

Creation Research Society Quarterly

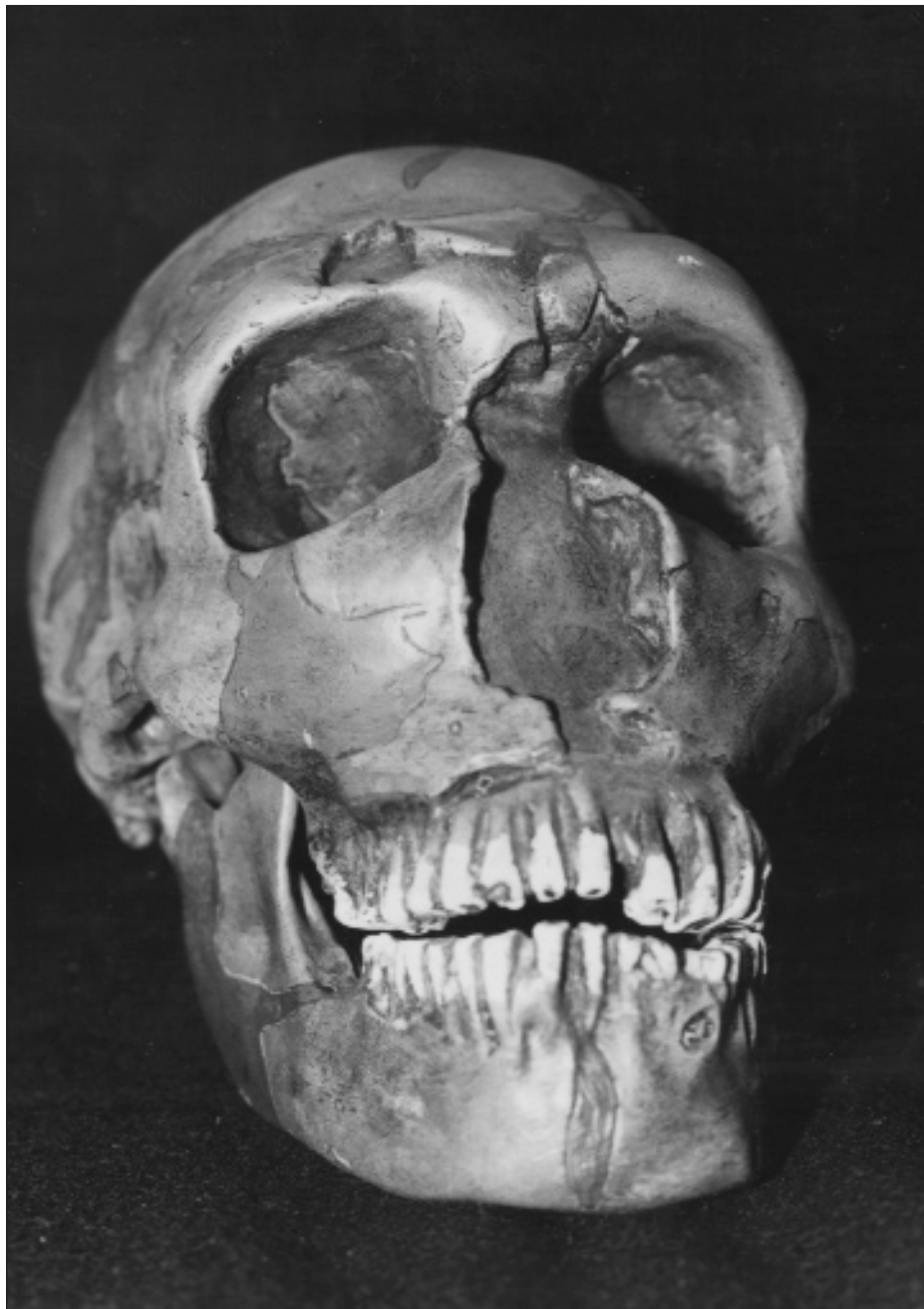
Haec credimus:

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

VOLUME 34

SEPTEMBER 1997

NUMBER 2



NEANDERTHAL MAN

CREATION RESEARCH SOCIETY

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Front Cover Photograph

This is a front view of *Homo sapiens neanderthalensis*—La Ferrass I. Author Celedonio Ramos places the Neanderthals together with *Homo erectus* and *Homo sapiens sapiens* (modern man) into one hominid; see article on p. 93.

Back Cover Photographs

See page 128 for a photo essay.

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CREATION RESEARCH SOCIETY

History The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and about 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 The Van Andel Creation Research Center in Chino Valley, Arizona.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$22.00 (\$27.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 8263, St. Joseph, MO 64508-8263. 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 \$22.00 (\$27.00 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: \$25.00 (\$30.00 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. All members of the Society subscribe to the following statement of belief:

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

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

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

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

EDITOR'S COMMENTS

The September issue includes an evaluation of the geology near the Creation Research Society's Van Andel Creation Research Center (VACRC). In CRS sponsored research, Carl Froede, George Howe, John Reed, and John Meyer have studied the stratigraphy and other geologic features near the VACRC in the light of the Flood model. Similarly, Carl Froede examines the stratigraphy of the Gulf coast of the United States, attempting to define what strata may be classed as post-Flood.

P. V. Vorpahl makes some interesting observations about whether carnivorous animals existed before the Fall. Mark Twain, perhaps the foremost author in the history of American literature, had many interesting comments on the creation-evolution issue. Dr. Don DeYoung has researched Twain's views and has prepared a summary.

From a new Spanish author, Celedonio García-Pozuelo Ramos, we are pleased to publish a study of the taxonomy of primates. It is encouraging to see authors use such powerful techniques to attempt to identify the Genesis kinds.

In a follow-up paper, Jeremy Auldaney, Paul Rosnau, Edwin Back, and Norman Davis give further documentation of the human-like track impressions that were reported in an earlier *CRSQ* issue. These tracks are accompanied by dinosaur tracks. There will be a Part II to this article in which the workers will discuss some possible Flood model interpretations.

We hope that readers will also enjoy the shorter items such as letters to the editor, book reviews, and the Lab Director's report.

Please make every effort to promote the Quarterly. College and university libraries often need to be encouraged to subscribe. CRS members may find it rewarding to write a letter to their alma mater offering to donate a subscription if they will agree to shelve and care for the Quarterly along with the other peer-reviewed journals. I would appreciate hearing of the outcome of any such effort.

