 369) claims that it was historically the materialists that tended to believe life exists on other worlds, and that this life could have visited the earth. Acceptance of UFOs is related and partly dependent upon the theory of evolution that life can arise spontaneously where conditions are appropriate and evolve of its own accord. This hypothesis is a key both to UFO belief and the conclusion that material life exists in the universe aside from the earth. Other theories that purport to explain the existence of life in other areas of the universe include the position that our solar system and the life within it were both created by God. Christian theology has historically taught that the God of the Bible is not just the God of the earth, but of the entire universe, and thus He is the only potential creator of life in other solar systems.

References

CRSQ-Creation Research Society Quarterly.

Abell, George. 1976. One astronomer's views. *The Humanist* 36(1)4-12.

Allnutt, Frank. 1978. Infinite encounters. Fleming H. Revell Company. Old Tappen, NJ.

Armstrong, Harold. 1970. Are there corporeal living beings outside the earth? *CRSQ* 7:38-42.

Barrow, John D. and Frank J. Tipler. 1986. The anthropic cosmological principle. Oxford University Press. New York.

Bergman Jerry. 1993. Teaching evolution through science fiction. *Creation Ex Nihilo Technical Journal* 7:172-180.

Bernard, Raymond. 1979. The hollow earth. Bell Publishing Company. New York.

Buskirk, Michael Van. 1979. Alien UFOs are here. *CARIS* Newsletter 3(2):l-2.

Cantril, Hadley. 1966. The invasion from Mars: A study in the psychology of panic. Harper and Row. New York.

Chambers, Howard. 1967. UFO for the millions. Bell Publishing Company. New York.

Clark, Arthur. 1968. Man in space. Time-Life Books. New York.

Coleman, James. 1954. Relativity for the layman. The Macmillan Company. New York.

Cousins, Frank W. 1970. Is there life on other worlds? A critical reassessment of the evidence. *CRSQ* 7:29-37.

Dobzhanski, Theodosius. 1973. Genetic diversity and human equality. Basic Books. New York.

Downing, Barry. 1968. The Bible and flying saucers. Avon Books. New York.

Drake. Frank. 1992. The search for extraterrestrial intelligence. *Omni* 15(1):6.

Eberhart, Jonathan. 1989. Listening for ET: What if the message comes? *Science News* 135:296-298.

Edwards, Frank. 1966. Flying saucers-serious business. Lyle Stewart. New York.

_____ 1967. Flying saucers—here and now. Lyle Stewart. New York.

Evans. Christopher. 1973. Cults of unreason. Farrar, Straus and Groux. New York.

Faulkes, Zen. 1991. Getting smart about getting smarts; evolutionary biology and extraterrestrial intelligence. *Skeptical Inquirer* 15: 263-268.

Ferris, Timothy. 1988. Coming of age in the Milky Way. William R. Morrow. New York.

Freeman, Hobart. 1969. Angels of light? Logos International. Plainfield, NJ.

Gardner, Martin. 1965. Relativity for the millions. Pocketbooks, Inc. New York.

Goeringer, Conrad. 1979. Close encounters of the halucinary kind. *American Atheist* 21(6):11-14.

Good, Roland H. 1968. Basic concepts of relativity. Reinhold Book Company. New York.

Hoyt, William Graves. 1981. Planets X and Pluto. The University of Arizona Press. Tucson. AZ.

Jansma, Sidney. 1981. UFOs and evolution. Published by author.

Klewin, Thomas. 1981. Why must there be life on Mars? *Good News Broadcaster* Jan, pp. 26-28.

Landau, L. D. and G. B. Rumer. 1966. What is relativity? Fawcett Publications. Greenwich, CT

Lawren, Bill. 1990. Alien back talk. *Omni* 12(5):36.

Lorenzen, Coral. 1966. Flying saucers: The startling evidence of the invasion from outer space. The New American Library. New York.

Lunan, Duncan. 1974. Interstellular contact. Henry Regnery Company. Chicago.

Mayr, Ernst. 1978. Evolution. *Scientific American* 239(3)46-55.

McDonough, Thomas R. 1991. Searching for extraterrestrial intelligence. *Skeptical Inquirer* 15:255-262.

Menger, Howard. 1967. From outer space. Pyramid Books. New York.

Menzel, Donald and Lyle Boyd. 1963. The world of flying saucers. Doubleday and Company. Inc. Garden City, NY.

Michel, Aime. 1956. The truth about flying saucers. Pyramid Books. New York.

Reichen, Charles-Albert. 1963. A history of astronomy. Hawthorn Books. New York.

Rublowski, John. 1962. Is anybody out there? Walker and Company. New York.

Ruppelt, Edward. 1956. The report on unidentified objects. Doubleday and Company, Garden City, NY.

Sagan, Carl and Jonathan Norton Leonard. 1972. Planets. Time-Life Books. New York.

_____. 1980. Cosmos. Random House. New York.

_____, et al. 1993. A search for life on earth from the Galileo spacecraft. *Nature* 365:715-716.

Segraves, Kelly. 1975. The great flying saucer myth. Beta Books, San Diego, CA.

Simpson, George Gaylord. 1964a. The nonprevalence of humanoids. *Science* 143:769-773.

_____ 1964b. The view of life. Harcourt, Brace and World. New York.

Singer, Dorothea Waley. 1950. Giordano Bruno; his life and thought. Henry Schuman. New York.

Stacy, Dennis. 1994. Cosmic conspiracy: Six decades of government UFO cover-ups, part III. *Omni* 16(9):54-56.

Steneck, Nicholas. 1976. Science and creation in the Middle Ages. University of Notre Dame Press. South Bend.

Sullivan, Woodruff T. 1990. Outward searchers. *Science* 250:303. [book review]

Thomas. Andrew. 1971. We are not the first. G. P. Putnam's Sons. New York.

Tipler, Frank. 1981. A brief history of the extraterrestrial intelligence concept. *Journal of the Royal Astronomical Society* 22(3):133-145.

Tralins, Robert. 1974. Supernatural warnings. Popular Library. New York.

Verne, Jules. 1878. Off on a comet; A journey through planetary space. Claxton, Remen and Haffelfinger Philadelphia.

Von Daniken, Erich. 1969. Chariots of the Gods?: Unsolved Mysteries of the Past. G. P. Putnam's Sons. New York.

Von Daniken, Erich. 1972. Gods from outer space. Bantam Books. New York.

Weldon, John. 1976. UFOs; What on earth is happening? Bantam House. New York.

Wells, Ernest H. 1975. Search for life in space. DeHoff Publishing, Murfreesboro, TN.

Wells, Herbert George. 1895. The first men in the Moon in seven famous novels. Garden City Pub. Co. Garden City, NY.

Wells, Herbert George. 1895. The war of the worlds in seven famous novels. Garden City Pub. Co. Garden City, NY.

Wetherill, George W. 1991. Occurrence of earth-like bodies in planetary systems. *Science* 253:535-538.

White, A. J. Monty. 1988. Is there life on other planets? *Creation Ex Nihilo* 10(2):36-38.

Wilkins, Harold. 1955. Flying saucers uncensored. Pyramid Books. New York.

_____ 1967. Flying saucers on the attack. Ace Books. New York.

Wilson. Clifford. 1972. Crash go the chariots. Lancer Books. New York.

_____ 1974. UFOs and their mission impossible. New American Library. New York.

_____ 1975. The chariots still crash. Fleming H. Revell Company, Old Tappan, NJ.

IN MEMORIAM
WILBERT H. L. RUSCH, SR.
February 19, 1913 — June 26, 1994

Dr. Rusch was on the original Team of Ten that corresponded and worked together to form the Creation Research Society. He served continuously as an officer of the Society from 1963 until he resigned as president in 1987 for reasons of health. His tenure as treasurer-membership secretary began in 1963 when John Grebe handed him a check for $500.00. In 1968 the responsibilities of his office were divided and he labored as membership secretary until 1985. Then he served as president of the Society until he felt it necessary to resign.

Bill Rusch, the son of a college professor, was born in Chicago. He was educated at Grace Lutheran School and Concordia High School, River Forest, IL. His college training included Concordia Teachers College (diploma, 1931), Illinois Institute of Technology (B.S., 1934), University of Michigan (M.S., 1952) and Eastern Michigan University (Sp. S., 1969). He also studied at Purdue and the University of Nebraska. In 1975, Concordia Theological Seminary in St. Louis awarded him the Doctor of Laws degree for his long and faithful service in the colleges of the Missouri Synod Lutheran Church.

Dr. Rusch taught at Concordia Teachers College, Seward, Nebraska; Junior Military Academy, Chicago; Concordia College, Fort Wayne, Indiana and Concordia College, Ann Arbor, Michigan. At Concordia in Ann Arbor, he served as professor of biology and geology and as chairman of the Science and Mathematics Division. Bill also held the positions of acting president and academic dean at the same school. He became professor emeritus in 1980 and was given the esteemed Christus Primus award.

Since Dr. Rusch was membership secretary for the Society for so many years, his home address was the mailing address of the Society. Thus he corresponded effectively with many creationists throughout the world. He wrote an article for the Quarterly in his last year as president (Rusch, 1987) in which he fondly reminisced about his years as the only "public relations officer" of the Society. Also, because of his association with Concordia College in Ann Arbor, the Board of Directors held annual meeting there from 1964-1992. One of my most pleasant memories of the Board meetings of the Society in Ann Arbor was the occasions when Dr. Rusch would invite us to his home for informal discussions and fellowship. Bill had a profound influence on the Society because of his pioneer work in the formative years. A dedication to Dr. Rusch was featured in the June 1981 Quarterly (Frair, 1981) commemorating his election as a Fellow of the Society. He was ably assisted by his wife, Marge, who shared his burdens as membership secretary—see Howe, 1992.

He was a tireless speaker for the cause discussing the creation model of science on many university campuses as well as in churches and at creationist conventions. Bill's wide knowledge in the sciences made him an ideal man to lecture on the limitations of science, particularly concerning the failures of the evolutionary model and the superiority of the creation model when examining origins. He authored many articles that appeared in the Quarterly as well as two monographs, *The Argument: Creationism vs. Evolutionism* and *Origins: What Is at Stake?* He was coauthor of the booklet, *Did Charles Darwin Become a Christian?* Also he authored chapters in three creationist books published by Concordia Press and published two editions of his book, *Tree Key for the Great Lakes States.*

Bill is survived by his wife, three sons, two daughters, 12 grandchildren and three great-grandchildren. No man worked longer and harder for the Society than Bill Rusch. He considered his efforts for the Society a rewarding task and he was devoted to the purposes of the organization. Bill was a Christian gentleman and a scholar, a faithful worker in the cause of creationism and a valued friend.

References

CRSQ—Creation Research Society Quarterly.
Frair, W. 1981. Dedication to Wilbert Henry Rusch, Sr. *CRSQ* 18:3.
Howe, G. 1992. A salute to two membership secretaries and their wives. *CRSQ* 29:133-134.
Rusch, Sr., W. H. 1987. Reflections in my final year as president of the Society. *CRSQ* 24:71-75.

Emmett L. Williams

BOOK REVIEW

Systematic Theology: An Introduction to New Testament Doctrine by Wayne Grudem. 1994. Intervarsity Press / Zondervan. Grand Rapids. 1,264 pp. $39.95.

Reviewed by Jerry Bergman*

Grudem is a leading New Testament scholar. His massive 1,264 page volume unequivocally affirms Scriptural inerrancy and consequently rejects the literary framework view of Genesis. It also firmly rejects Darwinian naturalism and concludes that both Adam and Eve and the various orders of existence were the result of special creation. The so-called old and young earth views are accurately reviewed, with the positions of each fairly presented. For creationists, the book's strength is the discussion of man's creation and the implications of creationism for theology, behavior, social policy and law. Many commentaries as well as works of systematic theology ignore the creation controversy, and consequently this work is a welcome addition to the rapidly growing creation-influenced literature. As creationism becomes more prominent in public discourse, it will likely be reflected more in theological discussions. An important role that this book may serve is to help put the question on the table for theologians, a first step in the evaluation of the evidence. This is a step that evolutionary naturalists have long fought against, often unethically.

*Northwest State College, Archbold, OH 43502.

LETTERS TO THE EDITOR

Greenhouse Conditions in Antediluvian Times?

Past climatic conditions associated with the uniformitarian Carboniferous Period have intrigued scientists for many years. This timespan is commonly interpreted as having mild climates and warm oceanic conditions, based on the significant amounts of limestone and subsequent coal deposits found in the stratigraphic record. Glacial activity is believed to have occurred in the lower global latitudes during this period and this is believed to have aided in the formation of world-wide coal deposits. The change in glacial activity is believed to have created the rapid rise and fall of sea-level conditions, which led to the formation of the vast coal deposits. Today uniformitarian scientists attempt to explain the Pennsylvanian Period forests using "uniformitarian" processes (i.e., those of the present day extrapolated back in time).

Pennsylvanian "Forests"

World-wide climatic conditions associated with the uniformitarian Pennsylvanian Period (Late Carboniferous) are generally interpreted as being warm and moist (Dunbar and Waage, 1969, pp. 271-272; Woodford, 1965, pp. 336-337; Stanley, 1993, p. 299). This interpretation is based on the occurrence of thick coal seams that are associated with this period of time. These coal deposits are believed to have formed in a near-shore swamp environment (McBride, 1973). Uniformitarian scientists suggest that during the Pennsylvanian Period wetlands were far more extensive than they are today, extending across the continents adjacent to epeiric seas (Stanley, 1993, pp. 305, 312).

However, Austin's work (1979; 1991a; 1991b) seriously questions many of the assumptions of the uniformitarian peat swamp model (i.e., the autochthonous formation of coal) and challenges Walther's Law of correlation of facies, which is also used to support the peat swamp model for coal formation (see Frazier and Schwimmer, 1987, pp. 286-288). Austin's work allows a less rigid interpretation of marine sediments and coal deposits than that imposed by the uniformitarian model and supports the formation of coal within the time constraints required by the young earth Flood model.

Paleoenvironmental reconstruction of the Pennsylvanian forests based on materials found in the modern coal seams reveals many giant versions of plants found on earth today (i.e., living fossils), specifically living members of the lycopods and sphenopsids (Stanley, 1993, p. 308). Presently, uniformitarian geoscientists have no explanation for the lush environment or why plants grew so large during this timespan.

Recently creation scientists have started to examine the stratigraphic record in an attempt to reconstruct conditions before, during, and following the Flood event. Many creationists now suggest the plant life (now found as coal deposits) from the uniformitarian Pennsylvanian Period represent conditions associated with the Antediluvian timeframe. Dillow (1982, pp. 135-191) and others have suggested the existence of a vapor canopy surrounding the earth during the Antediluvian timeframe. This vapor canopy is believed to have created "Greenhouse" conditions on the earth (Dillow, 1982, pp. 139-145; Cooper, 1993). Conditions such as high CO_2 levels, increased atmospheric pressure, and global warming are believed responsible for the large scale growth experienced by plant life during this time (Cooper, 1993, p. iii; Dillow, 1982, pp. 139-145).

Greenhouse Trees

Recent research conducted by foresters at the Nebraska Sandhills National Forest Nursery has resulted in the generation of seedlings in six months where in the past it required two years (Jones, 1994). Jones reports that according to nursery manager Clark Fleege:

> In the greenhouse, the conditions are fully automated and computerized and it takes six months (to grow seedlings). To speed tree growth, the light and temperature are controlled so the trees never go dormant. There is a *carbon dioxide generator* in the greenhouse and water is supplied as needed along with a continuous supply of fertilizer. (parenthesis and emphasis mine)

This rapid growth rate for trees would also hold true for other plant life. Thus in "greenhouse conditions" plants would grow more rapidly. This author suggests that if these trees remained in the greenhouse they would probably grow larger than those growing under atmospheric conditions.

Conclusions

The young earth creationist model predicts a "greenhouse" climate during the Antediluvian timeframe. These conditions changed following the Flood event. Today uniformitarian scientists attempt to explain the stratigraphic record based on "uniformitarian" processes (i.e., those of the present day extrapolated back in time). However, their unsuccessful attempts to explain both the proliferation and size (i.e., giant "living fossil" versions) of plant life in earth's past reveals serious flaws in their model.

Plant life found in the uniformitarian Pennsylvanian coal seams supports the greenhouse conditions proposed during the Antediluvian timeframe. We, as young earth creationists, have a "superior" model based on the Biblical record. Our research shows the Antediluvian timeframe as being like nothing on earth today. This past environment represents "the world that then was" (II Peter 3:6). Evidence of the past is found in the stratigraphic record of rocks, fossils, and plant life. Our model provides answers to conditions in earth's past, which remain enigmatic for Uniformitarians.

As both uniformitarian and creationist researchers and scientists continue to study the greenhouse environment, we can be confident in knowing that the "new" information discovered will allow us to better understand the Antediluvian world. Truly, there is no new thing under the sun (Ecc 1:9-11).

Acknowledgements

This is not "new" information to the reader. Rather this letter is intended to remind the reader that the young earth creationist Flood model provides "better" answers for understanding Earth's past. Thanks to my wife, Susan, for allowing me the time to write this letter. Glory to God in the highest (Pr 3:5-6).

References

CRSQ—Creation Research Society Quarterly.

Austin, S. A. 1979. Depositional environment of the Kentucky No. 12 coal bed (middle Pennsylvanian) of Western Kentucky, with special reference to the origin of coal lithotypes. Pennsylvania State University unpublished Ph.D. dissertation.

_____ 1991a. Floating logs and log deposits of Spirit Lake, Mount St. Helens Volcano National Monument, Washington. *Geological Society of America, Abstracts with Programs.* vol. 23.

_____.1991b. Mount St. Helens: A slide collection for educators. Geology Education Materials. El Cajon, CA.

Cooper, R. L. 1993. The greenhouse effect and Pre-Flood days. Impact No. 239. Institute for Creation Research. El Cajon, CA.

Dillow. J. C. 1982. The waters above: Earth's Pre-Flood vapor canopy. Moody Press. Chicago.

Dunbar, C. O. and K. M. Waage. 1969. Historical geology. Third edition. John Wiley and Sons. New York.

Frazier, W. J. and D. R. Schwimmer. 1987. Regional stratigraphy of North America. Plenum Press. New York.

Jones, C. 1994. High tech greenhouse produces trees in one-fourth the time. *Alternatives* 6:5.

McBride, E. F. 1973. Concepts of Appalachian Basin sedimentation. in R. N. Ginsburg, (editor), Evolving concepts in sedimentology. Studies in Geology No. 21. Johns Hopkins University Press. Baltimore, MD. pp. 93-117.

Stanley, S. M. 1993. Exploring Earth and life through time. W. H. Freeman. New York.

Woodford, A. O. 1965. Historical geology. W. H. Freeman. New York.

Carl R. Froede, Jr.
2895 Emerson Lake Drive
Snellville, GA 30278-6644

Could The Bristlecone Pine Have Survived A Catastrophic Flood?

As one who has come lately to the creationist position, I find articles such as that of Dr. Aardsma (1993a) on dendrochronology of particular interest. As Aardsma (1993b) pointed out one should not be dogmatic about dates that are calculated based on Genesis. Particularly since there is an obvious gap in the Genesis genealogy when compared to that of Luke 3:36. However, 2 Timothy 3:16 says "All Scripture is God-breathed and is useful for teaching, rebuking, correcting and training in righteousness" Therefore, the genealogy in Genesis must be included in Scripture for a particular purpose and to propose extensive gaps seems to do violence to Scripture.

Aardsma (1993a) starts with two possible assumptions, either the Flood was relatively tranquil so that it did not disrupt tree growth or that the Flood occurred more than 11,300 years ago. Perhaps there is a third possibility that could reconcile the dates which have been calculated based on Genesis and the tree ring record, somewhat.

But first it appears that the assumption of a tranquil Flood can be eliminated. Personal experience in the nursery industry has shown that the cambium layer of land plants rots quickly (a week to a month) when submerged in still water. The problem apparently is anaerobic decomposition caused by water borne pathogens. Therefore, the probability of most land plants surviving under water for a year would seem to be nil.

Bursera simaruba or Gumbo-Limbo is occasionally used for landscaping in Florida and the Caribbean. This tree which can grow to 50 to 60 feet tall and to 2 to 3 feet in diameter is also used for fence posts in the tropics. Limbs taken at 4 to 6 inches in diameter and cut to the required length are installed in the usual manner for fence posts. Without any further care most will root and continue to grow (Harrar and Harrar, 1962). I have planted limbs approximately 4 inches in diameter which were cut and discarded for perhaps a week or two and had them grow without difficulty.

Similarly, Rodrick and Zsuffa (1992) report that *Erythrina poeppigiana* stakes 1.5 meters in length were taken from mature trees and planted as shade for coffee and cocoa plantations. Rooting of the stakes varied between 0 percent and 90 percent depending on the source (parent) tree.

Perhaps of greater importance to this subject are the personal observations of Gene Joyner, County Extension Agent of Palm Beach County, FL. Joyner (1994) stated that he had observed trees 30 to 40 feet in length laying prostrate on sand bars in rivers in Costa Rica and Honduras. These trees had new vertical growth. From this he concluded these trees had been dislodged from the bank by flood water and transported downstream where they became entangled on the sand bar, took root and continued to grow.

From this it would seem entirely possible that trees which were floating in aerated water could root and continue to grow after the Flood. And in fact this may be the case for the olive tree from which the dove plucked a leaf (Genesis 8:11).

There is one additional factor which could account for the number of rings in the various tree-ring series reported by Aardsma. Whitcomb and Morris (1961, pp. 232-233) point out that the creation had an "appearance of age" when created. If this is true and it seems necessary that it is, then the number of tree-rings does not necessarily require an older creation. Quite possibly some of the trees which God created with an appearance of age survived the Flood and continued to grow. Therefore these tree-ring series should not require a revision to the date of the Flood.

It has been shown elsewhere (Taylor, 1994) that the pre-Flood atmosphere had from 10 to 17 times as much carbon dioxide as the present atmosphere. However, it was erroneously stated that increased atmospheric CO_2 would probably alter the amount of C-14 formed in the atmosphere. In fact an increase in atmospheric CO_2 would not affect the production of C-14. Rather the ratio of C-14 to C-12 would be reduced thereby indicating a greater age for pre-Flood biological material if dating is bases on the present ratio.

References

CRSQ—Creation Research Society Quarterly.

Aardsma, Gerald. E. 1993a. Tree-ring dating and multiple ring growth per year. *CRSQ* 29:184-189.

_____.1993b. Author's reply on tree rings. *CRSQ* 30:128.

Harrar, Ellwood S. and J. George Harrar. 1962. Guide to southern trees. Dover Publications. New York.

Joyner, Gene. 1994. Personal communication.

Rodrick, Michele C. and L. Zsuffa. 1992. Rooting trials with stem cuttings of *Erythina poeppigiana:* genotypic and seasonal variation in rooting. in Baker, F. W. G. (editor) Rapid propagation in fast-growing woody species. C.A.B. International. Wallinford, UK.

Taylor, Bruce J. 1994. Carbon dioxide in the antediluvian atmosphere. *CRSQ* 30:193-197.

Whitcomb, J. C. and H. M. Morris. 1961. The Genesis Flood. Presbyterian and Reformed Publishing. Phillipsburg, NJ.

Bruce J. Taylor
16700 Jupiter Farms Rd.
Jupiter, FL 33478

Editor's Note: Readers will be interested in the research of Walter Lammerts in the production of more than one growth ring per year in bristlecone pines. Lammerts, W. E. 1983. Are bristlecone pines really so old? *CRSQ* 20:108-115.

Dendrochronology and Biblical History

Gerald Aardsma (1993) has questioned whether conservative Biblical chronologists should date the Flood at about 4500 before present. He claims to have evidence from "master chronologies" of dendrochronology, that the Biblical Flood should be dated about 10,000 years earlier than literal Bible chronology indicates (i.e., about 15,000 years ago). I would like to offer the following objections to Aardsma's idea:

1) Aardsma refers to LaMarche and Harlan (1973), who claim to provide a "master tree ring chronology" of more than 5,000 years, differing by only two years among different samples and giving evidence that tree rings of the bristlecone pines are strictly of annual character, i.e., only one layer in a year. The authors, however, have shown only that rings are annual within approximately the past 90 years. That observation is of little value since, at the 10,000 feet elevation of these trees, the climate is fairly stable, dry and cold, so that rings are only formed annually. LaMarche and Harlan overlook or do not know, however, that the Bible describes the history of approximately the last 5000 years that is completely different from standard evolutionary history. According to Psalm 104, God elevated the earth's mountains after the Flood. Perhaps this uplift included the White Mountains, which presently are about 10,000 feet in elevation, and where the bristlecone pines have been studied. Moreover, LaMarche and Harlan pointed out that the timberline in the White Mountains has changed at least 150 feet. Today, we see above the tree line, dead trees containing many hundreds of tree rings. Evidently a major and abiding effect has caused the shifting of the tree line. The most probable cause was the elevation of the White Mountains themselves. This would mean that the trees grew at a lower altitude in the past. Trees living at lower altitudes and/or more southern latitudes often show more than one ring in a year (Fritts, 1969; Schulman, 1945). Hence, the claim of the authors that the bristlecone pines show only one ring per year over the whole time span of growth seems questionable.

2) The rings of the bristlecone pine are very thin, up to 100 rings (100 spring plus 100 late wood rings) in one centimeter. Very few cells comprise a spring and/or a late wood ring. Moreover, if there is an interruption of the feeding impetus of growth between the double rings, then double or triple rings may show the same characteristics as annual rings and cannot be distinguished from the annual rings (Glock and Agerter, 1963). Even up to five rings have been seen within one year.

3) Dobbs (1942) has shown that in southern Britain, Larch trees (also conifers) more often carry double rings than annual rings. So if the comparison trees for matching show the same rings, then it is impossible to say whether there is an annual ring or a double ring.

4) Sonnett and Suess (1984) have shown, that tree ring width follows the same cycle as C-14 development in the atmosphere and/or tree wood. If recurring cycles in tree ring width occur, then different rings might match in different trees because of these repeating cyclic patterns.

5) The claim of LaMarche and Harlan that their master chronology of more than 5000 rings differs by not more than two rings contrasts remarkably with the statements of their teacher, C. W. Ferguson, who, in a personal communication with H. C. Sorensen in 1970 wrote concerning bristlecone pines in the White mountains: "I am often unable to date specimens with one or two thousand rings against a 7500 year master chronology, even with the 'ball-park' placement provided by a radiocarbon date" (Sorensen, 1973).

6) Aardsma's Figure 4 is contradicted by an article of J. E. Lasken (1991).

7) Aardsma refers to a 1977 article in *CRSQ* 13:206-207. In that article a professor of forestry is cited, who states that a very high correlation factor of ring matching in different trees, sometimes as high as 99%, can be obtained for trees with no connection at all, while correlated trees can have a much lower confidence level of 90% (Wiant, 1977).

8) Aardsma rejects the idea that the Flood could have been a fairly tranquil affair. However, trees in tropical forests can survive floods lasting 305 days, and that many times during their lifetime (Gill, 1970). The Bible describes only a few weeks of flooding for the highest points. Perhaps bristlecone pines may have survived the Genesis Flood, as olive trees also may have (Genesis 8:11).

The preceding points suggest caution in interpreting tree rings.

References

CRSQ—Creation Research Society Quarterly.
Aardsma, Gerald. 1993. Tree-ring dating and multiple ring growth per year. *CRSQ* 29:184-189.
Beal, A. N. 1991. A bit creaky?—tree rings, radiocarbon, and ancient history. *Chronology and Catastrophism Review* (Orpington, England) 13:38-42.
Dobbs, C. G. 1942. A false tree ring pattern in larch. *Nature* 150: 377-378.
Fritts, H. C. 1969. Bristlecone pine in the White Mountains of California. Paper of The Laboratory of Tree-Ring Research. No. 4. University of Arizona Press. Tucson.
Gill, G. C. 1970. The flooding tolerance of woody species—a review. *Forestry Abstracts* 31:671-688.
Glock, W. S. and S. Agerter. 1963. Anomolous patterns in tree rings. *Endeavour* 22:9-13.
LaMarche, V. C., Jr. and T. P. Harlan. 1973. Accuracy of tree ring dating of bristlecone pine for calibration of the radiocarbon time scale. *Journal of Geophysical Research* 78:8849-8858.
Lasken, J. E. 1991. Should the European Oak chronologies be re-examined? *Chronology and Catastrophism Review* (Orpington, England) 13:30-35.
Schulman, E. 1945. *University of Arizona Bulletin* 16:1-51.
Sonett, C. P. and H. E. Suess. 1984. Correlation of bristlecone pine ring widths with atmospheric C-14 variations: A climate-Sun relation. *Nature* 307:141-143.
Sorensen, H. C. 1973. The ages of bristlecone pine. *Pensee* 3(2):15-18.
Wiant, H. V., Jr. 1977. What about dendrochronology? *CRSQ* 13: 206-207.

Harald Heinze
Kirchfeldweg 29
5036 Oberentfelden
Switzerland

Editor's Note: Readers will be interested in the research of Walter Lammerts in the production of more than one growth ring per year in bristlecone pines. Lammerts, W. E. 1983. Are bristlecone pines really so old? *CRSQ* 20:108-115.

Erratum

In CRSQ 31, March 1995, p. 221, in the first paragraph under the heading "Creationist Interpretation" the citation Gentry (1988, p. 133; pp. 194-195) should read Gentry (1988, p. 133; pp. 184-185).

