

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

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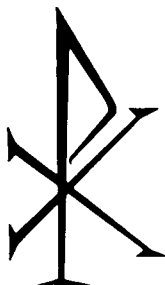
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CREATION RESEARCH SOCIETY

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

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

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$17.00 (\$21.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 14016, Terre Haute, IN 47803. 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 \$17.00 (\$21.00 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: \$20.00 (\$24.00 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 man, 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 an historic 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 Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.

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Editorial Comments

Contemporary science is being shaken by many surprises and uncertainties. High temperature superconductivity experiments have revealed how little we really know about the solid state of matter. The controversy over desk-top nuclear fusion shows how easily the basic assumptions of science can be challenged. In genetic engineering, no one can accurately predict the implications and possible dangers that lie just ahead. With these multiple unknowns, scientists no longer feel confident in predicting future technology, whether 100 years ahead or just a decade. However, extrapolation into the past is another matter! There is little hesitation in talking about past eons of time with pompous authority. The contrast between future caution and past dogmatism is obvious.

The Library of Congress receives 55,000 scientific periodicals, and it estimates that there are at least 15,000 more. Each year there are over one million different science articles published worldwide. One must read an article every three seconds, nonstop, to keep up! Instead of this impossible task, we hope you will study and enjoy the enclosed articles. We believe the CRS Quarterly makes a unique, essential contribution to the countless annual topics in print.

If Quarterly subscribers would like a copy of the CRS Constitution and Bylaws, they are invited to send a request to the Society Secretary.

Don DeYoung, Editor

ARE HUMAN AND MAMMAL TRACKS FOUND TOGETHER WITH THE TRACKS OF DINOSAURS IN THE KAYENTA OF ARIZONA? PART I: A HISTORY OF RESEARCH AND A SITE DESCRIPTION

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Received 17 December 1988; Revised 26 February 1989

Abstract

A history of current research on quasihuman ichnofossils (supposed man tracks) in Mesozoic strata is offered herein. The authors review literature relative to studies of human-like tracks along the Paluxy River, Glen Rose, Texas. They also present a history of work on humanoid tracks in Arizona.

A general geographic and geologic description of the study sites near Tuba City, Arizona, is given together with some pictures of representative tracks. A full presentation of results and conclusions will appear in Part II.

Introduction

Evolutionists believe (1) that our planet is billions of years old, (2) that organisms have evolved since life began in Precambrian times, and (3) that the evolution of organisms continues. Such beliefs are held even though there is an obvious absence of transitional life forms in the fossil record. It is also common knowledge among evolutionists that sedimentary strata have yielded an unsatisfactory record of evolutionary stages for any one kind of plant or animal, be it horse, clam, elephant, or man. Scientific evidence exists which does not fit with the belief in geologic time and evolution. For example, land plant pollen is found in Precambrian strata (Howe *et al.*, 1988) and millions of years are "missing" from Grand canyon rocks (Waisgerber *et al.*, 1987). Other anti-evolutionary evidence includes the likely existence of human footprints in pre-Cenozoic strata.

Those who believe in geologic time and evolution insist that ancestors of *Homo sapiens* first appeared a few million years ago, about 60 million years after

the Mesozoic era had closed with its complete dinosaur extinction. If the coexistence of man tracks and dinosaur tracks could be substantiated, this would seriously damage current trust in geologic time and evolution. If geologic time and evolution were abandoned, this would require a search for a more adequate origins model.

Unfortunately many evolutionists no longer test their evolutionary beliefs for accuracy but simply assume that macroevolution and geologic time are facts. Consequently, too many of these people (for example Cole, 1985 or Stokes, 1974) merely ignore or ridicule the opinion that man tracks could exist in strata yielding fossil dinosaurs, without using the scientific method on existing data.

On the other hand, evolutionists have analyzed alleged man-tracks in the more recent Pleistocene and Pliocene—see Leakey and Hay (1979) and Behrens-meyer and Laporte (1981)—but evolutionary literature offers little which is for or against the existence of man tracks with dinosaur tracks. Evolutionists have for the most part refused to study or even acknowledge the possibility of Mesozoic man tracks, as DeVilbiss (1986) noted. Evidently the mindset of many evolutionists is such that they are incapable of even considering the possible synchronism of *Homo sapiens* with dinosaurs. Thus the creationists who also believe in a young earth have led in the study of supposed man tracks in dinosaur-bearing strata—see Rusch (1971) and DeVilbiss (1986). It is regretted however that some creationist authors have lacked objectivity and/or method-

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ological rigor in their studies. Some of their foot track publications reveal scientific shortcomings as Rusch (1971), Cole (1985) and DeVilbiss (1986) have rightfully noted.

Scientific criticisms of creationist publications must be understood by those creationists who intend to enter the research arena. Lessons learned from the mistakes of certain creationists will allow others to undertake future studies in a more credible manner. Creationists must weld themselves to accepted principles of scientific investigation showing how facts support reasonable hypotheses and theories so they can truthfully practice "creation science." They must be more studious and more completely objective. Creation researchers must exude professionalism at all times. Rusch (1971, p. 201) has admonished the creation scientists who believe in a young earth that, concerning human tracks, we must not exhibit "... misplaced enthusiasm ... and too great a willingness to jump to unjustified conclusions."

But in today's scientific arena, it is often the macro-evolutionist rather than the creationist who has jumped to preconceived conclusions. Many critics of Mesozoic man track studies are themselves lacking in objectivity as Howe (1982, pp. 141-2) has indicated. They sometimes submit incomplete reports leaving out important data and then drawing biased conclusions. They have offered some misleading summaries of current research which have received widespread publicity via popular media as with Kuban who is quoted in Time (Lemonick *et al.*, 1986) without rebuttal.

Quasihuman Ichnofossils

In this paper and the one to follow, we will describe and evaluate possible man tracks, mammal tracks, dinosaur tracks, and other fossils from northern Arizona. In an effort to be scientifically objective, alleged man tracks should be designated as "quasihuman ichnofossils," which is a neutral term offered by DeVilbiss, (1986, p. 1) to describe man-like foot or hand impressions in stone. For purposes of variety, however, references in these two papers are made to footprints, impressions, imprints, tracks, or man tracks. Such references are not to be taken as implying positive identification but they are all to be understood as being quasihuman ichnofossils—rock marks that are still being evaluated as regards their possible human origin.

Alleged Human Evidences in Dinosaur Strata:

A Brief History and Current Assessment of Research

Since the late 1800's possible man tracks, human artifacts, inscriptions, and human bones have been reported from Mesozoic sites in North America and in other continents. These sites include the USA, the Gobi Desert in Asia, England, Switzerland, Germany, the USSR, and Nicaragua. Sites within the United States are in West Virginia, Kentucky, Ohio, Pennsylvania, Oklahoma, Texas, Colorado, Utah, Nevada, and Arizona—Morris and Whitcomb (1961), Meister (1970), Rusch (1971), Burdick (1973, 1975), von Fange (1974), Jochmans (1979), Corliss (1980), Anon. (1985) and Anon. (1988). Published reports concerning the presence of man in the Mesozoic demand greater consideration from all scientists, especially from evolutionists who have ignored the data (Howe 1982). Scientists

should study those publicized sites to determine what in fact these tracks, artifacts, inscriptions and bones really are. The existence of such a vast array of evidence is in itself impressive.

Foottrack Discoveries along the Paluxy River

Quasihuman ichnofossils have been found in abundance in Mesozoic calcareous strata at the Paluxy River, near the town of Glen Rose, Texas. Strata under the Paluxy River are assigned to the Cretaceous Period. According to evolutionary beliefs, the Cretaceous Period is the youngest of three intervals of time which are assigned to the Mesozoic Era. The next older geologic interval is the Jurassic Period and the oldest is the Triassic Period.

These geologic periods were placed in the Mesozoic Era because of presumed paleontologic similarities. It was conceded by early 20th century geologists that dinosaurs were the dominant life-form on earth during this era. According to the evolutionary view, dinosaurs completely disappeared several million years after deposition of Paluxy River calcareous sandstones so the possible presence of human tracks in the Glen Rose Dolomites would falsify the evolutionary scenario.

Certain workers (e.g. Neufeld, 1975) believe that the Paluxy River tracks of C. L. Burdick, geologist, (illustrated in Morris and Whitcomb 1961, pp. 172-5) were sculpted by Texas residents to collect tourist dollars. Other writers agree—Neufeld (1975), Cole (1985), and Godfrey and Cole (1936). DeVilbiss (1985, p. 9) disagrees because he maintains that tests to distinguish carved tracks from natural tracks are not conclusive. DeVilbiss writes, "... neither the carving nor the authenticity of Burdick's prints has been demonstrated." J. Morris (1980, pp. 109-26) offers evidence pro and con that certain of the tracks were manufactured by local artisans. Even if some Paluxy River man tracks were shown to be of recent manufacture, it should not be concluded that all of the Paluxy tracks are forgeries. Evolutionists are cognizant of the Piltown Man caper which was obviously concocted to support evolution. They would object if evolution were rejected on the basis of this one fraud.

Abundant quasihuman ichnofossils (not hand wrought forgeries) are found in situ under and along the banks of the Paluxy River. These strata are known to exhibit walking sequences of tracks with man-like strides. The tracks together with their humanoid resemblances have led many to conclude that these impressions in stone are human tracks—Burdick (1950, 1975), Taylor (1971, 1973), J. Morris (1976, 1980), Beierle (1977), Dougherty (1979), Fields (1980), Bartz (1982a and 1982b), Lang (1980, 1983a, 1983b), DeVilbiss (1985, 1986), Miller (1986), and Baugh and Wilson (1987). A motion picture documentary "Footprints in Stone" authenticated the tracks (Taylor 1973). One sequence of tracks was followed photographically to a low rock ledge. After the ledge was removed using heavy equipment, other tracks were discovered in the same stratum. These were consistent with the originally exposed tracks. The extended sequence of tracks was photographed.

Other workers studied the Paluxy tracks long after Taylor's motion picture was distributed. They argued that the sequences of alleged human tracks photo-

graphed by Taylor are actually from dinosaurs. Resemblance to dinosaurs was both in size of foot and pattern of stride-Cole (1985), Godfrey and Cole (1986), Edwards (1983), Milne and Schafersman (1983), and *Creation/Evolution* Special Issue (1985). Kuban (1986b, p. 8) also studied the Taylor tracks in the early 1980's about 10 years after issuance of "Footprints in Stone." Kuban determined that the Taylor tracks were real but asserted that they were elongated dinosaur tracks. He argued that the tracks were made by a dinosaur which traveled in a "quasi-plantigrade" style. He suggested that this unknown reptilian placed its weight on its metatarsus as well as its digits, thereby producing elongated human-like impressions.

In 1984, 11 years after the release of Taylor's film, Kuban restudied the Taylor tracks and further reported that most of the Taylor tracks exhibit tridactyl pointed toes with colored patterns along their leading edges. The marks were attributed by Kuban to dinosaurs (1986a and 1986b), and he asserted that the Taylor tracks gradually acquired these "colorations." Evidently such "colorations" were not observed when the tracks were excavated earlier by Taylor and others. After acknowledging and evaluating these colored marks, J. Morris (1986a, p. 4) questioned Kuban's conclusions (1986a, p. 4) and Kuban (1986c) offered answers to Morris. It should be noted that even if one concludes with Kuban that certain tracks with tridactyl color marks were made by dinosaurs, not all impressions along the Paluxy have these marks so other prints there might still be of human origin. Neither Kuban, nor any other investigator, has reported observing colored marks in freshly excavated "man tracks." No one has satisfactorily explained why the tracks change color over the years following exposure. Kuban's self propulsion "quasi-plantigrade" system for dinosaurs is in need of an honest review.

DeVilbiss (1986, p. 3) challenged Kuban's conclusions by asserting that 10 years of exposure may have caused a change in the Taylor documented tracks, before Kuban observed them. DeVilbiss raised questions and, as of the date of this publication, it is our opinion that Kuban has not provided adequate answers. Kuban suggested that infilling material somehow caused coloration of the dinosaur toe prints on previously excavated quasihuman ichnofossils. J. Morris has rightly concluded that, "... there is still much that is not known about the tracks and continued research is in order." (1986a, p. 4). Because of Kuban's findings and the beliefs of others, Films for Christ has withdrawn Taylor's film "Footprints in Stone" (see Films for Christ 1986). J. Morris (1986b) stopped publication of his 1980 book, and the Institute for Creation Research, San Diego, has likewise removed its museum display concerning the Paluxy River tracks.

Any renewed discussion about Paluxy River quasihuman ichnofossils must include the work of C. Baugh of Glen Rose, Texas. DeVilbiss (1986, p. 2) is a geophysicist who has observed Baugh's work from a proximate position. Concerning Baugh, DeVilbiss (1986b, p. 2) writes that:

No one has uncovered more of the footprints in question and no one knows as much as he [Baugh] does about the location of important trails. . . . The principal qualification to be an explorer for foot-

prints is to be a digger. Not much can be done from an armchair position. Baugh has been in contact with fresh data. No one has sacrificed his personal life for the sake of the research as much as Carl Baugh.

During the 1980's Baugh cleared a higher dolomitic stratum of Cretaceous age across the river from the Taylor and unearthed "... at least three footprints showing non-trivial resemblance to the modern human foot which has been witnessed independently by people trained in the sciences. . ." (DeVilbiss, 1986, p. 2). Then following this trail, Baugh and coworkers uncovered a hand print perhaps attributable to a human who slipped. Based on the discoveries of Baugh, DeVilbiss concludes that man tracks do exist in the Cretaceous dolomites of Glen Rose, Texas and he recommends that further research be carried out on a more technical basis.

Baugh and Wilson (1987, pp. 144-5) published data about the Baugh tracks and also reported the discovery of a human tooth. They cited dental authorities who identified the tooth as an upper maxillary right central deciduous juvenile human incisor. The tooth was found in Cretaceous strata. DeVilbiss intends to initiate in-depth archeological analysis of the Baugh findings. Because of the discoveries in Texas dolomites and the worldwide evidence for man in the Mesozoic, the footprint sites within Mesozoic strata near Tuba City, Arizona deserve detailed study. One of us (Howe) researched publications looking for references to the existence of man tracks in Arizona. Only one such paper was discovered in which Cole (1985) after attempting to debunk the man-tracks in Texas, wrote that at a convention he had heard someone say (about mantracks) that there were "good ones" in Arizona.

History of Tuba City Humanoid Ichnofossil Research

In the late 1960's E. Cummings (1985) was forced to land his private plane on a dirt road along the Moenkopi Wash, near the Little Colorado River of northern Arizona. Next to the road where the plane came down, Cummings discovered some alleged fossil tracks which appeared to be a northerly extending trackway of a barefoot human child and some dinosaur tracks in sandstone. He recognized the sandstone as being at the base of the the Kayenta, which is believed by macroevolutionists to be about 190 million years old. As an experienced archeologist who has searched for the Ark on Mt. Ararat, Cummings recognized the importance of these human-like tracks and attempted to interest scientists in the site. He was not successful in finding anyone who would finance or undertake such a project.