Eugene Chaffin
Editor, *CRSQ*

INSTRUCTIONS TO AUTHORS

1. Manuscripts shall be typed and double spaced.
2. An original plus two copies shall be submitted to the editor of the Quarterly.
3. All submitted articles will be reviewed by at least two technical referees. The editor may or may not follow the advice of these reviewers. Also, the prospective author may defend his position against referee opinion.
4. The editor reserves the right to improve the style of the submitted articles. If the revisions of the editor and referees are extensive, the changes will be sent to the author. If the changes are not suitable to the prospective author, he may withdraw his request for publication.
5. Due to the expense involved, manuscripts and illustrations will not be returned to authors.
6. All references (bibliography) must be presented in the style shown in the Quarterly. If a prospective author is not familiar with the *CRSQ* format, the editor will furnish an example reference page.
7. All figures and drawings must be prepared professionally. No sloppy hand drawings or freehand lettering will be

accepted. The editor reserves the right to approve submitted figures. Unacceptable illustrations will result in rejection of the manuscript for publication. Do not send slides.

8. Any manuscript containing more than 25 pages is discouraged. If a topic cannot be covered to the author's satisfaction in this length of pages, the author *must* divide his material into separate papers that can be serialized in the Quarterly.

9. The Quarterly is a journal of original writings. Only under unusual circumstances will we reprint previously published manuscripts. Never submit an article to two or three journals, including ours, hoping all of them will publish your work. When submitting an article, please state if the material has been published previously or has been submitted to other journals.

10. Book reviews should be limited to 1000 words or fewer.

11. Authors are requested to supply a list of key words for subjects covered in their articles.

Quote – The Line of Demarcation

But I shall certainly admit a system as empirical or scientific only if it is capable of being tested by experience. These considerations suggest that not the *verifiability* but the *falsifiability* of a system is to be taken as a criterion of demarcation. In other words: I shall not require of a scientific system that it shall be capable of being singled out, once and for all, in a positive sense; but I shall require that its logical form shall be such that it can be singled out, by means of empirical tests, in a negative sense: *it must be possible for an empirical scientific system to be refuted by experience* [emphasis is in the original]. Popper, Sir Karl R. 1968. The logic of scientific discovery. Harper and Row. New York. p. 40-41.

AN OVERVIEW OF THE GEOMORPHOLOGY OF ARIZONA (VAN ANDEL CREATION RESEARCH CENTER REPORT NUMBER 1)

CARL R. FROEDE, JR., GEORGE F. HOWE, JOHN K. REED, JOHN R. MEYER, and EMMETT L. WILLIAMS*

Received 12 February 1996; Revised 30 October 1996

Abstract

The recently established Creation Research Society Van Andel Creation Research Center (CRS/VACRC) located in Chino Valley, Arizona provides an excellent working laboratory for Young-Earth Creationist studies. An important component for many studies to be conducted from this facility is a general knowledge of the geomorphology of the state and region. Arizona can be divided into three general provinces: 1) the Colorado Plateau Province, 2) Transition Zone or Central Mountain Province, and 3) the Basin and Range Province. The CRS/VACRC lies within the Transition Zone/Central Mountain Province. With a general knowledge of the geomorphology of the state we can then better understand how the Arizona terrain and topography are affected from a climatic, floral, and faunal perspective. We can also initiate studies into how these geomorphological provinces were originally formed and developed within the constraints of the Young-Earth Flood Model.

Introduction

Over the years the Research Committee of the Society realized the need of establishing a center totally devoted to creationist research and field studies. Walter Lammerts, the founder, and George Howe, former Quarterly editor and one of the past presidents, strongly advocated that such a center be located on or near the Colorado Plateau because of the scientific possibilities of the region. In the early 1980's, Walter Lammerts, George Howe and Emmett Williams, then the chairman of the Research Committee, made two trips to Arizona to seek a site for a proposed laboratory. The lack of water and remoteness of many of the sites plus a brutal winter climate militated against selecting a location on the Colorado Plateau. The place chosen (Chino Valley) to build the facility had an abundance of water, milder climate and was not as remote. Two and a half acres were purchased on a paved major north/south US highway. Some of these details and other interesting circumstances of the search for property can be found in Lammerts, 1983; Howe, 1983. The Board of Directors unanimously approved the purchase of the land in 1983.

Later George Howe and John Meyer conducted a unique reconnaissance of the region around Chino Valley and issued a comprehensive report of the investigation (Howe, 1984). However, the Society did not have funds to build on the land. John Meyer evidenced keen interest in a laboratory/study center and brought detailed plans to several Board meetings. He submitted a grant proposal to the Jay and Betty Van Andel Foundation which was accepted and because of the generous gifts of the Van Andels, construction could begin! (See Meyer, 1991; 1992.) Two and a half additional acres were purchased to give a total of five acres,

and construction was completed under the guidance of Dr. Meyer. Thus a center is available to facilitate research and field studies within the framework of the Creation Young-Earth model from its strategic location in north-central Arizona (Figure 1). Recently, the Van Andels have donated funds for the construction of a greenhouse which will provide for greater research possibilities at the center.

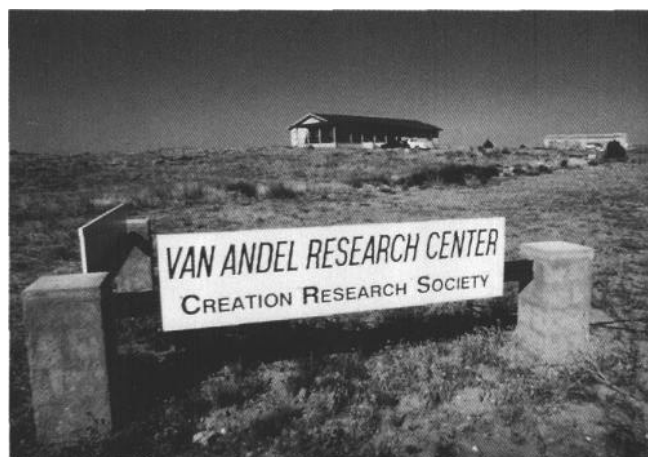


Figure 1. Creation Research Society's recently established Van Andel Creation Research Center located in Chino Valley, Arizona. This facility provides working space for many creationist researchers to conduct a variety of experiments (both laboratory and field).

In this article we orient the readers of the *Creation Research Society Quarterly* to the location of the Society's Van Andel Creation Research Center (CRS/VACRC) within Arizona's geomorphologic/geologic provinces. Field studies and activities conducted from the CRS/VACRC will likely occur within one of these provinces. Hence, this information should prove valuable. This work is only intended as a general overview of the geomorphology of Arizona. It is not expected to satisfy the details of specific areas or preclude additional reporting on other aspects of the geomorphology of Arizona. It is our hope that additional studies will be con-

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ducted to further investigate the geomorphology of the state. Through this paper we will seek to examine and describe Arizona's geomorphology based within the constraints of the Biblical record (e.g., Froede, 1995; Reed, Froede, and Bennett, 1996; Walker, 1994).