HONOR TO WHOM HONOR . . . MATTHEW FONTAINE MAURY (1806-1873)

TREVOR J. MAJOR*

Received 30 June 1994; Revised 6 November 1994

Abstract

Matthew Fontaine Maury achieved considerable respect in the middle of the nineteenth century for founding the science of oceanography. His mapping of the world's major ocean and wind currents for the benefit of sailing ships earned him the title "Pathfinder of the Seas." Other fields, such as meteorology, navigation, and ordnance, also profited from his methodical and inventive mind. Although largely forgotten outside his native Virginia, Maury endures in Bible-science literature as a credible scientist who took a literal view of Scripture. According to one common story, Maury's reading about the "paths of the seas" in Psalm 8:8 led him to discover ocean currents. Although various aspects of this legend fail historical scrutiny, Maury held strongly to the view that the Bible and science were in perfect harmony. For modern creationists, he represents a successful scientist who eschewed the modernistic trend to divide secular and biblical knowledge.

In the 1840s and '50s, Matthew Fontaine Maury reached the prime of his life, in both years and deeds. With no formal academic training, and confined to a desk job by a lame leg, this land-bound sailor set the fledgling studies of oceanography and meteorology on firm scientific foundations.

Yet these achievements in no way overshadow Maury's high regard for Scripture. He believed that the Bible's allusions to the natural world matched his observations precisely. Like Newton in the planets, and Paley in the living world, Maury believed that the ocean, atmosphere and land were in such perfect harmony that they could only be the product of an intelligent Creator. These convictions infused every part of his life during a time of rising skepticism and naturalism in the academic community.

While the secular world barely remembers Maury, creationists have enlisted him in the ranks of distinguished, Bible-believing scientists. He is put forward as a challenge to the popular notion that religious devotion precludes good science. Typically, these accounts are brief, and they focus almost exclusively on a story about the "paths of the seas" (Psalm 8:8) inspiring Maury to chart the ocean currents (a laudable exception being Meyer, 1982). Yet this story may seem to "preach" a little too well, and has attained such legendary status, that critics may wonder whether it is true at all. As we flesh out the story, however, we find that there was a lot more to Matthew Fontaine Maury than a short phrase from Psalms.

Enduring Achievement

Early Years

Matthew Fontaine Maury was born in Spotsylvania County, Virginia on January 14, 1806. Both his middle and last names reveal descent from a line of Huguenot refugees. He and his family moved to a farm six miles west of Franklin, Tennessee in 1810 (Wayland, 1930, p. 9). At the age of 12, a potentially tragic incident set his course away from the land to more scholarly pursuits. A fall injured his back, so his father, fearing that farm work might make matters worse, sent Matthew to school. Maury excelled in his studies, but his real desire lay toward the sea, perhaps egged on by the adventures of his older brother John. With an appointment as midshipman secured by Sam Houston, the 19-year-old Maury set off to join the U.S. Navy.

Over the next few years, Maury honed his nautical experiences, while expanding his academic interests. The U.S. Navy did not have a training academy for its officers, yet its midshipmen were expected to take examinations, not only in naval matters, but in languages, literature, math, and philosophy. He passed, and went on to become the sailing master of the *Falmouth.* Perhaps this hands-on experience prodded his interest in refining the art of navigation (Lewis. 1927, p. 51).

Wielding the Pen

In 1834, after marrying Ann Hull Hemdon and settling in Fredericksburg, Virginia, the midshipman wrote two science articles: One on the navigation of Cape Horn, and the other on an invention or finding true lunar distance (Wayland, 1930, p. 40). He followed these with a critically acclaimed book on navigation, published in 1836, which would become a standard text for junior officers in the navy. In this period, he lectured on scientific subjects; studied mineralogy, geology and drawing; became superintendent of a government gold mine near Fredericksburg; and rose to the rank of lieutenant.

Maury's academic achievements were noticed in high quarters, and opened the door to further opportunities. In 1837 he added astronomy to his list of talents. Then, after withdrawing from what he saw as a badly managed expedition to the South Pacific, he commenced a campaign of naval reform via letters to newspapers and journals under various pseudonyms. These elicited such great grass roots support that Maury's brother officers reprinted them for wider distribution.

International Repute

As in his boyhood, Maury would experience another course-changing accident. On a rainy night in the summer of 1839, Maury was riding on top of a crowded stage coach. An embankment gave way on the road near Somerset, Ohio, overturning the coach. The accident dislocated Maury's knee and fractured his thigh bone. Unlike the earlier mishap this injury would plague him for the rest of his life. From 1840-1841,

*Trevor J. Major, M.Sc., M.A., 230 Landmark Dr., Montgomery, AL 36117.

Maury resumed his pseudonymous but popular plea for reforms, while recuperating and seeking a return to active duty. However, the author's identity emerged in June 1841, and these articles, with Maury's scientific contributions and limited mobility, confined him to duty on land. On July 1, 1842, Lieutenant Maury took charge of his new post as Superintendent of the Depot of Charts and Instruments in Washington. This would later become the Naval Observatory.

Maury's primary goal was to produce charts that drew upon the vast experiences of sailors from around the world, so that a ship's captain could sail efficiently and safely on any route. No one, up to this point, had undertaken such a systematic and comprehensive study of the ocean.

Beginning with old log books, Maury compiled data from whaling, prevailing winds, sailing times, and other details. He combined this information with an understanding that there were vast "rivers in the sea," and made a special study of the Gulf Stream (Wayland, 1930, pp. 55, 81-83). The result, a "Wind and Current Chart of the North Atlantic," appeared in 1847. Maury and his staff constantly refined their work by adding thousands of new observations from ships that used the charts. In 1855, Maury suggested twenty-mile-wide "ocean lanes" as standard sailing routes across the busy North Atlantic, principally to avoid accidents. Maury's charts and lanes saved millions of dollars, dozens of sailing days, and many lives. These labors bore other fruits in the fifties:

— Maury recognized the need for a standard system of collecting meteorological information on both land and sea. In response he organized the International Meteorological Conference, convened in Brussels in 1853.
— He advanced the study of meteorology for agriculture. While the army had a system of information gathering already, it published the data infrequently, and well after the observations. Under Maury's plan, weather watchers would transmit the information by telegraph, so that farmers in specific counties could receive warning of impending storms (Caskie, 1928, pp. 96, 105).
— His surveys of the North Atlantic sea floor suggested the feasibility of a transatlantic telegraph cable, and he lent technical support to the cable-laying project.

Maury's most substantial written work also appeared in this decade. It began from "Sailing Directions" which Maury originally intended as a guide book on the use and interpretation of his charts (Lewis, 1927, p. 54). The German naturalist, Baron von Humboldt, was so impressed with the scientific information in these "Directions," that he proposed a name for this new field of study: The Physical Geography of the Sea (Lewis, 1927, p. 68). Finally, in 1855, Maury combined "Directions" and his other thoughts on oceanography, marine meteorology, and navigation into one source bearing Humboldt's suggested title. *The Physical Geography of the Sea* was an instant success, going through many printings and editions, and appearing in several languages.

Although Maury's trail-blazing work was largely obsolete by the beginning of the twentieth century, none but the severest critic could diminish its important contribution. Francis H. Smith writes that the book was "intended rather for the educated many than for the scientific few," and "severely pruned" compared to other scientific works of the time (1909, p. 3439). While contemporaries objected to some of Maury's speculations, this left

> unaffected the great facts which the author had reached. A fertile mind, like a vigorous tree, produces many germs that never fructify. Yet if one acorn brings an oak, we forget the rest (Smith, 1909, p. 3439).

Birthright Before Science

This flood of great achievements ended with the American Civil War In April 1861, President Lincoln called on the Governor of Virginia to send troops to fight the rebelling states. Virginia promptly passed an ordinance of secession, and sided with the Southern Confederacy. Like fellow Virginian Robert E. Lee, Maury felt bound to serve his home state first (Smith, 1909, p. 3440). Although Maury opposed the slave trade and national division, he believed Virginia had rights to secession under the agreement it signed in 1788 upon joining the Union (Caskie, 1928, p. 132). Maury, having reached the rank of Commander, resigned his commission in the navy and left the Observatory. He immediately offered his services to Virginia and, later, to the Confederate navy.

During the war, Maury applied himself to the development of electric mines, and participated in outfitting the ironclad *Merrimac.* After a brief period in Mexico serving Emperor Maximilian, and self-exile in Europe, Maury returned home in July 1868, having accepted the chair of physics at the Virginia Military Institute. However, he spent most of his time outside the classroom directing the physical survey of Virginia, writing a series of textbooks on geography for children, and delivering public lectures and addresses.

So while Maury never ceased his labors, the war curtailed his research momentum. Illness overcame him in the winter of 1872, and he died at home in Lexington, Virginia, on February 1, 1873. At his request, the family took him through the Goshen Pass, and buried him in Richmond.

Mixed Honors

Today, Maury is largely forgotten by his native America. He appears most often in books about the ocean, but general texts hardly accord him the stature of a Benjamin Franklin or Thomas Edison. It is difficult to pinpoint the precise cause of this neglect, although there are a few possibilities. First, many in the South, particularly in Virginia, feel that the North penalized him as a "rebel." Smith complains:

> Especially heavy has been the censure visited upon him, not so much by open rebuke as by silent neglect, by the victorious section in the Civil War. His name is carefully omitted in official records of the departments he created (1909, p. 3441).

Second, some may have been jealous of Maury's popularity and respect, both gained without formal training in science or lofty pedigree. Third, and perhaps related to the previous point, political machinations within the navy and in the scientific community may have worked

against him (Meyer, 1982, pp. 93-94). It is ironic that in 1855, at the height of Maury's career, a naval "Retiring Board" demoted Maury and put him on leave of absence with reduced pay. After three years of intense lobbying on the part of his friends and admirers, the President restored him to active service and elevated him to the rank of commander, retroactive to the time of his demotion (Lewis, 1927, p. 117).

While many of his American peers in science and the navy were stingy in their praise, others were prompt in recognizing his contributions. The Southern states, and many nations in Europe, gave Maury their highest accolades, not so much for his service as a naval officer, but for his scientific achievements (Caskie, 1928, p. 144). Several nations offered him scientific appointments following his resignation from the Naval Observatory. The University of North Carolina awarded him a Master of Arts in 1847, and a Doctor of Laws in 1852. Columbia University awarded him a Doctor of Laws in 1854, and Cambridge University honored him with a Doctor of Letters in 1868.

Recognition continued after his death, with several educational institutions founding buildings and schools in Maury's name (Wayland, 1930, pp. 182-183). In 1923, the State of Virginia erected a memorial in the Goshen Pass. A bronze plaque, attached to a granite shaft, reads (Lewis, 1927. p. 241 facing):

Matthew Fontaine Maury
Pathfinder of the Seas
The Genius who first Snatched
From Ocean & Atmosphere
The Secret of their Laws

Born January 14th, 1806
Died at Lexington, Va., February 1st, 1873
Carried through Goshen Pass To His Final
Resting Place in Richmond, Virginia.

Every Mariner
For Countless Ages
As he takes his Chart to Shape
His course across the Seas,
Will think of thee

His Inspiration Holy Writ

Psalms 8 & 107, Verses 8, 23, & 24
Ecclesiastes Chap. 1, Verse 8
A Tribute by his Native State
Virginia
1923

His Last Words
"Carry My Body Through The
Pass When the Rhododendron
is in Bloom"

In 1915, Mrs. E. E. Moffitt founded the Matthew Fontaine Maury Association, which raised $60,000 to build an impressive monument in Richmond (Lewis,. 1927, pp. 1 facing, 245; see also front cover, *Creation Research Society Quarterly,* September 1982). The whole piece, standing 28 ft high, includes a globe and figures atop a tall column, Maury sitting in a large chair against the column, with a compass and pencil in one hand and a chart in the other, a Bible next to the chair, and an inscription below the statue that reads "Maury, Pathfinder of the Seas."

Maury on The Bible And Science

Religious Roots and Life

Maury was born into a deeply religious family. "As Matthew himself stated in later years, he was taught to respect women, to love the truth, and to remember God" (Wayland, 1930, p. 10). His grandfather, James Maury, was an Episcopal clergyman and teacher of some note (Caskie, 1928, p. 14). While lenient in some respects, Matthew's father "was strict as to their religious training in the home and gathered the children together morning and night each day to read the Psalter" (Lewis, 1927, p. 3).

This dedication to spiritual service stayed with Maury into his adulthood. In his daily life and writings, Maury "often quoted passages from Shakespeare, Byron, Dante, and the Bible" (Lewis, 1927, p. 131). His wife taught Bible lessons and the catechism to their children. While in Washington, and located some distance from their church building, Maury would lead the evening service for his family (Wayland, 1930, p. 138). A eulogy of the Temple Bar reads:

> His religious feeling was deep and personal. He never obstruded [sic] his views upon others, though he died, as he lived, in open profession and full communion of the Protestant Episcopal Church" (as quoted in Caskie, 1928, p. 177).

In his final days, Maury surrounded himself with his family, Scripture reading, hymns, and prayer. The General Assembly of Virginia resolved the following:

> In the general grief which pervades thousands of hearts in both hemispheres, we but give expression to the sentiment of all who knew him when we point to his noble, earnest, and unselfish life as a beautiful illustration of what the most ardent votary of science, animated by lofty Christian principle, may accomplish for humanity (as quoted in Caskie, 1928, p. 182).

Such praise could be exaggerated because (after all) it is polite to speak well of the departed. However, Maury's supporters were ready always to champion his cause. They came to his aid after the "Retiring Board" scandal and, following the Civil War, contributed money and letters of appeal for his repatriation. Such patronage speaks well of the man's character.

Two Books; One Divine Author

Maury went further than many of his peers in believing that science and the Bible were in total harmony. Lewis appreciated the extent to which this view influenced Maury:

> He had very definite ideas about the relation between science and the Bible, and declared that it was his rule never to forget who was the Author of the great volume which Nature spreads out before men, and always to remember that the same Being was the author of the book which revelation holds forth for contemplation (1927, p. 71).

Not only were the Bible and science in harmony, but science could shed light on interpretation of certain

passages—even those misunderstood by defenders of orthodoxy in times past. Maury launches into this subject in the middle of discussing trade winds:

> The Bible frequently makes allusions to the laws of nature, their operation and effects. But such allusions are often so wrapped in the folds of the peculiar and graceful drapery with which its language is occasionally clothed, that the meaning, though peeping out from its thin covering all the while, yet lies in some sense concealed, until the lights and revelations of science are thrown upon it: then its bursts out and strikes us with exquisite force and beauty.
>
> As our knowledge of nature and her laws increased, so has our understanding of many passages in the Bible been improved. The Psalmist called the earth "the round world;" yet for ages it was the most damnable heresy for Christian men to say the world is round; and, finally, sailors circumnavigated the globe, proved the Bible right, and saved Christian men of science from the stake (1859, p. 79).

Whoever studies the sea, Maury contended, "must look upon it as a part of that exquisite machinery by which the harmonics of nature are preserved, and then will begin to perceive the developments of order and the evidences of design" (1859, p. 57). For the one who does this, Maury adds with shades of William Paley,

> the sea, with its physical geography, becomes as the mainspring of a watch; its waters, and its currents, and its salts, and its inhabitants, with their adaptations, as balance-wheels, cogs and pinions, and jewels. Thus he perceives that they, too, are according to one design; that they are the expression of One Thought, a unity with harmonics which One Intelligence alone, could utter" (1859, p. 58; also see p. 100).

Physical Geography contains many allusions and direct quotations of Scripture, especially those passages that, in Maury's opinion, agreed with new scientific findings. The following is a partial list of Bible references, with Maury's application (book, chapter and verse have been added where Maury gave a quotation or allusion without specific citation).

a. Job 38:4/Psalm 147:9 and Matthew 10:29/Luke 12:6—The carrying of nutrients by the Gulf Stream from the Gulf of Mexico to whales in the western North Atlantic portrays the "providential care of that great and good Being which feeds the young ravens when they cry, and caters for the sparrow! (p. 74);
b. Job 38:31—Only astronomy can answer the question, "Canst thou bind the sweet influences of Pleiades?" Astronomers have found that the Solar System is in motion around a point "in the direction of the star Alcyon, one of the Pleiades!" (p. 79);
c. Ecclesiastes 1:6—"And as for the general system of atmospherical circulation . . . , the Bible tells it all" (p. 80);
d. Ecclesiastes 1:7—The weather cycle matches biblical observations (pp. 85-86);
e. Matthew 8:27/Mark 4:41—No matter how small the influence of the marine organism on oceanic circulation, any influence is "by design, and according to the commandment of Him whose 'voice the winds and the sea obey' " (p. 197);
f. Genesis 1:9-10,2:6,10—As the dry land and waters appeared before rivers and the weather cycle, then the seas were salty. The geological record, "as to the early condition of our planet, indicates the same" (p. 203);
G. Job 28:25—That the atmosphere exerts pressure (a "weight for the winds") is "set forth as distinctly in the book of nature as it is in the book of revelation" (p. 213).

Maury may be employing these scriptures in three ways: (1) as evocative images of God's handiwork in the creation (a, e); (2) as accurate observations of the natural world (c, d); and (3) as knowledge confirmed by modern science (b, f, g). Examples in this last category resemble claims of scientific foreknowledge—the idea that the Bible contains facts about science that ancient people could not possibly have known or understood without special revelation from God. It is hard to say how far Maury would take this principle. While he shows little concern for exegeting these passages, it seems unlikely that Maury would go as far as defenders a century later, who found scriptures anticipating nuclear physics, radios, submarines, and automobiles (Ramm, 1954, p. 89).

Whatever the case, Maury believed that the Bible contained scientific truths because nature and Scripture have a common Author. Further, the interaction went both ways: Science could illuminate Bible passages, and the Bible had something to contribute to science. He defended these views before 5000 people at the founding of the University of the South in 1860:

> I have been blamed by men of science, both in this country and in England, for quoting the Bible in confirmation of the doctrines of physical geography. The Bible, they say, was not written for scientific purposes, and is therefore no authority in matters of science. I beg pardon! The Bible **IS** authority for everything it touches. What would you think of an historian who should refuse to consult historical records of the Bible, because the Bible was not written for the purposes of history? The Bible is true and science is true (as quoted in Lewis, 1927, p. 99, emphasis in original).

Maury reiterated these sentiments to a Cambridge audience eight years later, as summarized by Lewis: "the Bible and science do not conflict if each is rightly interpreted" (1927, p. 218).

A Man of His Time

Modern writers have also "blamed" Maury for including God in his observations. In Isaac Asimov's judgment, *Physical Geography* "was marred by Maury's refusal to consider evolutionary aspects of oceanography because of his insistence on accepting the literal words of the Bible" (1972, p. 319). Asimov probably means "uniformitarian," rather than "evolutionary," because Maury's book appeared before a completely naturalistic view of origins dominated academia. Certainly, many of his colleagues in the earth sciences would have rejected Maury's biblical literalism (Rudwick, 1985, p. 44). Still, most contemporaries

recognized *Physical Geography's* pioneering contribution to science.

Moreover, that Maury could defend his views at Cambridge (Darwin's alma mater) within a few years following the publication of the *Origin* should not seem surprising. While modernism in theology and naturalism in science was gaining popularity, the issues were far from settled. For example, *Essays and Reviews,* which appeared in 1860, catapulted German higher criticism into Anglican theology. Yet "the years following 1860 were a time of great religious revival in England" (Gregory, 1986, p. 373). Meanwhile, on the other side of the Atlantic, Louis Agassiz was attacking Darwinism to popular acclaim. It took several more years for Darwin's work to have an impact on American theology. When the challenge finally came, the torch passed to Charles Hodge, who was already a champion of conservative theology (Ahlstrom, 1972, pp. 462-463). In this context, Maury's respect for the Bible was typical of Protestant beliefs in mid-nineteenth century America. As Dupree reminds us, "Darwin and Darwinism came out of a profoundly Christian culture" (1986, pp. 351-352).

The Psalm 8 Legend

Lewis, at the very close of his biography, quotes a lengthy passage from the Richmond *Times* written by Virginia Lee Cox. After describing the soon-to-be-completed monument, Cox wrote the following:

> The story goes that once when Maury was ill he had his son read the Bible to him each night. One night he read the eighth Psalm, and when he came to the passage—'the fishes of the sea and whatsoever walketh through the paths of the sea'—Maury had him read it over several times. Finally he said, 'If God says there are paths in the sea I am going to find them if I get out of this bed.' Thus the Psalm was the direct inspiration for his discoveries (as quoted in Lewis, 1927, p. 252).

Lewis says nothing more about this story, and other detailed biographies do not mention this incident. Nonetheless, the story has received wide distribution in various forms through popular articles and books on the Bible and science. For example, DeHoff (1939, p. 53) and Morton (1978, p. 121) follow the essential elements of the Cox story, although neither mentions Lewis' source.

Other accounts do not mention the son's involvement, but attach significance to the verse. According to biographer Francis Leigh Williams, Maury told his family that the words of Psalm 8:8 came to him frequently, and convinced him that he was "right in his belief that there were natural paths through the seas, even as there were natural paths through mountain passes, if man would but persist until he discovered them" (as quoted in Meyer, 1982, p. 98). Gish (1991, pp. iii-iv), who wrote the "Foreword" to Morton's book, has Maury, not the son, reading Psalm 8. Morris (1988, p. 49) and Barfield (1988, pp. 173-174) simply link Maury's work to Psalm 8:8. Some of these accounts contain inaccuracies. For example, DeHoff says that the Richmond statue has Maury holding a Bible in one hand (the Bible is next to the chair), and Morris refers to a nonexistent tombstone at the U.S. Naval Academy (perhaps he is confusing this with the Goshen Pass monument).

Varied readings and factual mistakes may lead us to wonder whether we may connect Maury with this passage at all. Only a comprehensive search of original documents (a privilege not available to this writer) could shed light on this question. The main difficulties with Cox's version center on timing. Maury's eldest son, Richard Lancelot, was born on October 9, 1840, which means that unless he was a particularly gifted boy, the reading had to occur in the middle or final stages of Maury's work on the first chart. By this time, Maury had an extensive knowledge of ocean and wind currents. So, if he viewed the "paths" as currents, and if there is any basis for the reading incident, then Psalm 8:8 could have been an inspiration to continue his work, but not the "direct inspiration for his discoveries" as stated by Cox. As an alternative, we could speculate that the "paths" refer to Maury's standard shipping routes. This brings the incident forward another seven or eight years and allows us to consider older children. In this case, we might suppose that the reading inspired Maury to create his shipping lanes. Again, this differs from the idea of discovery suggested by Cox. With these difficulties, neither explanation seems plausible, and we must conclude that Cox's version contains hagiographic embellishments.

Having subtracted a questionable basis for this story, we must now address a dubious application of the story. Many accounts cited previously suggest that the "paths of the sea" were hidden from human understanding until Maury's discoveries. For example, Barfield notes that while ancient seafarers and early investigators had little or no idea of ocean currents, Maury based his search not on "physical evidence but a reference in the Bible" (1988, p. 174). Even Williams' seemingly objective account suggests that Psalm 8:8 led Maury to discover ocean currents. However, Benjamin Franklin and Baron von Humboldt had studied ocean currents several decades earlier (the Gulf Stream and Humboldt or Peru currents, respectively). Maury's achievement was to add detail, and expand these studies on a global scale.

Further, biblical interpretation does not seem to support the idea that the passage contains special or prescientific knowledge about the natural world, or about ocean or air currents in particular. In context, the chief concern of Psalm 8:6-8 is humanity's relationship with God's creation of animals, and it reiterates the stewardship grant of Genesis 1:26, 28 (Schaeffer, 1972, pp. 49-50). The psalmist praises God for giving humankind ("the son of man," verse 4) the preeminent place among His creative acts, even extending dominion to creatures dwelling in the alien environment of the sea. In poetic form, the language emphasizes the totality of this domain: all animals on the land, whether wild or domesticated; all birds in the sky; and all creatures of the sea, including fish and "whatsoever passeth through the paths of the seas" (Leupold 1959, pp. 105-107; Dahood, 1965, pp. 51-52). Delitzsch suggests that these words "may be a comprehensive designation of that portion of the animal kingdom which is found in the sea" (1982, p. 156). Although "paths" (Hebrew, *'orach)* has a wide range of meanings in the Hebrew Scriptures (Harris, 1980, p. 71), the context does not suggest any-

thing as specific as sailing routes, fish migration patterns, or ocean currents.

Nonetheless, like many legends, the Cox story and other accounts mentioned previously contain an element of truth: that Psalm 8:8 figured significantly in Maury's world view. As a biblically-minded man with a deep interest in navigation, it seems that Maury could not help but be intrigued by the "paths of the seas." It is possible that he read ocean currents into this phrase, but this does not diminish the resulting scientific contributions. Moreland described this process precisely:

> Sometimes scientists do not adduce an idea from tacit knowledge of a domain of study. Frequently in the history of science, they have derived their conceptual ideas from the metaphysical aspects of philosophical or theological theories. Philosophical or theological frameworks can motivate scientific investigation, guide research by suggesting lines of testing, provide conceptual problems to be solved, enable scientists to see data they could not see before, and determine, in part, what counts as veridical data (1989, p. 69).

Conclusion

Matthew Fontaine Maury drew no artificial boundary between his knowledge of science and his knowledge of the Bible. In his mind, they were integrated perfectly. To a great degree, the Bible inspired Maury's scientific work. It gave him a sense of purpose and fulfillment to give whoever would listen a deeper insight into the works of the Creator. He believed that God was the Author of Scripture and Nature, and was in no way surprised that the Bible should have something to say about the natural world, or should complement recent scientific discoveries.

Despite the diminished respect for a theistic world view among modern scientists, Maury's achievements bear considerable merit. Indeed, his systematic mapping of large-scale wind and ocean currents earned him the epithet, "Pathfinder of the Seas." Several Bible-science works suggest that Maury launched this venture after reading about the "paths of the seas" in Psalm 8:8. As his *Physical Geography* shows, this is quite possible because the Bible was an integral part of Maury's approach to science. However, exactly when or how this reading occurred is not clear. Some writers go further in suggesting that no one knew about these currents until Maury's (or his son's) fortuitous reading, and thus credit him with uncovering a scientific truth previously unknown apart from Scripture. Despite the apparent reliability of the source for a popular version of the Psalm 8 story (Lewis' quote of Virginia Lee Cox), neither history nor biblical interpretation will support some of its claims.

Maury's labors may have brought forth many more fruits, if it had not been for the American Civil War. Yet the man's character withstood even this sad incident, and he is worthy of emulation by Bible-believing scientists of today.

Acknowledgment

The author wishes to thank Dr. John Meyer for his helpful comments and correction to the article.

References

Ahlstrom, Sydney E. 1972. A religious history of the American people. Yale University Press. New Haven. CT

Asimov, Isaac. 1972. Biographical encyclopedia of science and technology. Avon, revised edition. New York.

Barfield, Kenny. 1988. Why the Bible is number 1. Baker. Grand Rapids. MI.

Caskie, Jaqueline Ambler. 1928. Life and letters of Matthew Fontaine Maury. Richmond Press. Richmond, VA.

Dahood, Mitchell. 1965, Psalms I: 1-50. Doubleday. Garden City, NY.

Delitzcsh, F. 1982. Psalms, Volume 1. Eerdmans, reprint. Grand Rapids, MI.

DeHoff, George W. 1939. Why we believe the Bible. DeHoff Publications, 1974 reprint. Murfreesboro, TN.

Dupree, A. Hunter. 1986. Christianity and the scientific community in the age of Darwin, in D. C. Lindberg and R. L. Numbers (Editors), God and nature. University of California Press. Berkeley, CA.

Gish, Duane T. 1991. Modern scientific discoveries verify the Scriptures. *Acts and Facts* 20(9):i-iv. (ICR Impact Article No. 219).

Gregory, Frederick. 1986. The impact of Darwinian evolution on Protestant theology in the nineteenth century, in D. C. Lindberg and R. L. Numbers (Editors). God and nature. University of California Press. Berkeley, CA.

Harris, R. Laird. 1980. *'arach*, in R. L. Harris, G. L. Archer and B. K. Waltke, Theological wordbook of the Old Testament. Moody Press. Chicago. 1:71.

Leupold, H. C. 1959. Exposition of the Psalms, volume 1. Baker, 1969 reprint. Grand Rapids, MI.

Lewis, Charles Lee. 1927. Matthew Fontaine Maury: the pathfinder of the seas. United States Naval Institute. Annapolis, MD. AMS Press, 1969 reprint. New York.

Maury, M. F., 1859. The physical geography of the sea. Harper and Brothers, sixth edition. New York.

Meyer, John R. 1982. The life and philosophy of Matthew Fontaine Maury, pathfinder of the sea. *Creation Research Society Quarterly.* 19:91-100.

Moreland, J. P. 1989. Christianity and the nature of science. Baker. Grand Rapids, MI.

Morris, Henry M. 1988. Men of science-men of God: great scientists who believed the Bible. Master Books. revised edition. El Cajon, CA.

Morton, Jean Sloat. 1978. Science in the Bible. Moody Press. Chicago.

Ramm, Bernard. 1954. The Christian view of science and Scripture. Eerdmans. Grand Rapids, MI.

Rudwick, Martin J. S. 1985. The great Devonian controversy. University of Chicago Press. Chicago.

Schaeffer, Francis. 1972. Genesis in space and time. Intervarsity Press. Downers Grove, IL.

Smith, Francis H. 1909. Matthew Fontaine Maury, in F. P. Gamble (Editor), Library of Southern Literature. Martin and Hoyt. Atlanta, GA. 8:3435-3457.

Wayland, John W. 1930. The pathfinder of the seas: the life of Matthew Fontaine Maury. Garrett and Massie. Richmond, VA.