In 1984 Lorraine Austin, author and creationist lecturer, informed one of us (Rosnau) of human-like fossil tracks she had seen in limey sandstone beds that also contained dinosaur foot impressions near Tuba City, Arizona. That same year, 1984, Rosnau visited the dinosaur print area which we now designate as site-1. Here he located many quasihuman ichnofossils and what appeared to be the fossil track and handprint of a child located near alleged dinosaur trackways—see Figures 1-4. In 1985 Rosnau met Cummings and received directions from him for the fossil human trailway located approximately 3 km from site-1. After this talk with Cummings, Rosnau made another trip to

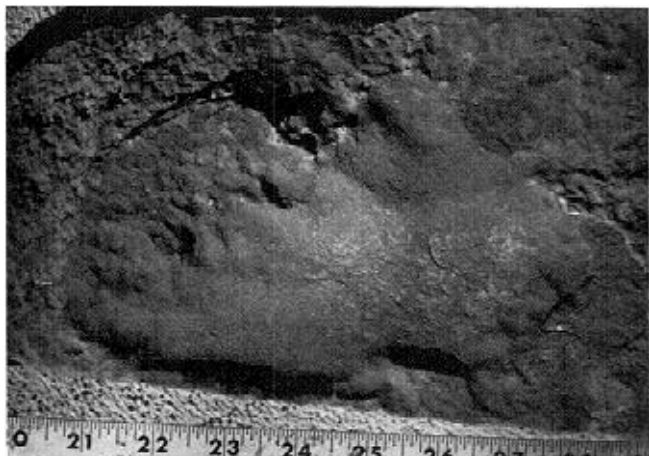


Figure 1. Possible print of juvenile band and foot. For interpretation of this print, see Figure 2. Note the foot track to the left, with toes somewhat visible. Then the left band print is seen at the right with palm and thumb visible. It measures 19.5 cm x 12 cm. It was found by W. Horrmann. Dimensions of ruler in inches.

Tuba City in 1986. He was unable to locate the specific Cummings' trackways. He concluded that they had been destroyed when the dirt road upon which Cummings had landed was later widened with a bulldozer. However, about 100 meters west of that same road, Rosnau discovered dozens of fossil man-like impressions. We now call this second location site-2.

Following discussion with Rosnau, and a visit to the Paluxy River Texas track site, Auldaney traveled to site-1 in 1985, where he discovered what appears to be a double impression of the left foot of a child, showing toe-like marks at the front of the impression and two heel-like marks in the rear—see Figures 5 and 6. Toe-like impressions were found on the side of this track. On other trips in 1986 Auldaney and Rosnau located additional human-like tracks and a possible hand print. In 1987 Rosnau and Auldaney contacted Howe who organized some CRS research trips. Between 1987 and 1989 the CRS research committee sponsored a series of three such visits to these Tuba City sites. On the first trip Waisgerber located an area of concretions at site-1, while Auldaney noted fossil clams, phytosaur bones, teeth, and some possible dinosaur bones. On the third trip Auldaney located an additional area of quasihuman ichnofossils about 1 km north of site-1 where he also located more fossil bones and teeth. On the third research trip Howe also discovered a trail of 4 alleged fossil humanoid tracks at site-2.

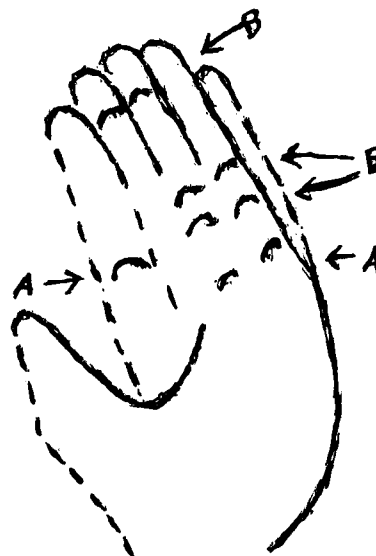


Figure 2. Interpretive sketch of hand and foot print from Figure 1.

General Site Information and Geography

The Navajo and Hopi Reservations occupy the northeasterly corner of Arizona. Tuba City, Arizona, lies within the southwesterly corner of the Navajo Reservation and has an altitude of about 1525 m above sea level. Both reservations are a part of an extensive geomorphic province known commonly as the Colorado Plateau. This plateau extends easterly into New Mexico, northeasterly into Colorado, northerly into Utah and westerly to include the Grand Canyon region. Our two research sites are about 40 km easterly of the northern section of Grand Canyon National Park.

From the south, access to Tuba City is secured by turning northward from U.S. Interstate 10 (east of Flagstaff, Arizona) onto Highway 89. Follow Highway 89 northerly to the junction with Highway 160. Then turn to the east and drive towards Tuba City. About 0.3 km east of mile marker 316 turn northward onto a



Figures 3 and 4. Possible skid track of human right hand (left, Figure 3) and its interpretation (right Figure 4). Dimensions of ruler in inches. Measuring 21 cm x 12 cm x 2.8 cm, this print, located by Rosnau, displays successive impressions of the fingertips. The fingers were first retracted (A) as the person stumbled into the mud, then extended flat as the person regained balance. Half-moon marks (B) show progressive fingertip impressions. Broken lines indicate portions of the hand not clearly delineated in the matrix. The half moon marks might otherwise be joint lines on the handprint.



Figure 5. Double impression of possible juvenile left foot located at site-1, about 3 m northwest of the tracks from Figure 1-4. Note apparent heel print visible here. See caption of Figure 6 for other interpretive details. This double print was found by Auldane.

public gravel road. At the junction of this gravel road and Highway 160 there is a sign with an arrow publicizing dinosaur tracks. Drive about 250 m northerly of the sign. This public gravel road is approximately 10 km westerly of Tuba City and can be used to reach the oasis of Moenave, farther to the north. Parking is available near wooden structures where native American jewelry is on sale—see Figure 7. For a gratuity, Navajo guides direct tourists to a dinosaur track area

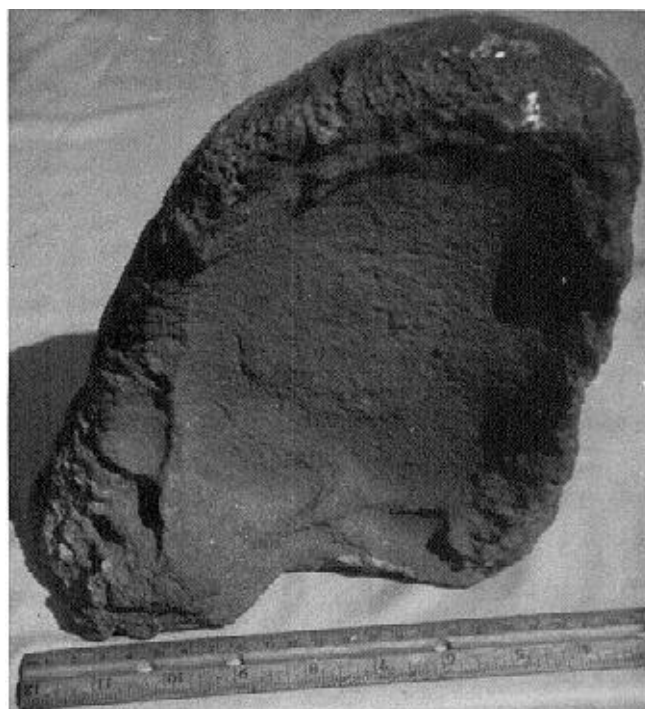


Figure 6. Same double print as Figure 5. Note toe-like prints on the side of the cast which are quite clear in the limey sandstone. They are also juvenile in size. There are marks correlating to the right foot leaving impressions of a large toe and successively smaller ones (including a little toe print) angling off to the left, as if the individual's next step was the left foot (facing left) at a right angle to the right toe-like impressions. These impressions shown in Figure 1-6 are at site-1 and are about 120 meters south of a large area of limey red sandstone, covered with tridactyl dinosaur prints. All these prints and others will be located on maps to be published in the next paper.

that is near the sales structures. Our site-1 is located 100 m on a line 45° west of south from the sales structures. During the authors' studies, Navajo guides did not take tourists to our site-1 human tracks. The Navajo guides were aware of these nearby humanoid track sites, however, and referred to the quasihuman ichnofossils there as "cave man tracks."

We will supply specific directions to dinosaur, humanoid, and other fossil locations at site-1 in our second paper. However, we will not publish explicit directions to site-2. Although most of the humanoid tracks at both sites are firmly attached to the rock strata, some at site-1 have weathered loose and subsequently disappeared. We do not wish to subject site-2 tracks to theft or vandalism. Responsible researchers may write to Rosnau for the precise locations of site-2 study areas.

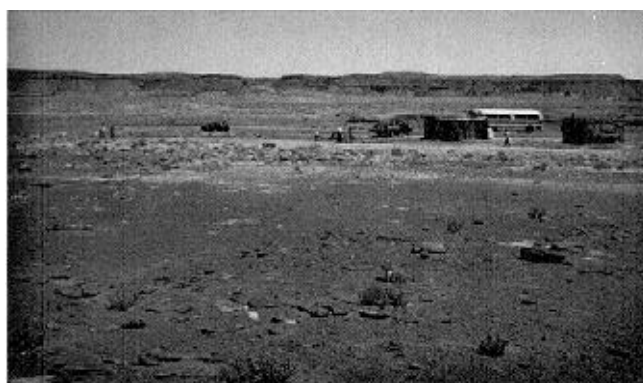


Figure 7. Navajo jewelry sales structures near site-1. In this photograph one is looking northeasterly at a tour bus stopped along the gravel road to visit the sales structures and dinosaur area D-1. Our mantrack area H-1 is in the foreground and H-2 is off the picture to the right.

Individuals desiring to conduct geological, paleontological or other related investigations on the Navajo Reservation must first apply for and receive a permit from the Navajo Nation Minerals Department, P.O. Box 146, Window Rock, AZ 86515. The permit application fee of \$100.00, a map detailing the area of investigation and a description of all proposed activities is required for processing the application. Navajo regulations deny random access to Navajo Reservation terrain by non-Navajos. Denial includes land which is contiguous to public roads. A permit is not required to visit or photograph study areas at site-1 near the jewelry stands. Here one is presumed to be a guest of Navajo proprietors. However, even here collecting and/or removing any kind of specimen from tribal lands without specific permit is prohibited.

Topographic and Geologic Information

Evolutionary geologists view the Colorado Plateau as an extensive, exceptionally flattened (peneplaned) geomorphic feature which exhibits unusual geologic stability. According to them, the Colorado Plateau has risen above sea level and fallen below sea level during evolutionary geologic time with little erosion or deformation of successively deposited Paleozoic, Mesozoic, and Cenozoic sedimentary formations. Nearly flat-lying strata within this province contrast with

similar strata under adjoining geomorphic terrains, where folding and faulting of similar strata are decidedly more intense than here. Evidence of extensive diastrophic volcanic activity within the Colorado Plateau is also relatively rare. In contrast, evidence for volcanism is common where significant diastrophism has occurred. Observe for example, volcanic action to the south of the Colorado Plateau, near Flagstaff, Arizona. Volcanism is also associated with repeated stratal sequences near Jerome, Arizona.

According to the Arizona Bureau of Mines (and USGS) Geologic Map of Arizona (1969), strata within most of Navajo and Hopi Reservations (including the Tuba City region) exhibit structural geological elements with general southeast to northwest trends. These structural elements consist principally of (1) broad folds in sedimentary strata and (2) localized normal faults of apparent minor vertical displacement. Strata within the Tuba City portion of the Colorado Plateau are assigned to the Glen Canyon Group of



Figure 8. Chinle formation. This is volcanic ash and clay, layered in water. The picture was taken along Highway 160, several miles west of site-1. The view is similar to the famous Painted Desert which lies many miles to the south.

formations. The evolutionary related age for the Glen Canyon Group is deemed to be from late Triassic to early Jurassic times. Thus the strata are presumed to have been deposited during an interval from 175 million to 100 million years before the present. The Glen Canyon Group of formations from the youngest downward consist of:

1. the uppermost (Early Jurassic) Navajo Sandstone under which is
2. the Kayenta Formation, below which there is
3. the Moenave Formation, which lies above
4. the oldest, (Late Triassic) Wingate Sandstone.

It is presumed from evidence on the Geologic Map of Arizona and from the field that early Jurassic Navajo Sandstone lies under cliffs which exist near Tuba City, east of our study areas. In contrast the oldest Wingate Sandstone is nearer to and parallels northerly trending Highway 89, to the west of our sites. The Triassic, Wingate Sandstone, lies on very colorful bentonitic beds assigned to the older Chinle Formation of late Triassic age. It is the Chinle Formation which contributes greatly to the natural panorama known as The Painted Desert (see Figure 8) and occurs northwesterly of our study areas.

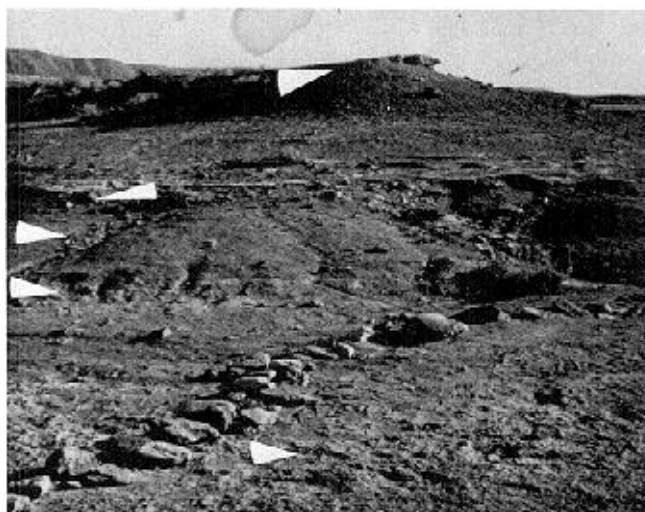


Figure 9. Landscape profile at site-1. On this side of the line of rocks are tracks of dinosaurs, probably *Dilophosaurus* (lowest arrow). The second arrow up signifies a white volcanic clay while the third arrow from the bottom points to a layer of red volcanic clay (bentonite). The fourth arrow points to a thin white limey sandstone layer, similar to the lower layer where the tracks are found. Above the fourth arrow is white and red bentonite grading into a red paleosoil. The fifth arrow up points to a conglomerate sandstone layer approximately 30 m thick with a greenish tinge, a layer like that where bones and teeth of a phytosaur (crocodile-like reptile) and many *Unio* clams were found. These specimens will be described in our second paper. In the background at the left, topographically higher than the top arrow, are cliffs of interbedded sandstone, clay, and conglomerate mixed with volcanic clay topped by Navajo Sandstone.

Field evidence suggests very strongly that the four formations of the Glen Canyon Group grade laterally and vertically, one into another. Hence throughout any part of the Tuba City region, it is difficult if not impossible to determine precisely where one formation ends and another begins. This is obviously why the four formations were combined into the Glen Canyon Group. In this report site-1 lies to the west of the previously described public gravel road to Moenave. These strata are assigned tentatively to the Kayenta Formation. They are here represented by very pale

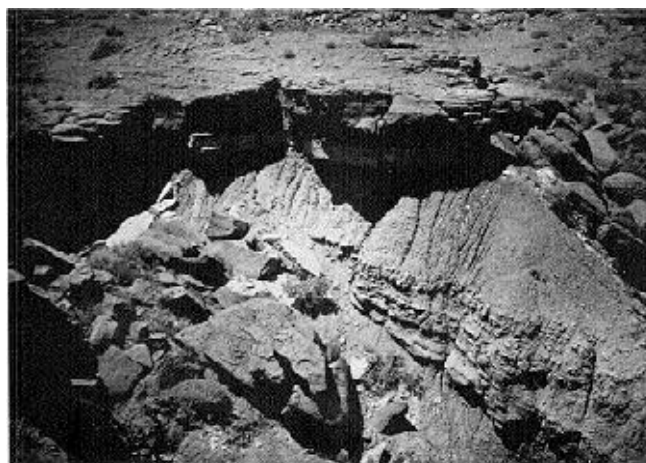


Figure 10. Bentonite deposits, Moenkopi Wash. Layers rich in volcanic ash (bentonite) are seen here beneath overlying sandstone, a short distance from site-2. This same material rises in the hills to the south.

green to white, fine-grained to medium-grained or even coarse-grained sandstones, locally calcareous. The sandstones are overlain by interbedded red shales, red mudstones, and some bentonite. Red mudstones lie under the jewelry stands and can be seen to dip regionally about 10 degrees or less, downwards easterly. In contrast, to the east of the public gravel road, beds of red sandstones of the Kayenta formation are exposed. To the north are hills, the upper strata of which are cross bedded eolian (windblown) sandstones of the younger Navajo formation, see Figure 9.