Geomorphology

Geomorphology is a broad based science. According to Bates and Jackson (1987, p. 272) geomorphology is defined as:

The science that treats the general configuration of the Earth's surface; specifically the study of the classification, description, nature, origin, and development of present land forms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features.

Thus, geomorphology is more than just the simple study of surface landforms. It is also an attempt to explain the forces which occurred throughout Earth history in shaping the land surface. The geomorphic features observed by creationist or uniformitarian scientists remain the same. Additionally, our description of the various landforms will not vary from those previously proposed by Uniformitarians. However, we do not accept either the proposed vast ages

suggested as necessary to create these many features, or some of the suggested conditions in which they were formed (e.g., subaerial versus subaqueous, paleoenvironmental succession, sedimentary environments, facies development).

For geomorphologists the similarities among landscape features usually suggest a common geologic history. Divisions can be made within any given region based on the differences in flora, fauna, climate, and geology (Hunt, 1967). Geologic divisions within a region can be based on such features as rock type, structure, and erosion (Shimer, 1972, pp. 3-4; Thornbury, 1965, pp. 1-12).

Arizona Geomorphology

Arizona can be divided into three general regions or provinces: 1) the Colorado Plateau Province, 2) Transition Zone or Central Mountain Province, and 3) the Basin and Range Province (Figure 2). Parts of these three geomorphological regions extend across other areas of the Western United States. For the many subprovinces also recognized across Arizona, see Krantz, 1989, p. 464; Menges and Pearthree, 1989, p. 651; Peirce, 1986; and Smiley, Nations, Péwé and Schafer, 1984. According to Peirce (1986, p. 80) the unraveling of Arizona's geologic history cannot be performed unless interprovincial considerations are also addressed. We agree and believe that additional studies should be conducted to orient all of these geomorphic provinces within the framework of our model.

The Colorado Plateau Province

The Colorado Plateau Province extends across the upper third of Arizona where it comprises several individually named plateaus together with various valleys, buttes, and mesas (Wilson, 1962, p. 96). According to Nations and Stump (1981, p. 80), this province is described as:

...predominantly horizontal stratified sedimentary rocks that have been eroded into numerous canyons, plateaus and scarps along which are exposed many colorful rocks ranging in age from Precambrian to Cenozoic. Many of the famous landscape features such as the Grand Canyon, Black Mesa, Painted Desert and Petrified Forest, and the Mogollon Rim have been carved into these rocks by erosion. Others such as the San Francisco Mountains and the White Mountains have been piled on top of the Plateau by Cenozoic activity.

A study of the lower-most strata in the Colorado Plateau Province reveals complex structural relationships between Archeozoic basement and overlying Proterozoic rocks. The flat-lying Paleozoic rocks which overlie the Proterozoic reveal that little to no tectonic activity occurred both during and following the deposition of the original sediments. Figure 3 shows a typical landscape of the Colorado Plateau Province with canyons and generally flat-lying strata. Prob-

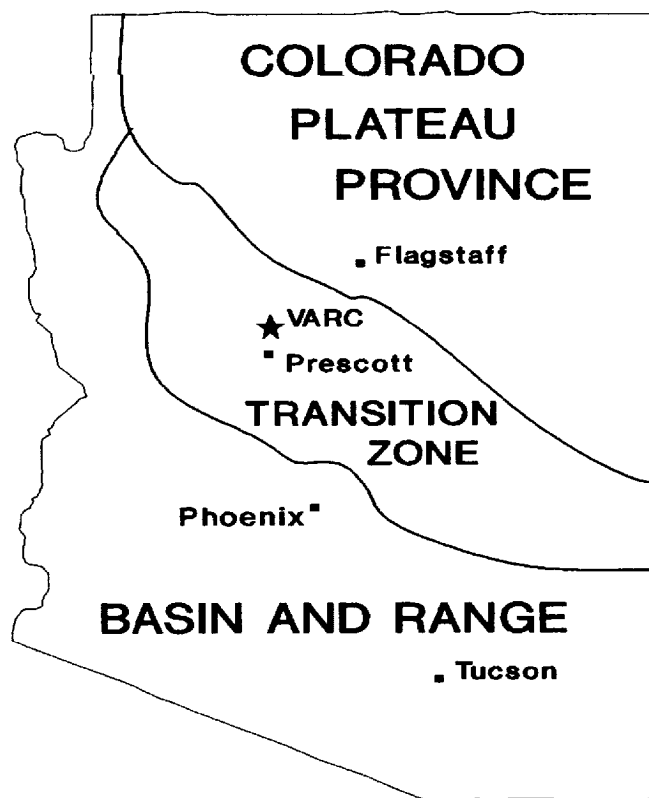


Figure 2. The three major geomorphologic regions identified in Arizona are based on a variation in elevation, surface features, and geological mechanisms in their formation. Modified from Nations and Stump, 1981, p. 79.



Figure 3. The Colorado Plateau Province looking north across the Little Colorado River. Note the flat-lying nature of the surface of this province. Much of the strata found in the subsurface also exhibit this same flat layering.



Figure 4. The Grand Canyon from the south rim. This is probably the best known feature found in the Colorado Plateau Province. Note the flat-lying nature of the strata exposed along the sidewalls of this photograph.

ably the most famous feature within this province is the Grand Canyon where the horizontal nature of the Paleozoic strata are clearly exposed (Figure 4).

The Transition Zone

The Transition Zone/Central Mountain Province is an area which lies between the Colorado Plateau and the Basin and Range Provinces. Strata found within this province contain characteristics of both the adjacent provinces. Nations and Stump (1981, p. 90) have identified this relatively narrow band of landscape which forms this province as:

...rugged mountains of igneous, metamorphic and deformed sedimentary and volcanic rocks of Precambrian age, with erosional remnants of Paleozoic age. The elevations are generally lower and the crustal rocks have been more severely faulted than in the Plateau

Province. Well known landscape features in the Central Mountain Province include the Black Hills near Jerome and Prescott, the Mazatzal and Sierra Ancha Mountains around Roosevelt Lake, and the Salt River Canyon between Show Low and Globe. The important copper mining districts extending from Jerome to Morenci, and the uranium occurrences in the Precambrian Dripping Spring Quartzite, are located in this area.