TAPE REVIEW

Powerhouse Christian Tape and Book Series. Powerhouse. PO. Box 859, Clayton, CA. $3.95. per tape.

Reviewed by Jerry Bergman*

The growing proliferation of alternative sources of information, including tapes, CD rom, and videos, is now also being exploited by Christian publishers. Powerhouse is a new company which carries a large number of tapes related to Christian topics. Fortunately, the Powerhouse editors have seen fit to include a large selection of useful tapes on creation/evolution, many by Dr. Norman Geisler. I recently reviewed several dozen of the tapes on creation and found them all excellent. The quality of the recording is high, and the presentations are easy to follow, and free of static or disruptions.

*Northwest State College, Archbold, OH 43502.

LETTERS TO THE EDITOR

Beneficial Mutations?

Lane Lester (1995), in his helpful article "Genetics: Enemy of Evolution," discussed the possibility of beneficial mutations and claimed that a mutation in tomatoes "caused a change in its growth pattern, making the tomatoes much easier to harvest" (p. 6). How is it known that this was a mutation and not simply an existing variety or a trait due to transposon movement or genetic recombinations such as from crossing over, or due to one of the many other mechanisms designed to produce variety such as sexual reproduction or a combination of these? Although we can speculate that this may be a beneficial mutation in some situations, we cannot know until we rule out all of the above mechanisms as a possible source.

In addition, the possession of bacterial antibiotic resistance is often attributed to "mutations" when as far as I know not one single case exists in which this has been confirmed. Although it is quite possible, bacteria ahead possess plasmids for resistance to a wide variety of antibiotics. These are not mutations and have existed for eons in the bacterial gene pool. We also know that bacteria trade plasmids and have mechanisms such as those discovered by Susumu Tonegawa to gain resistance. Likely most, of not all, of the examples of antibiotic resistance in bacteria are due to natural, designed mechanisms, not chance mutations. Again, all of the other possibilities must be ruled out before we can conclusively confirm an example as a mutation. Unfortunately, the word mutation is often used to describe *many changes* in organisms as well as the appearance of a trait which is not conclusively and obviously inherited. The word is even used to designate changes which humans cause in the genome so as to distinguish the altered genome from the wild type (that found in nature). Strictly speaking, this is not a mutation because a mutation is normally defined as an accidental copying error.

Reference

Lester, Lane P. 1995. Genetics: enemy of evolution. *CRSQ* 31(4): Copy-n-share insert.

Jerry Bergman
Northwest College, Archbold, OH 43502

Reply To Bergman

Jerry Bergman's comments are certainly understandable, because we would not expect mistakes (mutations) to produce improvements in the Creation. Dr. Bergman is also correct that many cases of so-called mutations have turned out to be genetic variation already present in the species. I have no desire to defend mutation as a source of beneficial change, merely to suggest that it can happen. It must be remembered that a beneficial mutation, by definition, is simply one that enables its owner to produce more offspring in a specific situation. I would be among the first to agree. that mutations cannot provide the kinds of changes required by the evolution model: Long-term benefits to the species, including the creation of new structures and functions.

Lane P. Lester
Route 1, Box 205, Hull, GA 30636-9734

The Puzzle of A Persistent Ammonite

I went for a stroll one afternoon along the Sacramento River, Shasta County, CA and observed a ledge of siltstone protruding into the river. The siltstone is part of the Cretaceous Chico Formation, a marine formation whose surficial exposures disintegrate in one's hand.

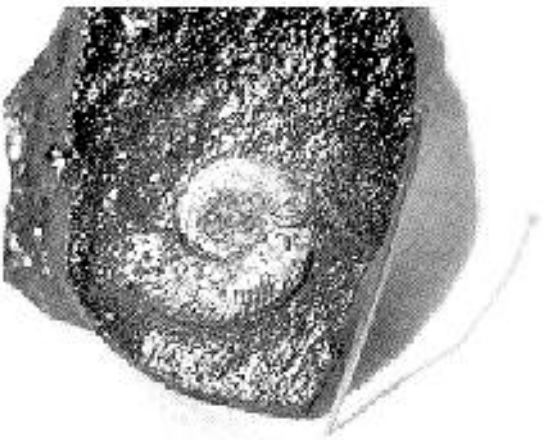


Figure 1. Ammonite from Shasta County, CA. The fossil was sprayed with clear varnish. Delicate mother-of-pearl nacre is visible. Pin at right gives perspective. Macrophotograph by George Howe.

Figure 2. Low magnification scanning electron photomicrograph (SEM) of ammonite shell showing several ridges and grooves of shell structure. Dotted interval at base of photograph is 750 micrometers (μ m). This SEM photo and the others which follow were taken by William G. Stark.

I went to work on the rock, digging below the disintegrated material and recovered several small ammonites, all exhibiting the original mother-of-pearl (nacre) but in a most delicate way. So I sprayed clear varnish on the ammonite and the siltstone to hold the material together. The nacre is probably calcium carbonate—the mineral aragonite. See Figure 1. Figures 2-4 were taken of fossil ammonites that were not sprayed with varnish.

According to conventional geologic wisdom, the formation was laid down about 90,000,000 years ago. Then nothing is known about the Cenozoic history for the next 80,000,000 years or so—we have a hiatus. Then the area was covered with sediments that pre-date the Ice Ages by about a million years.

Why would ammonite nacre have remained in the rock for 90,000,000 years, particularly when the formation was intimately associated with the ever-flowing Sacramento River? Why would not the water have dissolved the calcium carbonate and carried it away?

This is a good example of chemistry gone wrong. During an interval of millions of years one would expect water to be a universal solvent, to dissolve shell and rock.

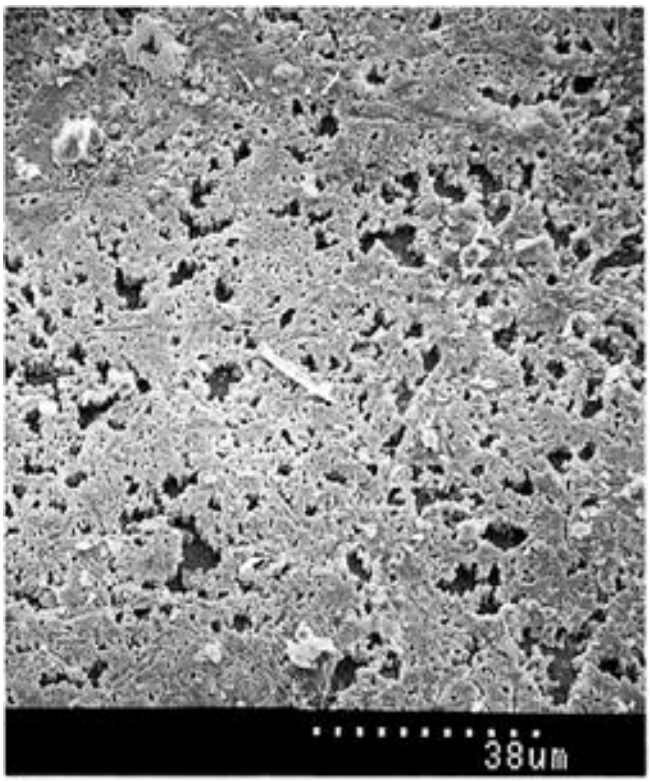


Figure 3. High magnification SEM view of fossil ammonite shell taken by William G. Stark. Apparent degeneration of shell surface (from water and weathering?) can be seen. Dotted interval below the photograph is 38 μ m.

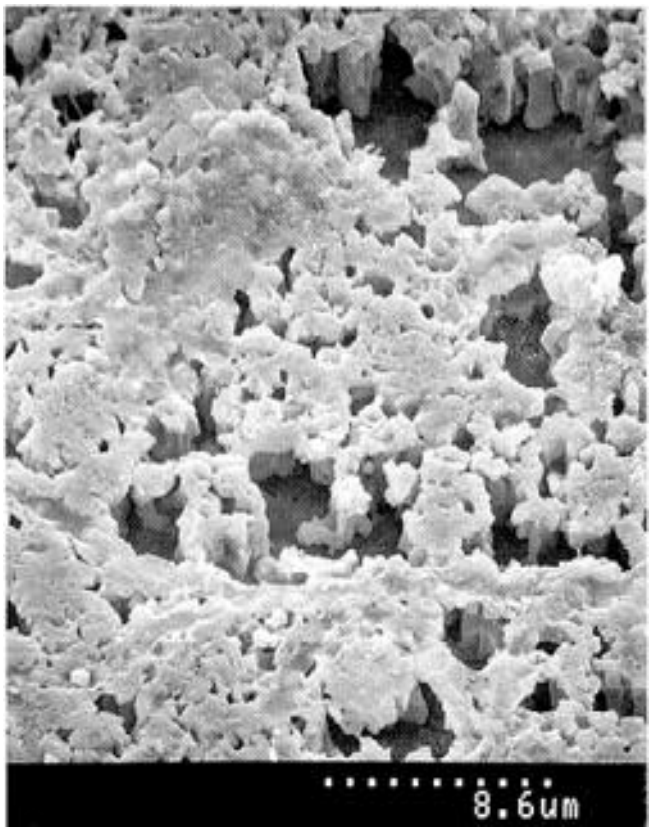


Figure 4. Very high magnification SEM view of fossil ammonite shell taken by William G. Stark. This highly magnified picture shows the obvious void areas in the shell, perhaps caused by weathering. Dotted interval below photograph is 8.6 μ m.

Bill Waisgerber
P.O. Box 1115
Mt. Shasta, CA 96067

Editorial Comment

In response to the letter by Allan de Gruyter in the March issue, Dr. Siegfried Scherer sent some references which offer a critical analysis of the evolution of photosynthesis:

Scherer, Siegfried. 1984. Transmembrane electron transport and the neutral theory of evolution. *Origins of Life* 14:725-731.

_____. 1983. Basic functional states in the evolution of light-driven cyclic electron transport. *Journal of Theoretical Biology* 104:289-299.

_____. 1983. Photosynthese, Dedeutung und Enstehung—ein kritischer überblick. Hänssler-Verlag. Neuhausen-Stuttgart.

Quote: Help Recapture Science

Every Christian who in his academic work is ashamed of the Name of Christ Jesus, because he desires honour among men, will be totally useless in the mighty struggle to recapture science, one of the great powers of Western culture, for the Kingdom of God.

Herman Dooyeweerd from *The Prism* 1:1, April 1995. Dooyeweerd Centre for Christian Philosophy, 777 Highway 53E, Ancaster, ON, Canada L9KlJ4.

A PROPOSAL FOR A CREATIONIST GEOLOGICAL TIMESCALE

CARL R. FROEDE JR.*

Received 29 March 1994; Revised 9 November 1994

Abstract

The uniformitarian framework for the origin and age of the earth began over 200 years ago with the writings of Scottish geologist James Hutton. Since that time uniformitarians have been defining and refining their model in an effort to reconstruct earth history from purely physical processes. Many young earth creation scientists have attempted to integrate the Biblical record with that proposed by the uniformitarians. This has resulted in confusion and disbelief in the Biblical account provided in Genesis one. This author proposes that an integration between the uniformitarian model and the creationist model will not work; rather, it is proposed that a framework be constructed which is based squarely on the Biblical young earth Creation/Flood model. By creating our own timescale we can then follow the timeframes outlined in the Biblical account. Field work should be performed and all relevant and appropriate geologic information should be examined to further substantiate the creationist timescale. Using our own timescale will then allow creationists to examine the stratigraphic record without unrealistic presuppositions, and should result in a more accurate account of the earth's geologic history.

Introduction

The philosophy of uniformitarian geology began in 1788 with the publication of James Hutton's *Theory of the Earth* (Albritton, 1986, p. 96). Hutton's concepts grew from his examination of rock outcrops found in various areas around Great Britain. In the succeeding years additional rock outcrops across the continent of Europe were used to better define and refine a rudimentary geological timescale. However, this timescale did not serve to "date" the sediments and fossils which were found. Initially, the rock layers were correlated using lithologic (lithostratigraphy) composition and their stratigraphic position compared to each other (Law of Superposition). It was later noted that certain types of flora and fauna were found in particular types of rocks, and hence this was another way of dividing the rocks into units, resulting in biostratigraphy (Law of Faunal Succession). This biostratigraphic division of rock types was later used to construct the evolutionary progression of life and show support for Charles Darwin's theory of evolution. Additionally, it was postulated that first and last appearances of specific flora and fauna found in the strata could define the possible time boundaries of each rock unit. This led to the concept of chronostratigraphy. Eventually all of the chronostratigraphic strata were pieced together to reconstruct the events of earth's past. Today's uniformitarian geologic timescale has been approximately 150 years in the making and continues to be refined within the framework of their model (e.g., North American Commission on Stratigraphic Nomenclature, 1983; Snelling, 1985; Harland, Cox, Llewellyn, Pickton, Smith and Walters, 1982; Cohee, Glaessner and Hedberg, 1978).

Dangers of The Uniformitarian Timescale

Many creationists have used the uniformitarian geologic timescale without realizing the dangers that it holds. The uniformitarian geologic timescale is built on the premise of biological evolution. **ALL** dating of strata is based on the flora and fauna contained in it at a "Type" locale. The type locale is exposed in outcrop at a single location or only at a few places on earth, and is extrapolated outward to other formations based on their containing the same flora and fauna. Additionally, any formation can be dated in relation to the formations either above or below it by comparing the fossils contained in them (using the Laws of Superposition and Faunal Succession). *The use* of *the uniformitarian timescale is based on more than just lithology*. Lithology can and will change, however, flora and/or fauna contained either in, above or below the formation will serve to date the formation in question. While this author is not totally against the use of the uniformitarian geologic timescale, its unqualified use by creationists can create misunderstanding. However, creationists should seek out and use all uniformitarian information where applicable and appropriate (incorporating it into the Flood model) in describing or studying the area under investigation. Because of the many differences between the uniformitarian model and that of the young earth creationists, this author proposes that young earth creationists construct and follow their own timescale.

Many young earth Flood geologists have wrestled with the correlation of the uniformitarian geologic timescale within the framework of a young earth model (Figure 1). Many ideas have been proposed in an effort to unite the two scales (Whitcomb and Morris, 1961, p. 276; Hedtke, 1971; Woodmorappe, 1980; Coffin, 1983, p. 74; Scheven, 1990; Rugg, 1990; Northrup, 1986, 1990a, 1990b). However, none have proved satisfactory for broad based use. One specific point of confusion lies with the correlation of the Flood event with the uniformitarian timescale Eras, Epochs and Stages.

The geologic history, within the context of the creationist framework, contains several basic distinctions from the uniformitarian system: 1) the biblical record of time contradicts the uniformitarian record of time, 2) the key to interpreting geologic history is the interpretation of event-effect relationships, rather than chronological ones, and 3) the biblical record of time suggests that the rock record is much more complete than the uniformitarian interpretation would allow (i.e., unconformities, disconformities, non-conformities, etc., might not really exist). These issues, along with many others, serve to define specific differences in the two models. As this timescale is further developed these differences will become key points in defining and refining the creationist geological timescale.

*Carl R. Froede, Jr., B.S., P.G., 2895 Emerson Lake Drive, Snellville, Georgia, 30278-6644.

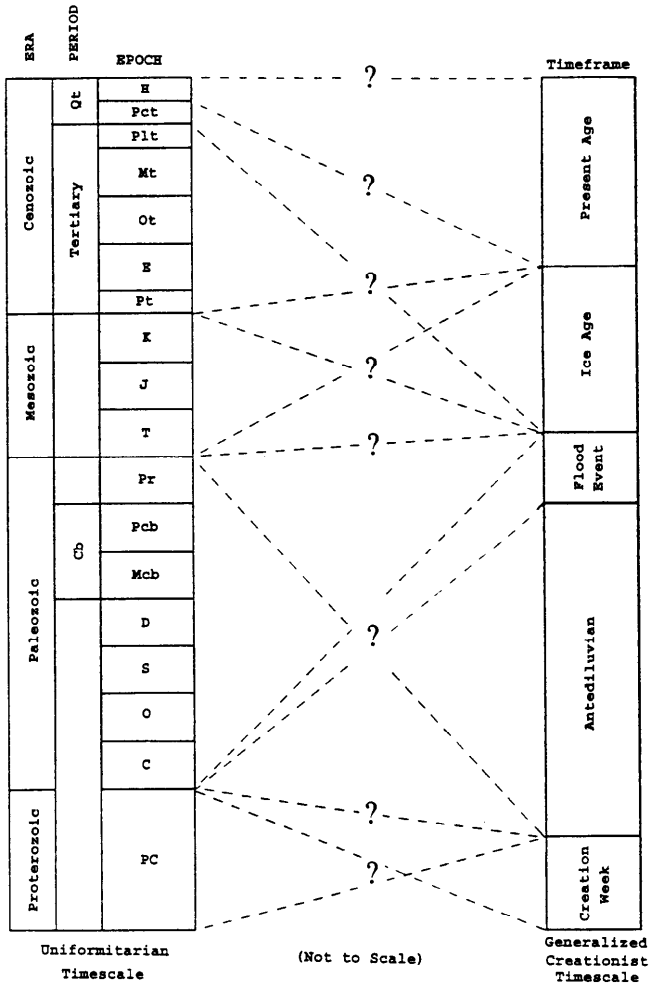


Figure 1. The modern uniformitarian timescale (left side) [modified from Bennison, 1975]: PC-Precambrian, C-Cambrian, O-Ordovician, S-Silurian, D-Devonian, Ch-Carboniferous, Mcb-Mississippian, Pcb-Pennsylvanian, Pr-Permian, T-Triassic, J-Jurassic, K-Cretaceous, Pt-Paleocene, E-Eocene, Ot-Oligocene, Mt-Miocene, Pit-Pliocene, Qt-Quaternary, Pct-Pleistocene, H-Holocene. Generalized creationist timescale (right side). Lines of correlation do not correspond between the two scales. This leads to confusion and frustration regarding how the young earth Creation/Flood model "fits" in relation to the uniformitarian timescale. The creationist's timescale will allow the user the flexibility to evaluate individual sites and large areas without confusing evolutionary geology with the stratigraphic record.

Creation Geology

Because creationist geologists are starting to investigate the earth within the framework of the young earth Creation/Flood model, this author believes that creationist geology is in its infancy. Many creationists have theorized that the Flood caused most geologic features seen in the rock record. However, little fieldwork has been performed to validate these theories. Hence, this has led to confusion regarding how the Flood model might "fit" with local geology. Theories are only as good as the specific field evidence and assumptions used to support them. **It is time to go into the field and examine the rocks found at specific sites.** Following field examination and literature re-search, a possible reconstruction of a particular site could be proposed within the Flood model. Eventually these local sites could be combined into a small region and the region could then be reconstructed within the young earth Flood model. The opposite would also hold true; a regional study could be initiated, with the focus ultimately culminating on a small area or specific site.

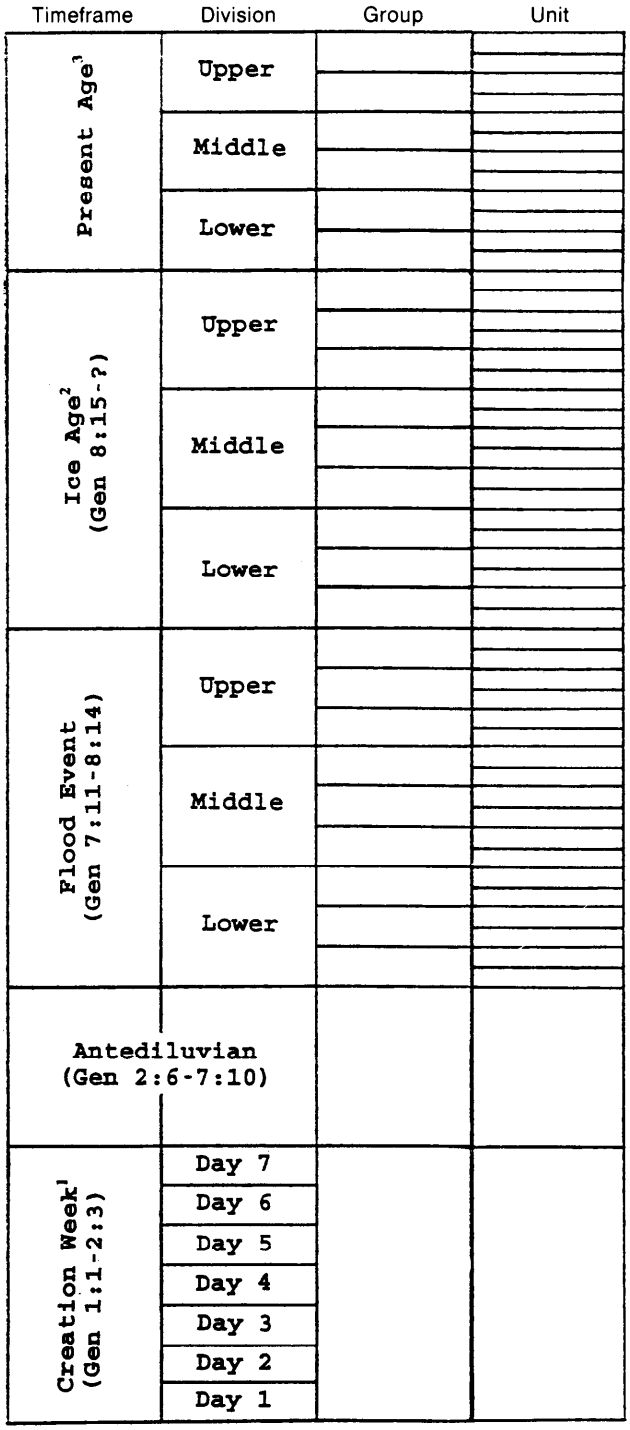
The author recognizes that the creationist timescale/stratigraphic column will suffer the same limited lateral expression that the uniformitarian timescale/stratigraphic column suffers. The site or area specific stratigraphic column will depend on the local lithology and the regional timeframe in which those sediments occurred (i.e., Antediluvian, Flood Event, Post Flood/Ice Age or Present Age). The timescale/stratigraphic boundary lines will move based on the "Timeframe" in which the sediments were deposited and the thickness of those sediments. For example, the creationist timescale/stratigraphic column (CTSC) found in the John Day Country see Nevins, 1974—Post Flood/Ice Age) will not directly compare to the CTSC found in the Grand Canyon (see Austin, 1994) or to that found at Mount St. Helens (Austin, 1991—Present Age deposits) because the time, types, and amounts of deposits have varied. Hence the time of deposition along with the lithology, paleontology, sedimentology, and stratigraphy will vary as the rocks and sediments change in their lateral extent. A determination as to when certain sediments were deposited within the creationist timescale will require a site, area, or regional investigation. Every attempt should be made to examine the entire stratigraphic column (both surface outcrops and subsurface cores and well logs) to accurately determine the "Timeframe" for smaller time/strata section) in which the strata in question were deposited.

Subsurface Characterization

Subsurface examination of strata can be performed using geophysical techniques (i.e., well logs, seismic lines, etc.), and should be utilized to add the third dimension to creationist geologic studies. Correlation of seismic data to control wells would allow large scale stratigraphic interpretation, otherwise known as seismic stratigraphy (see Froede, 1994). This information could be used to postulate the formation of the strata within the Flood model. Current techniques of geologic investigation should be applied as appropriate in the reconstruction of the subsurface.

Sources of Information

Any work previously done by uniformitarian geologists should be examined to determine its usefulness in the reconstruction of a given study site within the Creation/Flood model. While uniformitarian geologists talk about "events" or catastrophes, they are usually addressing what they see as small scale incidents to explain their model for the formation of certain deposits (e.g., storm deposits, localized volcanic eruptions, etc.). This author believes that the stratigraphic record more accurately reflects catastrophic events which occurred as a result of the Flood event and subsequent Ice Age, and that "uniformitarian" physical processes essentially began with the close of the Ice Age Time frame. Additionally, many of the uniformitarian interpretations fit well within the "big picture" of the Flood model, the difference being the time factor involved in generating the deposit. Where uniformitarians propose millions of



General Framework For A Creationist Timescale

Figure 2. The generalized creationist's timescale. This timescale is intended to be dynamic and flexible. Much field work exists in constructing this timescale. Additionally, this timescale should serve as a springboard to further define and refine the young earth Creation/Flood model. Our own timescale should become the central focus of every field investigation from this point forward it is only through a consistent approach to the stratigraphical record that young earth catastrophists can move forward in our science. Footnotes: 1) Each day is a literal 24 hour period of time. 2) Ice Age is not directly reflected in the Biblical record, however, the geological record does reflect its occurrence and creationists generally agree that a single Ice Age has occurred in earth past (see Oard 1986; 1990). 3) This Timeframe reflects "uniformitarian processes" (2 Pet 3:3-7).

years for the formation of various strata, catastrophists can reconstruct the same site within a much shorter timeframe. Many well respected uniformitarian geologists have acknowledged that "events" (i.e., catastrophes) better explain much of the stratigraphical record (Dott, 1983, pp. 5-23; Seilacher, 1984, pp. 49-54; Miall, 1990, p. 169; Einsele, Ricken and Seilacher, 1991, pp. 1-19; Ager, 1993, pp. 55-70).

Conclusion

With a dynamic creationist timescale we can approach stratigraphic outcrops and attempt to reconstruct them within the young earth Flood model timeframe (Figure 2). Not every formation is a "Flood" deposit and much field work is necessary to determine where they fit within our young earth Creation/Flood model. With the basic shell of a creationist timescale now proposed, we can move into the field, perform the necessary investigations, and eventually fill-in the various stratigraphic units within the framework of the Biblically based young earth Creation/Flood model.

Appendix
Introduction

This appendix provides a brief summary of some of the terms and ideas that young earth creation geologists, need to refine in order to create our own timescale. These terms are not meant to define everything necessary to use our model, rather this paper is meant to stimulate open discussion between creation geoscientists and to serve as a beginning point for the construction of a creationist geological timescale. The author solicits input into defining and refining the young earth Flood model and envisions the eventual formation of a Commission of Creationist Stratigraphy (Pr 11:14; Pr 15:22; Pr 24:6). This group will serve to guide and define the creationist timescale, including its units, groups, divisions, and timeframes, as well as the concepts of stratigraphy, within our catastrophic model.

Terms

Timeframe — A specific period of time from the Genesis record, which provides a basis for the creationist's geological timescale. The Timeframe section could include the grouping of several uniformitarian Eras and Epochs, more or less depending on the site under investigation.

Division — Divisible sections within the Timeframe which reflect different sedimentary or depositional conditions and which can be defined within a certain portion of the Timeframe. This section could include the grouping of one or more uniformitarian Eras, Epochs and possibly Periods.

Group — A subset within the Division which reflect different sedimentary or depositional conditions and can be defined within a certain portion of the Division. This section could include the grouping of one or more uniformitarian formations, sequences, etc. I envision the creationist's "Group" as similar to what the uniformitarian "group" serves, that being a compilation of formations, sequences, etc., which reflect a certain period of time.

Unit — A subset within the Group which reflects different sedimentary or depositional conditions (i.e., lithologic variation) and can be defined within a certain

portion of the Group. This section can include the uniformitarian formations, groups or members as is determined based on field evidence. The use of the term unit is the equivalent to that currently used by uniformitarians in designating the lithostratigraphic unit (i.e., a lithostratigraphic unit defined by a body of sedimentary, extrusive igneous, metasedimentary, or metavolcanic strata which is distinguished and delimited on the basis of lithic characteristics and stratigraphic position [North American Commission on Stratigraphic Nomenclature, 1983, p. 855]). Units will vary over areal extent, however, the timeframe in which they were deposited could be time equivalent. This issue will be resolved through field work and stratigraphic comparison.

Additional sections can be created based on the need to further "split" the stratigraphical record and hence further refine our timescale. The author has deliberately selected different terms to define our timescale so as to eliminate any confusion when discussing the two models. However, some confusion could ultimately develop. This can be minimized if we keep to our own timescale and work to eliminate any confusion which might arise.

Concepts

The creationist geological timescale will allow the user to investigate various sites globally, and place those sites within a timescale which reflects the Biblical record. Various interpretations will be resolved as this timescale is developed. The author has deliberately not defined any specific Timeframe, Division, Group or Unit so as not to lead the reader into any preconceived ideas (e.g., possible creation of single celled life on Day three, spreading of the continents, origin of granite, origin of coal, first rain event, eustasy, tectonics, etc.). These issues can be addressed and discussed as we further develop and refine our timescale and model.

This timescale will allow the young earth creationist scientist to perform field work at specific sites and present it in a manner which would then be understood by all creation scientists. This should eliminate confusion when field work is performed. For example a study performed on "Cretaceous" deposits could in fact reflect several timeframes within our timescale. One site might be interpreted as Flood deposits, and at another Ice Age deposits, etc. By creating and maintaining our own timescale we can determine how local sites "fit" into our young earth Flood model.

A major consideration in any investigation will be the determination of a "scour" level which is defined as the bottom most level of erosion caused by the Flood. Some sites might still contain "original" rock which was created during the first week and was not removed during the Flood. Other sites might have the entire stratigraphic section represented as Flood and Ice Age deposits. This determination could be one of the most complex questions to answer.

Another consideration is the deposition and/or erosion timeframe which relate to energy levels necessary to account for that event. For example for many years it was suggested that the Grand Canyon strata formed during the Flood event and the canyon itself formed with the receding of the Flood waters. This is because the amount of erosion which was necessary to account for the erosion of the canyon was thought to only have come from the high erosion associated with the Flood event (Whitcomb and Morris, 1961, p. 153). However, catastrophic geologic processes are now known which can form the canyon well after the Flood event (probably during the Ice Age Timeframe), via breached dams (Austin, 1994, p. 92-107). These depositional/erosional energy levels directly affect the placement of the strata within certain "Timeframes." So a clear understanding as to event/effect relationships must be attempted when determining where certain strata fit within the creationist timescale/stratigraphic column.