Mention is made again of the bentonitic strata of the older Chinle Formation, a formation which extends across the Painted Desert from south to north for many miles. This 20 meter thick outcrop consists of volcanic ash which has been altered into bentonite clay. This bentonite or volcanic ash is found above and below site-2. It is most commonly found in the Triassic Chinle, but is also present well up into the Jurassic strata. Bentonite is found in Moab, Utah overlying dinosaur bones in the Jurassic, Morrison formation. It is also seen overlying Cenozoic mammal bones in the Oligocene beds in Wyoming and North Dakota, and the Pleistocene beds in the Rainbow Basin near Barstow, California. These are but a few examples of the distribution of bentonite which is found in Utah, Colorado, Wyoming, and New Mexico. The outcrop is visible from our sites-1 and -2 in the Moenkopi Wash, which is a westerly descending gulch found to the south of our site-1, see Figure 10. The bentonite outcrop is extremely fossiliferous. It yields petrified wood segments by the millions as seen in Figure 11. The Chinle bentonitic material also yields amphibians, phytosaurs, and dinosaurs—Nations and Stump (1981).

Site-1 is at an elevation of 1406 m above sea level (USGS Map). Higher mesas to the north and east average 1550 m in elevation. This variation in elevation suggests that the tracks and fossils of site-1 were originally covered with at least 150 m of Glen Canyon Group strata. These superjacent beds were presumably removed from atop site-1 by the processes of erosion. Site-1 is relatively flat—see Figure 7. Dinosaur and quasihuman ichnofossils are to be seen in slabs of

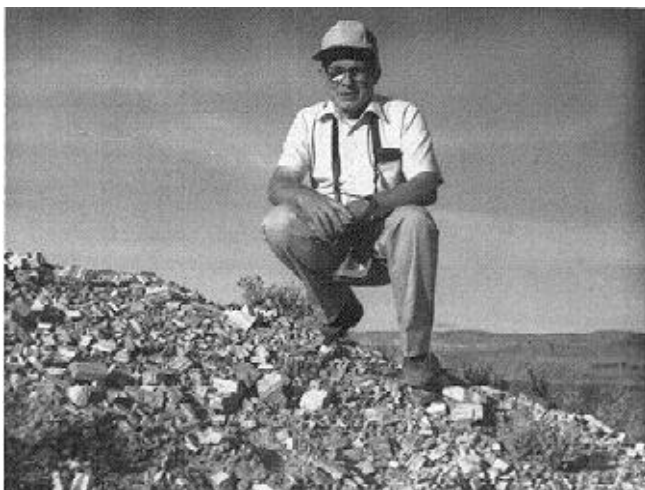


Figure 11. Petrified wood in bentonite of the Triassic Chinle formation. Rosnau stands above a bed of shattered petrified wood west of our site-1, near Highway 89.

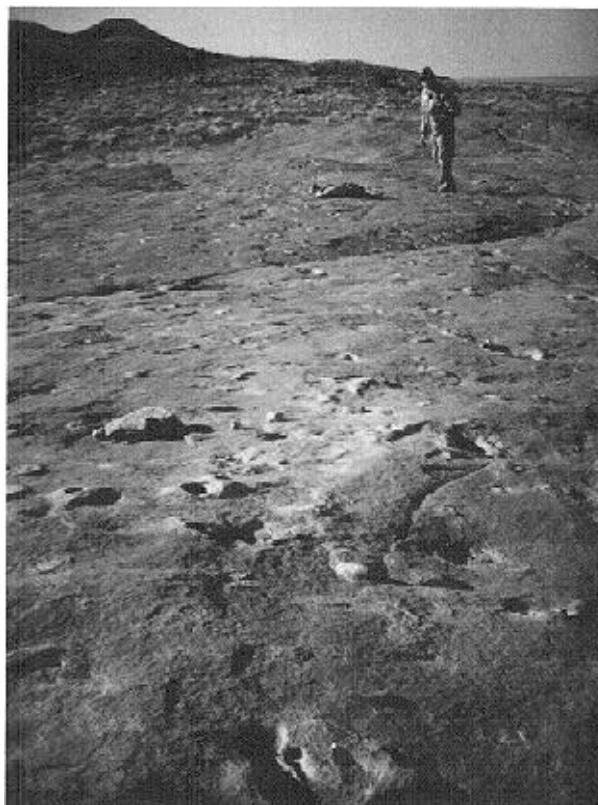


Figure 12. A view of the pockmarked terrain near site-2. Looking westward, this photograph shows the many ridged impressions characteristic of the red and white fluvial sandstone mounds at site-2. Note the foot-like nature of some impressions in the foreground. Lang stands in the background. A tridactyl track is seen at the bottom of the photo — foreground.

sandstone which are locally calcareous and/or conglomeratic.

Site-2 is about 1450 m above sea level and is therefore more than 40 m higher than site-1. At site-2 alternating red and white bentonite colorfully layered beds crop out. These resemble the strata seen to the east of the public gravel road for site-1. Proximate relationships



Figure 13. "Classic" print, site-2. Note the ridge around this possible human track, a ridge suggesting that the impression was made while the matrix was soft and wet. The ball and heel are concave while at the arch there is a prominent ridge. The length is 31 cm and the width at the ball is 13 cm. The sharp periphery supports the belief that it was made by a human wearing a soft-soled moccasin. This one and many other quasi-human ichnofossils will be mapped and more fully discussed in the next paper. Dimensions of ruler in inches.

between site-1 and site-2 suggest that fluvial sandstones under site-2 are a higher part of the Kayenta Formation. At site-2 there are a number of sandstone mounds on terrain which ascends to the north—see Figure 12. Certain mounds that contain tracks at site-2 rise nearly 1.5 m above the sloping terrain. Some of the mounds are about 15 m in diameter and are pockmarked with small craters. They contain ridged impressions of various shapes, some of which suggest human footprints and mammalian tracks with splash ridges around them—see Figure 13. In the second paper we will display, map, and evaluate numerous possible human, mammal, and dinosaur tracks from specific areas at site-1 and site-2. At the conclusion of that paper, each author will state his own views regarding the possible authenticity of the supposed man tracks.

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IS THE SUN AN AGE INDICATOR?

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Abstract

Questions on the age of the sun necessarily hinge on how it produces its enormous energy. Long-age evolutionists favor thermonuclear fusion, the only known process that could last for billions of years. Young-age creationists counter that the evidence for fusion is scanty at best, and many have readily adopted data which seems to show that the sun is shrinking. If so, it could be heating itself by gravitational collapse instead of fusion. However, such data is probably in error, and, in any case is so much larger than the rate actually necessary to produce the sun's heat as to be irrelevant. The sun may be heated by gravitational collapse, by fusion, or a combination of both—there is simply not enough evidence to tell. The sun is therefore not an age indicator one way or the other.

Introduction

In 1979, noted astronomer John Eddy of the Harvard-Smithsonian Center for Astrophysics and High Altitude Observatory in Boulder, Colorado, and Aram Boornazian, a mathematician in private practice, made a dramatic announcement: the sun is shrinking. By analyzing measurements of solar transits made at the Royal Greenwich Observatory since 1836 and the U.S. Naval Observatory since 1846 (for the original purpose of determining exactly when is high noon), they calculated that the sun is apparently shrinking at the rate of 5 ft/hr in diameter (0.1% per century, 2 arc-sec/century). When they considered more tenuous data from observations of solar eclipses for the past four centuries, they saw some evidence for a longer term solar contraction. They pointed out that such a contraction could produce a significant portion of the sun's luminosity (Eddy and Boornazian, 1979; Lubkin, 1979).

For those committed to a view of the sun as several billion years old, and for those who accepted Eddy and Boornazian's interpretation of the data, this was seen as only part of a long solar cycle or pulsation. Such a large rate of contraction could obviously not be maintained for long, they reasoned, and so a cyclic change was assumed. Actually observed solar cycles range from five minute oscillations to, perhaps, several centuries in the case of sunspots. Some are regular, but some are irregular coughs and sputters. Eddy laments, "I don't think that such irregularity is a mark of health. I think it's the mark of a shaky, rickety machine" (Bell, 1978).

Some young-age creationists, on the other hand, eagerly accepted the initial report, including Akridge, 1980; Hanson, 1981; Hinderliter, 1980a, 1980b; Steidl, 1980; Taylor, 1984; Chaffin, 1987; Barnes, 1987; Benton, 1987. They used it as evidence that the sun generates its heat not by thermonuclear fusion but by gravitational collapse, and hence cannot be more than 30 million years old (Appendix A-C). Some (e.g. Akridge) also used the uniformitarian's favorite cliché, "The present is the key to the past" to extrapolate the 5ft/hr rate backwards and obtain a time when the sun would have engulfed the earth. This was on the order of 20 million years ago, and would also set an upper limit to

the age of life on the earth that is obviously much less than evolution requires. Had this been done merely to poke fun at the evolutionist's most sacred principle, all would have been fine. But using the data as serious evidence for a young sun, and hence a young solar system and earth, is not valid.

Problem Analysis

There are three main problems with placing undue emphasis on solar diameter measurements. Each of these will be discussed in detail.

1. Eddy and Boornazian's results are suspect.

A number of other observers do not accept Eddy and Boornazian's conclusions. They do so on the basis of other historical data (e.g. transits of Mercury), and a reanalysis of the Greenwich data, which was gathered using several different instruments by different observers at different locations (Gilliland, 1981; Brown, 1982; Labonte and Howard, 1981; Sofia *et al.*, 1985; Parkinson, 1983; Parkinson *et al.*, 1980; Endal and Twigg, 1982; Krasinsky *et al.*, 1985; Dunham *et al.*, 1980; Shapiro, 1980; Sofia *et al.*, 1979; Ribes *et al.*, 1987; O'Dell and Van Helden, 1987). Some of these writers suggest a slight contraction of the sun, but most see no real change. Eddy and Boornazian themselves have been silent on the matter, neither retracting nor defending their results. Accordingly, the controversy they stirred up seems to be settling down. From 1984 through mid-1988, their original articles have been referred to only four times in non-creationist scientific literature, according to the Citation Index. These are articles by Dransinsky *et al.* (1985), Sofia *et al.* (1985), Ribes *et al.* (1987), and O'Dell and Van Helden (1987). Eddy has not referred to his articles since their publication (again, according to the Citation Index). Even if the initial report had been accepted by everyone, creationists would still not be justified in applying the gross extrapolation the uniformitarian principle entails to those results and then proclaiming "proof" of a young earth.

Because of Eddy's prestige within the astronomical community, attention has been given not only toward reanalyzing historical data but also to gathering current measurements of the solar diameter (Lites, 1983; Rosch and Yerle, 1983; Sofia *et al.*, 1985; Morrison *et al.*, 1988). Methods of measurement are being standardized, special instruments have been developed, and more accurate results should be available in coming years.

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The sun diameter topic has been complicated by the efforts of some to caricature creationists. For example, Van Till (1988) has titled solar changes as a false "legend" which creationists alone continue to believe and perpetuate. Three comments are in order: First, the point is well taken, but it goes entirely too far. As the list of references shows, discussion of solar changes still remains active both in creationist and in secular science. The question of solar changes has not been settled as completely as Van Till implies. A science topic which is less than 10 years old certainly does not deserve the term "legend." Second, creationists have always shown a diversity of views concerning the solar diameter problem. *Third*, it is unfair to connect the creation view with the word "legend." This seems to reveal a hidden agenda of maligning the Biblical foundation of creationism.

2. The suggested rate of solar diameter change is irrelevant to theoretical gravitational contraction.

If the sun were slowly shrinking, each particle as it fell inward would release gravitational potential energy as heat. This heat would be radiated away to space, thereby lowering the temperature, reducing the supporting pressure, and allowing the cycle to begin again with more contraction. The theoretical rate of gravitational collapse necessary to produce the sun's current luminosity has been known for a long time. Its principles were worked out by Helmholtz (1854) and Kelvin (1861). All the sun's current heat could be produced by a contraction rate of only .02 ft per hour (Appendix B), some 250 times *less* than Eddy and Boornazian's rate. They were aware of this, and therefore suggested that only a thin outer shell is contracting, with the massive interior staying at constant diameter. Some creationists (Akridge, 1980; Hinderliter, 1980b; Steidl, 1979) have readily adopted this view. It enables them to keep the suggested contraction rate (which throws the evolutionist's long time scale into jeopardy) without over-heating the sun. But it is plainly an *ad hoc* hypothesis, since the only reason it is put forth is to reconcile Eddy and Boornazian's interpretation of the data with the theoretical contraction rate. It is certainly speculative to (1) extrapolate the questionable 5 ft/hr rate (2) in a straight line manner (it should vary inversely as the radius) (3) for vast lengths of time, as Akridge has done (even though he qualifies his reasoning).

The theoretical gravitational collapse rate of .02 ft/hr (at the present value of the diameter) is much too small to be seen, if indeed it is occurring. It will be *centuries* before a new generation of instruments, sophisticated though they are, gather enough information to pass judgment. The reason is that a rate of .02 ft/hr, or 3 miles/century, amounts to only .007 arc-sec/century, an extremely small change. The best ground-based instruments are limited for this purpose to about .25 arc-sec of resolution. Satellites may do somewhat better in the future, but there is probably enough inherent uncertainty in determining the "edge" of a hot, active ball of gas to preclude definitive contraction measurements of this magnitude for generations to come. Even if the 5 ft/hr rate were true, that is still only 2 arc-sec/century, a rate that would take many decades to verify, especially if there really is an 80-

year cyclic variation in diameter, as Parkinson (1983) claims.

Creationists have *always* been justified in pointing out that gravitational collapse *could be* providing the sun's heat. Theoretically, it could have been doing so for up to 30 million years (Appendix C). The creationist can easily live within this constraint, but the evolutionist requires much more time. He must come up with another source of energy. The question both must now ask is, Is there any other possible source of energy? The answer appears to be, yes, it is probable that hydrogen fusion is energizing the sun.

3. Theory and observation indicate that thermonuclear fusion is probably working in the sun.

Calculations show that the interior of the sun experiences an extremely high temperature and pressure which should force nuclear fusion to occur (Appendix A). In addition, a "laboratory experiment" that shows fusion actually is possible is the hydrogen bomb. These two lines of reasoning can be used to say the sun could be burning hydrogen. But is there any evidence that it actually is? The answer is a fairly certain, yes.

It is generally conceded by creationists and evolutionists that a byproduct of fusion reaction, the neutrino, is detected on earth. However, the evidence is equivocal, since the neutrino signal is barely above the background noise, and is only a fraction (usually put at 1/3) of what it should be. These well known "missing neutrinos" are seen as a major problem of modern solar physics (DeYoung, 1987 p. 64; Zeilik and Smith, 1987 p. 276; Waldrop, 1985; Gingras, 1987). In addition, the faint signal is nondirectional. Sensitive experiments are now underway to determine if the signal is indeed directed from the sun. Results are expected within two or three years.