According to Wilson (1962, p. 96), three great valleys (i.e., the Chino, Verde, and Tonto) have formed as a result of the relative downfaulting and erosion associated with this province. The CRS/VACRC is located in Chino Valley (Fig-

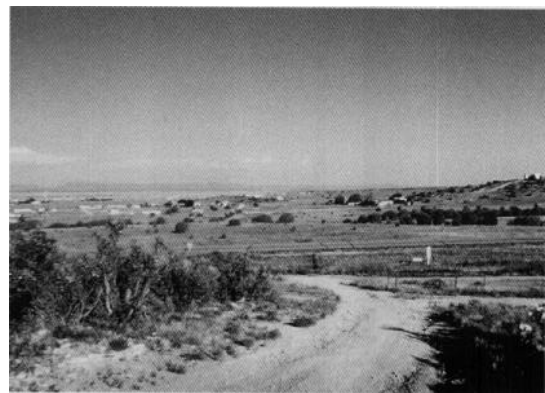


Figure 5. A photograph of the Chino Valley looking northwestward. This valley is one of three major valleys found in the Transition Zone/Central Mountain Province.

ure 2 and Figure 5). These same tectonic and weathering processes have affected the strata found within the Transition Zone in many other locations and has served to separate them from the Colorado Plateau Province, which it structurally resembles, in that its strata are essentially flat-lying except for local flexing (Wilson, 1962, p. 98) [Figures 6 and 7]. Hence, this province is viewed as having experienced greater tectonic instability than the adjacent Colorado Plateau Province in Earth's past.



Figure 6. A photograph showing some of the peaks of the Mingus Mountains which lie to the west of Jerome, within the Transition Zone/Central Mountain Province.



Figure 7. A photograph taken from Transition Zone Mingus Mountains looking northward across the Verde Valley toward the Colorado Plateau.

The Basin and Range Province

The Basin and Range Province extends across most of the Southwestern United States. In Arizona this province stretches across the lower third of the state. According to Nations and Stump (1981, p. 80) the Basin and Range Province in Arizona is characterized by:

...elongated mountain ranges trending northwest-southeast, separated by broad alluvial valleys. The mountains consist of tilted, and sometimes structurally deformed, blocks of Precambrian, Paleozoic, Mesozoic and Cenozoic rocks that are bounded by faults and have been severely eroded. The valleys are intermontane depressions that have subsided thousands of feet, and are filled with Cenozoic volcanics, alluvium, and lacustrine sediments.

The southernmost portion of the Basin and Range in Arizona exists within the Sonoran Desert. Because of the influence of aridity associated with the Sonoran Desert the topography becomes progressively sharper and more rugged as one moves southwestward and westward (Wilson, 1962, p. 90).

The Basin and Range Province has experienced the greatest amount of tectonic instability. Extensional tectonics within this province has served to stretch and rotate the Earth's crust forming a whole series of fault-block mountains (Eaton, 1982). The fault-block pattern for most of the Basin and Range mountains generally trend in a northwest to southeast direction (Figure 8a and 8b). Uniformitarians suggest that orogenic activity which occurred during the Miocene (Tertiary) resulted in the formation of the Basin and Range Province (Nations and Stump, 1991, p. 9). In some places the Basin and Range fault-block mountains are superimposed over metamorphic core complex mountains. The metamorphic core complex mountains generally lie in a southwest to northeast direction which is opposite to the general direction of the other mountains found within the

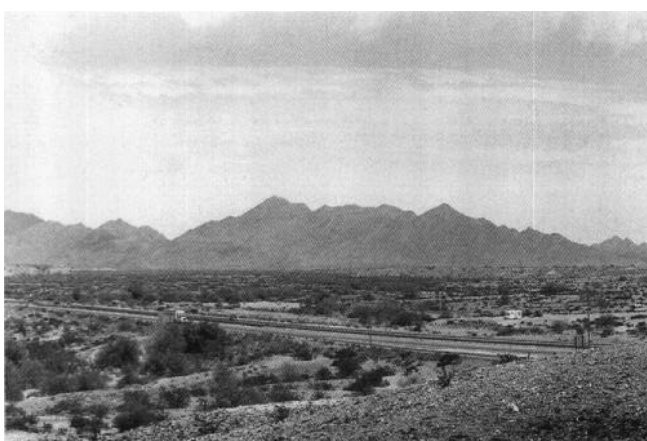


Figure 8a. A photograph showing the general topography of the Basin and Range Province. This is an example of fault-block mountains. This is Dome Rock Mountain, looking southeastward from mile marker 8 along Interstate 10, near Ehrenberg, AZ. Photograph by George F. Howe.



Figure 8b. A photograph showing the general topography of the Basin and Range Province. This is an example of fault-block mountains. This is Castle Dome, part of the Kofa Mountains, looking southeastward from mile marker 13 along Interstate 10, Quartzite, AZ. Photograph by George F. Howe.

Basin and Range Province (Armstrong, 1982: Chronic, 1983, p. 75; Crittendon, Coney, and Davis, 1980; Dickinson, 1991; Reynolds, 1980; Rehrig, 1986; Reynolds, Richard, Haxel, Tosdal, and Laubach, 1988, pp. 483-490; Spencer, 1992; Spencer and Reynolds, 1989a, p. 553; 1989b) [Figures 9a and 9b]. These mountains contain metamorphic rocks (i.e., mylonite) within fault zones which suggest their formation under directional tension. It has been proposed that the metamorphic core complex mountains were formed in the Mid-Tertiary, about 20 million years before the orogeny which created the Basin and Range Province (Chronic, 1983, p. xii-viii; Howard, John, and Miller, 1987; Livaccari, Geissman, and Reynolds, 1995; Nelson and Beratan, 1995). Reynolds et al., (1988, p. 483) suggested that western Arizona and adjacent parts of southeastern California have had:



Figure 9a. A photograph showing the general topography of the Basin and Range Province. This is an example of metamorphic core complex mountains. Harcuvar Mountains looking northwestward from mile marker 79 along Arizona Highway 60, near Aguila, AZ. Photograph by George F. Howe.

...a more complicated history of Mesozoic and early Tertiary metamorphism and deformation than the rest of Arizona. In addition to middle Tertiary mylonitization and detachment faulting, at least five major meta-



Figure 9b. A photograph showing the general topography of the Basin and Range Province. This is an example of metamorphic core complex mountains. Whipple Mountains looking northwestward from Highway 95, eastern California. Photograph by George F. Howe.

morphic episodes, ranging in age from Triassic to early Tertiary, have affected the region. Most metamorphic episodes were associated with regional deformation, including large scale thrusting, and some were accompanied by synkinematic plutonism.