Another issue to be addressed in stratigraphic interpretation is the concept of local versus global stratigraphic markers. Ager (1993) describes the global extent of some lithologic units, but he presents no real explanation as to how they formed. Platinum group metals (e.g., iridium, osmium, etc.) along with other materials have been found along certain strata boundaries around the world. Presently these "impact" materials are reported at six geologic horizons other than the K/T boundary (Raup, 1991, p. 172; see also Stanley, 1987; Donovan, 1989; Dao-Yi, Zheng, Qin-Wen, Zhi-Fang, Yi-Yin, Jin-Wen, 1989). Many scientists suggest that more of these materials remain to be found at other stratigraphic boundaries. These stratigraphic markers might prove useful in further defining worldwide boundaries within the creationist geologic timescale. Additional study is required to determine the usefulness of these stratigraphic markers and their significance within the Flood/Ice Age Timeframes.

This author hopes to present specific sites within possible creationist stratigraphic "timeframes" in future issues of the *Creation Research Society Quarterly*. However, much work remains to be done and the author believes that at this early stage of establishing a timescale, it would be inappropriate to "force" additional interpretations on fellow scientists without further evidences or discussion. This is a dynamic flexible beginning point for the development of the young earth Creation/Flood model. It is now up to us to further develop, define, and refine our model.

Glossary

Biostratigraphic unit — is a body of rock defined and characterized by its fossil content. The basic unit in biostratigraphic classification is the biozone, of which there are several kinds (North American Commission on Stratigraphic Nomenclature, 1983, p. 862).

Chronostratigraphic unit — is a body of rock established to serve as the material reference for all rocks formed during the same span of time. Each of its boundaries is synchronous. Chronostratigraphy provides a means of organizing strata into units based on their age relations. A chronostratigraphic body also serves as the basis for defining the specific interval of geologic time, or geochronologic unit, represented by the referent (North American Commission on Stratigraphic Nomenclature, 1983, p. 868).

Formation — is the fundamental unit in lithostratigraphic classification and is defined as a body of rock identified by lithic characteristics and stratigraphic position; it is prevailing but not necessarily tabular and is mappable at the Earth's surface or traceable in the

subsurface (North American Commission on Stratigraphic Nomenclature, 1983, p. 858).

Law of Faunal Succession — different strata each contain particular assemblages of fossils by which the rocks may be identified and correlated over long distances; and that these fossil forms succeed one another in a definite and habitual order (Allaby and Allaby, 1990, p. 213).

Law of Superposition — strata are deposited sequentially, so that in an undisturbed sedimentary succession each layer of rock is younger than the layer beneath it. Subsequent earth movements may overturn and invert the sequence (Allaby and Allaby, 1990, p. 213).

Lithostratigraphic unit—is a defined body of sedimentary, extrusive igneous, metasedimentary, or metavolcanic strata which is distinguished and delimited on the basis of lithic characteristics and stratigraphic position. A lithostratigraphic unit generally conforms to the Law of Superposition (youngest on top) and commonly is stratified and tabular in form (North American Commission on Stratigraphic Nomenclature, 1983, p. 955).

Storm bed (event deposit) — A bed of sediment deposited by a storm event (Allaby and Allaby, 1990, p. 356).

Acknowledgments

The author thanks Dr. George Howe for his review of the initial draft along with Dr. John K. Reed who provided excellent comments and discussions regarding the philosophical aspects of both the uniformitarian and creationist timescales. Additionally, John Reed provided much needed editing to this document. A special thanks to my wife Susan, who gave me the time to research and write this document. Glory to God in the highest (Proverbs 3:5-6).

References

CRSQ—Creation Research Society Quarterly.

Ager, D. V. 1993. The nature of the stratigraphical record. Third edition. John Wiley. New York.

Albritton, Jr., C. C. 1986. The abyss of time: Changing conceptions of the earths antiquity after the sixteenth century. St. Martin's Press. New York.

Allaby, A. and M. Allaby. 1990. The concise Oxford dictionary of earth sciences. Oxford University Press. New York.

Austin, S. A. 1991. Mount St. Helens: A slide collection for educators. Geology Education Materials. El Cajon, CA.

_____ 1994. Grand Canyon: Monument to catastrophe. Institute for Creation Research. Santee, CA.

Bennison, A. P. 1975. Geological highway map of the Southeastern Region: Map No. 9. American Association of Petroleum Geologists. Tulsa.

Coffin, H. G. and R. H. Brown. 1983. Origin by design. Review and Herald Publishing. Washington, D.C.

Cohee, G. V., M. F. Glaessner and H. D. Hedberg (editors). 1978. Contributions to the geologic time scale. Studies in geology No. 6. American Association of Petroleum Geologists. Tulsa.

Dao-Yi, X., Y. Zheng, Z. Qin-Wen, C. Zhi-Fang, S. Yi-Yin, H. Jin-Wen. 1989. Astrogeological events in China. Van Nostrand Reinhold. New York.

Donovan, S. K. (editor). 1989. Mass extinctions: Processes and evidence. Columbia University Press. New York.

Dott, Jr., R. H. 1983. 1982 SEPM Presidential address: Episodic sediment—How normal is average? How rare is rare? Does it matter? *Journal of Sedimentary Petrology* 53:5-23.

Einsele, G., W. Ricken and A. Seilacher. 1991. Cycles and events in stratigraphy—basic concepts and terms. Springer Verlag. New York.

Froede, Jr., C. R. 1994. Sequence stratigraphy and creation science. *CRSQ* 31:138-147.

Harland, W. B., A. V. Cox, P. G. Llewellyn, C. A. G. Pickton, A. G. Smith and R. Walters. 1982. A geologic time scale. Cambridge University Press. New York.

Hedtke, R. 1971. A geo-ecological explanation of the fossil record based upon divine creation. *CRSQ* 7:214-221.

Miall, A. D. 1990. Principles of sedimentary basin analysis. Second edition. Springer-Verlag. New York.

Nevins. S. E. 1974. Post-Flood strata of the John Day Country. Northeastern Oregon. In Howe, G. F. (editor). Speak to the Earth: Creation studies in geoscience. Creation Research Society Books. Ashland, OH. pp. 22l-252.

North American Commission on Stratigraphic Nomenclature. 1983. North American Stratigraphic Code. *American Association of Petroleum Geologists Bulletin* 67:841-875.

Northrup, B. E. 1986. A walk through time: A study in harmonization. In Walsh. R. E.. C. L. Brooks and R. S. Crowell (editors). Proceedings of the First International Conference on Creationism. Volume II. Pittsburgh, PA. pp. 147-156.

_____ 1990a. Identifying the Noahic Flood in historical geology: Part one. In Walsh, R. E. and C. L. Brooks (editors). Proceedings of the First International Conference on Creationism. Volume I. Pittsburgh, PA. pp. 173-179.

_____. 1990b. Identifying the Noahic Flood in historical geology: Part two. In Walsh, R. E. and C. L. Brooks (editors). Proceedings of the First International Conference on Creationism. Volume I. Pittsburgh, PA. pp. 181-188.

Oard, M. J. 1986. An ice age within the Biblical time frame. In Walsh, R. E., C. L. Brooks and R. S. Crowell (editors). Proceedings of the First International Conference on Creationism. Volume II. Pittsburgh, PA. pp. 157-166.

_____ 1990. An ice age caused by the Genesis Flood. Institute for Creation Research. El Cajon, CA.

Raup, 1991. Extinction: Bad genes or bad luck? W. W. Norton and Company. New York.

Rugg, S. H. 1990. Detachment faults in the southwestern United States—Evidence for a short and catastrophic Tertiary Period. In Walsh, R. E. and C. L. Brooks (editors). Proceedings of the Second International Conference on Creationism. Volume II. Pittsburgh, PA. pp. 217-229.

Scheven, J. 1990. The Flood/Post-Flood boundary in the fossil record. In Walsh, R. E. and C. L. Brooks (editors). Proceedings of the Second International Conference on Creationism. Volume II. Pittsburgh, PA. pp. 247-266.

Seilacher, A. 1984. Storm beds: Their significance in event stratigraphy. In Seibold, E. and J. D. Meulenkamp (editors). Stratigraphy Quo Vadis? American Association of Petroleum Geologists. Studies in geology No. 16. Tulsa. pp. 49-54.

Snelling, N. J. 1985. (editor). The chronology of the geological record. The Geological Society Memoir No. 10. Blackwell Scientific Publications. Boston.

Stanley. S. M. 1987. Extinction. Scientific American Library. New York.

Whitcomb, Jr., J. C. and H. M. Morris. 1961. The Genesis Flood: The Biblical record and its scientific implications. Baker Book House. Grand Rapids.

Woodmorappe, J. 1980. The essential nonexistence of the evolutionary uniformitarian geologic column: A quantitative assessment. *CRSQ* 18:46-71.

Quote: On the Judiciary

If in France the tribunals were authorized to disobey the laws on the ground of their being opposed to the constitution, the supreme power would in fact be placed in their hands, since they alone would have the right of interpreting a constitution. . . . They would, therefore, take the place of the nation, and exercise as absolute a sway over society as the inherent weakness of judicial power would allow them to do.

Tocqueville, Alexis de. 1851. American institutions and their influence. A. S. Barnes. New York. p. 97.

KEYWORD INDEX TO VOLUME 31

GLEN W. WOLFROM*

For multi-page items, the reference is to the first page only. Letters following numbers indicate: a = article; L = letter; p = panorama; r = review; and n = note.

*Glen W. Wolfrom, Ph.D., is Membership Secretary of the Society.

MINUTES OF 1995 CREATION RESEARCH SOCIETY BOARD OF DIRECTORS MEETING

On Thursday, 20 April 1995, a meeting of the Executive Committee was held at the Van Andel Research Center (VARC), Chino Valley, Arizona, from 2015 to 2245 hours. The purpose of the Thursday meeting was to set up the agendas for the committee meetings on Friday.

On Friday, 21 April 1995, between the hours of 0800 and 1700, the Constitution and Bylaws, Financial, Publications, Quarterly Editorial Research, and CRSnet Committees (along with the VARC Committee) each held meetings of approximately two hours. The Chairman of each Committee or Team recorded the business in preparation for the Saturday business meeting.

The Friday evening open meeting of the Creation Research Society was held at the Prescott College-Elks Theater, Prescott, Arizona. Dr. Emmett Williams, President of C.R.S., welcomed everyone to the meeting. This was followed by a short prayer. Dr. John Meyer, Director of VARC, gave a report on the activities of VARC. Dr. George Howe spoke about recent CRS publications and research. Dr. Emmett Williams gave a report on CRS Quarterlies and back issues.

A Minisymposium on Developments in Creation Science followed. Dr. Richard Lumsden presented an illustrated talk on "Millipede Cyanogenesis and Cyanide Tolerance." Dr. David Kaufmann's slide presentation was entitled "Design in the Human Body." Dr. Don DeYoung gave a presentation on "A Visit from Isaac Newton." Dr. Russell Humphreys spoke about "A Young Earth Cosmology." Dr. Duane Gish's talk was entitled "Biology Refutes Evolution." The meeting was adjourned at 2115 hours for refreshments, book sales, and social discourses.

On Saturday, 22 April 1995, the closed business meeting of the Board of Directors (BOD) was called to order at 0815 hours. Present: T. Aufdemberge, D. Boylan, E. Chaffin, D. DeYoung, W. Frair, R. Gentet, D. Gish, R. Goette, G. Howe, R. Humphreys, D. Kaufmann, L. Lester, R. Lumsden, J. Meyer, D. Rodabaugh, E. Williams, G. Wolfrom.

The minutes of the 1995 meeting were read and accepted. Secretary Kaufmann reported that the following individuals were elected for a three-year term: DeYoung, Gish, Goette, Humphreys, Kaufmann, and Williams.

The Treasurer's report by Gentet was presented and accepted.

The Financial Secretary's report was given by Aufdemberge. He discussed the equity of investments and the status of VARC Funds for the year ending 1994.

The membership report by Wolfrom was given as follows: Total membership for 1994/95 was 1720 (638 voting, 703 sustaining, 335 subscribers and 44 students). This was a decrease of 23 from 1993/94.

The status of CRSnet was reported by Wolfrom. It currently has 115 participants.

Editor Chaffin reported that from November 1993 to March 1995, 74 articles were received. Of these, 19 were published and 26 were rejected. The rest are in progress.

The Financial Committee report resulted in several actions. It was passed to delete the following phrase from a motion recorded in 1989 CRS BOD Minutes: "When making investment, the Financial Secretary must confer with the Chairman of the Finance Committee and the President." It was passed that the previous year's records of the Financial Secretary and Treasurer be stored at VARC and disposed of at the discretion of the BOD. It was moved and passed that subscription rates be increased by $2 per category, that foreign surface mail be increased from $4 to $5, and that the foreign air mail rate be set at $14 effective Spring 1996. It was passed to count Life Memberships as dues and not contributions in order to conform to IRS laws. A motion was passed to increase Life Membership fees from $300 to $350 effective Spring 1996 with a promotion drive to join now, at $300. It was moved and passed to take out a Workman's Compensation Policy for the Director of VARC. The board passed a motion to give a 3% COLA increase to the Director of VARC effective 1 July 1995.

Editor Chaffin presented the Quarterly Editorial Committee report which was received and accepted. There was a discussion of revising the publication schedule so that the publication year would coincide with the calendar year for simplicity. It was moved and passed that this change be enacted by producing three issues in one year and having the first or number one issue of the next year be its March issue.

The Research Committee reported that the following research projects were in progress: Lumsden, millipede changes; Howe, Devil's claw; Humphreys, paleomagnetics; Williams, change and petrification of wood; and DeYoung, Arizona craters.

The publications Committee (PC) report resulted in the following actions. It was passed to transfer $3000 from the PC's fund into "seed money" for a fund to purchase a building for storage of CRSQ issues and books. It was passed that the PC chairman received book sale tallies from Mrs. Meyer once each year and initiate payment of royalties. It was moved and passed that once each year 10% of the book and back journal sales for the year be transferred from the PC funds to VARC as payment for handling and shipping costs incurred by VARC for the PC. This will be handled once each year by the PC Chairman and the Treasurer. Wolfrom will contact Dr. John Moore about republishing an abbreviated version of his 1983 book *How to Teach Origins* and to check on possible copyrights by Mott Media. *Variations and Fixity in Nature* will not be reprinted by CRS Books. Wolfrom will solicit volunteers over CRSnet to translate CRS books into foreign languages. Goette will become PC Chairman at the CRS BOD meeting in 1996, replacing Howe. It was passed to commend Frair on his creation book ministry to libraries.

The report of the Constitution and Bylaw Committee was given. It was moved and passed that the Constitution and Bylaws Committee assume the responsibility of long range planning.

A motion passed to nominate T. Aufdemberge, D. Boylan, W. Frair, R. Gentet, and G. Howe for the 1996 Board of Directors election. The following officers were elected for 1995/96: President, Williams; Vice President, DeYoung; and Secretary, Kaufmann.

It was passed to renew a one-year contract for Dr. John Meyer as Director of VARC.

It was moved and passed that the 1996 BOD meeting be held at Chino Valley, Arizona, 18-20 April.

It was passed that Lester be appointed Editor of a CRS Newsletter to be started in January 1996.

The 1995 Budget was presented and adopted.

The meeting was adjourned at 1450 hours.

Respectfully submitted,
David A. Kaufmann, Secretary

RESOURCES FOR RESEARCH AND PUBLICATION — LAB DIRECTOR'S REPORT

JOHN R. MEYER, Director of the C.R.S. Van Andel Research Center

We believe the existence of God, His role in special creation, and His written Word, represent the most fundamental and basic understandings for the quest of truth in the physical and spiritual world. As a group of scientists, educators, and Christian leaders who are committed to the historical reality of Genesis, the Creation Research Society stands as one of the major roadblocks to the ascendancy of evolutionary naturalism and secular humanism in our culture. Most of the popularized arguments used against evolutionism first saw the light of day as a more technical and detailed article in the pages of the *Creation Research Society Quarterly*.

For nearly 35 years, the Creation Research Society has challenged evolutionism at its fountainhead—the evolutionary interpretative framework for the natural sciences. Our mission is to evaluate science in a Biblical framework.

If you believe in the mission of the Creation Research Society, your financial support of our work is critical. Regardless of the size of your gift, it, in concert with others, can provide essential funding for research, publication, and outreach programs which challenge naturalistic origins, strengthen the creationist position, and encourage believers around the world.

The Creation Research Society is a not-for-profit organization and exists entirely apart from government support. While the evolutionary establishment reaps the benefits of billions of dollars of taxpayers' hard-earned income, the Creation Research Society exists as the result of book sales and the donations of funds from hundreds of dedicated individuals. This, along with donations of property and time, represents our human resources.

Let's consider donations of time first. Over the past several years, several hundred hours of time have been donated to the work here at the Van Andel Research Center. This has ranged all the way from local folks donating a few hours to stuff envelopes or to fix fence, to an engineer from Virginia who has donated several weeks of time developing our meteor observation project. If you are traveling through this area and would like to donate time to a specific research, development, or maintenance project, please let me know.

Remember, this part of Arizona is a great area in which to live and many retirees are moving to this area. We can provide meaningful and significant retirement work for volunteers committed to our position. We will be glad to send a packet of information about the area if you will contact us.

Donations of cash are characterized by simplicity and flexibility. Generally such gifts are deductible to the extent of 50 percent of your adjusted gross income. However, any excess can be deducted over the next five years subject to the same limitation.

A donation of appreciated property held for more than one year generally produces a tax deduction equal to its fair market value. Thus, donations of highly appreciated stocks, for example, are especially effective for the donor. Gifts of stocks and bonds have provided an increasing form of support in recent years.

Recently we have received valuable gifts of tangible personal property such as computers, laboratory equipment, and books. Currently-needed items include such items as general electronics, mechanical, and carpentry shop equipment, an autoclave, a medium capacity air compressor, a fume hood, as well as HF and VHF amateur radio equipment. Please call to discuss transfer of any item.

Gifts of real estate and insurance policies remain an untapped resource for the Society. However, an increasing number of members are considering the Creation Research Society in bequests through their wills or trusts. Including the Society in your estate plan accomplishes several important goals:

— Provides a significant legacy to the Society for future growth and impact.
— Reduces estate tax burden by providing a charitable deduction equal to the value of your bequest at the time of your death.
— Ensures that your estate is distributed as you wish.

For help in thinking about estate planning we will be glad to provide a free brochure entitled, "A living trust—is it for you?" This non-technical material provides an overview of the advantages of living trusts.

As you consider ways to express your long-term commitment to the creationist movement and long term-opposition to evolutionary naturalism, we hope you will agree that support of the Creation Research Society is an appropriate response. For help in this important matter, please feel free to write to me at the Van Andel Research Center, PO. Box 376, Chino Valley, AZ 86323. I can be reached by phone at (526) 636-1153.

PANORAMA NOTES

Australopithecus ramidus: the Oldest "Hominid" Yet?

The fossil record of man has often existed by the skin of its teeth. The student of creation science will recall the often repeated stories of Nebraska Man and the grossly overinterpreted pig tooth (Milner, 1990). Tooth morphology has always been an important part of the study of vertebrate evolution, and particularly human evolution since teeth are among the most common vertebrate fossils. Fossilized teeth are often well preserved with the dental characteristics easily identified. The latest hominid find follows this general trend.

In the September 22, 1994, issue of *Nature* (White, Suwa and Asfaw, 1994; WoldeGabriel, et al., 1994; Wood, 1994;) and the September 30, 1994, issue of *Science* (Fischman, 1994), a series of papers present a collection of 17 fossils alleged to represent "a long-sought potential root species for the Hominidae" (White, et al., 1994, p. 306). These 17 fossils were uncovered by Tim White and his colleagues in the drainages of the Aramis and Adgantoli rivers located several kilometers west of the Awash river in the Afar depression, Ethiopia (see Figure 1). All but one of the specimens were surface finds pulled from between two tuff horizons (the arm elements were collected above the top tuff). The top horizon is a 20 to 40 cm thick dark-olive colored tuff called the Daam Aatu Basaltic Tuff (DABT) characterized by distinctive course-grained basaltic glass and rock fragments. The lower horizon lies approximately 4 m below and is a 1 m thick grey-vitric tuff referred to as the Gaala Vitric Tuff Complex (GATC). The 17 specimens were collected over a 2 to 3 km area from December 1992 to December 1993.

In addition to the 17 hominid specimens, 633 identifiable vertebrate specimens were collected. A variety of vertebrates were uncovered including a small squirrel, a bat, a dwarf mongoose and several species of rats. Primate remains were very abundant with the colobine monkey representing over 30% of the collected remains. The area appears to have been a place "where scattered carcasses of medium and large mammals were ravaged by carnivores" (WoldeGabriel, et al., 1994, p. 332). The hominid cranial and postcranial remains are in fact scarred by carnivore tooth marks.

Ten of the 17 fossilized hominid specimens represent an associated set of teeth from one individual. The remaining specimens consist of a right and left humerus, left radius and ulna, a mandible fragment and the remains of a cranial base. From these 17 fossils we are told that this species "lies so close to the divergence between the lineages leading to the African apes and modern humans" (Wood, 1994, page 280) that it represents "a long sought link in the evolutionary chain of species between humans and their African ape ancestors" (White, et al., 1994, p. 312). Tim White and his co-discoverers have named their find *Australopithecus ramidus* ("ramid" means "root" and is taken from the local Afar language) and place him (or her) as an evolutionary precursor of *Australopithecus afarensis.*

Part of what Tim White and his colleagues report as "compelling" evidence for the evolutionary status of

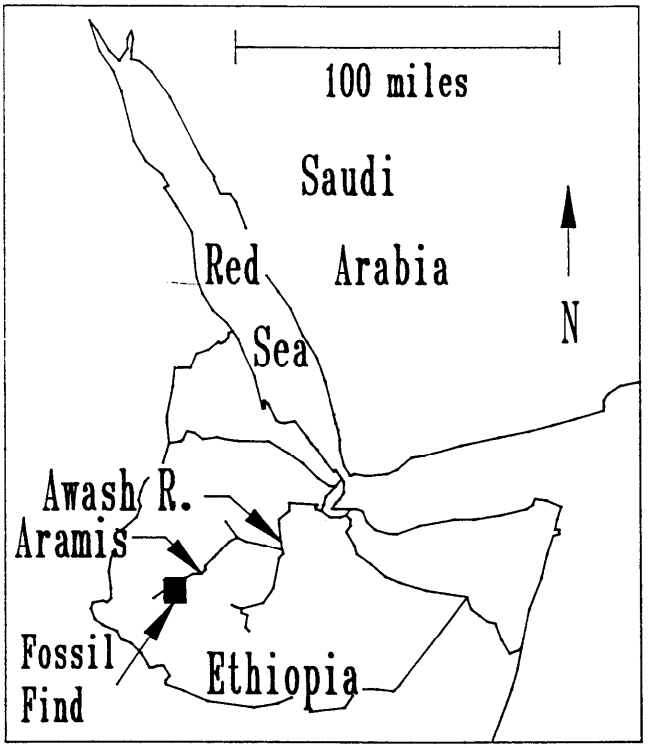


Figure 1. Location of the fossil finds. All finds were collected in the drainage of the Aramis river west of the Awash river over an area of 2 to 3 kilometers.

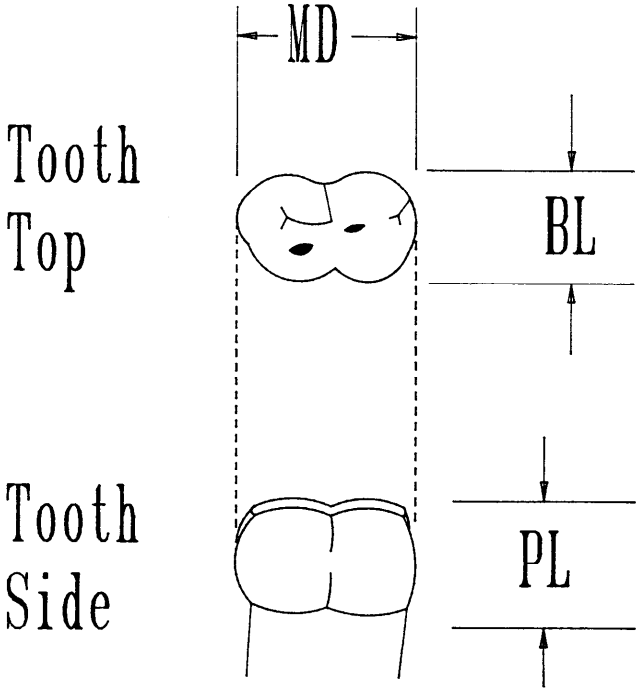


Figure 2. The mesiodistal length (MD), the buccolingual breadth (BL) and the protoconid length (PL). MD x BL is a measure of the crown or biting area and is indicative of diet. MD/PL is the relative protoconid length and is also indicative of diet.

Table I [Table 2 from White, et al., 1994]: Measurements are presented as mean values ± one standard deviation. See Figure 2 for a description of MD, BL and PL. n is number of samples for determining the mean. Shaded values overlap the reported values for *A. ramidus*.

Species	n	MD (mm)	BL (mm)	MD x BL (mm²)	PL (mm)	MD/PL
A. ramidus	1	7.3	4.9	35.8	5.2	1.4
A. afarensis	4	9.2 ± 0.5	7.9 ± 0.4	72.5 ± 5.7	5.1 ± 0.6	1.8 ± 0.1
A. africanus	7	8.8 ± 0.2	7.6 ± 0.4	66.6 ± 5.5	5.2 ± 0.1	1.7 ± 0.1
A. robustus	8	10.1 ± 0.5	8.3 ± 0.6	83.7 ± 9.5	4.9 ± 0.5	2.1 ± 0.1
Pan paniscus	21	7.4 ± 0.6	5.1 ± 0.3	37.6 ± 4.7	5.0 ± 0.5	1.5 ± 0.1
Pan troglodytes	29	8.1 ± 0.6	5.2 ± 0.4	42.2 ± 5.2	5.8 ± 0.5	1.4 ± 0.1
G. gorilla	20	11.0 ± 0.7	7.5 ± 0.6	82.3 ± 10.7	7.8 ± 0.6	1.4 ± 0.1
Pan pygmaeus	6	9.2 ± 0.7	7.1 ± 0.6	66.2 ± 10.3	6.7 ± 0.8	1.4 ± 0.1
Homo sapiens	21	8.4 ± 0.5	7.2 ± 0.4	60.4 ± 6.1	4.9 ± 0.5	1.7 ± 0.2

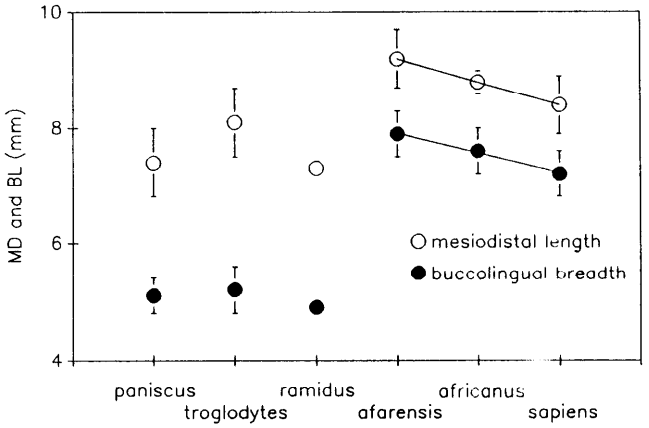


Figure 3. Graphical comparison of MD and BL data presented in Table I. Alledged evolutionary relationship is indicated by the connected data points for *A. afarensis - A. africanus - Homo sapiens.* Note that *A. ramidus* fits within the known variation of the two chimpanzee species.

A. ramidus are the lower first deciduous molar (dm_1) measurements. Measurements are presented for the mesiodistal length (MD), the buccolingual breadth (BL), the MD x BL area (crown area), the protoconid length (PL) and the MD/PL (relative protoconid length) or *A. ramidus* (Figure 2) and compared with similar values for modern humans, chimpanzees, gorillas and three additional Australopithecines: *afarensis, africanus* and *robustus.* This data is reproduced in Table I with a graphical comparison of the MD and BL data in Figure 3.

An interesting relationship appears when examining the data of White. All five dm_1 measurements for A. *ramidus* fall within the range of values known for the pygmy chimpanzee species *P. paniscus.* In addition, the MD and BL measurements for A. *ramidus* do not even come close to fitting the trend in values for MD and BL established by the alleged evolutionary sequence of A. *afarensis* — A. *africanus* — *Homo sapiens* (Figure 3). This fact did not escape the authors but it is interesting to read how their evolutionary bias lead them to interpret these data: "The Aramis *[A. ramidus]* remains evince significant cranial, dental and postcranial similarities to the chimpanzee condition, but some or all of these features may be primitive retentions." (White, et al., 1994, p. 312) and "*A. ramidus* is the most ape-like hominid ancestor known, and its remains suggest that modern apes are probably derived in many characteristics relative to the last common ancestor of apes and humans." (White, et al., 1994, p. 312). We also are told that the "canine enamel thickness approximates the chimpanzee condition" (White, et al., 1994, p. 308) and the "cranial fossils evince a strikingly chimpanzee-like morphology" (White, et al., 1994, p. 310). In other words, *A. ramidus* is so close to the evolutionary diverging point of chimpanzees and humans that it is indistinguishable from chimpanzees.