Of perhaps greater promise is the proposed test to detect low-energy neutrinos (Hudson, 1987; Perkins, 1988), which the present experiments cannot detect. By conventional theory, they should be produced by nearly all of the basic proton-proton chain reactions, whereas the high-energy ones actually detected are produced by only .02% of the reactions. There should therefore be more of the low-energy variety, and their detection from the sun's direction would be virtual proof that hydrogen fusion is powering the sun. Conversely, their lack of detection would be strong evidence that fusion is not powering the sun. Low-energy neutrinos will occasionally interact with gallium to produce germanium, so scientists have gathered much of the earth's meager supply of gallium and concentrated it in two detectors. One is in the Soviet Union and the other in Western Europe. Both are due to start in 1989. Another type of neutrino detector, using heavy water, is in the planning stage (Aardsma, 1987). The instrument will be able to measure the direction of incoming neutrinos, an important factor in the solar neutrino question.

The missing neutrinos have obviously sparked a great deal of international interest. Maddox (1988) comments, "However this tale turns out, it will remain a marvel that so much work, experimental as well as theoretical, has been stimulated by a single discrepant observation." As if the present data has not already caused enough trouble with standard solar theory,

there has recently emerged yet another intriguing speculation on the mysterious neutrinos. Maddox (1988) writes,

Now there has arisen a further source of distraction in a field already sufficiently confused—the possibility that some of the conversion of chlorine to argon nuclei observed originally by Davis may be driven not by neutrinos from the core of the Sun, but by solar flares. The suggestion appears to have been made last year by Davis himself, based on an apparent correlation between records of the Homestake equipment and the presence of flares on the Sun . . . Evidently, if this speculation were correct, the discrepancy between the expected and measured fluxes of neutrinos from the Sun would be further magnified.

However, Maddox goes on to say that other detectors have found no such correlation between solar flares and neutrinos.

There may be a correlation between sunspot number, apparent semidiameter of the sun, solar irradiance, and neutrinos. If so, “. . . then it is almost inevitable that the nuclear reaction rates in the core are varying with the cycle” (Gough, 1988). What further modifications in fusion theory this may require has apparently not yet been explored. The neutrinos that are now detected, then, are evidence for both sides of the solar energy question. The evolutionist says they show at least some of the sun’s heat is produced by fusion, while the creationist says that, if they even exist, they show only that some other source, i.e. gravitational contraction, accounts for most the sun’s energy.

It is worthwhile to note in passing what the evolutionist considers his strongest evidence for fusion: “. . . *gravitational contraction* can sustain the Sun at its present luminosity for only 15 million years; some other energy source must be sought if we are to account for billions of years of sunshine” (Zeilik and Smith, p. 274. italics theirs).

Now, life has existed on Earth for more than three billion years . . . and during that interval, at least, the Sun must have been shining more or less stably with a luminosity close to its present value (Shu).

Geological evidence, however, indicates that the terrestrial crust has an age of several billion years, and it is surely to be expected that the Sun is at least as old as the Earth . . . We must conclude that, although gravitational contraction may play an important role during short phases of stellar evolution, another source must be responsible for most of the energy output of a star (Novotny, p. 248).

Other Solar Energy Considerations

As further evidence against fusion, and for contraction, Steidl (1980) mentions what is now famous in solar physics as the 160 minute oscillation. This was detected via Doppler shifts of the solar surface which were interpreted as radial pulsations. The long period implies conditions in the sun’s interior which do not fit into modern solar theory. (Deep shock waves would efficiently transmit energy, setting up a lower temperature gradient.) The discoverers say bluntly, “The inter-

pretation of this phenomena seems to cause much theoretical difficulty” (Severny *et al.*, 1976).

However, the 160 minute cycle is not universally acknowledged. Woodard and Hudson (1983) and van der Raay (1980) have not found it, and Hudson has recently said, “Following its initial apparition . . . the 160 minute oscillation has remained elusive both theoretically and also observationally” (Hudson, 1987). The following papers from the majority who do accept the 160 minute oscillation and attempt to explain it will aid those interested in pursuing this new science of “helioseismology” and its implications: Severny *et al.*, 1976; Hill *et al.*, 1986; Grec *et al.*, 1980; Isaak, 1982; Claverie *et al.*, 1981; Delache and Scherrer, 1983; Scherrer and Wilcox, 1983; Ando, 1986.

Steidl (1980) lists “one final consideration,” which is important. He cites Cameron, an astrophysicist with Harvard University and the Smithsonian Institution, who calculated the maximum temperature obtainable by the standard evolutionary collapsing gas cloud theory of star formation as one million degrees Kelvin, or much too cool to initiate hydrogen fusion (Cameron, 1976). Steidl has a valid point. Whenever and wherever evolutionists start talking about origins they are quickly in deep trouble. But with their sacred philosophy, they usually just shrug their way out of it, as Cameron does here:

The existence of this large uncertainty about the way in which nuclear reactions turn on in the sun is an indication that the pre-main sequence evolution of the sun is not presently understood.

This natural origin problem is a strong testimony to the supernatural creation of the sun. The question we are addressing, however, is not one of origins but one of operation. For that, we need only do some simple calculations to arrive at a solar core temperature of 12 million K, which (with the help of quantum mechanics) should be enough to sustain hydrogen fusion (Appendix A).

Conclusion

The evidence, whether from analysis of historical data, theory, or observation, is not conclusive as to how the sun heats itself. We can say only that the sun may be shrinking, not that it definitely is.

APPENDIX A

The following theoretical analysis of the sun’s interior follows that given in introductory astrophysics texts; for example, *Astrophysics* (DeYoung), *Introductory Astronomy and Astrophysics* (Zeilik and Smith) and *Introduction to Stellar Atmospheres and Interiors* (Novotny).

Calculation of the sun’s central pressure (P_c):

Assumptions:

- a) The ideal gas law applies throughout the sun. This seems reasonable since the surface, which is certainly much cooler than the interior, is 6000 K, well above the boiling point of any element. In addition, hydrogen and helium make up 98% of the sun’s mass.
- b) The equation of hydrostatic equilibrium applies. This is the basic equation for any atmosphere, and it

seems reasonable to assume it describes the balance between the inward gravitational force and the outward gas pressure force. For a star the size of our sun, the outward radiation force may be neglected for an order of magnitude calculation.

$$\text{Hydrostatic Equation } \frac{dP}{dR} = -\rho g$$

P = pressure

R = radial distance

ρ = density

g = gravity acceleration

$$\text{As an approximation, let } \frac{dP}{dR} = -\frac{P_c}{R}$$

P_c = pressure at core of sun

R = radius of sun

= 7×10^8 meters (m)

$$\text{Surface gravity, } g = \frac{GM}{R^2}$$

$$= 273 \text{ m/sec}^2$$

M = solar mass

= 2×10^{30} kilograms (kg)

$$G = 6.67 \times 10^{-11} \frac{\text{newtons} \cdot \text{meter}^2}{\text{kilogram}^2}$$

Solar density, ρ = mass/volume

= 1410 kilograms/meter³

Core pressure, $P_c = \rho g R$

= 3×10^{14} nt/m²

= 3×10^9 earth atmospheres

Once the pressure is known, it may be used to estimate the temperature (T):

$$\text{Ideal gas law } P = nkT$$

n = number density of particles

= particles/m³

= ρ/μ

μ = average particle weight

≈ .5 amu, since the sun is mostly ionized hydrogen

k = Boltzmann constant

T = absolute temperature

$$\text{Therefore, } T = \frac{\mu P}{\rho k}$$

$$= 12 \times 10^6 \text{ K}$$

APPENDIX B

Calculation of the theoretical (Helmholtz-Kelvin) gravitational contraction rate.

1. Potential Energy, PE

The total solar PE may be estimated by imagining each solar particle as falling from infinity to the solar surface:

$$PE = \int_{\infty}^R \frac{GMm}{R^2} dR$$

$$= -\frac{GMm}{R}$$

$$= 3.8 \times 10^{41} \text{ joules}$$

M = solar mass

m = particle mass

Solar power per unit mass

$$\frac{\text{luminosity}}{\text{mass}} = 2 \times 10^{-4} \text{ j/sec} \cdot \text{kg}$$

L = solar luminosity

= 4×10^{26} joules/sec

Solar contraction rate, v

$$\text{Power} = \frac{d(PE)}{dt}$$

$$= \frac{GMm}{R^2} \frac{dR}{dt}$$

$$\frac{dR}{dt} = v, \text{ a constant contraction rate}$$

$$v = \frac{PR^2}{mGM}$$

$$= 7 \times 10^{-7} \text{ m/sec.}$$

$$= 0.01 \text{ ft/hour, radially}$$

APPENDIX C

Maximum age of the sun considering gravitational contraction only.

$$\text{Maximum age} = \frac{\text{Total available energy}}{\text{Present luminosity}}$$

$$= \frac{PE}{L}$$

$$= 10^{15} \text{ sec}$$

$$\approx 30 \text{ million years}$$

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PANORAMA OF SCIENCE

Bitterroot

In 1805 when Lewis and Clark crossed the Continental Divide they found Indians gathering the exquisite flower from the plant *Lewisia rediviva* (shown on the cover). The copious roots of the plant, when cooked, comprised an important staple in their native diet. When Lewis saw them preparing the raw roots, he asked for a taste of one; and with a wry face, immediately named it Bitterroot, the name it still bears today. From this incident our maps acquired several geographical names such as Bitterroot River and Mountains. In honor of Lewis' interesting commentary, the botanists later included his name in the scientific genus (*Lewisia*) of this beautiful plant.

Rediviva literally means resurrection and the plant gives ample evidence of that renewal. Notice there are no leaves visible. Since it grows in an extremely rocky habitat, the soil is too thin and sterile to afford leaves and flowers at the same time. Consequently the leaves appear early in the spring, perform their ordained function of photosynthesis, and store the energy in the

roots. The leaves then wither away and presently the buds appear to blossom and reproduce from the strength of that bitterroot reservoir.

Further testimony of its vitality is found in the vigor retained in those roots, as they may be replanted and will grow, even after being dried for several months. It is difficult to understand even the basics of photosynthesis, and here is a situation which compounds the problem. An organism can adapt to its environment but always there is that burning question of survival before adaptation. Also it is true for any group of plants that there are limits of adaption beyond which no individual of that species can survive. No less perplexing is the precision of timing if we assign this critical function to mere haphazard chance; for that photoperiodic timing of leaf and flower in this plant must be exact. Then there is the restoration in a dessicated root. Truly it is a "root out of a dry ground." (Isaiah 53:2)

Contributed by Willis E. Keithley

The Revolt Against God (Reilly)

There is no greater act of revolt than the denial of God's existence. Atheism is not only a disorder in the God-man relationship, but a denial of it. Since God is the source of the transcendent standard by which the distinction between good and evil is ultimately made, His removal erases the recognition of the moral struggle in man's soul. If there is no firm foundation for the knowledge of the good with which man ought to bring his acts into conformity, then man is free to reorder or to reconstruct himself in any way he wishes. Man can live "beyond good and evil." Man can be made over—not in the image of God—but in a new image conceived by man. But in what image? Who is man without God? And, if there is to be no relationship between man and God, what shape will the relations between men take?

The problem is that, by denying the possibility of a relationship between God and man, atheism also denies the possibility of a just relationship between men. In other words, atheism removes the grounds for the recognition of, and therefore respect for, another person as a fellow human being. Before one can know what is justly due a man, one must know what a man is. But in the absence of God, it is impossible to know it. Nicolas Berdyaev put it this way: "If there is no God, there is no man either." He meant that atheism strips man of his nature and transforms him into a material product of historical circumstances. Human life is sacred only if there is a God to sanctify it. Otherwise, man is just another collection of atoms and can be treated as such.

How does one treat a collection of atoms? Paul Eidelberg pointed out the logic and consequences of this loss of human nature: "Unless there is a being superior to man nothing in theory prevents some men from degrading other men to the level of the sub-human." If man does not have an immortal soul, the very standard by which one would judge the degradation of a human being is gone, because no fundamental distinction remains between a man and a dog. The degradation of man thus follows as a natural course from the denial of God. The consequences of this could not be more profound for the relationship between men. If a man dehumanizes another person, how does he then love him as a fellow human being and vice versa?

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Man and his "Ancestors"

Recently several articles have appeared in the Quarterly concerning the postulated evolutionary ancestors of Man and the problems associated with the prevailing views. Creationist interpretations have been offered in these treatises. An interested reader may find a selected bibliography from CRSQ on the subject to be of interest. Some are notes, others are lengthy articles offering a wide range of creationist scholarship on the subject.

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Contributed by Emmett L. Williams

The Origin of the Snake

Some creationists believe that the biblical account of the serpent being condemned to crawl upon its belly is an indication that the snake once had legs. Monitor lizards may be the best candidates for picturing precurse snakes. They are very snake-like, having slender

bodies, long necks and long tails. They also possess, like snakes, a forked tongue which can protrude a relatively long way beyond the mouth. Like snakes, they are capable of swallowing large prey because of the solid bony sheath around the brain, which helps to protect the brain from pressure as the prey is being swallowed. Another similarity lies in the jaw bones, which are moveable on each other, facilitating a wide opening of the mouth. The ossification of the temporal arch is complete. Thus the two halves of the lower jaw are joined by a ligament. There are also similarities in the structure of the skull itself. Despite all of this, the monitors are not viewed by evolutionists to be ancestors of snakes.

The above evidence, demonstrating the lizards such as the monitors carry many of the features of snakes, shows that a created lizard (a modified one at that, adapted to a meat-eating diet) could quite easily become the snake we know. This could happen without transgressing the Genesis kind.

Contributed by Colin Brown

Science vs. Humanity (Roche)

"When the men of science have said all their say about the human mind and heart," wrote Albert Jay Nock, "how far they are from accounting for all their phenomena, or from answering the simple, vital questions that one asks them! What is the power by which a certain number and order of air vibrations is translated into processes of great emotional significance? If anyone can answer that question believe me, he is just the man I want to see."

And just the man the world wants to see. Science, for all its brilliance, is blind to the things that matter most to us, in our hearts and minds and souls. Its genius has been our downfall. For two hundred years and more, men have placed their faith and hope in scientific advance, dazzled by its success and certitude. But

to do so, we must put aside our very humanity, for that part of us is forever veiled to scientific inquiry. This is the mistake of the anti-hero, seeing the natural side of us that needed no explaining, and ignoring our spiritual side, nay, denying it with scorn. Let it not be said of his doctrine: "It can't all be wrong. It must have some truth to it, to make such an immense impact on the world. Where there's smoke, there's fire." It is all wrong, and its results show it. It got its power from the seeming perfection of natural science in times long gone, science now obsolete. But anti-heroism is not science, it is philosophy built on flawed perceptions of scientific findings, and on some false findings at that. It deals in ideas, not science, and its ideas must be judged by their truth.

In looking at the curious faiths of the anti-hero, we do not see ourselves. We do not see men. We do not see real people trying to live life on a human scale, and get along, and love one another, and care for their families.

We see, rather, grotesque beings, automatons spun by an uncaring goddess called Nature. We see a beast that thinks it thinks, but some of its "most advanced" thinkers say its thought is a meaningless illusion. We see a beast that acts as if it could act, but has no will to do so. We see a beast that aches in its soul to be good, but has no soul and inhabits a place that has no good. We see a beast that cries out in joy when an imaginary dragon is slain, and weeps real tears when an imaginary princess is felled by an imaginary flower; yet one having no imagination or spirit.

There is no such beast. We are human creatures of a loving God, who take joy in life and grow in His spirit, or not at all.