This plutonism is the result of deep-seated volcanics which have been injected into the overlying fractured and faulted crust. Erosion later served to exposed these rocks (e.g., granite and diabase) at the surface. In some places within this province these volcanic magmas penetrated to the surface and erupted resulting in the formation of volcanic deposits.

Young Earth Flood Model

Much creationist field work has been accomplished in Arizona and on the Colorado Plateau. The palynology of certain strata in the Grand Canyon (Burdick, 1966, 1972; Chadwick, DeBord and Fisk, 1973; Howe, 1986; Lammerts and Howe, 1987; Howe, Williams, Matzko and Lammerts, 1988) has been investigated extensively. The stratigraphy of the Colorado Plateau in relation to the rapid deposition of the various layers was noted by Clark (1966). A study of Grand Canyon strata with an emphasis on continuous deposition without any interval of erosion was accomplished (Waisgerber, Howe and Williams, 1987). Austin (1994) discussed the sedimentary strata in the Grand Canyon extensively from a creationist perspective. A possible pre-Flood/Flood boundary was identified within Grand Canyon strata (Austin and Wise, 1994). A fossil location within Red-wall Limestone was discussed as evidence for a catastrophic burial event by Austin and Wise (1995).

Considerable effort has been exerted by creationists in developing models for the formation of the Grand Canyon as well as showing the extent of the immense post-Flood erosion evident on the Colorado Plateau (Austin, 1994; Brown, 1989; Burdick, 1974; Cunningham, 1977; Holroyd, 1990a, b; Oard, 1993; Williams, 1996; Williams, Meyer and Wolfrom, 1991; 1992a, b). Several biogeography studies which relate to geomorphology of the region have been done by creationists (Howe, 1981; Meyer, 1985 [The creationist model developed in this investigation depends directly on the recent formation of the Grand Canyon]; Meyer and Howe, 1988; Williams, Howe and White, 1991). An ichnological study was conducted by Rosnau, Auldaney, Howe and Waisgerber (1989a, b). DeYoung (1994) discussed the meteor crater in Arizona within a young earth model. A geomorphological study of Kanab Plateau and the Grand Staircase on the Colorado Plateau has been finished and a report is being prepared. Also a proposal for a geological investigation of the San Francisco Mountain region has been approved.

The stratigraphy of the Colorado Plateau spans more uniformitarian time than anywhere else on Earth. This strati-

graphic column is also important to our understanding of Earth history within the context of our own model (i.e., Flood energy and its effect on sedimentation—see Reed, Froede, and Bennett, 1996). It is easy to understand why so many creationist investigators have focused their attention on it.

Presently it is unknown when much of the strata which composes the Transition Zone/Central Mountain Province was formed. We anticipate that the Flood served to redistribute Antediluvian sediments along with adding new materials derived from other sources across both the Colorado Plateau and Transition Zones. There are many areas within the Transition zone which contain the same strata as sections of the Grand Canyon (e.g., Supai, Redwall, and Tapeats formations). During the Flood, tectonic activity within the Transition Zone served to break the basement rocks into large fault-bounded blocks. These blocks then rose or sank due to various orogenic forces transforming the Transition Zone into a mountainous region which no longer resembles the adjacent Colorado Plateau or Basin and Range Provinces.

Many investigations have been conducted within the Transition Zone/Central Mountain Province because of the economically important minerals contained in certain areas (Anderson and Blacet, 1972; Anderson and Creasey, 1958, 1967; Anthony, Williams, Bideaux, and Grant, 1995; Krieger, 1965; Lehner, 1958). These investigations have concluded that this region has undergone a complex geologic history. Various volcanic strata found within this province suggest that they originally formed in a subaqueous environment. This is evidenced by the occurrence of pillow and amygdaloidal basalt structures in certain areas of this Province (Anderson and Creasey, 1958, 1967). These subaqueous deposits suggest to us a possible link to the Flood. Further investigation is required to develop this interpretation.

In topographically higher areas within this province we observed evidences of subaerial ash fall, lava flow, and base surge deposits all of which suggest subaerial Ice Age or even Present Age Timeframe deposits. These sedimentary and volcanic deposits and their associated erosional features, suggest a complicated history for the Transition Zone/Central Mountain Province which has yet to be investigated with any detail, within the framework of our model.

The Basin and Range Province of the southern and far western sections of the state also contains minerals of economic significance and much work has been conducted in locating these valuable deposits (Anthony, Williams, Bideaux, and Grant, 1995). The Basin and Range is interpreted by Hunt (1975, pp. 144-145) to have started with the injection and uplift associated with the granitic intrusion of the Sierra Nevada which created conditions of instability and resulted in the formation of this province. Austin (1994) and Austin and Wise (1994) have addressed a portion of this

province from northwestern Arizona through southern Nevada, extending into California.

Conclusions

The Creation Research Society's Van Andel Creation Research Center now provides the creationist researcher with an outstanding facility from which to conduct field investigations. A general understanding of these three major geomorphic provinces could prove important for future research conducted from this facility.

Geologically, the sediments and strata found within these three provinces range in age from Creation Week (Day 3) to Present Age Timeframe (following Froede, 1995). With additional investigation we hope to reconstruct the geological history for each of these provinces within the framework of the Young Earth Flood Model. We believe that such a model fits with the Creator's activity recorded in Genesis.

Much work remains to be performed in characterizing the geology of Arizona within the Young-Earth Flood Model. However, with the advent of the CRS/ VACRC we now have a base of operations from which creationist research can be conducted.

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THE FLOOD EVENT/ICE AGE STRATIGRAPHIC BOUNDARY ON THE UNITED STATES SOUTHEASTERN COASTAL PLAIN

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Abstract

With the introduction of two creationist geological timescales, it is imperative that we begin to consistently interpret the stratigraphic record within the constraints of the Biblical narrative. Young-Earth geoscientists should develop Biblically-based geologic concepts and conduct field work to substantiate those interpretations. With this in mind, three sections within the Southeastern Coastal Plain of the United States are examined in an effort to define its strata within the construct of a creationist stratigraphic column. A broad-based concept is suggested to differentiate which strata reflect Floodwater deposition and which were formed during the single post-Flood Ice Age. It is further suggested that the boundary separating these sedimentary deposits (and their associated Timeframes) would be found at the termination of marine deposits and the institution of terrigenous (i.e., freshwater) deposition.