Most of White and colleagues' paper is dedicated to establishing *A. ramidus* as a separate species of Australopithecus which is distinct and more primitive (more ape-like) than *A. afarensis* and *A. africanus.* In fact, this is presented as a major finding in his paper. Bernard Wood in his introductory article states that these conclusions are "soundly based." But referring to *A. ramidus* as representing "a long-sought potential root species for the Hominidae" (White, et al., 1994, p. 306) is going beyond what the fossil data allow. If *A. ramidus* is so similar to apes (as White himself claims) then why go to all the trouble of calling it anything but an ape? The simple (and therefore the more preferred) interpretation of the fossil data would be to assign *A. ramidus* to an extinct species of ape (as are the placements by creationists of *A. afarensis* and *A. africanus* (Beasley, 1990)). Why go to the trouble of describing *A. ramidus* as practically indistinguishable from modern apes in one sentence and then calling it a missing-link in the next breath?

The overinterpretation continued with the temporal placement of these fossils (WoldeGabriel, et al., 1994). The lower GATC was dated using the single crystal laser fusion $^{40}Ar/^{39}Ar$ method to provide a maximum age for the hominid remains. The higher DABT was not dated. In the words of the authors:

> . . . most of the feldspar grains separated for these analyses are contaminated by a dominant population of sanidine grains yielding an early Miocene age (~23.5 Myr) . . . one sample of the GATC, a though showing the early Miocene contamination, yielded a dominant feldspar population providing a mean age of 4.387 ± 0.031 Myr . . . this age is *viewed as the best estimate* for the age of the GATC . . . [my emphasis] (WoldeGabriel, et al., 1994, p. 331).

In fact, the GATC was so "contaminated" that a sample located 1 km from the nearest fossil was used to provide the "best estimate" of 4.387 Myr.

Bernard Wood (Wood, 1994, p. 281) in his introductory article in Nature writes: "The metaphor of a 'missing link' has often been misused, but it is suitable epithet for the hominid from Aramis." All this from 10 teeth, four arm fragments and the remains of a mandible and cranial base all displaying "significant . . . similarities to the chimpanzee condition" (White, et al., 1994, p. 312). I think it is clear that White and colleagues have discovered nothing more than an extinct ape and their overinterpretation of the data is typical of the methodology used by the majority of paleontologists studying "human evolution."

References

Beasley, G. 1990. Pre-flood giantism: A key to the interpretation of fossil hominids and hominoids. *Ex Nihilo Technical Journal* 4:5-55.

Fischman, J. 1994. Putting our oldest ancestors in their proper place. *Science* 265:2011-2012.

Milner, R. 1990. The encyclopedia of evolution. Facts on File. New York.

White, T., G. Suwa, and B. Asfaw, 1994. *Australopithecus ramidus,* a new species of early hominid from Aramis, Ethiopia. *Nature* 371:306-312.

WoldeGabriel, G. T. White, G. Suwa, P. Renne, J. Heinzelin, W. Hart, and G. Heiken. 1994. Ecological and temporal placement of early pliocene hominids at Aramis, Ethiopia. *Nature* 371:330-333.

Wood, B. 1994. The oldest hominid yet. *Nature* 371:280-281.

Kevin P. Peil*

Thunder Eggs: Evidence For Subaqueous Deposition? (Big Bend National Park, Texas)

Introduction

Ongoing research is currently being performed, by creation scientists, in seeking answers to perplexing questions at Big Bend National Park, Texas, within the framework of the young earth Creation/Flood model (e.g., Williams and Howe, 1993; Williams, Matzko, Howe, White and Stark, 1993). The Park contains a rich variety of geologically dissimilar rocks (e.g., sedimentary to volcanic extrusives), within close proximity to one another and presents what this author views as evidence of catastrophic events which have occurred in the recent past (i.e., from Upper Flood Event through the Ice Age to the Present timeframes). The specific case presented in this note concerns the origin and occurrence of "Thunder Eggs" found in the surficial (alluvial) deposits across sections of the Park and their possible subaqueous formation with much of the volcaniclastic rocks found throughout the Park.

Thunder Eggs

Dake (1938), first identified agate-filled nodules found in Central Oregon as "thunder eggs" Additionally, Dake (1938) found that the thunder eggs appeared to be associated only with rhyolitic rocks. It was C. S. Ross (1941, pp. 731-732) who first identified the mysterious "thunder eggs." of Oregon, Nevada, and California, as chalcedony-filled spherulites, which formed from a welded ash-flow tuff. According to Ross (1941, p. 731):

Figure 1. Pitted thunder egg. The chalcedony filling is visible within each of the pits. This specimen was located in Dawson Creek region. Scale in inches and centimeters.

Figure 2. Pitted thunder egg. Weathering has resulted in the erosion of certain portions of the outer covering, thereby exposing the inner chalcedony core. Same specimen as above, opposite side of egg.

> A glassy volcanic ash evidently fell in so hot and plastic a condition that welding was complete and a nearly homogenous material was produced, but even after this it retained volcanic gases in solution in the glass. These gases began to collect locally at centers of crystallization and, as crystallization proceeded, more and more gas collected and enlarged the cavity. Thus the nodules represent hollow spherulites that were subsequently filled with chalcedony.

Additionally, Ross (1941, p. 732) proposed that chalcedony was deposited within the hollow space when the surrounding ash weathered to a clay.

Thunder Eggs At Big Bend National Park

The author observed the occurrence of thunder eggs at several locations (e.g., Dawson Creek, Alamo Creek, Javelina Wash, and Cerro Castellan) within Big Bend National Park (Figures 1 and 2). They lie on the ground surface mixed with brecciated rhyolite (Figure 3). Both the brecciated rhyolite and thunder eggs appear to be outwashed talus from volcanic deposits presently found

*4636 Eight Mile Road, Auburn, MI 48611.

Editorial Comment: Readers who wish to put the new finds in perspective may wish to consult the article by DuBois, P. 1988. Creationist evaluation of *Australopithecus afarensis. Creation Research Society Quarterly* 25:65-69.

at higher elevations (Figure 4). The formation(s) from which the thunder eggs have been derived has not been identified by the author at this time. However, Williams (1994) has postulated their derivation possibly from the Ash Spring Basalt Member [see Maxwell, Lonsdale, Hazzard and Wilson, 1967, p. 134. unit no. 21.]. Big Bend National Park contains many areas of volcanic rock (Williams and Howe, 1993, p. 48; Williams, 1993, p. 119) which could be considered the source rock for thunder eggs. Additional field work is required in attempting to identify any and all formations of origin.

Discussion

Subsequent to the identification of "thunder eggs," much research has been performed on welded ash-flow tuffs (e.g., Ross and Smith, 1961; Chapin and Elston, 1979; Fisher and Schmincke, 1984; Fisher and Smith, 1991). Currently the most commonly accepted theory for the formation of the thunder eggs along with the associated volcanic deposits is in a subaerial setting. Even current creationist thinking accepts this subaerial environment for volcaniclastic emplacement at Big Bend (e.g., Williams and Howe, 1993, p. 50; Williams, 1993, p. 119). However, is this the only possible depositional setting for these types of volcanic rocks and the formation of "thunder eggs?"

It has been documented that *subaqueous* ash flows have resulted in the formation of welded deposits similar in every way to subaerially deposited ash flows (Fisher and Schmincke, 1984, pp. 293-296; Ayres, Van Wagoner and Ferreira, 1991, pp. 183-184; Sparks, Sigurdsson and Carey, 1980a, 1980b; Fernandez, 1969; Howells, Leveridge and Evans, 1973; Francis and Howells, 1973; Kato, Muroi, Yamasaki and Abe, 1971; Yamazaki, Kato, Muroi and Abe, 1973; Yamada, 1984; Fisher, 1984). The heat generated within a flow is generally accepted as providing sufficient energy to weld the ash together to form the ash flow tuff (Ross and Smith, 1961, pp. 41-44), although higher temperatures would be required to weld the ash *subaqueously* (Fisher and Schmincke, 1984, p. 295). Where sufficient heat was not available it would result in an unconsolidated ash deposit. To ensure complete welding of the entire formation the top of the formation must be covered quickly or the unwelded top of the formation could be lost due to erosion (Ross and Smith, 1961, p. 24).

The author proposes two possible interpretations for the formation of thunder eggs. The first is catastrophic and better fits the young earth Creation/Flood model. It is based on the belief that much of the volcanic deposits found at Big Bend National Park were possibly deposited subaqueously. This theory suggests that the thunder eggs formed in an ash-flow tuff or possibly in an amygduled basalt which was *deposited subaqueously during the closing stages of the Flood Event Timeframe.* Following the cooling of the volcanic material, and the formation of a hollow gas cavity, waters were able to penetrate the deposit. The waters dissolved silica from the immediate or surrounding volcanic material and precipitated it (i.e., chalcedony) into the hollow cavity, creating the thunder egg. Erosion, associated with this timeframe and ensuing Ice Age, eventually weathered out the thunder eggs and transported them along creek channels where many "eggs" are seen today.

Figure 3. Alluvial deposits of brecciated rhyolite, petrified wood and thunder eggs in the Dawson Creek drainage basin.

Figure 4. Volcanic rocks exist at higher elevations than the lower drainage valleys and plains. This particular peak is capped by rhyolite which directly correlates with deposits several thousands of feet away on the left side of the photograph. Severe erosional conditions must have been present to erode away all the intervening volcanic rock material.

Another interpretation is that the ash-flow tuff and/or vesicular basalt was deposited subaerially and that atmospheric precipitation could have penetrated the volcanic material sufficiently to dissolve the silica and precipitate it within the "gas hollow" thus forming the thunder egg. This subaerial depositional environment is currently the leading theory in the formation of the massive volcanic deposits found at Big Bend National Park (Maxwell et al., 1967; Henry, Price, Parker, and Wolff, 1989; Williams and Howe, 1993; Williams, 1993).

This author currently challenges this "subaerial depositional theory" within the framework of the young earth Creation/Flood model, which requires both rapid deposition and subsequent erosion within a 4000 year timespan (the Flood to present time). While Mount St. Helens provides a modern analogy for rapid volcaniclastic sedimentation and subsequent rapid erosion, this author seriously doubts that any mammalian life could have existed in the Big Bend Area if all the volcanic events occurred, as has been suggested, following the reestablishment of mammalian life (via the

"land-bridge") during the Post-Flood / Ice Age Timeframes (and if it did not re-establish itself during this period, then from where did the fossils come—the Flood?). The subject of a creationist interpretation for the "paleontology" and "paleoecology" found at Big Bend National Park will be covered in a subsequent paper (Froede, in press). Nevins (1974) has postulated the assemblage of volcanic rock with mammalian fossils in the John Day Country of Northeast Oregon as being Post-Flood. His justification for this position versus the setting at Big Bend will not be addressed within this note.

The author believes that sufficient evidence exists at the Park to show that *catastrophic subaqueous deposition* provides the best interpretation for the formation of the massive amounts of volcaniclastics and thunder eggs within the young earth Creation / Flood model. The author suggests that many of the volcanic rocks of Big Bend National Park are Upper Flood Event deposits (as opposed to Post Flood / Ice Age deposits) due to the large amounts of erosion which have occurred in the Park. Large areas of volcanic rock have been eroded from many sections of the Park, leaving buttes and mesas as evidence of the erosion. The eroded volcanic material is nowhere to be found in the Park and this raises the issues of "missing talus" (i.e., where it went and how it was removed—see Holroyd, 1987; 1990; 1993). If all of the volcanic rocks were deposited *following* the Flood Event Timeframe (i.e., Post-Flood / Ice Age), then thousands of vertical feet and hundreds of square miles of volcanic rock would only have been exposed to erosion (e.g., rain and snow?) during the Ice Age to Present Timeframe (i.e., 4000 years of "uniformitarian" type processes). The author does not believe that the amount of time or weathering energy present during the 700 to 1000 year Ice Age timeframe (which was even at higher energy levels than present—Oard, 1990, pp. 188-189), coupled with the ensuing 3000 years following the Ice Age would provide sufficient "energy" to erode the massive amounts of volcanic rock seen missing from the Park today. Thus, the Late Flood timeframe for both deposition and erosion appear to better fit the erosive conditions necessary to remove large amounts of volcanic rock currently recognized as "missing" due to erosion.

The brecciated rhyolite, which forms some of the alluvial deposits and is commonly associated with the thunder eggs, has not undergone considerable transport and remains highly angular (Figure 3). The author believes that much of this rock material has been outwashed from higher elevations during the Post-Flood through the Ice Age to the Present Timeframe. This interpretation is based on the catastrophic requirements necessary to remove thousands of vertical feet of volcanic rock spread out over hundreds of square miles within a few thousand years (Figure 4). Other interpretations are possible and I welcome discussion in further refining and defining the geology of Big Bend National Park and volcanic sedimentology within the Creation / Flood model.

Conclusion

The author proposes that most of the original volcanic rocks were possibly deposited in the Upper Flood Event timeframe and were heavily eroded with the retreating of the Flood waters and subsequent Ice Age timeframe. This is currently not suggested by other creationists working at Big Bend (e.g., Williams and Howe, 1993; Williams, 1993). The author believes that the massive amounts of volcaniclastics, which were both deposited and eroded could not have occurred within any other timeframe than the closing stages of the Flood event, while waters were still available to rapidly erode the freshly deposited volcaniclastics. The volcanic surficial alluvial deposits (i.e., thunder eggs and brecciated rhyolite) found across several sections of Big Bend National Park represent deposits generated during the Post Flood through Ice Age to Present Timeframes. Following the erosion of the volcanics, the alluvium would occur as is presently observed across the lower areas of Big Bend Park stretching toward the Rio Grande River, which probably served as the main drainage channel for the receding Flood waters (Williams and Howe, 1993, p. 51).

Additional field work is required to further develop the young earth Creation / Flood model for deposition and subsequent erosion of the volcanic deposits found in and around Big Bend National Park, Texas.

Acknowledgments

The author thanks Dr. E. L. Williams for his extensive and helpful review of this article. Additional thanks to all of the reviewers who have made this a better article. My wife, Susan, deserves special thanks for allowing me the time to go to Big Bend National Park. Glory to God in the highest (Pr 3:5-6).

References

CRSQ—Creation Research Society Quarterly.

Ayres, L. D., N. A. Van Wagoner and W. S. Ferreira. 1991. Voluminous shallow-water to emergent phreatomagmatic basaltic volcaniclastic rocks, Proterozoic (~1886 MA) Amisk lake composite volcano, Flin Flon greenstone belt, Canada. In Fisher, R. V. and G. A. Smith (editors). Sedimentation in volcanic settings. Society of Economic Petrologists and Mineralogists (Society for Sedimentary Geology) Special Publication No. 45. Tulsa. pp. 175-197.

Chapin, C. E. and Elston, W. E. (editors) 1979. Ash-flow tuffs. Geological Society of America Special Paper 180. Boulder, CO.

Dake, H. C. 1938. The gem minerals of Oregon. Oregon State Department of Geology and Mineral Industries Bulletin 7. pp. 1-16.

Fernandez, H. E. 1969. Notes on the submarine ash flow tuff in Siargao Island, Surigao del Norte (Phillippines). Philippines Geology 23:29-36.

Fisher, R. V. 1984. Submarine volcaniclastic rocks. In Kokelaar, B. P. and M. F. Howells (editors). Marginal basin geology. Blackwell Scientific Publications. Boston. pp. 5-27.

_____, and H.-U. Schmincke. 1984. Pyroclastic rocks. Springer Verlag. New York.

_____ and G. A. Smith. (editors) 1991. Sedimentation in volcanic settings. Society of Economic Paleontologists and Mineralogists (Society for Sedimentary Geology) Special Publication NC. 45. Tulsa.

Francis, E. H. and M. F. Howells. 1973. Transgressive welded ash-flow tuffs among the Ordovician sediments of NE Snowdonia, North Wales. Journal of the Geological Society of London 129: 621-641.

Froede. Jr., C. R. (in press). Evidence of catastrophic physical processes at Goat Mountain, in Big Bend National Park, Texas.

Henry, C. D., J. G. Price, D. F. Parker, and J. A. Wolff. 1989. Excursion 9A: Mid-tertiary silicic alkalic magmatism of Trans-Pecos Texas: Rheomorphic tuffs and extensive silicic lavas. In Chapin. C. E. and J. Zidek (editors). Field excursions to volcanic terranes in the western United States, Volume I: Southern Rocky Mountain region. New Mexico Bureau of Mines and Mineral Resources Memoir 46. Santa Fe. pp. 231-274.

Holroyd, III, E. W. 1987. Missing talus. *CRSQ* 24:15-16.

_____ Missing talus on the Colorado Plateau. In Walsh, R. E. and C. L. Brooks (editors). Proceedings of the Second International Conference on Creationism. Volume II. Technical

symposium sessions and additional topics. Creation Science Fellowship, Inc. Pittsburgh. pp. 115-128.
_____. 1994. Bangs Canyon—A valley of boulders. *CRSQ* 31:99-109.
Howells. M. F., B. E. Leveridge and C. D. R. Evans. 1973. Ordovician ash flow tuffs in eastern Snowdonia. Institute of Geologic Sciences. N.E.R.C. (Great Britain) Report 73/3:33.
Kato, I., I. Muroi, T. Yamasaki and M. Abe. 1971. Subaqueous pyroclastic flow deposits in the upper Donzurabo Formation, Mijo-san District, Osaka, Japan. *Journal of Geological Society of Japan* 77:193-206.
Maxwell, R. A., J. T. Lonsdale, R. T. Hazzard and J. A. Wilson. 1967. Geology of Big Bend National Park, Brewster County, Texas. Texas Bureau of Economic Geology Publication No. 6711. Austin.
Nevins, S. E. 1974. Post-Flood strata of the John Day Country, Northeastern Oregon. In Howe, (editor). Speak to the Earth: Creation studies in geoscience. Creation Research Society Books. Ashland, OH.
Oard, M. J. 1990. An ice age caused by the Genesis Flood. Institute for Creation Research. El Cajon, CA.
Ross, C. S. 1941. Origin and geometric form of chalcedony-filled spherulites from Oregon. *American Mineralogist* 26:727-732.
_____, and R. L. Smith. 1961. Ash-flow tuffs: Their origin, geologic relations, and identification. U.S. Geological Survey Professional Paper 366. Washington, D.C.
Sparks, R. S. J., H. Sigurdsson and S. N. Carey. 1980a. The entrance of pyroclastic flows into the sea: I. Oceanographic and geologic evidence from Dominica, Lesser Antilles. *Journal of Volcanology and Geothermal Research* 7:87-96.
_____. 1986b. The entrance of pyroclastic flows into the sea: II. Theoretical considerations on subaqueous emplacement and welding. *Journal of Volcanology and Geothermal Research* 7:97-105.
Williams, E. L. and G. F. Howe. 1993. Fossil wood of Big Bend National Park, Brewster County, Texas: Part I—Geologic setting. *CRSQ* 30:47 54.
_____. 1993. Cerro Castellan. *CRSQ* 30:119.
_____. 1994. Personal communication.
_____, G. T. Matzko, G. F. Howe, R. R. White and W. G. Stark. 1993. Fossil wood of Big Bend National Park, Brewster County, Texas: Part III—Chemical tests performed on wood. *CRSQ* 30:169-176.
Yamada, E. 1984. Subaqueous pyroclastic flows: Their development and their deposits. In Kokelaar, B. P. and M. F. Howells (editors). Marginal basin geology. Blackwell Scientific Publications. Boston. pp. 29-35.
Yamazaki, T., T. Kato, Muroi and M. Abe. 1973. Textural analysis and flow mechanism of the Donsurubo subaqueous pyroclastic flow deposits. *Bulletin of Volcanology* 37:231-244.

Carl R. Froede, Jr.*

Reprinted CRSQ Volume 21

Introduction

The *Creation Research Society Quarterly* has been published since 1964 (31 complete volumes). In an effort to make these volumes available, all of the missing issues have been reprinted. Brief synopses have been written on volumes 1-20 and have appeared in the previous 20 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.

Personalities

The June 1984 Quarterly was dedicated to Henry M. Morris, the coauthor of *The Genesis Flood* (Williams, 1984, pp. 3-4). Dr. Morris' contribution to modern creationism and Flood geology is inestimable. The founder of the Institute for Creation Research is certainly one of the world's leading creationists. A three-part series on the life and writings of J. J. Duyvene DeWit, a Dutch creationist biologist, appeared in this volume of the Quarterly (Verbrugge, 1984a; 1984b; 1985).

John Grebe, one of the original "team of ten" who founded the Creation Research Society, passed away in 1984. A brief memorial to him was written by Rusch (1985, p. 199). A note with an extensive quote from a book review highlighted the fact that Sir Isaac Newton was not a mechanist (Williams, 1985, p. 195). Two articles were featured which examined the religious beliefs of Charles Darwin (Rusch, 1984, pp. 37-39; Klotz, 1985, pp. 165-170). These treatises are now two chapters in the book, *Did Charles Darwin Become a Christian?* and both examine critically Darwin's so-called conversion experience.

Research Stations

After the Research Committee, represented by Lammerts, Howe and Williams, purchased a portion of the land on which the Van Andel Research Center presently is located, George Howe and John Meyer did an in-depth study of the locale. Howe's (1984, pp. 9-17) report on this trip covered the botany, zoology and research potential of the Chino Valley, Arizona area. A preliminary report on the shortgrass and tallgrass plant succession studies initiated in Oklahoma was authored by Hagberg and Smith (1984).

Biology

Ecology

Klotz (1984, pp. 6-8) explored the topic of a creationist environmental ethic. The balance of nature and the stewardship of man were examined.

Vitalism

Mechanism vs. vitalism was discussed briefly by Armstrong (1984a, p. 78). He suggested that creationists should renew their interest in the subject.

Evolution, Mutations, Selection

In a detailed article, Hedtke (1984, pp. 40-46) exposed the religious nature of evolutionary theorizing. Natural selection, mutations, punctuated equilibria and the works of Darwin, Lamarck and DeVries were covered. The author stated that ". . . true science, namely, experimentation and observation, is inseparably united with God" (p. 40). The topics of microevolution and megaevolution and their predictive value briefly were elucidated by Moore (1984a, pp. 49-50). The quandary of modern evolutionary thought on the subjects of natural selection, mutations, punctuated equilibrium and chance was presented (Armstrong, 1985, p. 195).

Botany

Lammerts (1984a, pp. 104-108) reviewed the previous plant succession work conducted by Lammerts and Howe (1974) and noted that no evidence for evolution was found. Only variation and degeneration were operative. Suggestions for more research were offered. The plant species examined were:

Eschscholzia California
Lupinus succulentus
Salvia carduacea
Orthocarpus purpurascens
Viola pedunculata

Zoology

The giant panda's thumb was employed to illustrate some defects in evolutionary reasoning (O'Hern, 1984,

*2895 Emerson Lake Drive, Snellville, GA 36278-6644.

p. 123). Alteration of behavior by parasites was shown to be a problem for evolutionists (Smith, 1984, p. 124). Ostrich feathers, flightless birds, evolutionary descent and creation were examined by Armstrong (1984b, pp. 124-125). Egg laying and the incubation of eggs from the standpoint of design vs. chance were the subjects of two notes (Thompson, 1985b, p. 195; Smith, 1985a, pp. 197-198). A fascinating account from the creationist perspective of the ability of a beetle to safely eat poisonous seeds was presented by Lammerts (1985, pp. 196-197). The "vision" of a group of legless amphibians was explored from a design viewpoint (Smith, 1985b, p. 198).

Astronomy and Physics

Some creationists had suggested that the model of the universe developed by Moon and Spencer should be examined as a basis for the short travel time of light. Akridge (1984, pp. 18-22) did so and concluded that the Moon and Spencer model of the universe is too dense and short-lived to be realistic. Another small scale universe model has been suggested by Byl (1988) and Humphreys (1994) recently has produced a model to account for "old light in a young universe." Mandock (1984, p. 22) noted the futility of using ultraviolet radiation from the sun as a means of generating complex molecular molecules on earth in origin of life discussions. In a beautifully reasoned essay, Schneider (1984, pp. 119-123) posed the question: Did the universe start out structured? Since structureless models such as the big bang offer little hope for success, he suggested that the universe initiated in a structured form and evidence was offered to support the claim.

Woodmorappe (1984, pp. 125) noted that the "missing mass" between galaxies is an inescapable problem for the concept of an old universe. Humphreys (1984, pp. 140-149), in the first of a series of papers, offered a creation model for planetary magnetic fields. Employing water as the raw material of creation, Humphreys claimed:

> God could have started magnetic fields in the solar system . . . by creating the original atoms of the planets with many of their nuclear spins pointing in the same direction. The small magnetic fields of so many atomic nuclei add up to fields large enough to account for the magnetism of the planets . . . (p. 140).

This interesting proposal deserves serious study.

Tom Barnes (1984a, pp. 56-62) reviewed his unified theory of physics using classical methods. Dr. Barnes has been a leader in the movement to return to classical physics as opposed to modern physical theory. Along the same line, he (1985, p. 186-189) developed a unique transformer analogue or the hydrogen atom.

"Ice Ages"

Michael Oard, who has proposed a postFlood warm "ice age" model, prepared an extensive series of articles critically examining the uniformitarian concepts of ice ages encompassing long periods of time (1984a, pp. 66-76; 1984b, pp. 125-137; 1985, pp. 170-181). Some of the topics covered were:

Astronomical theory of the ice ages
Milankovitch cycles
Atmospheric climate simulations
Glaciation of northeastern North America
Manipulation of deep-sea cores
Isotopic oxygen measurements
Dating methods
Paleomagnetic stratigraphy
Reinforcement syndrome

This extensive series offers many interesting concepts useful to creationists.

Age of the Earth

Three creationist scientists formulated excellent answers to the criticism of G. Brent Dalrymple against the young earth model and his intemperate attack on creationists in general (Barnes, 1984b, pp. 109-113; Kofahl, 1984, pp. 114-115; Woodmorappe, 1985, pp. 184-186). A note (Thompson, 1985a, p. 194) discussed the age of Meteor Crater, Arizona being reduced. DeYoung (1994) recently wrote an excellent article on this subject.

The Genesis Flood

A heterogeneous model of the Flood along with the survival of freshwater and saltwater organisms during the event was investigated by Smith and Hagberg (1984, pp. 33-37). An opinion on asteroidal impacts and their influence during the Flood was offered by Unfred (1984, pp. 82-87).

Geology

An outstanding examination of the so-called geologic column was given by Morton (1984, pp. 23-33). He proposed that global catastrophism best explains the existence of the various layers of rock. Hall (1984, pp. 76-78) claimed that the essentialist biological views of James Hutton require the necessity of a singular epoch of rapid geologic activity.

Carol Armstrong (1985 pp. 198-199) reported on the recent discovery of a fossil bed south of Tampa, Florida and she hinted at a possible catastrophic deposition of the remains. A bibliography of overthrust literature, printed to encourage creationists to study the phenomena, was given by Lammerts (1984b, p. 88; 1984c, p. 150; 1985b, p. 200).

Teaching Origins Concepts

John Moore, who has developed many educational ideas on the presentation of origins in the classroom, started his series in the Quarterly with an article entitled "Teaching about origin questions." He compared the creation and evolution concepts and discussed the meaning of science and scientific theories and hypotheses (1984b, pp. 115-119). The second in the series of educational columns by the same author explained how to teach about the origin of the universe (1985, pp. 189-194). This well-presented essay defined cosmology and cosmogony, the methods of each discipline, the comparison of the creation and evolution models and noting that cosmogonies are historical, not scientific theories.

This volume of the Quarterly contains considerable information of value to creation scientists. Also many book reviews and letters to the editor explore topics not mentioned in this review.

References

CRSQ—Creation Research Society Quarterly.

Akridge, G. R. 1984. The universe is bigger than 15.71 light years. *CRSQ* 21:18-22.

Armstrong, C. 1985. Florida fossils puzzle the experts. *CRSQ* 21:198-199.

Armstrong, H. 1984a. Vitalism: A neglected weapon? *CRSQ* 21:78.

_____. 1984b. Ostrich feathers and horse feathers. *CRSQ* 21:124-125.

_____ 1985. Natural selection questioned again. *CRSQ* 21: 195.

Barnes, T. G. 1984a. A unified theory of physics. *CRSQ* 21:56-62.

_____ 1984b. Earth's young magnetic age: An answer to Dalrymple. *CRSQ* 21:109-113.

_____ 1985. Transformer analogue of the hydrogen atom. *CRSQ* 21:186-189.

Byl, J. 1988. On small curved-space models of the universe. *CRSQ* 25: 138-140.

DeYoung, D. 1994. Age of the Arizona Meteor Crater. *CRSQ* 31:153-158.

Hagberg, S. C. and E. N. Smith. 1984. A report of activity on the Grasslands Experiment Station for 1983. *CRSQ* 21:62-66.

Hall, J. L. 1984. Huttonian biology and geologic upheaval. *CRSQ* 21:76-78.

Hedtke, R. 1984. The divine essence of evolutionary theorizing—an analysis of the rise and fall of evolutionary natural selection, mutation and punctuated equilibria as mechanisms of megaevolution. *CRSQ* 21:40-46.

Howe. G. F. 1984. A trip to the Grand Canyon Experiment Station. *CRSQ* 21:9-17.

Humphreys, D. R. 1984. The creation of planetary magnetic fields. *CRSQ* 21:140-149.

_____. 1994. Starlight and time: Solving the puzzle of distant starlight in a young universe. Master Books. Colorado Springs.