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PREBIOTIC FORMATION OF THE FIRST CELL

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Abstract

While much attention and effort has focused on the prebiotic formation of such molecules as amino and nucleic acids, the formation of a reproducing cellular entity in a prebiotic environment constitutes a gap seldom addressed in the scientific literature. Indeed, the gap between simple organic molecules and a reproducing cell is vastly greater than that envisioned by most researchers in origin of life studies. The nature and complexity of known cells suggests that the simplest conceivable cellular form is far too complex to be a product of known prebiotic mechanisms. From directing metabolic processes to maintaining osmotic stasis, all would be necessary functions for the first cell.

Prebiotic Environment

An almost endless flow of speculation has been presented in recent decades on the origin and chemical composition of the organic soup from which life is claimed to have originated. At stake is the need for an environment in which organic compounds can thrive and spontaneously join together, forming the necessary components leading to the world's first cellular life form. In part, the cause for so much speculation is the large number of problems associated with the spontaneous appearance of organic life from an inorganic source.

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The presence of molecular oxygen (O₂) in the atmosphere would literally "eat up" any primitive organic molecules that spontaneously formed. The prevalent assumption, therefore, has been that the initial atmosphere of the earth was predominantly reducing. However, many researchers have argued against such an initial reducing atmosphere (Brinkmann, 1969; Clemmey and Badham, 1982; Thaxton *et al.*, 1984). Walker (1977) concluded that the strongest evidence for this reducing atmosphere was that such an atmosphere is what is required for the origin of life. A further complication is that a reducing atmosphere would provide

no protective ozone layer, allowing early organic molecules to be destroyed by cosmic rays. An aqueous environment would offer some protection from these rays, but would also prevent needed energy from reaching the molecules—inhibiting further chemical reactions and effectively stopping a cell from forming.

Another difficulty has been determining the mechanism by which biologically active amino acids and sugars sorted themselves from their biologically inactive mirror images. While such mixtures (racemates) occur naturally, the presence of only one biologically inactive molecule will inactivate an entire protein or nucleic acid. Thus, optical purity of these compounds is a biological requirement. Among the number of suggestions that have offered to explain how optically pure proteins formed spontaneously, the most popular appears to be the parity violation model (Mason, 1984). This concept suggests that these violations of parity induce an energy difference in optically active amino acids (L-amino acids) that may favor their formation into peptide chains while discriminating against the addition of D-amino acids into the peptide. Mason (1984) even suggests such a mechanism makes the production of optically pure molecules “fully determinate” rather than just a result of chance.

Mason’s observation, however, is somewhat over optimistic. Experimental data is very conflicting, and Pacheco (1987) observed that firm evidence for such a result has not yet been produced. Others have voiced great doubt that this mechanism could ever produce significant levels of optically pure molecules (Broda, 1984; Keszthelyi, 1984; Wilder-Smith, 1981).

Actually, such mechanisms tend to be beside the point. Any force favoring formation of optically pure molecules still could not negate the fact that optical activity will always tend to be lost by spontaneous racemization. Even more, such mechanisms working on inanimate molecules are strictly a nonbiological function. Therefore, the origin of optical purity is strictly incidental, and completely independent of any biological process. This would mean that inanimate organic molecules would also be affected, and optical purity should not be almost exclusively limited to, and intricately associated with living systems. Thus the paradox: without life there is no stereospecificity, yet stereospecificity must exist for there to be life.

However, despite these and other difficulties, the initial events in the theorized “primordial soup” are not the real problem. Even if plausible explanations of the origin of these early molecules were forth coming:

The most difficult aspect of the origin of life problem lies not in the origin of the soup but in the stages leading from the soup to the cell. Between the basic building block . . . and the simplest known types of living systems there is an immense discontinuity. (Denton, 1986. p. 263).

It follows that the heart of the abiding mystery of the origin of life is not the abiogenic origin of genes and proteins, it is the spontaneous generation of cells. This is hardly a resounding conclusion, but it is at variance with the impression one obtains from the literature of primordial evolution. (Harold, 1986. p. 170).

Transition From Chemical to Biological

All living organisms exhibit purpose in their behavior, which immediately distinguishes the quick from the dead. The ability to respond to environmental changes, regulate internal conditions, and ultimately reproduce is a common feature of all living cells. In fact, Jacques Monod (1971) incorporated the concept of purpose into his definition of living systems. He then assigned the role of executing biological purpose to proteins (enzymes). Enzymes recognize molecules with extreme precision, distinguishing one stereoisomer from the other. Their kinetic parameters enable them to select the proper reactions from all the thousands of thermodynamically possible reactions; thereby directing the course of metabolic activities in the cell. Such is the gulf that separates biological chemistry from organic chemistry.

In 1867 the physicist, James Clerk Maxwell, proposed a physics puzzle involving a hypothetical creature, which had the ability to recognize and manipulate single molecules. This creature, known as Maxwell’s demon, was able to decrease the entropy of a system simply by virtue of its cognitive ability. Like Maxwell’s demon, the cognitive ability of enzymes impart the cell with self determinancy (i.e., the ability to respond and adapt to environmental changes by processing and applying information). Furthermore, the cell’s ability to regulate all of this enzymatic determinancy is the key to making functional sense of its own metabolic machinery.

Views such as Oparin’s (1968) coacervate droplet are simply functionally impotent. They do not satisfy the criteria for even a “precellular” form, since they are incapable of informational application. While such models may use an ingenious mechanism to temporarily overcome thermodynamic restrictions, without the cognitive ability of Maxwell’s demon the system ultimately suffers a thermodynamic death (i.e., thermodynamic equilibrium). The self determinancy of the living cell enables it to overcome this tendency toward thermodynamic equilibrium, and thereby maintains its biological homeostasis. A model entailing anything short of this is inadequate. Maxwell’s demon obtained its self determinancy by violating the second law of thermodynamics (Morowitz, 1978). Without a similar type of violation, where did the self determinancy of the cell originate?

In bridging this gulf between the chemical and biological process, Bhargava and Gambhir (1984) suggest some possible transitional mechanisms. One proposal is that given the presence of all the necessary constituents, accompanied with sufficient time, the original cells (“protocells”) would naturally organize themselves into a cellular system by virtue of a stochastic event (random chemical reactions). The writers acknowledge that such a concept requires replenishment of all constituents that are lost prior to the completion of cellular formation. Since all the evidence is against such a stochastic event, they admit the probability would be “extremely small.” Even this would seem overly optimistic.

The second transitional mechanism is the result of an event that “for reasons unknown” produced a cellular form. This would be a single event in history, and all life in the universe would be a descendent of such an

event. This unknown mechanism is not a very intuitively satisfying explanation since it depends on naturalistic processes, but cannot be accounted for by those processes. This notion also requires that the three very distinct and diverse cellular forms, eubacteria, archaeobacteria, and eucaryotes (Woese, 1987) be the descendants of one "protobiont." While a common origin of cellular forms is the more popular assumption, currently these cellular types "stand equidistant apart, and equidistant from a theoretical common primeval ancestor" (Denton, 1986, p. 288). Also, the peculiarities of the mitochondrial nucleic acids, which appear not to follow the so-called universal genetic code (Anderson *et al.*, 1981), presents another difficulty for a one time event of "protocellular" formation.

Ultimately, and despite the grandiose claims of some, simple stochastic events or "mysterious" natural processes cannot account for the self determinancy of the cell or the intricate complexity that is commonplace in cellular technology. Yockey's (1981) statement that currently "there is no valid scientific scenario for the origin of life" (p. 15) is still accurate, at least as far as a naturalistic scenario is concerned.

Even more, the conviction that "enough time" is all that is necessary for the formation of living cells should no longer be acceptable to the scientific community. Such "infinite escape clauses" (Mora, 1965) serve no purpose other than to divert attention from the real issue; our present understanding of chemistry and biology does not offer a naturalistic mechanism for the formation of the first cell. As Shapiro (1986, p. 128) notes:

The improbability involved in generating even one bacterium is so large that it reduces all considerations of time and space to nothingness. Given such odds, the time until the black holes evaporate and the space to the ends of the universe would make no difference at all. It we were to wait, we would truly be waiting for a miracle.

Primitive Cells

The primitive cell must have possessed the ability to metabolize, generate and transduce energy, and reproduce. But above all, it had to be able to change, since this is the very essence of cellular evolution. Harold Morowitz (1966, 1967) postulated the minimal requirements for a self-replicating cell. Reasoning, in part, that ubiquity implies antiquity, he determined that constituents such as DNA, tRNA, ATP, NADH, and ribosomes must have formed early. Thus, these molecules set a lower limit to possible size and simplicity of the "protocell." Morowitz (1966 p. 456) suggested a cell with 45 functions and a diameter of about 1000Å. As he concedes:

It is almost certainly a lower limit, since we have allowed no control functions, no vitamin metabolism and extremely limited intermediary metabolism. Such a cell would be vulnerable to environmental fluctuation.

Today the minimal size and postulated number of functions in the "protocell" would most likely be larger since additional functions have been determined that are ubiquitous and logically required. For example,

Morowitz's postulations were prior to a more complete understanding of membrane-bound cellular structures. Our current knowledge suggests that functions such as reproduction and energy generation would require a number of distinct chemical entities, perhaps no fewer than the minimum in contemporary cells. Also, such capability can hardly be envisioned apart from some type of cellular membrane (see discussion below). Finally, compartmentation in the soluble phase is necessary to separate synthesis from degradation, and maintain the cyclic asymmetry required for cell division.

Nevertheless, applying Morowitz's cellular model, these early cells would have been some type of anaerobic chemotroph. Precursors for energy biosynthesis would have been obtained from carbon and nitrogen generated by abiogenic processes in the "primordial soup." Energy metabolism would, by necessity, be extremely simple. Probably some type of fermentative process was the most viable option for early "protocells." Fermentative products are normally organic acids that must be disposed before they acidify the cytoplasmic region of the cell. Passive efflux would not be sufficient since phospholipid bilayer membranes are virtually impermeable to protons and even organic acids would generally be retained. Ridding itself of these would require the "protocells" to be equipped with some type of catalytic mechanism that caused the efflux of metabolic wastes as well as an outward-directed proton pump (Figure 1).

A fermentative process, however, would require at least some sequence of enzymatic reactions, much like those involved in the Stickland reaction or the glycolytic pathway. Instead, an alternative pathway such as that employed by methanogens may have been more likely. Methanogens couple the conversion of H₂ to methane with the synthesis of ATP (Figure 2). But what initially appeared to be a simple electron transport chain has been found to involve an elaborate sequence of enzymatic reactions still not totally understood.

Simpler types of metabolic processes become, by necessity, more theoretical and less like those currently utilized by cells. Such models usually involve the flux of an ion, such as Na⁺ or H⁺ into cell. This influx of ions acts to create an electrochemical gradient, much the same as the sodium or proton motive force currently employed by many cells (Figure 3). However, even "simple" models require some type of ATPase, and compel the cell to accommodate wide fluctuations of cellular pH and ionic concentrations.

As part of their pH homeostasis mechanism, bacteria apparently utilize a proton pump generated pH gradient. In fact, alkalophiles utilize an inverted pH gradient (Booth, 1985). Raven and Smith (1976, 1982) have presented arguments that creating this outward-directed proton pump was the original function of the F₁F₀ ATPase. Evolutionarily, it is remarkable that such a sophisticated enzyme (or a similar one) may exist in all prokaryotes, as well as mitochondria and chloroplasts. This enzyme may become another "universal" cell constituent. In addition, this ATPase is electrogenic and net expulsion of protons requires concurrent movement of other ions, usually an ex-

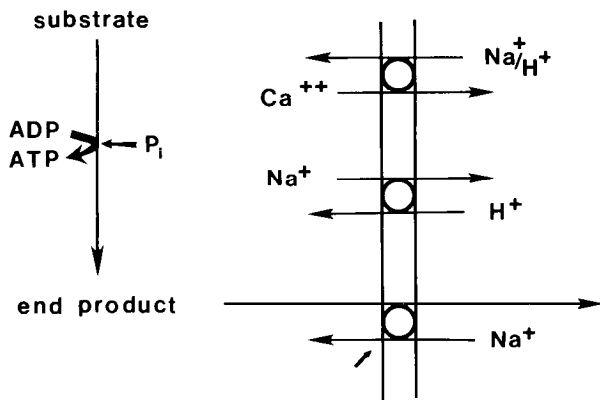


Figure 1. Model for metabolism of the "protocell." Energy (ATP) could be obtained from substrates, such as sugar or amino acids, by fermentative processes. The resulting end product (organic acid) is then pumped across the membrane and out of the cell. This pumping, would probably be coupled with the influx of sodium, and may involve an "early" form of ATPase (denoted by ⊗). Also shown are processes for transporting calcium, sodium, and protons across the membrane.

change of H⁺ for other cations. For this enzyme to be functioning in the "protocell," selective cation permeability must have also been present.

Any "protocellular" organization would also face the problem of osmotic stability. Metabolites and other macromolecules enclosed within the protomembrane would produce osmotic swelling of the "protocell." Cell breakage from such swelling would be a constant threat. In addition, the problem would be enhanced by the proton pump, which generates a negative membrane potential resulting in cation accumulation. Bacteria cope with this by using an external cell wall that restrains such swelling. The "protocell," lacking such a cell wall, would have to achieve stability by mechanisms such as the exclusion of a major medium constituent from the cytoplasm. Since K⁺ would have

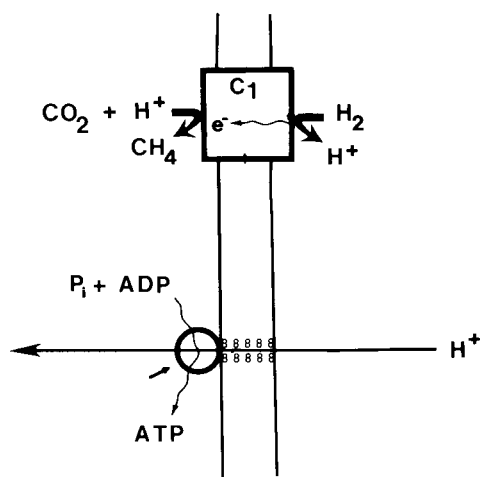


Figure 2. Model for energy production by methanogenic organisms. C₁ denotes the "Wolfe cycle" where electrons (e⁻) are transferred from hydrogen to carbon dioxide to produce methane. This cycle, once thought to be a simple transfer of electrons, is now known to involve an elaborate chain of intermediate compounds and enzymatic reactions using cofactors not found in other cells. The protons that result from this electron transfer are pumped through an F₁F₀ ATPase (denoted by ⊗) to produce ATP.

been insufficient, only Na⁺ could serve as this constituent, thus regulation of intracellular concentrations of K⁺ and Na⁺ would be necessary.