Introduction

Presently, two very similar creationist geological timescales have been proposed, both which seek to define geologic time and the stratigraphic record within the constraints of the Biblical narrative (Froede, 1995a; Walker, 1994, 1996a, 1996b). These timescales should now serve as the general framework from which the Young-Earth geoscientist should interpret the stratigraphic record. The major factor in defining stratigraphy within our model should be based on energy-effect relationships which directly reflect the changes in geologic-energy levels (Froede, 1995a; Reed, Froede, and Bennett, 1996). Hence, global generalizations about Earth history from a Biblical standpoint should NOT be based on the use of the uniformitarian stratigraphic column and its "handmaiden" evolutionary biology. We must define strata within limited areas and then compare/contrast them to determine how they correlate within the creationist stratigraphic column. To do otherwise will only result in confusion. What follows is a logical and reasonable approach to discerning Earth history for the United States Southeastern Coastal Plain. The generalized creationist geological timescale previously proposed by the author (Froede, 1995a) will be followed in defining the "Flood/Ice Age Timeframe" boundary for this region of the United States.

Much geologic information already exists for the strata comprising the Southeastern Coastal Plain. This existing information can be examined and reinterpreted in a manner which fits within the "Timeframes" and geologic-energy levels of our model. Additional site-specific field work is necessary to verify the projected interpretation.

Currently there is controversy regarding the positioning of coastal plain deposits within the creationist geological timescale (Froede 1996a, 1996b; Garner, Robinson, Garton,

and Tyler, 1996; Oard, 1996; Robinson, 1996). This article suggests a logical approach in determining the "Flood Event/Ice Age Timeframe" boundary. The author believes that most of the Cenozoic deposits, as found on the coastal plain, represent regressing (i.e., retreating) Floodwater produced marine deposits which correlate to the "Upper Flood Event Timeframe." However, "Ice Age Timeframe" deposits also occur on the coastal plain and only through a close examination of the strata and its composing sediments can the differences and boundary between the Flood and Ice Age strata be discerned. A glossary of terms is included to aid the reader in understanding some of the terminology.

Floodwater "Epeiric" Seaway

Uniformitarians have proposed that a warm-shallow Cretaceous Epeiric Seaway formerly existed on the North American continent. Some Young-Earth Creationists view this seaway and its associated sediments as reflecting retreating Floodwaters (Froede, 1995b). The slow withdrawal of these marine waters during the late stages of the Flood coupled with the development of various clastic depositional environments (e.g., volcanic, fluvial, deltaic, etc.) served to strand and bury both living and dead (i.e., bloated and floating**) creatures. The fossilized remains of these creatures along with the associated marine sediments raises the question: when/where do the Flood sediments end and ice age sediments begin in the stratigraphic record? The answer to this question is not as complex as it might seem.

How Many Floods?

It should be obvious to most Quarterly readers that: **There has only been one global Flood which resulted in the formation of most of the stratigraphic rock record.** It has been suggested that major post-Flood transgressions and

**A creationist model (Froede, 1996c, p. 200) has previously been suggested to explain the "Bloat and Float" occurrence of fossilized vertebrates found within portions of the stratigraphic record.

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regressions can be invoked to account for the deposition of thousands of feet of sediments following the Flood (Garner, 1996; Garton, 1996; Robinson, 1996; Tyler, 1996). This writer does not accept this explanation and believes that it cannot provide logical or reasonable (i.e., parsimonious) answers to depositional basins such as the Gulf Coastal Plain. Rather, after the highstand of the Floodwaters on Earth's continents, the waters continually withdrew.*** During this time the author acknowledges that global tectonic activity coupled with glacial advances and retreats could have created various small scale transgressive and regressive deposits. However, the wholesale withdrawal and later readvancement of marine waters across such broad areas as the North American continent in a post-Flood setting is unlikely.

Specific to the Coastal Plain, the regression of Floodwater probably required many years.**** Evidence to support this interpretation comes from buried marine paleoenvironments found within this region. These former marine environments were eventually buried due to continued sedimentation derived from the newly emerging landmasses as well as from other sources (e.g., biogenic carbonate producers, volcanic ash, etc.). The marine environments shifted ever seaward as the Floodwaters continued to recede toward the Gulf of Mexico.

The Flood/post-Flood Boundary Determination

Attempting to identify the Flood Event/Ice Age stratigraphic boundary is a problem involving both the lateral variation and vertical distribution of sedimentary deposits. It is proposed that generally all strata which reflect a **marine** fauna (e.g., oysters, snails, clams, marine fish skeletons) or **marine** lithology (e.g., carbonates, glauconite, bentonite) should be relegated to Flood deposition. Overlying sediments which reflect a terrestrial depositional setting (i.e., **freshwater** environment) would be identified as Ice Age or even later times (possibly even "Present Age Timeframe" deposits). **This determination must be based on the site specific stratigraphic position of the strata in question** (see Appendix). The boundary demarcating the two time frames should be indicated by the termination of marine indicators and the occurrence of freshwater conditions. Hence,

***The rate of Floodwater withdrawal from the continents was controlled by orogenic plate movement, accommodation space provided by oceanic basins, and as a result of the formation and development of continental glaciers associated with the onset of the Ice Age.

****In following the single post-Flood Ice Age model suggested by Michael Oard (1990, p. 117) the total withdrawal of marine Floodwaters from the North American Continent could have taken as long as 300 to 500 years. The author suggests that the geologic energy required to completely reconfigure the ocean basins to receive all the Floodwaters from the North American Continent (based on Reed, Froede, and Bennett, 1996) did not occur until well into the Ice Age Timeframe. Thus it is suggested that there were marine waters still covering most of the Southeastern United States when Noah emerged from the Ark.

the Flood/Ice Age boundary would likely occur in the uppermost portion of any site-specific stratigraphic section.

As the Flood Event/Ice Age boundary moves towards the modern coastal environment (tied directly to the withdrawal of the Floodwaters) its specific location within the stratigraphic record will become much more complicated. This is due to the changing sea-level positions associated with the continued but lessening intensity of tectonics (Reed, Froede, and Bennett, 1996) and the waxing and waning of the continental glaciers during the Ice Age Timeframe (Oard, 1990). Only through a careful study and understanding of the site and its specific stratigraphy, within the context of glacio/tectonic eustatic-shoreline change, can we further decipher the Flood Event/Ice Age boundary along the coasts.

Generalized Southeastern Coastal Plain Stratigraphy

Any attempt to understand when a specific site was deposited must begin with an overall knowledge of its stratigraphic position (Figures 1 and 2). A close examination of the contacts between strata along with lithologic and paleontologic composition of the various layers might prove useful in determining the possible original environment of deposition (without appealing to "millions of years" for its development).