Klotz, J. W. 1984. A creationist environmental ethic. *CRSQ* 21:6-8.

_____ 1985. Darwin's religious beliefs. *CRSQ* 21:165-170.

Kofahl, R. E. 1984. One error of Dalrymple corrected. *CRSQ* 21: 114-115.

Lammerts, W. E. 1984a. Plant succession studies in relation to micro-evolution and the extinction of species. *CRSQ* 21:104-108.

_____. 1984b. Recorded instances of wrong-order formations or presumed overthrusts in the United States: A bibliography—Part I. *CRSQ* 21:88.

_____ 1984c. Recorded instances of wrong-order formations or presumed overthrusts in the United States: A bibliography—Part II. *CRSQ* 21:150.

_____ 1985a. A seed-eating beetle's adaptation to poisonous seeds. *CRSQ* 21:196-197.

_____1985b. Recorded instances of wrong-order formations or presumed overthrusts in the United States: A bibliography—Part III. *CRSQ* 21:200.

_____ and G. F. Howe. 1974. Plant succession studies in relation to micro-evolution. *CRSQ* 10:208-228.

Mandock, R. L. 1984. Ultraviolet light thrown onto origins? *CRSQ* 21:22.

Moore, J. N. 1984a. Flip side of creationism. *CRSQ* 21:49-50.

_____ 1984b. Teaching about origin questions. *CRSQ* 21:115-119.

_____ 1985. Teaching about origin questions: Origin of the universe. *CRSQ* 21:189-194.

Oard, M. J. 1984a. Ice ages: The mystery solved? Part I: The inadequacy of a uniformitarian ice age. *CRSQ* 21:66-76.

_____ 1984b. Ice ages: The mystery solved? Part II: The manipulation of deep sea cores. *CRSQ* 21:125-137.

_____ 1985. Ice ages: The mystery solved? Part III: Paleomagnetic stratigraphy and data manipulation. *CRSQ* 21:170-181.

O'Hern, P. D. 1984. Proof. *CRSQ* 21:123.

Rusch, Sr., W. H. 1984. Darwin's last hours revisited. *CRSQ* 21:37-39.

_____ 1985. In memoriam, John J. Grebe: 1900-1984. *CRSQ* 21:199.

Schneider, H. 1984. Did the universe start out structured? *CRSQ* 21:119-123.

Smith, E. N. 1984. Alteration of behavior by parasites—a problem for evolutionists. *CRSQ* 21:124.

_____. 1985a. To incubate an egg. *CRSQ* 21:197-198.

_____. 1985b To see or not to see. *CRSQ* 21:198.

_____ and S. C. Hagberg. 1984. Survival of freshwater and saltwater organisms in a heterogeneous Flood model experiment. *CRSQ* 21:33-37.

Thompson, III, W. I. 1985a. Meteor Crater has its youth restored (to some extent). *CRSQ* 21:194.

_____.1985b. Another mechanistic explanation (as well as the chicken) lays an egg. *CRSQ* 21:195.

Unfred, D. W. 1984. Asteroidal impacts and the Flood judgment. *CRSQ* 21:82-87.

Verbrugge, M. 1984a. The legacy of Duyvene DeWit for creationist biology: Part I—the man and his work. *CRSQ* 21:79-81.

_____ 1984b. The legacy of Duyvene DeWit for creationist biology: Part II—the folly of man and the works of the Lord. *CRSQ* 21:137-140.

_____ 1985. The legacy of Duyvene DeWit for creationist biology: Part III—the cosmonomic philosophy, a Christian alternative to evolutionism. *CRSQ* 21:182-184.

Williams, E. L. 1984. Dedication to Henry Madison Morris. *CRSQ* 21:3-4.

_____ 1985. Sir Isaac Newton not a mechanist? *CRSQ* 21:195.

Woodmorappe, J. 1984. The "missing mass" between galaxies: An inescapable problem for an old universe. *CRSQ* 21:125.

_____ 1985. A reply to G. Brent Dalrymple. *CRSQ* 21: 184-186.

Emmett L. Williams*

Quote

Psalm 72:5-8

5 He will endure as long as the sun, as long as the moon, through all generations.
6 He will be like rain falling on a mown field, like showers watering the earth.
7 In his days the righteous will flourish; prosperity will abound till the moon is no more.
8 He will rule from sea to sea and from the River to the ends of the earth.

BOOK REVIEW

Why I Believe in Creation by A. J. Monty White. 1994. Evangelical Press. Durham, England. 24 pages. $4.00.

Reviewed by Don B. DeYoung**

This short, popular summary of creation evidence is from well-known creationist Monty White. He holds a Ph.D. in chemistry, and speaks and writes widely on creation topics. Several good points are made: Nowhere in Scripture is there a hint that God used evolutionary methods of production (p. 4). The basic laws of thermodynamics are imbedded in Genesis 1:1 (p. 8). Stanley Miller's 1953 "origin of life" experiment is invalidated by either the presence or the absence of oxygen (p. 10). There is concise discussion of the origin of the universe, life, species, mankind, and fossils.

This booklet will be useful to those who seek a readable summary of creation evidence. A list of creation organizations appears in the back. Unfortunately Monty White does not include the Creation Research Society, which precedes all of the other organizations.

*5093 Williamsport Drive, Norcross, GA 30092-2124.
**Grace College, 200 Seminary Drive, Winona Lake, IN 46590.

MID AND HIGH LATITUDE FLORA DEPOSITED IN THE GENESIS FLOOD PART I: UNIFORMITARIAN PARADOX

MICHAEL J. OARD*

Received 17 November 1994; Revised 4 February 1995

Abstract

Paleofloras from mid and high latitudes indicate a warm, equable climate for the "Mesozoic" and "early Tertiary." Especially interesting are the warm-climate "forests" and subtropical fauna found on Axel Heiberg and Ellesmere Islands near 80°N latitude. Computer simulations indicate the Cretaceous and early Tertiary climate would be quite cold in winter at high latitudes and at mid latitudes within continental interiors. Several possible explanations for this uniformitarian paradox are reviewed and shown to be inadequate. This presents another contradiction to the uniformitarian paradigm in which it has been suggested that there was a temperate and long lasting "Tertiary" period.

Introduction

Fossilized trees, leaves, sticks, cones, and fruits, indicating a mild temperate to tropical climate, have been known from mid and high latitudes since the mid 1800s (Hickey, West, Dawson, and Choi, 1983). This warm-climate flora has been dated from the upper Devonian through the early Tertiary of the geological time scale (Creber and Chaloner, 1984). (I do not subscribe to the uniformitarian time scale, which is based mainly on dating from the fossil floras and faunas. Periods and eras are used for discussion purposes only.) The temperature indicated by the fossil floras is cooler in the late Tertiary, although temperatures remain significantly warmer than at present (Chaney, 1959; Hills and Ogilvie, 1970; Funder, Abrahamsen, Bennike, and Feyling-Hanssen, 1985; Clutter, 1985; Matthews, 1987; Cronin and Dowsett, 1993).

Since about 1980, sigificantly more paleofloras, as well as paleofaunas, have been discovered at high latitudes of both hemispheres. Even dinosaurs have been unearthed in Antarctica and near the Arctic Ocean in Alaska and Canada (Oard, 1995). Scientists are also analyzing the wood from fossil "forests" in more detail to learn about the paleoenvironment (Christie and McMillan, 1991a). At the same time, general circulation models of the atmosphere are becoming more sophisticated and being applied to Cretaceous and early Tertiary paleoclimates (Walker, 1993).

It is the purpose of this article to briefly describe the climatic implication of the paleofloras from mid and high latitudes. Special emphasis will be placed on the detailed analysis of the vertically stacked leaf and "forest" layers on Axel Heiberg Island in the Canadian Archipelago. The results of improved climate simulations for presumed past climates will be described. Part II of this article will present a creationist hypothesis to account for the uniformitarian paradox.

Climatic Implications from Mid and High Latitude Paleoflora of Western North America

Fossil wood, leaves, fruits, and cones are common at mid and high latitudes worldwide from the late Mesozoic to the early Tertiary (Creber and Chaloner, 1985). The late Tertiary is assumed to be a time of gradual cooling from the warm Cretaceous Period to the Ice Age. So locations that have cooler-climate floras, not associated with the warm-climate floras or index fossils from an earlier period, are often pigeonholed into the late Tertiary climate "bin." Evidence for this is indicated by the many instances where dates have changed from one period to another based on newer information or reanalysis. For instance, some flora have jumped from a brief warm period in the Miocene back to the warm Eocene or Paleocene, and vice versa (Axelrod, 1966; Wolfe, 1980, p. 318; Schweitzer, 1980; Axelrod, 1984, p. 106; Wolfe and Wehr, 1987). If the cool-climate paleofloras cannot be relegated to the late Tertiary, they are assumed to either occupy a short cool period in an otherwise long warm period, or to have grown at high altitude and been mixed with warm flora during mountain floods.

Warm-climate floras are abundant in western North America. For instance, Wolfe (1977) has documented an early Tertiary paleoflora from Alaska north of 60°N that contains palms, swamp cypress, mangroves, climbing vines, and other plants that now inhabit a warm, if not tropical climate. The characteristics of the leaves, based on comparisons between modern plants and the climate, such as the size and whether the leaf margin is smooth or toothed, also favor warmth (Wolfe, 1978, 1985, 1993). Cool climate plants also found in the area are assumed to occupy a cool period within the warm early Tertiary (Wolfe, 1985).

Wolfe believes the overall evidence points to an early Tertiary subtropical to nearly tropical paleoclimate in southern Alaska. Not only that, this same climate can be found throughout the remainder of Alaska, British Columbia, the United States, and Siberia (Wolfe, 1977, pp. 42, 45). The climate was also highly equable, which means there was little or very slight seasonal or diurnal change in temperature (Wolfe, 1978, p. 697).

The northwestern part of the United States is well known for its many Tertiary paleoflora sites (Beck, 1945; Chaney, 1959; Wolfe, 1968, 1971, p. 28; Meyer, 1973; Manchester, 1981, 1987; Wolfe and Wehr, 1987). Ginkgo Petrified Forest State Park at Vantage, Washington, records over 200 species of trees from the area. The paleofloras are found within basalt interbeds associated with pillow lavas. One of the trees is the Ginkgo tree (Figure l), which is a common fossil across the Northern Hemisphere over much of Mesozoic and Tertiary geological time. It was thought extinct for many years until found growing in China.

The most unusual aspect of Ginkgo Petrified Forest State Park is that trees and plants range from subtropical, such as *Eucalyptus,* to cool temperate, such as spruce and birch (Coffin, 1983, p. 213). This strange

*Michael J. Oard, M.S., 3600 7th Ave. South, Great Falls, MT 59405.

Figure 1. Ginkgo tree growing in creationist Ed Nafziger's back yard in Ephrata, Washington, near Ginkgo Petrified Forest State Park. Although originally found living in China, it obviously has a greater climatic range.

mix of climate types is explained by floods transporting high altitude trees down into low altitude swamps. This explanation is doubtful, since the floras are found within flat interbeds between layers of the Columbia River Basalt.

This mix of tropical and cool-climate paleofloras during the early Tertiary is seen at other locations of western North America Brown, 1962; MacGinitie, 1974; Wolfe, 1977). In the Ruby River area of southwestern Montana, swamp cypress and a tropical vine are found with pine, spruce, and fir (Becker, 1961). At Republic, Washington, a mild temperate paleoflora was found (Wolfe and Wehr, 1987). These cool-climate trees and plants are assumed to be from an "upland" area, similar to the explanation given for cool-climate trees at Vantage. However, of the estimated 450 species in the paleofloras found at Republic and nearby Princeton. British Columbia, some are from tropical climates (Wehr and Hopkins, 1994).

Other Mid and High Latitude Paleofloras

So far, I have briefly discussed warm-climate paleofloras from the mid latitudes of western North America. The pattern is typical for other areas of the Northern Hemisphere. During the early Tertiary, a wide tropical belt supposedly extended to 50° paleolatitude with warm-climate to tropical paleofloras found from 50° almost to the poles (Frakes, Francis, and Syktus, 1992). For instance, palms and mangroves are among the tropical fossils found in southern England (Collinson and Hooker, 1987). Palms and swamp cypress are found in the early Tertiary of Spitsbergen (Schweitzer, 1980). *Metasequoia* and swamp cypress have been discovered in the Queen Elizabeth Islands of northeast Canada (Christie and McMillan, 1991a). A number of petrified palm fruits have been unearthed in northwestern Greenland (Koch, 1963).

Fossil floras indicating a warm climate have recently been discovered in Antarctica. Jefferson (1980) found a paleoflora on Adelaide Island of the Antarctic Peninsula that indicated a temperate Cretaceous climate. Closer to the South Pole on Alexander Island, at 70°S latitude, a fossil "forest" was discovered (Jefferson, 1982). Several other localities on the Antarctic Peninsula have yielded fossil trees, including cycads that currently grow in a subtropical to tropical climate (Francis, 1986, p. 668). Pollen and sports from a variety of tropical plants and trees are abundant on the Antarctic Peninsula (Dettmann, 1989). In spite of the tropical to subtropical vegetation and pollen, the climate is said to be only temperate, although equable and wet (Jefferson, 1980, 1982; Dettmann, 1989)

The Cretaceous trees from Antarctica show wide growth rings that are often uniform. The ring widths from the wood on Alexander Island average about 2 to 3 mm. The largest width is about 10 mm. These are comparable to ring widths of living trees from the warm- to cool-temperate forests of Australasia (Francis, 1986, p. 678). Semitropical Queensland, Australia, where trees have an average ring width of 2.5 mm, is a suggested analog. The precipitation in that region averages 1.7 to 2.7 meters / year with a dry season that causes the rings.

Just as surprising is the recent discovery of a fossil "forest" in the Transantarctic Mountains at 84°S latitude (Taylor, Taylor, and Cúneo, 1992). These upright tree stumps were fossil dated as Permian. They are likely *Glossopteris* trees because the shale below the "forest" contains leaf impressions from this tree. The rings of the tree stumps averaged 4.5 mm and were as large as 11.38 mm! There is a large amount of early wood, little late wood, and no frost rings. The climate was deduced to be warm and equable.

Normally, *Glossopteris* is assumed to be a cool climate plant only because it is closely associated with ancient ice age "tillites" from the Southern Hemisphere. However, recent information suggests that the *Glossopteris* paleoflora is a warm, possibly tropical, paleoflora (Banerjee, 1990). If *Glossopteris* was a tropical or even a warm-temperate plant, the late Paleozoic "tillites," intimately associated with the *Glossopteris* paleoflora, likely are not hardened ice age tills, but large submarine mass flows (Molén, 1990; Oard, 1994).

In discussing fossil paleofloras, I have assumed the current latitude. If the assumed paleolatitude is considered, the Antarctic Peninsula is shifted to a lower latitude, but much of Australia and New Zealand would be included within the Antarctic polar circle. A large variety of Cretaceous fauna and flora, including abundant dinosaurs, have been found in southeast Victoria, Australia (Oard, 1995). The paleolatitude is assumed to be 70 to 85°S (Douglas and Williams, 1982). A mixture of climatic types is found, including the subtropical cycad tree. The conifers indicate no marked period of dormancy. Although Douglas and Williams interpret this data as supporting a warm temperate climate, much of the fauna and flora indicate at least a subtropical climate with rare freezing temperatures.

The abundant evidence for warmth at mid and high latitudes is extremely perplexing to uniformitarian scientists. Because of this conundrum, some uniformitarian scientists have tried to downplay the tropical aspect of the paleoflora (MacGinitie, 1974, p. 40; Axelrod, 1984; Horrell, 1991). Creber and Chaloner (1985, p. 38) state the implication of this warm mid and high latitude vegetation:

> Together with the broadening of the low-latitude belt there is a corresponding extension of fossil wood occurrences into very high northern and

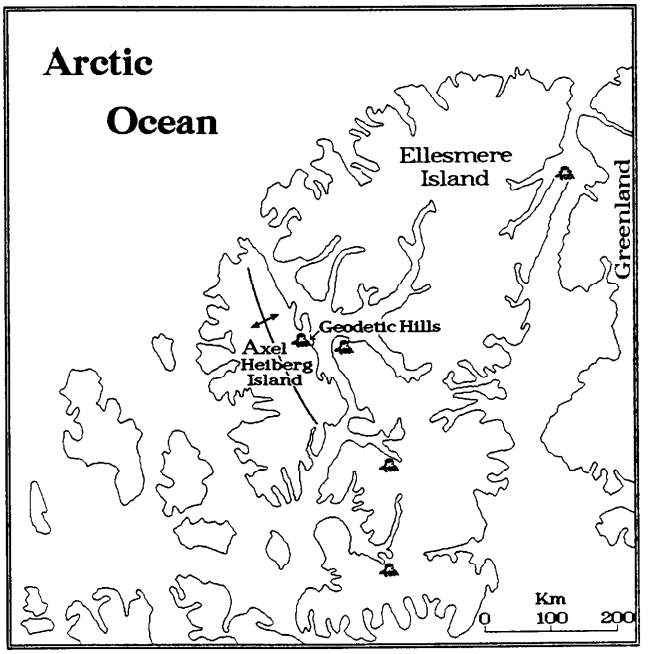


Figure 2. Map of Axel Heiberg and Ellesmere Islands showing locations of the Geodetic Hills stacked mummified "forests" and other "forests" found on Ellesmere Island. Sediments at the Geodetic Hills likely derived when anticline in central Axel Heiberg Island rose (Drawn by David Oard).

> southern palaeolatitudes where tree growth is not possible today in the climate that obtains in such high latitudes. Not only do the occurrences of fossil wood indicate the existence of very high latitude forests but the wide ring widths show that wood productivity was of a high order. . . . The ring widths of the modern plants are minute compared with those in the later Mesozoic and Early Tertiary at comparable latitudes. It is very evident that the climate of the latter geological periods must have been of a totally different character to have promoted such productivity demonstrated by the fossil woods.

Mummified "Forests" on Axel Heiberg Island

Perhaps the most perplexing fossil flora site for uniformitarian scientists is the mummified "forests" and leaf litters found on Axel Heiberg Island at 80°N latitude in the Queen Elizabeth Islands of Canada (Figure 2). The flora is exceptionally well preserved and well studied (Christie and McMillan, 1991a). The wood is not petrified and can be cut with an axe and burned. The upright trees are up to one meter high, waterlogged, and often hollow.

The largest trunk diameter is one meter, and the root mass flares to as much as several meters in diameter. There are also horizontal logs associated with the upright stumps. One horizontal log is 11.5 meters (m) long with little taper, indicating the tree was once much longer (Francis, 1991b, p. 34). Mummified fossil forests are also found on Ellesmere, Ellef Ringnes, and Amund Ringnes Islands (Francis, 1988, 1990, 1991a; Taylor, 1990; Felix, 1993). Not all of the wood in the Queen Elizabeth Islands is mummified; much of it is petrified (Riediger and Bustin, 1987; Francis, 1988).

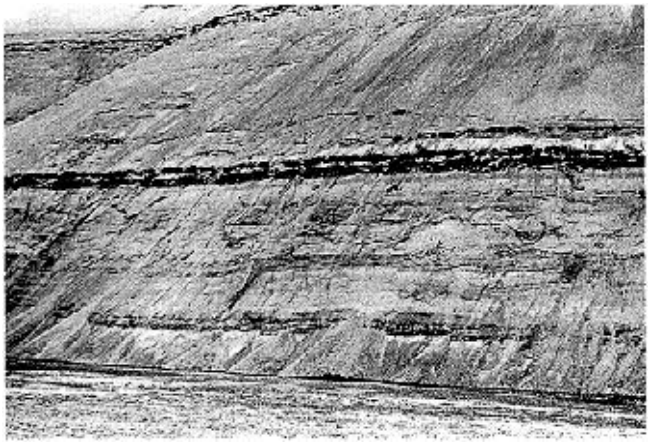


Figure 3. Fining-upward sandstone-coal (lignite) units in the upper coal members of the Eureka Sound Formation at the Geodetic Hills, eastern Axel Heiberg Island (photo by B. D. Ricketts, courtesy of the Geological Survey of Canada - GSC 1994-3301).

The "forests" in the Geodetic Hills of eastern Axel Heiberg Island are located in the upper portion of the Eureka Sound Formation. This formation is a 3,300 meter thick unit that changes facies from conglomerate in central Axel Heiberg Island to interbedded mudstone, siltstone, sandstone, and "coal" in the east (Miall, 1986; Riediger and Bustin, 1987; Ricketts, 1991). The conglomerate likely was eroded during the uplift of the Princess Margaret Arch, shown as a generally north-south anticline on Figure 2 in the central part of the island. Paleocurrent directions are toward the east and southeast in eastern Axel Heiberg Island (Ricketts, 1991, p. 15). The eastern facies are generally unconsolidated and really should be called sand, silt, and clay (Tarnocai and Smith, 1991, p. 175).

In the Geodetic Hills, there are 50 "coal" beds in a 120 meter vertical section (Ricketts, 1991). However, some investigators recognize only about 20 to 30 "coal" beds. Figure 3 shows about six of these "coal" seams separated by sandstone and finer-grained layers. You can see that a case can be made for more than six, depending on whether one counts the beds that split into two or more beds due to mudstone interbeds.

The "coal" beds, also called lignite (a weakly developed coal), are actually compressed peat (Tarnocai and Smith, 1991, p. 175). The peat beds vary from a few centimeters to 1.5 m thick and can be traced up to 5 km with little change in thickness (Ricketts, 1991). On neighboring Ellesmere Island, 26 "coal" seams, one as much as 45 m thick. occur in a 434 m section (Miall, 1986, p. 249).

The hundreds of mummified upright tree stumps are found in only a few of the upper peat beds on Axel Heiberg Island. These vertically stacked "forests" bring to mind the multiple fossil "forests" in Yellowstone National Park (Coffin, 1983). Bustin (1982, p. 146) thought most of the peat was allochthonous (transported), but the upright tree stumps persuaded investigators that the peat beds were autochthonous (grew in place). See a creationist discussion of allochthonous vs autochthonous deposition of fossil wood in Williams, 1993, pp. 110-111.

The Eureka Sound Formation is dated as late Cretaceous and early Tertiary. However because of a diag-

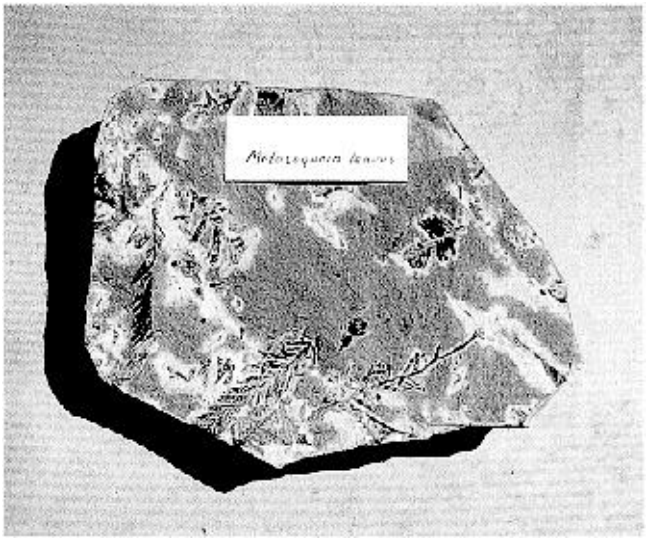


Figure 4. Fossil needles of *Metasequoia* from Ginkgo Petrified Forest State Park, Vantage, Washington Ed Nafziger's fossil collection).

nostic spruce cone, the upper part of the formation, near where the fossil forests are found. was once considered Miocene and early Pliocene. Bustin (1982, p. 140) states:

> The occurrence of abundant cones of *Picea banksii*, together with the microflora in these deposits, however, clearly indicates they are correlative with the upper member of the Beaufort Formation on northern Banks Island and on Meighen Island and are of Miocene (?)early Pliocene age . . . [emphasis mine].

The spruce, *Picea banksii,* is considered an index fossil, dating layers as in the upper Beaufort Formation of Miocene and Pliocene age in the Canadian Arctic Islands (Hills and Ogilvie, 1970). The Beaufort Formation, found mainly in the western Queen Elizabeth Islands, contains fossil wood, seeds, and nuts of at least 95 vascular plants and trees, many of which come from modern climates much farther south (Matthews, 1987). Lithologically, the Beaufort and Eureka Sound Formations are very similar (Christie and McMillan, 1991b, p. xiv). Thus, the two formations are simply separated subjectively by index fossils (West, Dawson, Hickey, and Miall, 1981, p. 294; Hickey, West, Dawson, and Choi, 1983; Matthews, 1987, p. 83). The fossil forests of the Geodetic Hills are now considered Eocene, based on palynology, although spruce cones that look like *Picea banksii* are found in the leaf litters (Basinger, 1991, pp. 62, 63).

Because of plant fossils, the Eureka Sound Formation was long considered exclusively nonmarine in origin, until Dawson, West, Ramaekers, and Hutchison (1975) found marine fossils, including crinoids, foraminifera, and dinoflagellates. Marine fossil specimens are now relatively common (Riediger and Bustin, 1987). This indicates that a large portion of the formation is marine in origin. The marine fossils also give us a clue to the environment of formation of the fossil "forests."

An analysis of the well preserved leaves, cones, fruits, twigs, and upright stumps in the Geodetic Hills indicates the climate was much warmer and wetter than the present polar climate. The macroflora in the peat, as well as most of the upright stumps, is predominantly from the deciduous conifers *Metasequoia* and *Glyptostrobus.* The *Metasequoia* (Figure 4), like the Ginkgo tree, is a very common fossil tree found in the Cretaceous and Tertiary of the Northern Hemisphere. It was also thought extinct, but was found in a remote area of south central China, where the climate is mild with wet summers and very little winter frost (Chu and Cooper, 1950). *Glyptostrobus* is the swamp cypress and indicates a warm climate. The tree rings in the stumps are large, typically 3 mm wide with a maximum of 10 mm, and show little or no indication of stress (Francis, 1990; Greenwood and Basinger, 1993, p. 1919). An analog for the environment and climate on Axel Heiberg Island is the cypress swamps of the Alabama wetlands (Francis, 1991b, p. 34) or the Florida Everglades (Francis, 1991a, p. 60).

Analysis of macroscopic plant remains and pollen in the peat beds indicates the presence of hickory, maple, elm, ash, alder, birch, beech, oak, pine, spruce, fir, larch, cedar, hemlock, and katsura (Frances, 1990; Basinger, 1991; McIntyre, 1991). Most of these plants and trees grow in a temperate to warm temperate climate (McIntyre, 1991, p. 86). The spruce, larch, and white pine generally grow in cool to temperate climates (Obst et al., 1991, p. 141). So there is a mixture of plants and trees from different climates (Greenwood and Basinger, 1993, p. 1921). Thus, the climate deduced from the paleoflora of the Geodetic Hills fits with the early Tertiary paleoclimate from other areas of the high latitudes of the Northern Hemisphere (Basinger, 1991, p. 40).

Vertebrate fossils unearthed from the Eureka Sound Formation on west central Ellesmere Island include varanid lizards, snakes, salamanders, tortoises, alligators, birds, and several mammals, including rodents, horses, and brontothere (West, Dawson, and Hutchison, 1977; Estes and Hutchison, 1980; McKenna, 1980; Francis, 1988, p. 315). The mammals also include abundant flying lemurs, which need a year-round supply of seeds and fruits in the trees, implying above freezing conditions all through winter. The fossil fauna is further reason the "forest" beds are now placed in the Eocene upper Eureka Sound Formation and not in the Beaufort Formation (Ricketts, 1991, p. 3). The fossil vertebrates reinforce the conclusion of an equable climate, but also indicate it was more subtropical or tropical than temperate (Brattstrom, 1961; McKenna, 1980; Estes and Hutchison, 1980; Francis, 1988). Basinger succinctly sums up the climatic implication of this paleoflora and paleofauna: "There was no frost" (Pearce, 1992, p. 6).

The present mostly frozen terrain is barren with only a few dwarf willows that grow a few centimeters high in summer. The current annual average temperature for the area is estimated to be -20°C with a yearly precipitation of only 6.5 cm (Tarnocai and Smith, 1991, p. 172). The average temperature of the coldest month is -38°C (Pearce, 1992). At that average, minimum temperatures likely average around -45°C. The extreme minimum temperature, therefore, is probably around -55°C, the difference between the extreme minimum temperature represented by the Eureka Sound paleoflora and paleofauna and the present temperature is about 55°C!

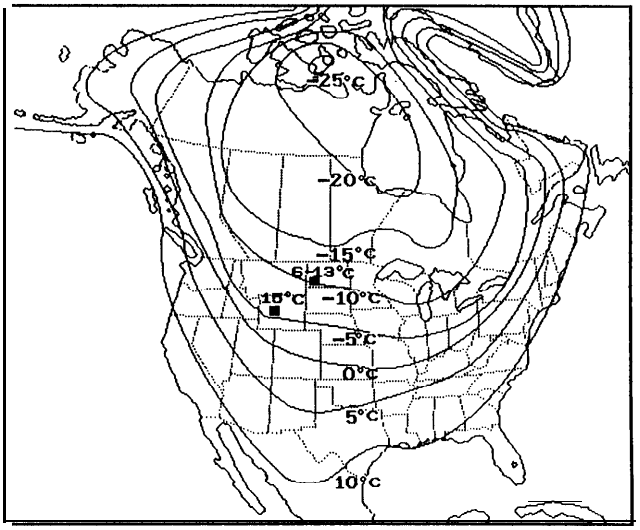


Figure 5. Simulated minimum January surface temperature for the Eocene of North America using polar sea-surface temperatures 6 to 12°C warmer than today with low topography. Minimum surface temperature from Eocene paleoflora indicated for western Wyoming and North Dakota (Redrawn from Sloan and Barron (1992) by David and Nathan Oard).