Mechanisms for such regulation (i.e., accumulation of K⁺ and exclusion of Na⁺), by necessity, may have predated the fixation of a ribosomal mechanism of protein synthesis, which requires K⁺. In fact, K⁺ is the predominant monovalent cation in the cytoplasm of most cells, and it is a critical component in maintenance of cell osmolarity. Therefore, a primary or secondary sodium pump, in addition to some type of proton pump, would probably be needed for cellular stability (Wilson and Lin, 1980). Apparently the "proto-

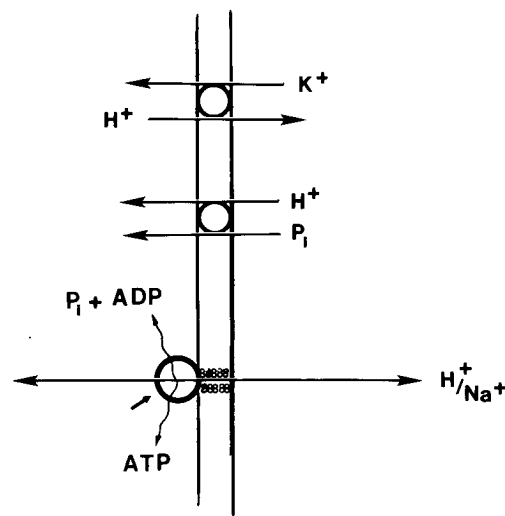


Figure 3. Model for a "simplified" mechanism of energy generation. Protons or sodium ions are pumped through an ATPase (denoted by ⊗) by which ATP is formed. This ATPase may also have the capability to pump these ions out of the cell. Also shown are processes for transporting potassium and inorganic phosphate across the membrane. Such capability would be crucial for the cell to be able to generate ATP or synthesize proteins.

cell" faced the problem of either immediately possessing the ability to maintain its osmotic pressure or rupture if it failed to do so.

Another serious problem faced by the "protocell" is that the seclusion of metabolic processes in closed vesicles requires additional transport systems. However, it would be very unlikely that such additional transport systems would be formed in the absence of a reasonably sophisticated level of cellular organization, and the availability of cellular energy (i.e., ATP, GTP, etc.). Inorganic phosphate (P_i) is a major component of ATP, and in nature is usually a growth-limiting nutrient. This is primarily because of the propensity of P_i to form an insoluble precipitate with metals such as ferric iron. This makes any accumulation of P_i by the "protocell" increasingly difficult.

Under natural conditions availability of P_i will depend, not only on total environmental P_i, but also its solubility, which is in turn dictated by the presence of alkaline earth and heavy metal ions, pH, and many other factors. Nonetheless, in terms of quantitative requirements and, disregarding the elements of water, P_i ranks third, after carbon and nitrogen, among nutrients required for bacterial growth (Rosenberg, 1987). Thus, metabolic use of ATP, an early require-

ment for the "protocell," appears to have required the presence of a Pi accumulating transport system.

Compounding this problem of Pi availability is the high tendency of Ca^{++} to precipitate Pi, especially at alkaline pH. This is particularly serious for the "protocell" since Ca^{++} is abundant in natural waters and will accumulate to high levels in any vesicle with a negative membrane potential, regardless of the membrane's impermeability. Therefore, the ability to rid itself of Ca^{++} appears to be another necessity of any "protocell" system.

Because of the growing evidence against the existence of a primordial soup, Woese (1979, 1980) suggests that life developed in the atmosphere. Envisioning a hot dry earth and an atmosphere similar to that of Venus, Woese speculates that there were clouds in the upper atmosphere consisting of droplets of saline. At the surface of these droplets he proposes that the progenitors of life were formed. However, it is doubtful these macromolecules could avoid destruction by oxidation and ultraviolet (UV) radiation. It is also very likely these compounds, once formed, would settle out of the upper atmosphere prior to assembling into some form of "protocell." This becomes even more critical since contact with earth's hot surface would also be a lethal event for the newly formed "protocells." Their only chance of survival would be a reproduction rate greater than their rate of descent. Studies of particle descent in the atmosphere of Jupiter suggests the "protocell" would have only months before it descended to the planet surface (Sagan and Salpeter, 1976).

... a self-reproducible unit would have had to develop during the suspension time interval with a reproduction rate high enough to permit several "cell divisions" (i.e., some sort of infection of other particles, a mechanism for which is difficult to conceive) before the unit reached the hot surface. (Scherer, 1985. p. 93)

Woese's model also is vague as to how these "protocells" were formed or the origin of their genetic information. But such radical departure from standard naturalistic scenarios is refreshing amid the daily barrage of useless and baseless chemical evolutionary literature.

Regardless of the primeval nature of the "protocell," it required some mechanism by which to reproduce. Such ability would not only be necessary for simple survival, it is a prerequisite for mutational evolution and natural selection. Because of the sophistication involved in the formation of cellular organization, many scenarios have attempted to place "reproduction" of the biochemical polymers prior to encapsulation within a crude cellular structure (Argyle, 1977; Eigen and Schuster, 1982). Thus, the formation of cellular structure is viewed as of secondary consideration.

The discovery that RNA can catalyze specific reactions, without enzymatic assistance, has led some to speculate that RNA preceded DNA and even proteins (Gilbert, 1986; Lazcano *et al.*, 1988). RNA is suggested as the agent responsible for catalyzing the initial activities required to form a functional "protocell" system. Since large RNA molecules (several hundred nucleotides) could not be expected to exist in pre-

cellular systems, small RNA molecules are assumed to be sufficient (Orgel, 1986).

The absence of cellular compartments would force nucleic acids to survive "unprotected" in the prebiotic environment. More to the point, the survival would have to be long enough to allow the coupling of transcription and translation from which the components for cellular encapsulation would subsequently be produced.

Almost certainly a large number of nucleosides (specifically ribonucleosides) would have to form by precellular mechanisms for any "noncellular" replication to occur. However, as the number of reactive hydroxyl-bearing components increased in the environment, the synthesis rate of these oligo molecules would have dramatically dropped (Shapiro, 1984). For example, ribonucleosides would have been swamped by high proportions of closely related molecules such as adenosine analogs.

Adenine can react at positions other than N-9. There are two other monoaminopurines, three diaminopurines, and one triaminopurine. Eight straight chain aldopentoses exist, and sixteen aldohexoses; each of the 24 has 4 different ring forms. By selecting one sugar and one base from the above, we can generate 2,640 nucleosides. Much larger numbers would be obtained by including branched chain sugars, amino sugars, ketoses, reduced sugars, as well as ketopurines, methylpurines, and derivatives of hundreds of other heterocyclic systems. (Shapiro, 1984. p. 569)

Such a prebiotic "soup" would also have contained alcohols, hydroxyethers, hydroxyacids, and millions of other compounds capable of polymerizing the nucleosides. In fact, nucleosides have a higher affinity for these compounds than for other nucleosides, thus effectively stopping RNA and DNA formation altogether.

Many other synthetic difficulties existed for the prebiotic formation of RNA. For example, the postulated pH of the prebiotic soup is 8-9. However, at this pH amino acids react freely with carbohydrates and other compounds containing ketone and aldehyde groups. This reaction results in the degradation of both molecules. Abelson (1966) states that these reactions would have depleted virtually all the free glucose, ribose, and deoxyribose. Lacking these carbohydrates, synthesis of RNA, DNA, AMP, etc. would not be possible. Nucleic acids also have a high affinity for UV light, and are consequently particularly subject to UV-induced damage. Without the protection of a membrane, UV light would effectively destroy any precellular system attempting to develop a primitive genetic apparatus. In fact, the prebiotic availability of even ribose, a necessary component of RNA, is extremely questionable (Shapiro, 1988).

Harold (1986) perceives that life processes and cellular organization are intricately related. He concludes (p. 171) that the concept of precellular reproduction

... is flawed in principle: cellular organization, far from an after thought, must have been from the beginning part and parcel of the origin of life. The vital force, that *vis vitae* which will not be ex-

orced without proper explanation, has its roots in the astonishing degree of organization that pervades the living world from the molecular level to the organismic and societal. Biological order must be maintained by a continuous flux of energy. Therefore a believable biopoietic scheme is one that creates mounting levels of biological order naturally, by providing the means to convert the flux of energy into the organization of matter. This seems to me inconceivable without compartments.

The coupling of an energy liberating reaction to synthesis of macromolecules (energy requiring) can hardly be rationalized without the existence of some type of cellular membrane.

A final difficulty existed for the metabolic and genetic apparatus of the first cell. By definition, the cellular systems of the "protocell" would have been less efficient than its present day descendant. Woese (1965) acknowledges that such early systems would be much more likely to make an error, to the point that error-free gene translation could not have been done. However, an inaccurate translation does not lead to a more accurate translational system. An excellent summary of this difficulty is provided by Denton (1986, pp. 266-68)

It is difficult enough to see how an imperfect translational system could ever have existed . . . That such a cell might undergo further evolution, improving itself by "selecting" advantageous changes which would be inevitably lost in the next cycle of replication, seems contradictory in the extreme . . . That an error-prone translational system would lead inevitably to self-destruction is not only a theoretical prediction but also a well-established empirical observation . . .

Summary

Our current understanding of the cell forces the conclusion that the first cell possessed mechanisms, not only for reproduction, but for internal regulation of organic and inorganic molecules. Such regulation was required since systems that cannot maintain biological homeostasis are unable to prevent a thermodynamic death. Therefore, no model of the formation of the first cell can be considered valid that does not account for formation of the elaborate mechanisms and regulations that were a necessary component. The only *prima facie* conclusion possible is that the first cell would have been far too complex to be a product of known prebiotic mechanisms. It would seem that a naturalistic explanation for the origin of the first cell cannot yet be offered.

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QUOTE

But neither millenarianism nor rationalism would, by itself, have been able to sustain the utopian temper had it not been for the advent of modern technology, with its large promise of human control over human destiny. There is nothing dreamlike about technology: it works—and because it works, it gives plausibility to the notion that modern man is uniquely in the position of being able to convert his idealized dreams into tangible reality. It also gives plausibility to the notion that, because the development of technology—of man's control over both nature and man—is progressive, therefore human history itself can be defined as progressive, as leading us from an imperfect human condition to a perfected one. The ancient Hebrews, the Greeks, the Christians all felt that there was a diabolical aspect to the power of technology; they saw no reason to think that men would always use this power wisely, and thought it quite probable that we would use it for destructive ends. But modern technology, emerging in a context of millenarian aspirations and rationalist metaphysics, was not bothered—at least not until recently—by such doubts. Francis Bacon's *New Atlantis* is the first truly modern utopia—a society governed by scientists and technologists which, it is clear, Bacon thought could easily exist in fact, and which he proposed as a very possible and completely desirable future.

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BOOK REVIEWS

The Case for Creation. 1988. Films for Christ. 2628-A West Birchwood Circle, Mesa, AZ. \$45.00.
Reviewed by Dudley J. Benton*

The Case for Creation is presented in the form of a documentary and opens with Dr. James Kennedy mounting the steps of the Dayton, Tennessee courthouse where the landmark Scopes trial took place in 1925. The evidence—then and now—is re-examined as expert witnesses are “called to the stand” through the device of “modern visual media.” The main points of the film are the false pretense under which the Scopes Trial was conducted, the inaccurate way in which the Trial has been represented, the inconclusiveness of the evidence for evolution (then and more so now), the teaching of origins in the classroom, the repression of evidence and scientists which do not conform to the evolutionary dogma, and the hypocrisy of the evolutionists who have constructed a system which suppresses the views of those who refuse to conform—the very thing which the evolutionists so vehemently protested just 64 years ago.

Using the vehicle of a mock trial complete with on-location testimonies, Dr. Kennedy presents *The Case for Creation*. Witnesses are interviewed to refute the evidence used in the Scopes Trial as well as the current “defense” of evolution. Testimonies are given as to the pervasiveness of evolutionary teaching in the public schools and the inaccuracy of much of the high school material—even from the evolutionists’ standpoint. Legal interpretations are presented regarding the recent court rulings pertaining to the teaching of creation in the public schools. Finally, three case studies are documented involving discrimination against scientists and teachers because of their espousal to creationism.

The Case for Creation ends with a call to be informed, to inform, and to take action. Kennedy calls our attention again to the fact that the Scopes Trial—from the perspective of the evolutionist—was lost in the courtroom but won in the public forum. Even if the courts were to reverse their previous decisions on the matter, in the words of Harold O. J. Brown on another subject, it would still have to pass through the “jaws of public consensus.” Kennedy reminds us, true education was the answer in 1925 and is still the answer in 1989—In the end, “truth will prevail.”

The film presents a variety of information in a concise form on a level which is suitable to a general adult audience. It is not an attempt to present all of the minute details of evolution or creation science. Through the innovative vehicles of a mock trial and on-location interviews, it includes the elements of history and law for which there is rarely time in a single presentation of creation science. There is also no direct appeal to Biblical authority, making it suitable for audiences which might be alienated by such an appeal. *The Case for Creation* should serve as an effective presentation and call to action in high school and college, youth and adult, community and church groups.

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Galileo, Science and the Church by Jerome J. Langford. 1987. The University of Michigan Press. Ann Arbor. 207 pages. \$7.95.
Reviewed by Clifford L. Lillo*

The Foreword, written by Stillman Drake, says,

... as Father Langford points out in his opening sentence, the Catholic Church has not been allowed to regard its ancient condemnation of Galileo as a dead issue. The effective prohibition of a scientific thesis which later became an established truth has stood ever since as a symbol ... Galileo’s condemnation was the first of two outstanding events in modern times that have come to symbolize the conflict of religion and science. Indeed, without the treatment accorded to the views of Galileo and Darwin, the very concept of such a conflict might never have been formulated (p. ix).

This cogently illustrates why every creationist should read this book. Simply put, Drake believes that if it had not been for the harsh treatment of these two men by the Church we might not have the religion/science conflict today. But, does that mean theologians should blindly accept criticism from secular scientists and modify church doctrines or disbelieve the Bible? I think not. The facts regarding Galileo’s censure by the Catholic Church are often erroneously reported by those who have not taken the trouble to research the subject thoroughly. Langford corrects many of these wrong impressions by presenting a detailed account of the circumstances surrounding the life of Galileo and his conflict with Church authorities.

The author begins by describing events leading up to the time of Galileo. He states that the Reformation “was not a sudden outburst against the Catholic Church begun only when Luther posted his 95 theses on the door of the Wittenberg Church in 1517” (p. 4). On the contrary, conditions favoring a revolt had been occurring for several years in spite of attempts by the Church to carry out reforms demanded by influential political and religious leaders.

Prior to 1530, the geocentric theory of the universe (which holds that the earth is motionless and is at the center of the universe) was the accepted astronomical system. Then, Copernicus published his view that the earth itself moves and is not the center but only one planet among many. By 1594, Galileo embraced that view even though he had no real proof that the Copernican system was anything more than a theory. Many scientists of the day, political leaders, and Church authorities rejected the new theory. On February 26, 1616, the Holy Office of the Catholic Church stated,

... Galileo ... was ... admonished by the Cardinal of the error of the aforesaid opinion and that he should abandon it; ... the said Commissary did enjoin upon the said Galileo ... and did order him ... to relinquish altogether the said opinion, namely, that the sun is in the center of the universe and immobile, and that the earth moves ... (p. 92).

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Later, after publication of his *Dialogue on the Great World Systems* in 1632, Galileo was tried and convicted. He was ordered to abjure his heresies and condemned to prison for three years. Langford says that "After the trial and abjuration, the sentence was commuted (p. 157)." Drake comments that, "It is interesting to see that Father Langford . . . believes that the Church made a mistake in the case of Galileo . . . (p. x)." But, what if the Church had censored him for some of his other beliefs? Will and Ariel Durant say that Galileo wrote in 1615,

As to the arrangement of the parts of the universe, I hold the sun to be situated motionless in the center of the revolution of the celestial orbs . . . (Durant, p. 607).

In their comment, the Durants say,

By the humor of history this is a proposition that no astronomer holds today. Perhaps all astronomy, like all history, should be taken as hypothesis (Durant, p. 607).

Galileo was also wrong in his theory about tides. Langford says,

It is on the fourth and final day [Four "days" of discussion divide the *Dialogue*] that Galileo proudly unveils his "clinching proof," his theory of the tides. Here, Galileo felt, was a physical effect which could have only one necessary cause: the double motion of the earth . . .

Galileo rejected Kepler's explanation that the tides are caused by the moon's attraction (pp. 126, 127).