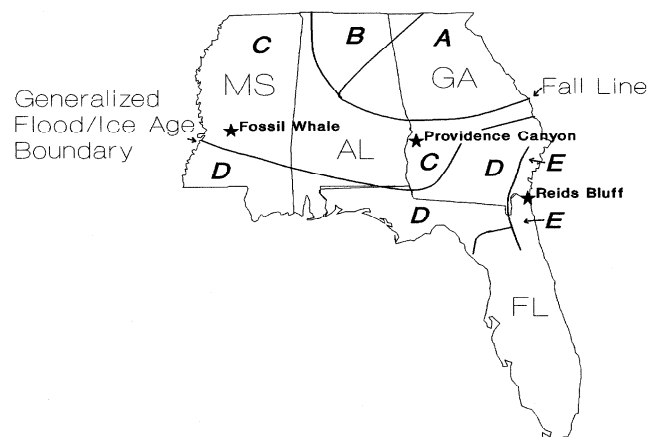


Figure 1. Generalized surface outcrop map of the Southeastern United States showing the locations cited as examples of either Flood or Ice Age deposits. Key to the letters: A. Piedmont (Lower Flood Deposits - Precambrian to Paleozoic); B. Valley and Ridge (Middle Flood Deposits - Paleozoic); C. Coastal Plain marine sediments (Upper Flood Deposits - Upper Cretaceous through lower Miocene); D. Gulf Coastal Plain fluvial sediments (Lower Ice Age deposits - Miocene to Pleistocene); E. Atlantic Coastal Plain sediments (Ice Age deposits - Pleistocene to Holocene) - representing cyclic marine/fluvial deposits. Map compiled from Bennison, 1975.

In specifically dealing with the Southeast the author will address the surface expression of the stratigraphic units and then explain how this translates into the subsurface. Figure 1 presents the first part of our discussion. The Fall Line marks the upgradient boundary for the issues which are to

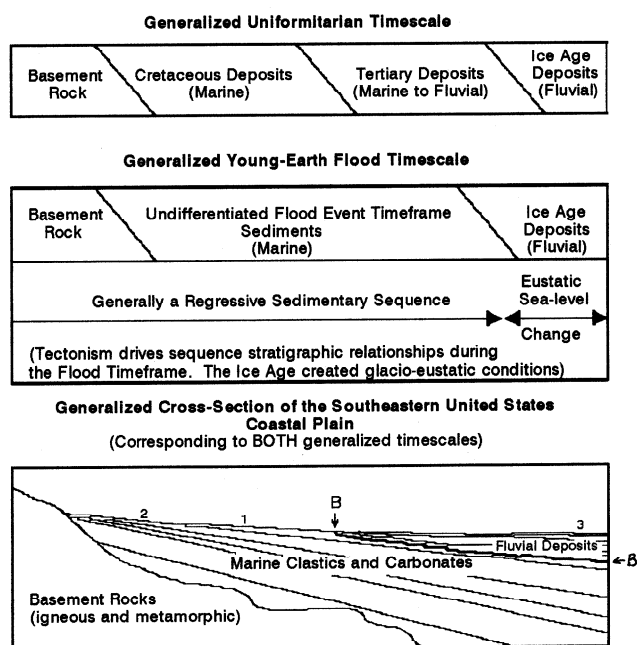


Figure 2. Generalized subsurface cross-section along dip of the typical southeastern coastal plain strata. This stratigraphic section is compared with both the uniformitarian and Young-Earth Flood Model geological sections. Key to the numbers and letter: 1. *Basilosaurus* sp. locale; 2. Providence Canyon; 3. Reids Bluff, B. Boundary separating the Flood deposits from the overlying Ice Age deposits. The boundary marks the transition from receding Flood waters (i.e., marine) to terrestrial fluvial (i.e., fresh water) conditions.

be addressed. Areas A and B represent the higher elevations of the Piedmont and are suggested to represent Lower to Middle Flood Event Division rocks/strata. These two regions served as the source areas for much of the sediments which presently fill the Gulf Coastal Basin and Atlantic Coastal Plain. Area C contains strata which were deposited in a marine environment. The marine sediments which compose Area C were originally derived from at least three sources: 1) floodwater sources (precipitation of calcium carbonate and/or other minerals by biota), 2) from adjacent areas of higher elevation [Areas A and B], and 3) from areas outside of this region (e.g., volcanic ash). These strata are identified by Uniformitarians as ranging from the Upper Cretaceous to middle Miocene in age. Area C is in many places overlain by a small amount of Holocene (i.e., Quaternary) sediments. These overlying sediments are often of a continental composition and sometimes contain fossils suggestive of a terrigenous setting (e.g., loess, fluvial deposits, freshwater snail and/or clam shells, along with the bones of a variety of land animals - mammoth, mastodon, camel, and horse). Additionally, these freshwater/terrestrial sediments also extend and thicken gulfward across Area D. Figure 1 provides the surface boundary where Flood deposited marine strata (Area C) lie adjacent to Ice Age deposited freshwater strata (Area D).

The surface exposure marking the Flood Event/Ice Age boundary can generally be interpreted to occur where the marine sediments found in Area C are **overlain** by freshwater/terrestrial sediments of Area D (Figure 2 - Letter B). This boundary is expressed as a contact line exposed both on the surface (e.g., Figure 1 - line separating Area C from Area D) and in the subsurface (e.g., Figure 2 - line "B").

Floodwater withdrawal resulted in the development of the terrigenous/freshwater sediments and strata found in Area D which were derived from upgradient areas (sediments derived from areas A, B, and C and from outside sources (e.g., loess and volcanic ash). The sediments which compose Area D are typical to those of a fluvial/flood plain setting. This type of environment resulted in the development of soils which in turn allowed the ground to be vegetated by various plants (being driven by climatic forces and a drop in sea-level). However, there are places within Area D where surface (e.g., rivers, creeks, streams, etc.) and subsurface (e.g., limestone dissolution) erosion have served to remove Ice Age freshwater sediments exposing the underlying marine sediments. With an understanding of the local stratigraphy these locations can be easily identified. Hence, the freshwater strata found in Area D would then date to the Ice Age Timeframe.

Global sea-level fluctuated rapidly throughout the Ice Age Timeframe and has probably continued to do so into more recent times. This is best exemplified in Area E. Any attempt to identify the Flood Event/Ice Age boundary at the ground surface within Area E would be confusing. A general understanding of the stratigraphy of this area can solve this confusion.