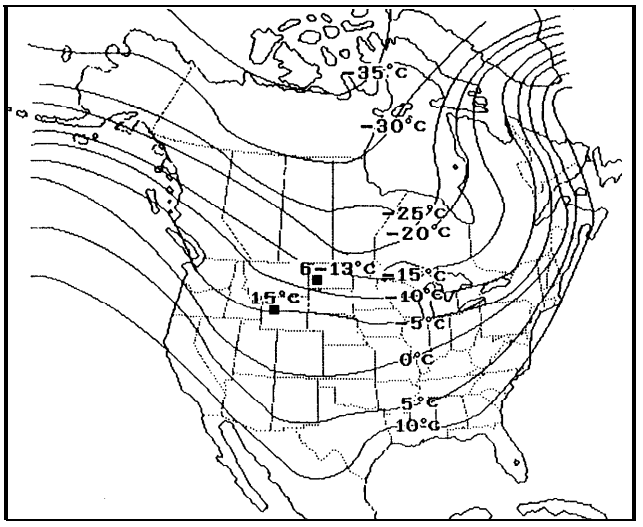


Figure 6. Same as Figure 5, except for present-day sea-surface temperatures (Redrawn from Sloan and Barron (1992) by David and Nathan Oard).

Computer Simulations Indicate Cold Winters

Uniformitarian scientists talk often about a warm Cretaceous and early Tertiary at mid and high latitudes. But is such a climate possible? To test this possibility, climatologists have tried to model the paleoclimate with presumed Cretaceous and early Tertiary geography. The GENESIS model, run by Sloan and Barron (1990, 1992), has seasonably varying solar radiation and a mixed-layer ocean submodel. So the recent climate models are much improved over the older versions.

Sloan and Barron are sympathetic to the concerns of the paleobotanists. Thus, they have tried to simulate the presumed early Eocene January climate using favorable sea-surface temperatures and low continental altitudes. Figure 5 shows the simulated average January minimum temperatures over North America for the Eocene with low continental altitude and with polar ocean temperatures 6 to 12°C warmer than at present. This compares with the computer simulation with current polar ocean temperatures in Figure 6. As can be seen, warmer polar oceans significantly warmed northern Canada. However, January temperatures over large areas of interior Canada were colder than -15°C. The model is known to be 7°C too cool in some areas within the continental interior (Sloan and Barron, 1992, p. 485). However, they do not believe this model bias for local areas is significant for their conclusions.

Figures 5 and 6 both show quite cold January temperatures in the northern United States. January minimum temperatures generated by the GENESIS model compare to the calculated minimum temperatures from the fossils of 6 to 13°C for western North Dakota and 15°C for western Wyoming. The fossil temperatures were based on both the paleoflora and paleofauna (MacGinitie, 1974; Hickey, 1977; Wing and Greenwood, 1993; Wing, 1994). For instance, there are Eocene crocodiles, large tortoise that cannot hibernate, tree ferns, and palm fossils in Wyoming and Montana (Brattstrom, 1961; Kerr, 1993; Wing and Greenwood, 1993). A new analysis of fossil crocodiles in the United States and southern Canada shows crocodiles are found as far north as extreme southern Alberta or Saskatchewan in the Eocene, as well as in the Miocene (Hutchison, 1982; Markwick, 1994). The above warm-climate fossils constrain the paleoclimate of interior North America to at least a mild climate with rare frost (Wing and Greenwood, 1993, p. 245). Both Eocene climate simulations, on the other hand, simulated temperatures of -10°C for North Dakota and -6°C for Wyoming. Simulated annual precipitation for western North Dakota was about 50 cm/yr, while the paleoflora suggested 129 cm/yr (Sloan and Barron, 1992, p. 198).

In analyzing the cold Eocene temperatures under favorable boundary conditions, Sloan and Barron (1990, 1992) conclude that January temperatures in continental interiors depend only weakly on sea-surface temperature and altitude. The cold, dry winter temperatures at high and mid latitudes within continental interiors depend primarily on the *lack of sunlight*, and there does not appear to be anything that can be done about it. Thus, Sloan and Barron (1990, p. 489) see little hope for resolving the contradiction between the paleofloras and paleoclimate:

> Eocene and Cretaceous climate-model experiments demonstrate that regardless of conditions of warm polar oceans, differences in pole-to-equator surface-temperature gradient, or topography, above freezing temperatures in winter for continental interiors at middle to high latitudes cannot be maintained.

Of course, paleobotanists cannot accept this conclusion. They believe there is something drastically wrong with the climate simulations. Paleobotanist Bruce Tiffney insists the climate models are wrong: "The models don't match the data we've got. The modellers have missed something, and its time we brought them to heel" (Pearce, 1992, p. 6). Could it be that the models are basically correct and the paleobotanists are operating with a defunct uniformitarian model?

Uniformitarian Attempts to Solve the Contradiction

Uniformitarian scientists have brought forth several proposed solutions to the contradiction. Some have suggested increasing greenhouse gases, such as CO_2, in the climate models by up to 10 times current levels. However, increased CO_2 will not help because high CO_2 concentrations are already implicit in the Sloan and Barron model by the higher polar sea-surface temperatures. Besides, increased greenhouse gases would likely cause the tropics to overheat (Barron and Washington, 1985; Wing, 1994, p. 2).

One obvious possibility is that the paleofloras could have floated to mid and high latitude. Uniformitarian scientists, therefore, would not be constrained to postulate a warm climate at polar latitude. They reject this idea because the upright fossil trees and the fresh leaves, cones, and fruits force them to believe the floras grew in place.

One possible explanation is that the flora "floated" to higher latitudes from low latitudes on crustal plates. However, plate tectonics is of little help. The paleolatitude of Antarctica supposedly has changed little since the Permian. Although the Antarctic Peninsula supposedly was at lower latitude during the Cretaceous, Australia and New Zealand were within the Antarctic circle (Douglas and Williams, 1982). More land would produce cooler polar temperatures. According to plate tectonics, Axel Heiberg and Ellesmere Islands had an Eocene paleolatitude of between 74 and 80°N, not much different from the present (Irving and Wynne, 1991). The presumed paleolatitude of Alaska during the late Mesozoic and early Tertiary presumably was 70 to 75°N, about 10° farther north (Wolfe, 1985)! The mid latitudes of North America have changed little since the Cretaceous (Wolfe, 1985).

Some have suggested that Alaska is a patchwork of "exotic" microplates or terranes, plastered there by the northward moving Pacific plate. Thus, they claim the warm climate vegetation originated at low latitude. Wolfe (1977, pp. 36, 37; 1978, p. 698) believes that this plastering of microplates occurred before the Tertiary. Wolfe (1985, p. 362) also states that the geologic and paleontologic data do not support the Yakutat microplate being at low latitude during the warm early Eocene. Besides, the warm climate vegetation is found in many other areas of the mid and high latitude of the Northern Hemisphere, most notably Axel Heiberg and Ellesmere Islands. Wing (1994, p. 1) admits that drifting continents are no help:

> In the succeeding decades, however, it has become clear that many of the occurrences of warm-adapted lineages in regions that presently have cold climates are not explained by drifting continents.

Another possibility for solving the problem of warm-climate vegetation at mid and high latitude is that the continents contained more lakes or inland seas that would moderate the climate. The Mesozoic "inland sea" should have helped warm the Cretaceous climate in the simulation. This apparently did not help. When the GENESIS model was run with presumed Cretaceous geography, it produced a mean global cooling of about 0.2 C below today's average (Walker, 1993)!

The "inland sea" of middle North America likely is of little help for the Eocene simulation, since it mostly was dry by that time. Sloan and Barron suggest that large lakes could explain the warm Eocene Wyoming paleoflora. Recently, Sloan (1994) has published a paleoclimate simulation with a large lake that makes up the Eocene Green River Formation in northeast Utah, northwest Colorado, and southwest Wyoming. She also included simulations with two and six times the pre-industrial CO_2 level, and one and one half times the current northward oceanic heat transport. The simulation with six times the CO_2 level did confine below freezing January temperatures to Canada. However, nothing was said about overheating the tropics. The addition of the large lake with twice the CO_2 and one and one half times the current oceanic heat transport did manage to warm the January minimum temperatures above freezing around the lake and a little downwind to the east. However, the model was still 10°C too cool compared to the fossils found at those locations.

Sloan's model has too crude a grid, which is 4.5° in latitude by 7.5° in longitude, to accurately simulate lakes. The lake occupied roughly two grid points in the simulation, which is too large and about four times the size of one of today's Great Lakes (Valdes, 1994). The area of the Eocene Lake is only supposed to be 25,000 km^2, which is much smaller than the combined area of the Great Lakes, which is about an order of magnitude larger. The Great Lakes ameliorate winter climate some around the lakes, but temperatures are still quite cold and snowfall high in winter. I would expect the net effect of the lakes represented by the Green River Formation to be small and only near the lake. Besides, there are warm-climate Eocene paleoflora and paleofauna that are quite far from the Green River Formation, for instance in western North Dakota, southern Alberta, and southern Saskatchewan. They all could not be adjacent to large lakes. There is also the uniformitarian problem of no Arctic Ocean during the Eocene that would have modified the mid and high latitude climate (Wolfe, 1985, p. 363).

Some have suggested a reduced tilt of the earth's axis as a solution to the problem (Wolfe, 1978, 1980; Douglas and Williams, 1982). Barron (1984) has shown from climate simulations that a low axial tilt causes a cooler climate at high latitudes, not a warmer climate. This is because total annual solar radiation would be reduced. It is the 23.5° tilt of the earth's axis that causes a warmer polar climate.

Scott Wing (1994) dismisses other possibilities for explaining a much warmer climate. For instance, evolving climatic tolerances of plants and animals does not work: "It appears that evolving climatic preferences do not explain 'misplaced' tropical plants and animals" (Wing, 1994, p. 1). More efficient poleward heat transport by the oceans and atmosphere, reduced polar elevation, no polar ice, and higher sea levels are not strong enough to overcome strong cooling during winter darkness (Wing, 1994, p. 2). He concludes: "The problem of equable climates at high latitudes has become a central paradox in paleoclimatology." (1994, p. 12)

Uniformitarian Explanation for the Axel Heiberg "Forests"

Investigators, tied to uniformitarian explanations, postulate the trees on Axel Heiberg Island grew in anaerobic swamps on a meander flood plain. They also claim a paleosol below the leaf litter as evidence the trees grew in situ, even though the stumps rarely penetrate this "paleosol." The trees first died and then the part above water rotted away. Then, periodically a large flood would come along and rapidly bury the forests and their leaf litter with sand and mud (Ricketts, 1991, p. 21; Basinger, 1991, p. 46). Basinger (1986, p. 35) writes:

> Far rarer, though, were catastrophic events that could preserve an entire forest. Such events could only have been floods of immense proportions. carrying huge quantities of sediment into river systems and spilling out over the flood plain, rapidly burying the lowland swamp forests beneath a suffocating blanket of silt.

There are many serious problems with this hypothesis. One problem is that a giant flood would also have buried trees taller than one m that had not yet died. A second problem is that there are many horizontal logs up to 10 m long that had not yet rotted. A third problem is the paleoflora of the leaf litter indicates many other types of trees that do not normally grow well in swamps. A fourth reason contrary to the uniformitarian scenario is that the leaf litter was not eroded, since the thickness of each layer is generally uniform. The postulated floods would indeed be gigantic because they start out depositing thick three-dimensional conglomerate in the west that fines eastward. The thickness of the flood sediments over the peat layers varies, but is up to about 10 m thick. A flood that deposits this much sediment would be so substantial that it should bury trees taller than one m. Why are all the tree stumps a meter or less in height?

It is also doubtful the layers underlying the peat layers are really paleosols. "Paleosols" are commonly claimed in the geological literature (Wright, 1986). It seems to me these claims are specious and are based on uniformitarian assumptions (Oard, 1990, p. 149-159). In other words, since plants obviously grow in soils, buried soils are *automatically* assumed whenever plant remains are found.

In the Geodetic Hills the peat layers are assumed to be the A layer of a soil profile. So the layer below each leaf litter is automatically a B horizon. This "paleosol" was analyzed by Tarnocai and Smith (1991). After mentioning how difficult it is to distinguish ancient pedological features from those formed by geochemical effects in a layer, they list seven criteria used to determine a buried soil. According to them, if any *one* of these features is present, the layer is defined as a paleosol! Just the fact there is a leaf layer above a fine-grained sediment qualifies the sequence as a paleosol. No wonder there are so many claimed paleosols in the geological literature!

However, one criterion especially disqualifies the Geodetic Hills sequence as a series of vertically stacked paleosols. There is no gradation in the degree of decomposition in the leaf litter with depth (Basinger, 1991, p. 43). Christie and McMillan (1991b, p. xiii) express their surprise: ". . . why did the organic matter not rot, oxidize, or petrify during the approximately 45 million years it has awaited exposure in today's Geodetic Hills [sic]?"

Summary

I have mentioned the abundant evidence of paleofloras from warm, even tropical, climates that predominates at mid and high latitudes. Special attention was given to the intriguing succession of fossil mummified "forests" and their attendant leaf litters on Axel Heiberg Island. The paleoflora, as well as the warm-climate paleofauna, speak of a climate in which wintertime minimum temperatures would have been 55°C warmer than now. Climate simulations, using assumed Eocene geography, a warm polar ocean, and low altitude indicated that warmth was not likely at high latitudes nor at mid latitudes within continental interiors. The uniformitarian mechanism for depositing the Geodetic Hills "forests" and leaf litters and other mid latitude paleofloras falls far short.

In Part II I will suggest that the warm climate paleofloras were deposited from floating plant debris during the Genesis Flood. The repeating "forests" and leaf litters on Axel Heiberg Island can also be explained by this model, which is an application of the floating log mat model developed by John Woodmorappe (1978), Harold Coffin (1983), and Steve Austin (1987).*

Acknowledgments

I thank my sons, David and Nathan Oard, for drawing Figures 2, 5 and 6. Special thanks go to Mr. Peter Klevberg for reviewing the final draft and to two anonymous reviewers for their suggestions to an earlier draft.

References

CRSQ—Creation Research Society Quarterly.

Austin. S. A. 1987. Mount St. Helens and catastrophism. in Proceedings of the First International Conference on Creationism, Volume I. Pittsburgh. pp. 3-9.

Axelrod, D. I. 1966. Potassium-argon ages of some western Tertiary floras. *American Journal of Science* 264:497-506.

_____ 1984. An interpretation of Cretaceous and Tertiary biota in polar regions. *Palaeogeography, Palaeoclimatology, Palaeoecology* 45:105-147.

Banerjee. M. 1990. Glossopterid leaves, fertile organs, their earliest occurrence, distribution in time and space and remarks on environment, in H. Ulbrich and A. C. Rocha Campos (Editors), Gondwana Seven Proceedings. Instituto de Geociencias. Universidade de Sao Paulo. Sao Paulo, Brazil. pp. 483-502.

Barron, E. J. 1984. Climatic implications of the variable obliquity explanation of Cretaceous-Paleocene high-latitude floras. *Geology* 12:595-598.

_____ and W. M. Washington. 1985. Warm Cretaceous climates: High atmospheric CO_2 as a plausible mechanism, in E. T. Sundquist and W. S. Broecker (Editors). The carbon cycle and atmospheric CO_2: Natural variations Archean to present. Geophysical Monograph 32. American Geophysical Union. Washington D.C. pp. 546-553.

Basinger, J. F. 1986. Our 'tropical' Arctic. *Canadian Geographic* 106:28-37.

_____.1991. The fossil forests of the Buchanan Lake Formation (early Tertiary), Axel Heiberg Island, Canadian arctic archipelago: preliminary floristics and paleoclimate, in R. L. Christie

*Editor's Note: Readers may be interested in a recent series on petrified and charcoalified wood that appeared in the Quarterly as well as the paleoenvironmental conclusions reached in this series. Williams and Howe, 1993, Part I; Williams, 1993, Part II; Williams et al., 1993, Part III; Williams et al. 1995, Part IV.

and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 39-56.

Beck, G. F. 1945. Ancient forest trees of the sagebrush area of central Washington. *Journal of Forestry* 43:334-338.

Becker, H. F. 1961. Oligocene plants from the upper Ruby River Basin, southwestern Montana. Geological Society of America Memoir 82. Boulder, CO.

Brattstrom, B. H. 1961. Some new fossil tortoises from western North America with remarks on the zoogeography and paleoecology of tortoises. *Journal of Paleontology* 35:543-560.

Brown. R. W. 1962. Paleocene flora of the Rocky Mountains and Great Plains. U.S. Geological Survey Professional Paper 375. U.S. Government Printing Office. Washington D.C.

Bustin, R. M. 1982. Beaufort Formation, eastern Axel Heiberg Island, Canadian arctic archipelago. *Bulletin of Canadian Petroleum Geology* 30:140-149.

Chaney, R. W. 1959. Miocene floras of the Columbia Plateau: Part I. composition and interpretation. Carnegie Institution of Washington Publication 617. Washington D.C. pp. 1-134.

Christie, R. L. and N. J. McMillan (Editors). 1991a. Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa.

_____ 1991b. Introduction, in R. L. Christie and N. J. McMillan (Editors), Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. xiii-xvi.

Chu, K-L. and W. S. Cooper. 1950. An ecological reconnaissance in the native home of *Metasequoia glyptostroboides. Ecology* 31: 260-278.

Clutter, T. 1985. The Clarkia fossil bowl. *American Forests* 91(2): 22-25.

Coffin, H. G. 1983. Origin by design. Review and Herald Publishing Association. Washington D.C.

Collinson. M. E. and J. J. Hooker. 1987. Vegetational and mammalian faunal changes in the Early Tertiary of southern England, in E. M. Friis. W. G. Chaloner. and P. R. Crane (Editors), The origins of angiosperms and their biological consequences. Cambridge University Press. Cambridge. pp. 259-303.

Creber, G. T. and W. G. Chaloner. 1984. Influence of environmental factors on the wood structure of living and fossil trees. *The Botanical Review* 50:357-448.

_____. 1985. Tree growth in the Mesozoic and Early Tertiary and the reconstruction of palaeoclimates. *Palaeogeography, Palaeoclimatology. Palaeoecology* 52:35-60.

Cronin, T. M. and H. J. Dowsett. 1993. PRISM—warm climates of the Pliocene. *Geotimes* November: 17-19.

Dawson, M. R., R. M. West, P. Ramaekers, and J. H. Hutchison. 1975. New evidence on the palaeobiology of the Eureka Sound Formation, Arctic Canada. *Current Issues in Zoology* 28:110-116.

Dettmann, M. E. 1989. Antarctica: Cretaceous cradle of austral temperate rainforests? in J. A. Crame (Editor), Origins and evolution of the Antarctic biota. Geological Society of London Special Publication No. 47. London. pp. 89-105.

Douglas, J. G. and G. E. Williams. 1982. Southern polar forests: the early Cretaceous floras of Victoria and their palaeoclimatic significance. *Palaeogeography, Palaeoclimatology, Palaeoecology* 39:171-185.

Estes, R. and J. H. Hutchison. 1980. Eocene lower vertebrates from Ellesmere Island, Canadian Arctic Archipelago. *Palaeogeography, Palaeoclimatology, Palaeoecology* 30:225-247.

Felix, C. 1993. The mummified forests of the Canadian arctic. *CRSQ* 29:189-191.

Frakes, L. A., J. E. Francis, and J. I. Syktus. 1992. Climate modes of the Phanerozoic. Cambridge University Press. New York.

Francis, J. E. 1986. Growth rings in Cretaceous and Tertiary wood from Antarctica and their palaeoclimatic implications. *Palaeontology* 29, Part 4:665-684.

_____.1988. A 50-million-year-old fossil forest from Strathcona Fiord. Ellesmere Island. arctic Canada: evidence for a warm polar climate. *Arctic* 41:314-318.

_____. 1990. Polar fossil forests. *Geology Today* 6:92-95.

_____. 1991a. Arctic Eden. *Natural History* 100(1):57-64.

_____. 1991b. The dynamics of polar forests: Tertiary fossil forests of Axel Heiberg Island, Canadian arctic archipelago, in R. L. Christie and N. J. McMillan (Editors), Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 29-38.

Funder, S., N. Abrahamsen, O. Bennike, and R. W. Feyling-Hanssen. 1985. Forested Arctic: evidence from North Greenland. *Geology* 13:542-546.

Greenwood D. R. and J. F. Basinger. 1993. Stratigraphy and floristics of Eocene swamp forests from Axel HeiberG Island, Canadian arctic archipelago. *Canadian Journal of Earth Sciences* 30:1914-1923.

Hickey, L. J. 1977. Stratigraphy and Paleobotany of the Golden Valley Formation (Early Tertiary) of western North Dakota. Geological Society of America Memoir 150. Boulder, CO.

Hickey, L. J., R. M. West, M. R. Dawson, and D. K. Choi. 1983. Arctic terrestrial biota: paleomagnetic evidence of age disparity with mid-northern latitudes during the Late Cretaceous and Early Tertiary. *Science* 221:1153-1156.

Hills, L. V. and R. T. Ogilvie. 1970. *Picea banksii n. sp.* Beaufort Formation (Tertiary), northwestern Banks Island, arctic Canada. *Canadian Journal of Botany* 48:457-464.

Horrell, M. A. 1991. Phytogeography and paleoclimatic interpretation of the Maestrichtian. *Palaeogeography, Palaeoclimatology, Palaeoecology* 86:87-138.

Hutchison, J. H. 1982. Turtle, crocodilian, and champosaur diversity changes in the Cenozoic of the north-central region of western United States. *Palaeogeography, Palaeoclimatology, Palaeoecology* 37:149-164.

Irving, E. and P. J. Wynne. 1991. The paleolatitude of the Eocene fossil forests of arctic Canada, in R. L. Christie and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 209-211.

Jefferson, T. H. 1980. Angiosperm fossils in supposed Jurassic volcanogenic shales. Antarctica. *Nature* 285:157-158.

_____ 1982. Fossil forests from the Lower Cretaceous of Alexander Island, Antarctica. *Palaeontology* 24, Part 4:681-708.

Kerr, R. A. 1993. Fossils tell of mild winters in an ancient hothouse. *Science* 261:682.

Koch, B. E. 1963. Fossil plants from the lower Paleocene of the Agatdalen (Angmartussut) area, central Nugssuaq Peninsula, Northwest Greenland. *Meddelelser Om Gronland* 172(5):1-120.

MacGinitie, H. D. 1974. An early middle Eocene flora from the Yellowstone-Absaroka volcanic province, northwestern Wind River Basin, Wyoming. University of California Publications in Geological Sciences 108:1-103.

Manchester, S. R. 1981. Fossils plants of the Eocene Clarno Nut Beds. *Oregon Geology* 43(6):75-81.

_____ 1987. Oligocene fossil plants of the John Day Formation, Fossil, Oregon. *Oregon Geology* 49(10):115-127.

Markwick, P. J. 1994. "Equability," continentality, and Tertiary "climate": The crocodilian perspective. *Geology* 22:613-616.

Matthews, Jr., J. V. 1987. Plant macrofossils from the Neogene Beaufort Formation on Banks and Meighen Islands, District of Franklin. Geological Survey of Canada Paper 87-1A. Ottawa. pp. 73-87.

McIntyre, D. J. 1991. Pollen and spore flora of an Eocene forest, eastern Axel Heiberg Island, N.W.T, R. L. Christie and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 83-97.

McKenna, M. C. 1980. Eocene paleolatitude, climate, and mammals of Ellesmere Island. *Palaeogeography, Palaeoclimatology, Palaeoecology* 30:349-362.

Meyer, H. 1973. The Oligocene Lyons flora of northwestern Oregon. *The Ore Bin* 35(3):37-51.

Miall, A. D. 1986. The Eureka Sound Group (upper Cretaceous-Oligocene). Canadian Arctic Islands. *Bulletin of Canadian Petroleum Geology* 34:240-270.

Molen, M. 1990. Diamictites: ice-ages or gravity flows? in Proceedings of the Second International Conference on Creationism. Volume II. Pittsburgh. pp. 177-190.

Oard, M. J. 1990. An ice age caused by the Genesis Flood. Institute for Creation Research. El Cajon, CA.

_____ 1994. Submarine mass flow deposition of pre-Pleistocene "ice age" deposits, in Walsh, R. E. (Editor). Proceedings of the Third International Conference on Creationism. Pittsburgh.

_____. 1995. Polar dinosaurs and the Genesis Flood. *CRSQ* 32: (in press).

Obst, J. R., N. J. McMillan, R. A. Blanchette, D. J. Christensen, O. Faix. J. S. Han. T. A. Kuster. L. L. Landucci. P. J. Newman. R. C. Petterson, V. H. Schwandt, and M. F. Mesolowski. 1991. Characterization of Canadian arctic fossil woods, in R. L. Christie and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic

Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 123-146.

Pearce, F. 1992. Ancient forests muddy global warming models. New Scientist 140(1901):6-7.

Ricketts, B. D. 1991. Sedimentation, Eurekan tectonism and the fossil forest succession on eastern Axel Heiberg Island, Canadian Arctic Archipelago, in R. L. Christie and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island, Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 1-27.

Riediger, C. L. and R. M. Bustin. 1987. The Eureka Sound Formation, southern Ellesmere Island. *Bulletin of Canadian Petroleum Geology* 35:123-142.

Schweitzer, Hans-Joachim. 1980. Environment and climate in the early Tertiary of Spitsbergen. *Palaeogeography, Palaeoclimatology, Palaeoecology* 30:297-311.

Sloan, L. C. 1994. Equable climates during the early Eocene: significance of regional paleogeography for North American climate. *Geology* 22:881-884.

_____and E. J. Barron. 1990. "Equable" climates during earth history? *Geology* 18:489-492.

_____ 1992. A comparison of Eocene climate model results to quantified paleoclimatic interpretations. *Palaeogeography, Palaeoclimatology, Palaeoecology* 93:183-202.

Tarnocai, C. and C. A. S. Smith. 1991. Paleosols of the fossil forest area, Axel Heiberg Island, in R. L. Christie and N. J. McMillan (Editors). Tertiary fossil forests of the Geodetic Hills, Axel Heiberg Island. Arctic Archipelago. Geological Survey of Canada Bulletin 403. Ottawa. pp. 171-187.

Taylor, E. L., T. N. Taylor, and N. R. Cuneo. 1992. The present is not the key to the past: A polar forest from the Permian of Antarctica. *Science* 257:1675-1677.

Taylor, I. 1990. Canada's frozen forests. Creation Science Association of Ontario No. 18. pp. 14.

Valdes. P. 1994. Damping seasonal variation. *Nature* 372:221.

Walker, G. 1993. Back to the future. *Nature* 362:110.

Wehr, W. C. and D. Q. Hopkins. 1994. The Eocene orchards and gardens of Republic, Washington. *Washington Geology* 22(3): 27-34.

West, R. M., M. R. Dawson, and J. H. Hutchison. 1977. Fossils from the Paleogene Eureka Sound Formation, N.W.T. Canada: occurrence, climatic and paleogeographic implications, in R. M. West (Editor). Paleontology and Plate Tectonics. Milwaukee Public Museum Special Publications in Biology and Geology No. 2. Milwaukee. pp. 77-93.

West, R. M., M. R. Dawson, L. J. Hickey, and A. D. Miall. 1981. Upper Cretaceous and Paleogene sedimentary rocks, eastern Canadian arctic and related North Atlantic areas, in J. W. Kerr and A. J. Fergusson (Editors). Geology of the North Atlantic Borderlands. Canadian Society of Petroleum Geologists Memoir 7. Calgary. pp. 279-298.

Williams, E. L. and G. F. Howe. 1993. Fossil wood of Big Bend National Park, Brewster County, TX: Part I—Geologic setting. CRSQ 30:47-54.

Williams, E. L. 1993. Fossil wood of Big Bend National Park, Brewster County, TX: Part II—Mechanism of silicification of wood and other pertinent factors. *CRSQ* 30:106-111.

Williams, E. L., G. T. Matzko, G. F. Howe, R. R. White, and W. G. Stark. 1993. Fossil wood of Big Bend National Park, Brewster County, TX: Part III—Chemical tests performed on wood. *CRSQ* 30:169-176.

Williams, E. L., G. F. Howe, G. T. Matzko, R. R. White and W. G. Stark. 1995. Fossil wood of Big Bend National Park, Brewster County, TX: Part IV—Wood structure, nodules, paleosols, and climate. *CRSQ* 31:225-232.

Wing, S. 1994. Paleoclimate, proxies, paradoxes, and predictions. *Palaios* 9:1-3.

Wing, S. L. and D. R. Greenwood. 1993. Fossils and fossil climate: the case for equable continental interiors in the Eocene. *Philosophical Transactions of the Royal Society of London B* 341:243-252.

Wolfe, J. A. 1968. Paleogene biostratigraphy of nonmarine rocks in King County, Washington. U.S. Geological Survey Professional Paper 571. U.S. Government Printing Office. Washington D.C.

_____. 1971. Tertiary climatic fluctuations and methods of analysis of Tertiary floras. *Palaeogeography, Palaeoclimatology, Palaeoecology* 9:27-57.

_____ 1977. Paleogene floras from the Gulf of Alaska region. U.S. Geological Survey Professional Paper 997. U.S. Government Printing Office. Washington D.C.

_____ 1978. A paleobotanical interpretation of Tertiary climates in the Northern Hemisphere. *American Scientist* 66:694-703.