It is easy for scientists to criticize the Church for convicting Galileo of heresy since later developments showed the Copernician theory of the earth moving around the sun was the correct one. But Galileo was not divine, nor even a prophet of God, and thus had erroneous ideas the same as many other scientists have, even today.

Dr. Langford is no longer a cleric and is Director at the University of Notre Dame Press, in South Bend, Indiana. The book, now in its tenth printing, is as relevant today as when it was written in 1966.

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Durant, Will and Ariel. 1961. *The age of reason begins*. Simon and Schuster. New York.

Astronomy and the Bible by Donald B. DeYoung. 1989. Baker Book House, Grand Rapids, MI. 146 pages. \$7.95.

Reviewed by Emmett L. Williams*

As an astronomy teacher and seminar lecturer for many years, the author has written answers to 100 questions in six categories. The scope of the questions asked is quite broad. A partial list is noted: geocentrism, Velokovskyism, changes in the temperatures of the Earth, nine questions about the moon including its origin (as coauthor of *The Moon*, many questions and

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answers should be expected on this topic), avoiding scientific explanations of miracles, origin of the universe within a biblical six-day framework, noting that the Earth is unique among all celestial created bodies, Jupiter effect, stellar distance, black holes, stellar evolution (actually stellar decay), so-called new or emerging stars, the big bang hypothesis and its problems, red shift, age of the universe and whether man should explore outer space.

The wide range of topics covered should interest all readers that find the subjects of astronomy and origins fascinating. Dr. DeYoung is faithful to a young Earth, Biblical framework within the creation model of science. This book can be given to students without any fear of corrupting their faith in Scripture. The author answers practical questions often asked by inquisitive students such as whether astronomy may lead a person to God and the proper limits of scientific investigation. All questions are thoughtfully and concisely answered. The author shares his knowledge of the subject matter in an appealing and unique way.

The book makes a welcome companion volume to more rigid creationist presentations such as *The Moon* and *Design and Origins in Astronomy*. It provides an unusually large amount of information in a readable format. The volume is enhanced with a suggested resources section for persons interested in an in-depth presentation of astronomy and creationism, a glossary, Scripture and subject indexes. If you know a Christian interested in astronomy, consider giving him this book.

A Critique of Howard J. Van Till's The Fourth Day by Samuel E. Waldron. 1988. Truth for Eternity Ministries, 3181 Bradford NE, Grand Rapids, MI 49506. 44 pages. \$3.00.

Reviewed by Don B. DeYoung*

Howard Van Till's *The Fourth Day* (1986) has become widely known for its theistic evolutionary view of astronomy. Actually, Van Till calls his position the "creationomic perspective" to emphasize his view that God directed evolution. A review of this book from the science perspective appeared in the December 1986 *CRSQ* (DeYoung, 1986). Now a detailed theological analysis of Van Till's position is available in this powerful critique. Samuel Waldron is a Reformed Baptist pastor. He goes through Van Till's book like a surgeon, excising the weaknesses and dangerous implications of any position which compromises scripture.

Waldron divides Van Till's errors into three distinct areas. *First*, he finds a subtle departure from an inerrant view of scripture. Van Till would certainly deny this accusation, but his written words speak loudly. Waldron looks at "unequal emphasis of scripture," the view that some portions are "more important" than others. Obviously, this selective emphasis of Bible passages opens the door to error and personal bias. *Second*, Waldron shows that Van Till's high view of science leads consistently to a denial of miracles. Some might feel that Waldron is "reading between the lines" of *The Fourth Day* for this criticism, but the condemning conclusion is on firm ground. *Third*, Waldron exposes Van Till's unspoken rejection of a

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literal, historical Adam and Eve. To make this point Waldron carefully gathers many scattered quotes by Van Till. Waldron's critique is a helpful and powerful analysis of the dangers and weaknesses of theistic evolution.

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LETTERS TO THE EDITOR

Earth Magnetism

If there have been many magnetic reversals of the earth, is there any way to explain the apparent magnetization reversals without invoking a self-reversal mechanism, within the framework of a young earth? I have found one such explanation. All electrical engineers are familiar with the formation of eddy currents which generate unwanted heat in transformers. To reduce the magnitude of eddy currents, engineers have devised an ingenious technique. Transformers are designed not as a solid core, but as a multi-layer of laminates. The currents then flow among individual laminates instead of through the bulk of the transformer core. Thus, eddy currents are extensively reduced, along with heating. Because the transformer is laminated, the magnetic fields produced between the laminates are reverse polarized. As long as the currents are flowing through the laminated core, tiny reversals of magnetic fields are present between the laminate boundaries.

This is what I propose to account for the reversals in magnetization found in rocks, without a reversal of the earth's magnetic field. This proposal could be tested empirically in two stages. A geologist told me that during and after an earthquake, the local magnetic disturbance is quite great. This means that the local electric field is also greatly disturbed. The first stage to test the proposal is to equip earthquake geologists with sensitive current probes. Current probes operate on the principle of varying magnetic fields. When a magnetic field changes, a corresponding electric field perpendicular to the magnetic field is induced. During an earthquake, geologists could use these current probes to detect possible flow currents on the surface of the ground and also at different depths below the ground. The Los Angeles Basin is probably an ideal place to test the idea. The second stage to test the theory is to detect eddy currents near an erupting volcano or a lava flow. This would be difficult but no more demanding than flying an aircraft full of magnetometers over a volcano. The theory will be defeated if all these tests are negative. If these tests are positive, then we can conclude that the reversals in magnetization in rocks of all ages may not be due to actual magnetic field reversals of the earth, but rather due to the laminated nature of the earth's crust that provides layers of transverse eddy currents, which in turn produce reversely magnetized rocks.

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The Gene-Theme Model and Origin of Man

In my paper 'The Law of Symmetric Variation and the Gene-Theme Model' (Brown, 1987), I put forward an explanation of the means by which organisms remain within their respective Genesis kinds, (the Law of Symmetric Variation) followed by a mathematical illustration of the workings of the law (Brown, 1989). Also, in my 1987 paper, I gave an explanation as to why certain fish and amphibians, certain reptiles and mammals, certain birds and reptiles share various features to varying extents; namely, that God has taken some aspects of certain themes of some kinds and used them, to some degree, in other kinds.

Has the Gene-Theme Model been used in the creation of man and certain non-human primates? Let us briefly review some of the main points of the fossil record in relation to this subject. At the most recent end of the fossil record lie ourselves, *Homo sapiens sapiens*, immediately preceded by *Homo sapiens neanderthalensis*. The latter, together with all of its predecessors, had according to the appearance of the skulls, robust brow ridges, jaws and teeth, together with relatively elongated skulls. Are these features the inheritance from some non-human ancestor? The answer is NO!

The internal bone structure of Neanderthal man was far more robust than that of modern man; this was due to their far greater physical activity during the course of their lives. The internal bone structure of wild animals is more akin to that of Neanderthal man, while that of domestic animals is more akin to that of modern man (Constable, 1973, pp. 64-5). The stronger bones would carry a stronger musculature and larger teeth; therefore, I believe the pressure imposed upon the brow ridge area would cause the brow ridges to be more robust, to help withstand the mastication process. I feel that this would apply also to all the other earlier men with this feature. The brow ridges were neither homologous with those of apes nor were those of the so-called *Homo erectus*.

In modern man, there is one small hole in each side of the jaw, the mental foramina whereas in other forms of man, multiple mental foraminae are found. This is due to the size of the jaw, but in some men contemporary with Neanderthal, they are single but large, which is comparable to having many smaller ones. The brain size of man has varied over the years, although it must be said that brain size cannot be used to measure intelligence. For example, people with hydrocephaly, or 'water on the brain,' have a cavity which is filled with fluid, leaving the remaining shell of brain cells to

learn to compensate for the missing bulk of brain matter. Yet, such people live normal lives, pass their driving test and obtain an excellent education. Therefore, intelligence must be in the individual cell make-up, together with its arrangement with other cells in the brain.

Many specimens of the so-called *Homo erectus* are often questioned because of the fragmentary nature, together with stories surrounding their finds. Until recently, skull ER-3733 was the oldest and best preserved specimen, dated at 1.6 million years on the evolutionary dating scale. In 1984, however, Richard Leakey's team found, on the west side of Lake Turkana in Kenya, an almost complete skeleton of *Homo erectus*, a boy, dated at 1.6 million years, known officially as WT 1500. The post-cranial skeleton is surely that of a biped. It is their assurance that all of the bones belong to the same individual, although they were found scattered over a fairly wide area (Brown, *et al.*, 1988).

Leakey no longer considers *Homo habilis*, including the 1470 man, to have been human. A. H. Cave (famous for his work on Neanderthal man in 1957, demonstrating that this form was a subspecies of *Homo sapiens* and not part brute) inspected the 1470 skull in 1972 and said that it was typically human (Hillaby, 1972). To test whether his opinion had changed at all, I sent him quite a number of excellent color photographs of a number of skulls, including 1470. He said that 1470 was 'distinctly human' (letter) and 'undoubtedly human' (telephone). Skull 1813 was viewed as *Homo habilis*. What was undoubtedly non-human was the famous 'Mrs Pleas,' *Australopithecus africanus* (Cave, 1984). A letter received from David Pilbeam states that he does not consider the 1470 skull to resemble *Australopithecus africanus* (Pilbeam, 1984). Where, then, does all of this leave us, with regard to the Gene-Theme Model in connection with man and certain non-human primates? A number of options are available from which to choose.

The original type of man could have been robust, with an elongated skull and prominent brow ridge area. These features are not homologous with those of non-humans; rather, they are adaptations to cope with the amount of physical activity that man would have to undertake in his early days. They were, quite simply, far more powerful than ourselves; not, I hasten to add, 'ape-men,' simply robust human beings. In this sense, the Gene-Theme Model would be in operation, as God would take the robust theme and apply it to man.

The latest news on Neanderthal man is that, according to dates obtained from a site on Mount Carmel in Israel, the suggestion is that they were not our ancestors. The dates, on the evolutionary dating scale, point to the Neanderthals having lived at this site at the same time as modern-looking people, 48,000 to 60,000 years ago (Bunney, 1987, p. 32). Bunney also reports that more modern-type skulls are known from about 100,000 years ago, in Africa. This in itself would not necessarily disqualify the robust Neanderthal-like humans from being the original types of man. For example, there are still Swanscombe, Stenheim and the ones from Petralona in Greece, to name a few, as possible candidates for this title. All of these are viewed to have preceded the classic Neanderthals.

Turning to the so-called *Homo erectus*, hand axes have been found near the Sea of Galilee, which are claimed by some authorities to be 1.9 million years old (Calder, 1984, p. 141). Needless to say, this date has been strongly challenged, because the evolutionists have very little room to maneuver for their theory to fit the facts. As far as creationists are concerned, this find does not disturb their view of life's history. Nor would the idea of finding Neanderthal-type humans at around that time, among fossils of *H. erectus*, *H. habilis* and the *Australopithecines* pose a problem. Not even a Cro-Magnon find would challenge creation. This is one reason why more modern-type human finds have, in the past, been rejected by evolutionists; they simply did not fit with evolutionary ideas.

A case where such a find would be less likely to be rejected came about in the case of the Fontchevade skull, dated, on the evolutionist's scale, at about 150,000 years old. In this case, there was a layer of rock, underneath which was a 20 to 30 foot layer of limestone; the fossil was found in the limestone showing beyond reasonable doubt that it was not a false deposit.

In other words, the position of the fossil in the geologic column must be indisputable or evolutionists usually will invent circumstances to be rid of such an uncomfortable find. This, sadly, could be the fate of other fossil finds of other creatures.

The only other option to the Gene-Theme Model of man, would be that *Homo sapiens sapiens*, are the original type of man and that all other forms are degenerate. Returning to the Gene-Theme Model of robust man being the original type of man, it is possible that at least one of the non-human kinds could have been so different from the other non-human primates, that it had a more upright stance and gait than, for instance, the chimpanzee, yet not related to the human line.

Is not it odd how the earliest known *Australopithecine*, 'Lucy,' is viewed to have done so? Very fortuitous, too, is the dating of the earliest known 'upright non-human' footprints, from on the evolutionary dating scale, around the same time as Lucy lived, in the same area. Were the footprints human, or non-human and evidence of the Gene-Theme Model?

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Genetic Variability*

In Walter E. Lammerts' "Concerning Disjunct Populations of Mammals and Plants," (*CRSQ* 25:126-8) I find the following paragraph, which contains several distortions of the Genesis account of the incidents leading up to the Noahic Deluge:

In my reply (1975) I wondered if Morris had ever considered what a miracle would have been required for Noah to have inherited or been heterozygous for all the genes of mankind, estimated at between 5000 and 120,000 by Curt Stern (1950, p. 69). There is nothing in the Bible to indicate such a miraculous event was connected with the selection of Noah as the sole survivor of the then existing race. His selection was clearly based on the fact that 'he walked with God.' (Genesis 6:9). Also by the year 1921 B.C., 326 years after the confusion of tongues, we find Abram leaving famine stricken Bethel and going to Egypt, evidently a well known nation already! This was about 10 generations after mankind was scattered over the face of the earth. Now if Noah did not have the potential for transmitting the gene differences for the various races of mankind then how did they originate? . . .

These statements were made in an effort to support a hypothesis that, at the time of confusing of the language of mankind at Babel, man's genetic variability was greatly increased at the same time. It seems to me, however, that Lammerts has drastically weakened this bit of speculation by several serious distortions of the Genesis record. First, it is quite obvious by the Genesis account of the Deluge that Noah was not the sole survivor; he was only one of eight survivors. Second, Noah's wife, and the wives of his three sons, also carried a primary source of genes as did Noah. (Noah's sons, of course, obtained their genes from Noah and his wife, presumably in a fifty-fifty mixture). Thus we see that there was not one, but five people who carried all the genes of post-diluvian mankind. That reduces the load on Noah (and each of the other four) by a factor of five (1000 to 24,000 per capita by Stern's estimate, which is at best apparently an educated guess to begin with).

Now then, from where did all the racial variations come? Remember that there are actually only three major subdivisions of mankind. The basic characteristics of each subdivision are clearly evident today, even after many generations of cross-breeding. Apparently they derived from the genes of the wives of Noah's three sons, with certain variations of the genes of the three sons included. But that does not account for the many variations between tribes within each subdivision. When speech was confused at Babel, the purpose was to scatter mankind over the earth with the result that tribes no doubt often originated in one single pair of human beings. The offspring of this pair then intermarried, which limited the genes of the tribe to those of the originating parents for many generations. As the result of this, the entire tribe bore marked resemblance to its first parents. Thus the tribal characteristics are the result, not of increased genetic variability, but a drastic reduction of it.

*Dr. Lammerts is in the hospital and has not been able to answer this letter.

While it is obvious that Noah did not carry all the genes of mankind, the fact that he walked with God was only one factor in his family being selected to repopulate the earth. Just prior to the statement that Noah walked with God appears the statement: "Noah was a just man, and perfect in his generations." When we remember that the human stock had been contaminated by the genes of fallen angels who had changed themselves into the likeness of men for the purpose of having sexual intercourse with women, that statement becomes extremely important. The Hebrew word from which "generations" is translated is (in Arabic spelling) "toldah," which means "descent," or "family." What the statement apparently means is that Noah and his family were perfect genetically. Whether or not "perfect" means that they carried all the genes needed for mankind in the future, it most certainly means that their genes were not contaminated by those of fallen angels. It seems very likely that Noah's family were the only people living who were genetically pure humans. I believe this indicates the importance God placed on keeping mankind, as originally created, genetically pure. If God was going into the gene-changing business at Babel, He could have corrected any discrepancies at that time and been unconcerned about contamination of genes at the time of the Deluge.