_____ 1980. Tertiary climates and floristic relationships at high latitudes in the Northern Hemisphere. *Palaeogeography, Palaeoclimatology, Palaeoecology* 30:313-323.

_____ 1985. Distribution of major vegetational types during the Tertiary in E. T. Sundquist and W. S. Broecker (Editors). The carbon cycle and atmospheric CO_2: natural variations Archean to present. Geophysical Monograph 32. American Geophysical Union. Washington D.C. pp. 357-375.

_____ 1993. A method of obtaining climatic parameters from leaf assemblages. U.S. Geological Survey Bulletin 2040. U.S. Government Printing Office. Washington D.C.

_____and W. Wehr. 1987. Middle Eocene dicotyledonous plants from Republic, Washington. U.S. Geological Survey Bulletin 1597. U.S. Government Printing Office. Washington D.C.

Woodmorappe, J. 1978. A diluvian interpretation of ancient cyclic sedimentation. *CRSQ* 14:189-208.

Wright, V. P. editor. 1986. Paleosols (their recognition and interpretation). Blackwell Scientific Publications. London.

BOOK REVIEWS

God's Own Scientists; Creationists in A Secular World by Christopher P. Toumey. 1994. Rutgers University Press. New Brunswick, NJ. 289 pages. Paper $15.00. Cloth $45.00.

Reviewed by Jerry Bergman*

This reviewer has read most of the three dozen or so books often termed anti-creationist, written to lambaste and "refute" the conclusions of those who argue in favor of a designed world view. Most are written by individuals who have a limited first-hand understanding of the intelligent design view. Many simply repeat incorrect statements until conclusions which lack foundation are accepted because they are so often repeated. Those who have completed extensive research in the creationist movement such as Numbers and Toumey have effectively refuted, or at least critiqued, some of the many false conclusions that are mainstay among evolutionary naturalists. As Toumey states, "Two of the most common and simplistic reactions to creationism, especially from its enemies, are that creationism is nothing more than a rote exercise in biblical literalism and that the source of creationism is ignorance of science" (p. 5). He adds that creationism is a "body of knowledge and belief [that] is much richer and much deeper than a narrow-minded devotion to a few dozen verses of sacred scripture" (p. 5). Toumey's account illustrates well the many orientations in creationist research, and effectively refutes the common misconception that creationists are uncritical, uninformed followers of a narrow ideology.

*Northwest State College, Archbold, OH 43502.

He also generally accurately reviews the antagonism to the creationist world view from mainline science. An example is Dr. Arleton C. Murray who went to a revival to scoff at Christianity, but after he heard the "message of salvation," he

> soon rejected evolution, with all that it stands for. When he declared his new found faith to his evolutionist bosses at the Smithsonian, they demanded that he choose between evolution and Christ, whereupon he promptly and dramatically turned his back on his job with the paleontologists and turned his face toward Jesus (p. 1).

A book covering a controversial subject like creation is rarely without flaws, this one included, especially on topics that are largely peripheral to the study's focus. Toumey highlights the poor examples of creationists such as Harry Rimmer and George McCready Price, but largely ignores the more scholarly, responsible creationists such as Sir Ambrose Fleming. The best example is that when the author attempted to cover the secular humanism debate, which includes abortion, he left his role as a scholar and became an apologist. Another example is his review of creationists' ideas that emphasizes the role of chance, random processes and time in evolution. Toumey claims that evolutionary biology does not teach that "evolution is the result of a long series of random accidents" (a quote from Newell, p. 93). Many evolutionists, including Gould, do stress the extreme importance of chance. Toumey also underestimates the opposition to geocentricism and decay of light theory among creationists (p. 129). Compared to other works on creationism, though, these shortcomings are relatively minor—this work has come a long way and must be measured in terms of the progress that it has achieved rather than a fully accurate account of the situation.

My criticisms of the work are not made in reference to the negative aspects of the creation movement that the author reveals. These should be told, but honestly and fairly to help outsiders understand the movement, and insiders to deal with internal concerns. Problems must be faced and dealt with, not swept under the rug. The key, as Toumey brings out, is "in order to appreciate why creationism moves people as deeply as it does, one must see it as a body of existential questions and answers—'cultural systems of meaning,'. . . about realities, anxieties, uncertainties, and changes in U.S. life in our time. Most particularly, creationism asks and offers answers to" major questions of life (p. 8).

Toumey also presents an excellent review of the history of the development of science, ultimately arguing that "when the study of nature was guided by Protestant principles, it affirmed the same lessons of cosmic order and design as did scripture" (p. 17), and concluding that modern science came out of Biblical Protestantism. Toumey also concludes that

> the presumption that science is entirely compatible with evolution, and not at all with creationism, has been subjected to an aggressive and articulate campaign by creationists . . . (p. 6).

He eloquently argues that "too many people take science too seriously, endowing it with a moral authority equivalent to that of our conventional Judeo-Christian religions" (p. 7).

A major focus of the book is the importance of the so-called resurgence of creationism that occurred with the publishing of *The Genesis Flood* by Whitcomb and Morris. Toumey ignores the creationist movement that existed before this book and the numerous scientists and scores of creationists' publications from about the time of Darwin down to today. Many American denominations regularly discussed creationism in their religious literature and, although a resurgence occurred in the sixties, this probably has more to do with groups like the Institute for Creation Research and the Creation Research Society which gave persons who had scientific or philosophical objections to evolutionary naturalism a publication outlet. A major concern in founding these movements is the fact that "most scientific journals had explicitly anti-creationist editorial standards . . ." (p. 34).

My major criticism of the work is that it tends to infer that secularism is the only valid belief structure, and that the theistic world view is to be viewed only in reference to the "truth," secularism. It would be far more accurate to compare the two as conflicting world views in an effort to understand both. The author also totally ignores the Catholic creationist movements and the many scientists involved with this orientation, both past and present. This is ironic considering the author's background as a Roman Catholic. The section on creationism in North Carolina, while helpful, is limited to one specific group which manifests both similarities and differences with the hundreds of other creationist groups throughout the world.

For balance, this work should be read in conjunction with others, such as Morris' *History of Scientific Creationism*. An important book, *God's Own Scientists* should be in every academic library, and is a must read for anyone interested in a relatively objective look at the modern creation movement. As Toumey concludes,

> scientific creationism has changed the nation's assumptions about the credibility of evolutionary thought and has given conservative Christians reason to believe that science is the Bible's best friend. . . . Modern creationism cannot be reduced to either scientific illiteracy or a slavish devotion to . . . scripture. In fact it is a rich, complicated, and varied system of knowledge, values and beliefs, . . . that enable . . . Christians to come to terms with certain realities, anxieties, uncertainties, and changes in U.S. life. . . . ICR's followers take science more seriously than most scientists do (pp. 143-144).

Toumey's work is hopefully the beginning of new objectivity in this area, although it is hard to be optimistic—a recent excerpt from his work was much less than complete and objective (Toumey, 1994).

References

Gould, Stephen J. 1989. Wonderful life: The Burgess shale and the nature of history. Norton. New York.

Morris, Henry. 1984. History of scientific creationism. Master Books. Colorado Springs.

Raup, David M. 1991. Extinction: Bad genes or bad luck. W. W. Norton. New York.

Toumey, Christopher P. 1994. God's own scientists. *Natural History*. 103(7):4-9.

The Creationist Movement in Modern America by Raymond A. Eve and Francis B. Harrold. 1991. Twayne Publishers. Boston. 234 pp. $20.00.

Reviewed by R. Brown*

Sociologist Eve and archaeologist/anthropologist Harrold from the University of Texas endeavor to analyze modern creationism as a social movement. There is no consideration of truth and error that might be involved in a discussion of related scientific evidence or Biblical testimony. However, the book should have high priority consideration by everyone who lectures or writes on creationism. We need to understand how others see us in order to communicate effectively.

The authors say that "creationists and their opponents uncannily resemble each other in their sense of threat to their respective worldviews, and in the appeals for money and other help that they make to like-minded people. Both are in effect saying, 'Our opponents are bent on destroying the values that underlie our society's greatness, and they are indoctrinating our children in their ideology. You must help us stop them before it's too late! (p. 118).

In the estimation of the authors, "conservative Protestant values have lost influence in the United States over the past century" (p. 56). Looking to the future they anticipate

> that the proportion of evangelicals and fundamentalists in the general population will continue to increase in a reaction against modernism, and this in turn will bring many new adherents to creationism (p. 189).

Chapter 3 contains an analysis of 16 statistical studies of beliefs related to creation and evolution that were made in the U.S. between 1982 and 1990. Although many of these studies are of limited scope, each contributes to a perception of general attitude in the population. After outlining the differing attitudes regarding creation/evolution among denominational groups, and giving a detailed discussion of the various forms of creationism, the authors conclude that "What all creationists share is antievolutionism based on commitment to religious faith" (p. 49).

Opposition to evolutionism can be categorized under *rejectionism*, {"flatly reject[ing] out of hand any scientific conclusions that contradict their beliefs" (p. 49)} and *Scientific creationism—or creation science* —{confident that the correct interpretation of scientific evidence is actually consistent with Genesis (p. 49)}. The authors state that "creation science is founded upon a view of science that favors commonsense explanations and upon a rejection of the legitimacy of the power at [sic] those at the center—including big science, big corporations, and big government" (p. 115). They then make the significant observation that "Creation scientists [are] at odds . . . even with the vast majority of their fellow Christians. . . . [They are] neither crazy nor simply ignorant, as some detractors claim, but represent an older, less sophisticated version of science, one congenial to their religious beliefs" (p. 116).

The classification of creationism with Ptolemy's geocentric view (p. 185) is unjustified, and intellectually unsound. Some beliefs held by individuals within the community of creationists might be appropriately so classified; but however determined and widespread the efforts of these individuals to promote their specialized views may be, the general category of creationism, and particularly Biblical Creationism, should not be identified with the extreme views held by some of its adherents.

The discussion of "the new emphasis on the scientific nature of creationism" (pp. 186, 187) brings me to express disfavor for considering any set of scientific evidence as support of, or proof for, a specific creation model, as is commonly claimed, or at least inferred, in creationist literature. From my perspective, *creation science* should be considered as the effort to develop logically sound interpretations of primary (not "massaged" by a theoretical viewpoint) data, and to do so within the constraints of basic scientific principles and the historical specifications in the Bible. On this basis one can speak of *success* and *failure* (lack of immediate success), but not *proof* or *disproof.* Creation science should be judged on its overall record of success, not as a means for "proof." Much acrimony between scientific creationists and secular scientists would have been avoided if this distinction had received due consideration.

The assertion that "Modern science generally, . . . would have little place in a society such as creationists envision" (p. 93) demands vigorous challenge. Would not recognition of God's creatorship, and acceptance of validated testimony concerning manifestations of His creative activity, provide the highest motivation for understanding God and His works (scientific research), and for application of that understanding in ways that would enhance the quality of human life (engineering research)? After all, the scientific revolution was in large measure initiated by creationists! The creation/evolution conflict is the result of efforts to make a materialistic, man-centered, thought-form universally dominant.

Contrary to their posture of presenting a nonjudgemental, purely sociological analysis, the authors assert "creationism is not credible. It cannot be made to correspond with the totality of modern observed data about the natural world" (p. 111). And in the questionable discussion of anthropology, rather than point out desirable modifications in creationist polemic regarding paleoanthropology, the authors seem determined to establish the concept of human evolution from lower animal ancestry. Their bias is further revealed when they assert that Noah's flood does not account for "the immense thickness of the earth's sedimentary rocks and the sequence of changing life-forms in its fossil record" (p. 81).

The discussion of *theory, hypothesis,* and *fact* gives a much-needed expanded understanding of the creation-evolution controversy (Ch. 4). The dialogue between creationists and evolutionists would be greatly improved if all parties understood and maintained consistent usage of these terms.

Although the information concerning creationist organizations is now six years out of date, and initially was somewhat incomplete and in error (e.g., Loma Linda University is located in Loma Linda, California, not Riverside), there is much useful information in Chapter 7. Students for Origin Research is now identi-

*12420 Birch St., Yucaipa, CA 92399-4218.

fied as Access Research Network, PO. Box 38069, Colorado Springs, CO 80937-8069. *Origins Research* is still published by this group.

Chapter 8 contains a review of legal conflicts over teaching creationism and evolutionism in public schools, and a survey of the tactics currently used by creationists and anti-creationists in their efforts to win public favor and influence in public schools.

Not A Chance—The Myth of Chance in Modern Science and Cosmology, by R. C. Sproul. 1994. Baker Books. Grand Rapids. 234 pages. $15.99.

Reviewed by John K. Reed*

R. C. Sproul is a philosophical theologian who has parted the curtain of science surrounding the temple of (and to) modern man, has entered unapologetically, and has thrown down one of the most revered chapels in the complex. *Not A Chance* demonstrates that the myth of modern chance is built on the careless use of language by modern scientists, the wish for emancipation from God by modern atheists and agnostics, and their selective rejection of formal reason.

In a much needed book, Sproul remorselessly zeroes in on the modern myth of chance as a description of something occurring without cause. This view supports a cosmology of chaos and strips science of explanatory power. As Sproul points out, there can be no middle ground: "If chance is, God is not." Sproul explains the absurdities that follow the attribution of causal power to chance. Since they are derived from a denial of the principals of non-contradiction and causality, anyone with training or experience in the hard sciences can easily and existentially understand the disabling consequences of those denials.

In this book, the key to unlocking the myth of chance is the recognition that not knowing a cause is far different from asserting that there is no cause to be known. Sproul demonstrates that even popularly acknowledged critics of causal thinking such as David Hume understood this crucial difference. The move from 'I can't know it' to 'It doesn't exist' blends the arrogance of modern man with the shallowness of his thought—a shallowness undoubtedly related to an evolutionary paradigm that allows him to sneer at his inferiors of the past.

In a telling passage that emphasizes the absurdity of chance as a causal agent, Sproul attacks the statement of Timothy Ferris in *Coming of Age in the Milky Way* (Ferris, 1988).

> Quantum indeterminacy may have nothing to do with human will, but as a matter of philosophical taste there are good reasons to celebrate the return of chance to the fundamental affairs of the world (p. 291).

Sproul pours cold water on the celebration by pointing out that science is intrinsically inductive and that any scientific distinction between indeterminacy as ignorance and indeterminacy as a denial of causality is impossible (and such a distinction thus rests on a formal foundation outside of science) because it relies on the empirical demonstration of a negative. He quotes William Poundstone's *Labyrinths of Reason: Paradox, Puzzles, and the Frailty of Knowledge* (1988):

> In a infinite universe, proving a negative hypothesis is a supertask. (If the universe is merely finite but very big, proving a negative hypothesis is a herculean labor so close to a supertask as to make no difference) (p. 41).

Sproul agrees, quickly cutting through the grandiose superfluity of Ferris in plain language:

> To celebrate the return of chance into the affairs of this world (in the sense that chance causes quantum leaps and therefore justifies the negative hypothesis that "nothing" causes the behavior of subatomic particles) is an exercise in futility. Such justification via negative hypothesis is more than a supertask—it is an impossible task. It is a task that even Hercules could not perform. If Hercules were to return, we would not ask him to perform such a task. We would ask him to repeat one of the tasks he had already performed. We would ask him once again to clean the stables (p. 51).

A helpful aspect of this book is its description of modern causal thinking as an effect of the divorce of science from an explicit dependence on supporting frameworks of knowledge provided in philosophy and theology. Because naturalistic science affirms the metaphysic of *solo phenomena,* it must therefore embrace an epistemology of *solo scientia naturalis;* thus, science becomes burdened with tasks traditionally assigned to philosophy and theology. Sproul ably demonstrates the inability of science to perform those tasks.

Not A Chance provides a bonus of a mini-education in the relationship of philosophy and theology to science from the perspective of a non-scientist. Sproul boldly asserts that philosophy acts as the policeman of science—a position that secularists have hotly contested for over a century. They realize that just as the supernatural transcends the phenomenal, knowledge of the supernatural and the phenomenal reflects not only the distinction between the two, but also their hierarchy, thus destroying a fundamental axiom of their naturalistic worldview.

R. C. Sproul has earned degrees in theology from the Free University of Amsterdam, Geneva College and Grove City College. He is the John Dyer Trimble, Sr., Chair of Systematic Theology at Reformed Theological Seminary in Orlando, but is better known nationally as the principal theologian of Ligonier Ministries, and author of such books as *The Holiness of God, Lifeviews, The Psychology of Atheism,* and *Classical Apologetics.*

References

Ferris, T. 1988. Coming of age in the Milky Way. Morrow. New York.
Poundstone, W. 1988. Labyrinths of reason: paradox, puzzles, and the frailty of knowledge. Doubleday. New York.

*915 Hunting Horn Way, Evans, GA 30809.

AVAILABLE FROM CREATION RESEARCH SOCIETY BOOKS

See Current *CRSQ* for book offers

CREATION RESEARCH SOCIETY BOOKS

See Current CRSQ for book offers

How Do We Know What We Know?

Lane P. Lester, Ph.D.

Each one of us knows lots of things. We know our name. We know our address. We know the sum of two plus two. We know which political party is best for the country . . . hmm. It seems that some people know things that are the opposite from what other people know. For example, many people know that evolution is the correct explanation for the history of life. But many other people know that *creation* is the correct explanation. How is it possible for different people to know different things? What does it mean to *know* something?

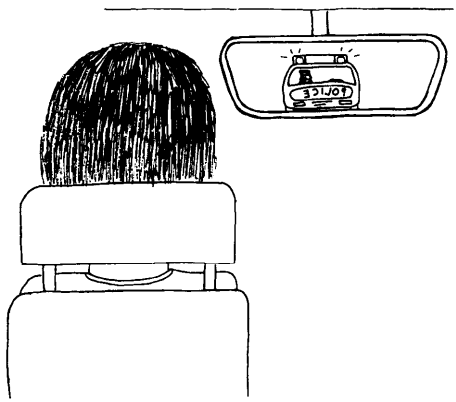
Perhaps we could agree that to know something is to be personally convinced of its truth. Notice the personal element here: knowing something doesn't make it true; it only means that we consider it to be true. The fact that some people know things that are the opposite from what other people know means that some people know things that are false!

Whether true or false, how do we come to know things? There are really only two ways: personal experience or someone tells us.

Personal Experience

Each of us knows many things we learned on our own. Let me give you some examples of mine:

- Stubbing your toe is painful. Knowledge like this we pick up early in life.
- Rolling through a stop sign will get you a traffic ticket. Actually, I had to experience this *twice* before I really knew it.
- Accepting Christ provides benefits in this life. I believe it was a former pastor of mine who pointed out that one of the benefits is that you associate with a better class of people! More seriously, I have the benefit of seeing my prayers answered.
- Passing electricity through water produces both hydrogen and oxygen gases. Perhaps in some science class, you also performed this classic experiment with a battery, wires, and test tubes.



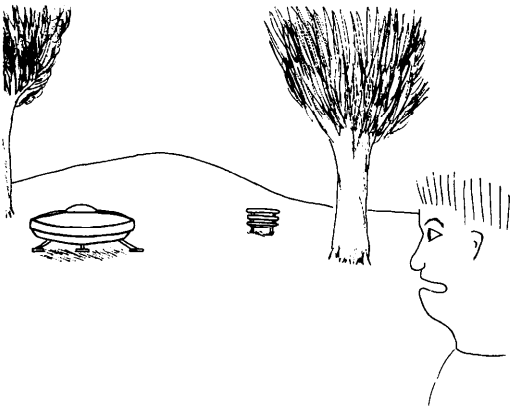
Someone Tells Us

If you know something and you didn't experience it yourself, someone had to tell you. Here are a few examples:

- The word "cat" is spelled "c-a-t." For the most part, education involves someone telling you things, either orally or in print.
- The speed limit on the expressway is 55 m.p.h.. If you don't learn this from the printed sign, a policeman will be glad to explain it to you both orally *and* in print.
- Accepting Christ gives me eternal life. I haven't experienced the full truth of this yet, but God has told me in the Bible that it is so.
- Hydrogen is the smallest element. You and I lack the equipment and knowledge to determine the truth of this scientific fact, "so we have to learn it from a science book.

Can You Trust Your Own Eyes?

In general, we are more willing to believe what we learn from personal experience than what someone tells us. But can we always believe what personal experience tells us? Would anything make you doubt the evidence of your senses? Imagine that you are walking along a busy sidewalk that fronts a large park. Out in the park you see a flying saucer descend and land. Would you immediately begin exclaiming to others about your discovery? I think I would, first glance around and see if anyone else was experiencing the same thing. On the other hand, if the landing craft were a helicopter, there would be no reason to doubt what my eyes had told me.

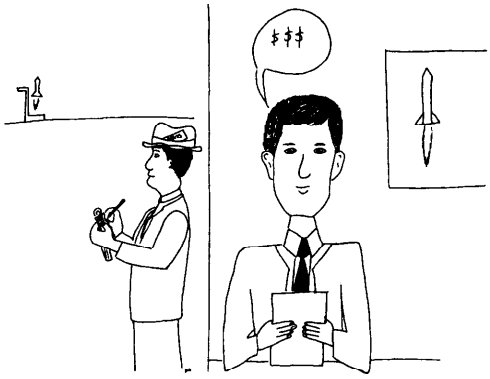


The general principle here is that we expect to see the commonplace and not the unusual. Indeed, our senses may even lie to us based on what we expect to be true. A good example of this comes from the life of Jesus when he cries out, "'Father, glorify your name!' Then a voice came from heaven, 'I have glorified it, and will glorify it again.' The crowd that was there and heard it said it had thundered; others said an angel had spoken to him." (John 12:28-29 NIV)

Whom Do You Believe?

What about the things we know because someone has told us? Remember that we're defining "know" as "being personally convinced of the truth of something." Not everything that we're told is the truth, is it? What is it that makes you more inclined to believe some people than others, to add what they say to the things you know? Here's a short list of pairs of individuals who tell us things:

- casual acquaintances and best friends
- philosophy professors and science professors
- newspaper reporters and television reporters
- pastors and God (Bible)



What determines how readily you would be to believe each of the above persons when they tell you something is true? Would you be more likely to believe one member rather than another in each of the above pairs? How long you've known the person might be one factor, and you would probably be more likely to believe your best friend than you would a casual acquaintance. In my case, there would be a problem because, when I was growing up, my best friend was a compulsive liar. A really nice guy, mind you, but he had a problem with the truth.

What about those two professors? If a science professor told you something about science, and the philosophy prof told you the opposite, you'd be more likely to believe the scientist, wouldn't you? So here's another factor in our willingness to believe what we're told: the expertise of the person making the statement.

Ah, but what if two equally knowledgeable people tell you opposite things, what then? This is a dilemma with which I often have to deal in questions about the creation/evolution controversy. Sure, I'm a scientist, but I certainly don't know all of science! My specialty is genetics, and I've never even had a course in geology. How do I evaluate the competing claims of evolutionist geologists and creationist geologists? Sometimes I have to choose on the basis of philosophy rather than science: I choose to believe the Christian rather than the atheist. This is not as nonrational as it may first appear. We all live our lives based on some set of assumptions of what is true, and that set of assumptions affects our decisions about many things. A person with a false philosophy will

be drawn infallibly into false conclusions about important matters.

The pair of reporters in our list brings us to the question of how does the fact of something being printed affect our willingness to believe it? It seems that we're more ready to believe something that's printed than something that is just spoken, so the newspaper reporter might get more credibility than the TV journalist . . of course, Peter Jennings does look awfully sincere !

Seriously now, does something being printed mean that it is more likely to be true? Sometimes yes, and sometimes no. Sometimes all it takes to get something published is money. We need a healthy skepticism for both what we hear and what we read.

Science — A Way of Knowing

Science is a very important way for coming to know things. Some of this scientific knowledge can come from personal experience, but almost all of it will come from being told by someone else. Even the science a scientist knows has come mostly from being told: through periodicals, books, meetings, etc.

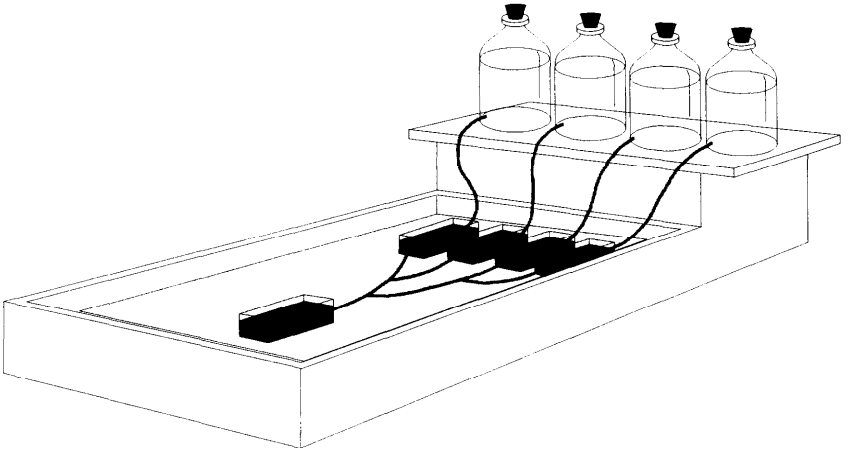
Even though the achievements of science today seem very modern, the modern way of doing science actually started in 1600's. Although it's not mentioned much and maybe hard to believe, most of the founders of modern science believed in a personal God who had created the universe. Their belief that the Creation was the result of intelligent design gave them confidence that they could study it and discover truth about it.

Because science is such an important path to knowledge and because science is so intimately associated with origins, it's important to understand something about it. Plainly stated, science proceeds by *making* and *testing* hypotheses. Scientists observe things, and then they try to explain their observations. Those explanations are called hypotheses. A hypothesis is a tentative explanation for observations, an "educated guess."

Making hypotheses about things is only the first step; much more difficult is the second step: testing hypotheses. The scientist has to design an experiment that will indicate whether the hypothesis is corrector not. Let's look at an actual example.

European eels reproduce in the Sargasso Sea, a part of the Atlantic Ocean. They migrate to freshwater streams where they

spend most of their lives.. How do they find those freshwater streams from the ocean? Some scientists hypothesized that the eels are able to sense the chemical composition of freshwater. They designed an experiment to test that hypothesis, and their apparatus is shown in the drawing. Each bottle held a different kind of water: tap, distilled, salt, fresh (from stream). Baby eels were placed in the



small box on the left from which they could swim through the tubes to one of the boxes holding a particular kind of water. The eels showed no preference for tap water over salt, but most of them swam into the box that contain natural freshwater. These results supported the hypothesis that the eels are able to detect the chemical nature of freshwater.

Is the Study of Origins Scientific?

There are hundreds (thousands?) of scientists studying origins: the origin of the universe, the origin of the earth, the origin of life, and the origin of species. Surely, the study of origins is scientific! Isn't it? Well, it depends on what you mean by science. If you mean the kind of science done by those studying the eels, the answer is no.

The late Dr. Richard Bliss, a great educator, explained the distinction better than anyone else when he coined the word "operation science" to contrast with "origins science." Operation science is what is done when scientists are trying to learn how something works, how it "operates." They can gather observations, make hypotheses, and test those hypotheses with experiments. Scientists who study origins can also gather observations, such as studying the stars or collecting fossils. They also can make educated guesses

about what those observations mean in terms of origins. But, with few exceptions, they cannot design experiments that will determine what happened in the prehistoric past. This is the same problem faced by the forensic scientist. He or she can gather clues: fingerprints, bloodstains, fibers, etc. Using that evidence, it is possible to suggest what took place, but there is no experiment that can be done to determine whether or not that suggestion is correct.

So while scientists can provide us with valuable information about events that happened a long time ago, they cannot provide us with answers that are as final as those about things taking place today. Because of that uncertainty, we can expect the philosophy of a scientist (Conservative Christian, Liberal Christian, Orthodox Jew, Reformed Jew, Muslim, Hindu, Atheist) to affect the conclusions they'll make. Whom will you believe?

Further Reading

Creation Research Society Quarterly, Creation Research Society, P.O. Box 969, Ashland, OH 44805-0969, $20 per year, $15 for students. The Creation Research Society is the national creation organization for scientists and those interested in science. Articles range from general interest to highly scientific.

Acts and Facts, Institute for Creation Research, Box 2667, El Cajon, CA 92021, donations appreciated. News about ICR, a group of creation scientists. Includes articles on Biblical and scientific topics.

Creator, His Creation, P.O. Box 785, Arvada, CO 80001, donations appreciated. Fine little newsletter including excellent materials for children.

Discovery, Apologetics Press, 230 Landmark Drive, Montgomery, AL 36117, $11 per year. Brief but beautiful 7-page "monthly paper of Bible and science for kids." Packed with good stuff.

The following are available from the Creation Research Society:

What Is Creation Science?, Henry M. Morris and Gary. E. Parker, Master Books. Good overview of the creation-evolution controversy.

Starlight and Time: Solving the Puzzle of Distant Starlight in a Young Universe, D. Russell Humphreys, Master Books. An exciting new model for the origin of the universe, which denies neither the observations of scientists nor the truth of the Bible.

Science and the Bible: 30 Scientific Demonstrations Illustrating Scriptural Truths, Donald B. DeYoung, Baker Books. An excellent tool for anyone wishing to demonstrate both scientific and scriptural principles.

Creation Scientists Answer Their Critics, Duane T. Gish, Master Books. Creationism's most outspoken proponent examines the claims and writings of creation's most vocal critics.

Credits

Brenda Lindley-Anderson is the artist for the all of the drawings except that of the eel experiment, which I drew so long ago that I don't remember the source of its inspiration.