As to Egypt being a well-known nation when Abram went there to escape starvation, I believe Genesis and geology shows us that Chaldea was also a well-known and advanced civilization when Abram left it. While things apparently did not move as fast in early times as they do now, I believe we should remember that the first permanent white settlement in America was established in 1620, just 368 years ago, and look at it now. Lammerts gives 326 years as the time lapse between the confusion of tongues and Abram's entry into Egypt, and calls it some ten generations. He fails to realize, it seems, that when the tenth generation was born, many of the first generation was probably still living. Apparently the human life span in the Genesis period was considerably longer than it is today.

So, I cannot see how Genesis can be made to support Lammerts' hypothesis that God increased the genetic variability of mankind at any time after the creation of Adam. Nor can I see any requirement for Him to do so.

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CRSQ Article Reprint

"How Many Animals in the Ark?" by Arthur L. Jones that first appeared in the Quarterly in 1973 (*CRSQ* 10:102-8) was recently reprinted by permission in *Ararat Report* (No. 19, Nov.-Dec. 1988). Creation Resource Foundation and Christian Information Ministries, International, 2050 North Collins Blvd., Suite 100, Richardson, TX 75080 publishes this newsletter and *Creation Discovery Digest*.

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The Norman-Setterfield Model: An Inaccurate Description of Reality

I am disappointed in Setterfield's explanation of the Norman-Setterfield (N-S) model for a decay in the speed of light (Setterfield, 1988). In my critique (Holt, 1988) I raised four main issues: 1] energy is not conserved in the N-S model, 2] linear and angular momentum is not conserved in the N-S model, 3] pulsar data contradicts the N-S model, and 4] the N-S model is inconsistent with the number of days per year when altered to conserve energy and momentum. Setterfield's explanation of my critique was inconsistent and he totally avoided one issue.

The N-S model maintains that atomic rest mass varies as $1/c^2$, as measured in dynamic time, and that the orbital and rotation times of the earth and moon are "dynamically invariant." With these postulates it should be obvious that linear momentum $[mv]$, angular momentum $[mvr]$, and rotational kinetic energy $[mR^2 \omega^2 / 5]$ cannot be conserved in dynamic time or atomic time. My critique stated that "Momentum is not mentioned in the model and violation of this conservation law is never discussed." Setterfield did not address this in his response and he continues to be silent. Those who choose to believe in the N-S model should realize and admit that the N-S model violates the conservation law for angular and linear momentum.

Setterfield attempted to explain the energy conservation problem by postulating an artificial dichotomy between microscopic (atomic) rest mass and macroscopic rest mass, and then discussing the "Q-value mass." In doing so, he effectively avoids discussing the violation of the conservation of rotational kinetic energy. My critique clearly pointed out that the N-S model violated rotational kinetic energy conservation; it is disappointing that Setterfield does not address this issue. Those who advocate the N-S model should realize and admit that it violates the first law of thermodynamics.

My critique demonstrated that if the first law holds in a modified N-S model the number of days in an earth year has changed dramatically. Setterfield states that the rotation and orbital periods are dynamically constant in the N-S model. One must reject either the N-S model or reject history and the conservation of momentum and rotational kinetic energy. For many of us it is easier to accept what we have evidence for and reject the N-S model.

Setterfield's contention that a conceptual error was made with regard to pulsar rotation rates is without substance. My critique provided the mathematical formulas showing what the N-S model would predict for pulsars and gave quantitative values for comparison with actual data. The N-S model does not predict pulsar spin up, but a spin down that is 6 to 15 orders of magnitude in error. (The spin up measured in a very few pulsars is due to contraction and accretion of mass with angular momentum.) If Setterfield believes a conceptual error was made, he should show explicit errors and give quantitative values.

Setterfield further avoids the pulsar data issue by alleging that pulsars are measured in atomic time not dynamic time. According to the N-S model of c-decay, atomic time and dynamic time have been the same since 1961 within the limits of measurement and ig-

noring variations in the earth day and year. Measuring a pulsar period in atomic time since 1968 is measuring it in dynamic time. The pulsar data and analysis stands; the N-S model makes predictions that are 6 to 15 orders of magnitudes in error.

The central assumption in the N-S model, that the earth dynamic year and day is constant or dynamically invariant, is erroneous. Measurements have shown that the years are getting longer and that the length of day varies with the season, the overall climate, and the angular momentum of the jet stream. In addition the length of day has been measured to vary a number of milliseconds in a 24 hour period of time. A dynamic day or year cannot correctly be called a constant or "dynamically invariant."

I am very disappointed in Setterfield's response to my critique and the other critiques. It is equally disappointing that Trevor Norman of Flinders University did not respond to the published critiques of the N-S model. (Does he still support the N-S model as published?) Until a superior model is presented supporting a decay in the speed of light, further critiques are unwarranted. It would be nice to be able to support the N-S model, but the model is an inaccurate description of reality.

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Reflections on Origins

It is a shame that Christians be divided on the issue of origins. I have an idea why they are. I was a theistic evolutionist during my training. After going through a time when even looking at scientific creationist literature made me feel ill, I began to consider the evidence and was astounded that I had never been told that there is design in life that cannot be accounted for by chance. I now have been convinced that the case is also strong for a young earth and recent creation.

Why do others not think so? There is strong peer pressure in science. Professor Pun was honest enough to say it when he stated, "I hate to hear the name *creationist*, because I am a creationist—but I don't want to be treated by my colleagues as a cultic person." (Durbin, 1988). In many cases it amounts to more than being looked down upon. Jerry Bergman, himself a victim of persecution, documents many instances of withholding degrees, losing positions and denying tenure to creationists (Bergman, 1984).

Creationist articles are rarely accepted for publication in refereed journals and creationist journals are unavailable in most public or college libraries. An exception is that some of the work of Robert Gentry on polonium halos was published before its significance was clear to the scientific community. Afterward, Gentry was treated very shabbily by those "objective scientists who control the flow of information (Gentry, 1986).

Because of all this, it is incredibly unlikely that a creationist can get through the system intact. Christians often take on "protective coloration" by accepting scientific orthodoxy but adding a Christian footnote to it. This is no threat to their peers because it fits the prevailing cultural idea that something can be "true for you but not for me." It does not fit the description of Paul in Romans 1, however. For there it says that the existence, divinity and eternal power of God are so apparent from the things He has made that those who fail to acknowledge Him are without excuse.

It is good to have a respect for scientists, both believers and unbelievers, but it is also healthy to recognize the human tendency for covering ulterior motives. If reporters used the same suspicious nature here they use on politicians with whom they disagree, we would have Pulitzer prizes for an expose of "Evolutiongate." I have had discussions with people who could run intellectual circles around me and seen them become infantile when logic led to an uncomfortable conclusion.

A treatment of this subject for Christians must be more than a "Gallup Poll" of scientists' opinions. The data must be examined. It is possible to make the key pieces of evidence understandable to non-scientists and there are a number of qualified people able to do it. This is an important issue. It is at the root of the conflict between our culture and the Gospel, for our age does not believe there is objective reality behind religious pronouncements. Yet the evidence for a young earth and recent creation marks the Bible as credible. It does not need to be "protected" from

science any more than it needed to be protected from history in the time of Karl Barth.

Regarding the Biblical data, I think it would be safe to say that if it were scientifically agreed that the earth is young, there would be absolutely no problem harmonizing that with the Bible. Waltke's recommendation that creationists argue for an ancient earth since the record indicates a chaotic period prior to "Let there be light" seems uncalled for since the period could have been moments or hours (Waltke, 1988). The concern that there was not enough time in a 24 hour day six to name all the animals diminishes when one recognizes the nature of Genesis "kinds." There is evidence that broad categories of creatures are genetically related. There was probably tremendous potential for variability built into the original living creatures that allowed a relatively small number of "kinds" to branch out into the plethora of life we see today. It does not allow macro-evolution because there are limits, but is still present even in many species and genera today. I am convinced that this is the truth and I am trying to speak in love.

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QUOTES

What makes modern millenarianism so powerful—one is tempted to say irresistible—is its association with modern scientific rationalism and modern technology. Scientific rationalism also emerges in the 16th century, persuading us that reality can be fully comprehended by man's abstract reason, and that therefore whatever exists should be capable of being rationally explained in a clear and consequential way.

Kristol, Irving. 1973. Utopianism, ancient and modern. *Imprimis*. 2(4):3.

Those who, like (C. S.) Lewis in *The Abolition of Man*, have seen the figure of Dr. Faustus as possessing a profound mythic significance for Western self-understanding have certainly been right. For Faust wanted no thing, no vocation, no possession, merely the unfettered expression of his own will. And from Faust to Bacon the road runs broad and straight, for in a Faustian world the purpose of science is not noetic, is neither wisdom nor knowledge of the natures of things, but that successful production, at any cost and by any means, of those fruits desired by mankind. For not only does man have no nature and fail of existence as a creature or being having self-identity and relatedness, but nature itself loses its very forms. Bacon's *Novum Organum* required as a companion piece Hume's *Treatise of Human Nature*, for the assertion of technological transcendence over man and nature cannot be pursued successfully unless the world has been swept clean of those forms that imply, indeed require, the existence of order and a certain profound respect for the integrity of beings. Thus the metaphysical platform of modernity, pursued from Occam to the English positivists, has had as its central project the extirpation of the Aristotelian-Platonic notion of form or natures or essences and the propagation of the thesis that the individuality of every being is merely subjective and conventional. Thus it is hardly surprising that at the end of this process there exists a populous race who, obedient to the folk Darwinism of their teachers, are willing to believe that no being has a determinate form, but that each may enjoy an indeterminate number of natures, passing down the interminable evolutionary corridor first as one creature then another. And at the end imagination is gripped by the paradox that everything is everything else, nothing itself. Persons as such, rational individuals capable of contracts, loyalties, politics, and faith, cease to exist.

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QUOTES

If Emersonianism was a heresy from the Gnostic dream world, naturalism was a heresy from the world of scientific materialism. The leaders of the school of naturalism wrote as if it were a new and complete revelation that man is affected by his environment. Frank Norris, Theodore Dreiser, and others embraced in varying degrees the scientific fallacy, which one is tempted to call the "nothing but" fallacy. The scientific fallacy is the theory that man is "nothing but" that which material circumstances can account for, or, as the literary practitioner has to apply it, that man is but one atom or collection of atoms in a vast system of interlocking causalities.

Curtis, III, George M. and James J. Thompson, Jr. (editors). 1987. *Contemporary Southern Literature in The Southern Essays of Richard M. Weaver*. Liberty Press. Indianapolis. p. 54.

Augustine of Hippo, in perplexity of spirit, heard a child repeating *tolle lege, tolle lege*; pick it up, read it; pick it up, read it. Opening at random the Epistles of Saint Paul, Augustine encountered this passage: "Not in revelling and drunkenness, not in debauchery and licentiousness, not in quarreling and jealousy. But put on the Lord Jesus Christ, and make no provision for the flesh, to gratify its desires." Obeying, Augustine began to enter into sanctity. Augustine was the most learned man of his age, and his wisdom descends to us in two great books especially.

Therein lies a moral obvious enough. It is said that the ideas most powerful in the age which is now passing away have been those of Darwin, Marx, and Freud. Who now reads Augustine of Hippo? Yet, as Benjamin Disraeli put it, prevailing opinions generally are the opinions of the generation that is passing. Some of us have unlearned the errors of yesteryear; and given grace, as little children we may begin to learn, gaining ground with every month that passes, something more of the sources of truth.

Kirk, Russell. 1988. The end of learning. *The Intercollegiate Review*. 24(1):27-8.

Perhaps it was in *The Everlasting Man*, the book published in 1925 in which 'all Chesterton's random thoughts were concentrated and refined,' that the best exposition of the evil effect of Darwinism on faith is set out. Most modern histories of mankind, Chesterton said, began with the word 'evolution,' and with a rather wordy exposition of evolution. 'There is something slow and soothing and gradual about the word and even about the idea.' However, Chesterton thought that evolution was not a practical word or a very profitable idea.

Nobody can get an inch nearer to it by explaining how something could turn into something else. It is really far more logical to start by saying 'In the beginning God created heaven and earth' even if you only mean 'In the beginning some unthinkable power began some unthinkable process.' For God is by its nature a name of mystery, and nobody ever supposed that man could imagine how a world was created any more than he could create one. But evolution really is mistaken for explanation. It had the fatal quality of leaving in many minds the impression that they do understand it and everything else; just as many of them live under a sort of illusion that they have read the *Origin of Species*.

The notion of something smooth and slow, like the ascent of a slope, was a great part of the illusion, Chesterton said; but it was an illogicality as well as an illusion; for slowness had really nothing to do with the question. An event was no more intrinsically intelligible or unintelligible because of the pace at which it moved. 'For a man who does not believe in a miracle, a slow miracle would be just as incredible as a swift one.'

Ffinch, M. 1986. *G. K. Chesterton—a biography*. Harper and Row. San Francisco. p. 143.

It is interesting to note that the elder Henry James, father of the great novelist, saw through Emerson in this respect. Though professing an admiration for him, he stated that Emerson was "all his days an arch traitor" to the existing order. He was, James went on to say, "fundamentally treacherous to our civilization without being at all aware himself of the fact." This was so because Emerson had no conscience; that is to say, no consciousness of evil in himself. It is the nature of conscience, James pointed out, to cry, "God be merciful on *me*, a sinner," but Emerson was incapable of passing that kind of judgment on himself. "He recognized no god outside himself and his interlocutor," and what he understood as holiness was simply innocence.

Curtis, III, George M. and James J. Thompson, Jr. (editors). 1987. *Contemporary Southern Literature in The Southern Essays of Richard M. Weaver*. Liberty Press. Indianapolis. p. 53.

The denial of evil is a very great heresy. If we are interested in classifying, it is a phase of the Gnostic heresy, whose chief impulse, originating in arrogance and egocentrism, is to substitute a dream world for the structure of reality. Emerson taught that evil is essentially nonexistent; it was, in his view, only a privation of reality, and so had no ontological standing. For the frustration and suffering that everyone encounters in this life, he had no explanation other than that it was all delusion. He depicted a world in which a divine nature and a Godlike man looked upon one another with mutual satisfaction. Thus for Emerson the world was monistic. The great struggle between good and evil, taught by the religion which he gave up, and dramatized by the greatest literature, does not essentially exist because the Great Adversary, the power of evil does not exist. To be natural is to be good, and all things work harmoniously by divine prompting.

Curtis, III, George M. and James J. Thompson, Jr. (editors). 1987. *Contemporary Southern Literature in The Southern Essays of Richard M. Weaver*. Liberty Press. Indianapolis. p. 52.

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QUOTE

Should the Soviet Union ever succeed in its often proclaimed goal of global hegemony—a goal to which it is far closer today than ever before—it will do so on the basis of a series of inversions, all of which are intimately related: the inversion within man's own soul according to which he thinks of himself, rather than God, as the ultimate arbiter of the universe, codified into a plan for secular salvation (Marxist-Leninist ideology); the institutionalization of that inversion in a regime based upon its principles and dedicated to its universal application (as in the Soviet Union); and the inversion of the relationship between weapons and politics, which addresses the material effects rather than the spiritual causes of conflict (a secularized West incapable of seeing that the true source of peace is justice, founded upon the sanctity of each individual). These inversions may lead to a war which the West may lose. Far more likely, they will not. Rather, they will lead to a defeat without war. But the "peace" which follows that defeat will have more casualties than the war that never was. Pax Sovietica.

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