Three specific sites will illustrate this approach in defining the Flood Event/Ice Age stratigraphic boundary on the Southeastern Coastal Plain. While much work remains to be conducted at specific locations within this region, the author is confident that what is proposed can serve as a starting point from which future field activities can be based.

The Yazoo Formation in Mississippi

The Yazoo Formation as found in central Mississippi is described as:

... a thick undifferentiated sequence of clay (Dockery and Siesser, 1984).

The Yazoo Clay is fossiliferous and the whale-like mammal *Basilosaurus* cetoides is common.***** The clay is montmorillonitic with occasional stringers of bentonite (Kolb, Russell and Johnson, 1976, p. 3).

The composition of the Yazoo Formation; a montmorillonite clay with bentonite lenses, suggests that it was originally a volcanic ash (see Carozzi, 1993, pp. 93-95; Charnley,

*****See Figure 4.

1989, pp. 411-414; Fisher and Schmincke, 1984, pp. 336-340; Grim, 1968, pp. 566-570; Williams, Turner, and Gilbert, 1982, pp. 272-274). Changing environmental conditions (e.g., marine to freshwater) resulted in the further alteration of the bentonite clay to a montmorillonitic clay.

The Upper Eocene (Jackson Stage) in Mississippi (which includes the Yazoo Formation) has been found to contain numerous specimens of Eocene whales, *Basilosaurus cetoides* and *Zygorhiza kochii* (Frazier, 1980; Carpenter and Dockery, 1985; Dockery and Johnston, 1986; Carpenter and White, 1986; Johnston, 1991; see also Thurmond and Jones, 1981). However, few of the whales have been found as complete skeletons, rather most are incomplete assemblages of bones, suggesting dead “bloated and floating” carcasses that were buried. Several years ago a *Basilosaurus*, discovered in the Yazoo Formation, was excavated and examined (Dockery and Johnston, 1986; Johnston, 1991) [Figure 5]. The condition of the specimen was reported as:

The lack of a skull or jaws at the anterior end of the vertebral column was a disappointment. . . . the last eight vertebrae were disjointed so that they did not conform to the arched trend of the spine and were approximately two feet higher than the rest of the skeleton. This configuration of the skeleton suggests that the main body of the whale (possibly excluding the head and front limbs) settled into a small depression on the ocean floor. The presence of oysters attached to one of the anterior vertebrae indicates that the skeleton lay exposed for some time before burial (Dockery and Johnston, 1986, pp. 6-7).

Several conclusions can be drawn from the condition of this specimen. First, the whale once existed in marine waters and was apparently dead for some period of time before it was buried due to its missing skeletal parts and the presence of oyster spats on its vertebrae (Figure 1). The time of its death cannot be determined. Secondly, the decomposing whale was probably buried rapidly under several feet of volcanic ash in a marine environment. This can be determined by the depth of burial (approximately 10 feet below the present ground surface - see Figure 5), the presence of bentonite clay layers in the Yazoo Formation, and the presence of marine oyster spats on the vertebrae.

The marine fossils along with the lithologic composition of the formation suggest that the Yazoo Formation was deposited in a marine environment. Likely this environment existed as Floodwaters continued their slow withdrawal toward the Gulf of Mexico. Hence, the Yazoo Formation, in Mississippi, would be considered a Flood deposit (Upper Flood Event Division).

The Providence Formation in Georgia

Another example of the contact between Flood Event and Ice Age deposits can be found at Providence Canyons, Georgia (Figure 6). Williams (1995) has provided a description of the history and development of this most interesting series of canyons, and Froede (1996d) has outlined a mechanism for their continuing growth. The Cretaceous Providence Formation and the overlying Paleocene Clayton Formation are exposed in the canyon walls.

The Providence Formation sands contain trace fossils indicative of a marine environment (e.g., *Ophiomorpha*, *Rosselia*, *Cylindricus*, *Thalassinoides*, and *Palaeophycus*) [Donovan and Reinhardt, 1986]. Additional information on trace fossils (i.e., ichnology) and their usefulness to the Young-Earth Flood Model can be found in Cowart and

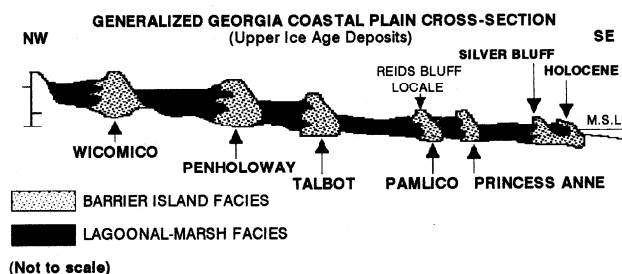


Figure 3. Generalized stratigraphic cross-section of the Georgia Coastal Plain (not to scale). Sea-level changes have resulted in stranded “barrier island” types of sand dune fields. This cross-section represents approximately 40 miles in lateral extent by 95 feet of relief (Kellam, Mallary, and Laney, 1991, pp. 6-16). These stranded dune ridges are believed to represent sea-level changes throughout the Pleistocene. The abbreviation “M.S.L.” is mean sea-level. Modified from Henry, et al., (1993, p. 4). These features are suggested to reflect the withdrawal of Floodwaters. Transgression/regression cycles within these terraces are suggested to reflect tectonic and glacial activity associated with the close of the Flood and the onset of the Ice Age.

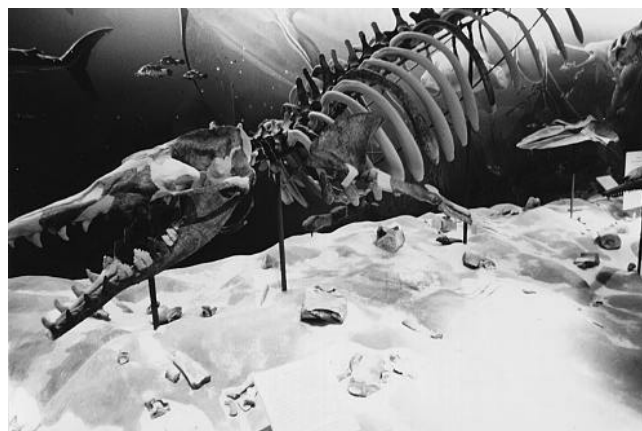


Figure 4. This is a reconstructed skeleton of a *Basilosaurus cetoides* from the United States National Museum of Natural History. These fossilized skeletal remains are found in the upper Eocene sediments of Mississippi, Louisiana, and Alabama and clearly reflect a marine environment. Additional support for a marine environment is provided with the occurrence of fossilized marine shells and sediments.

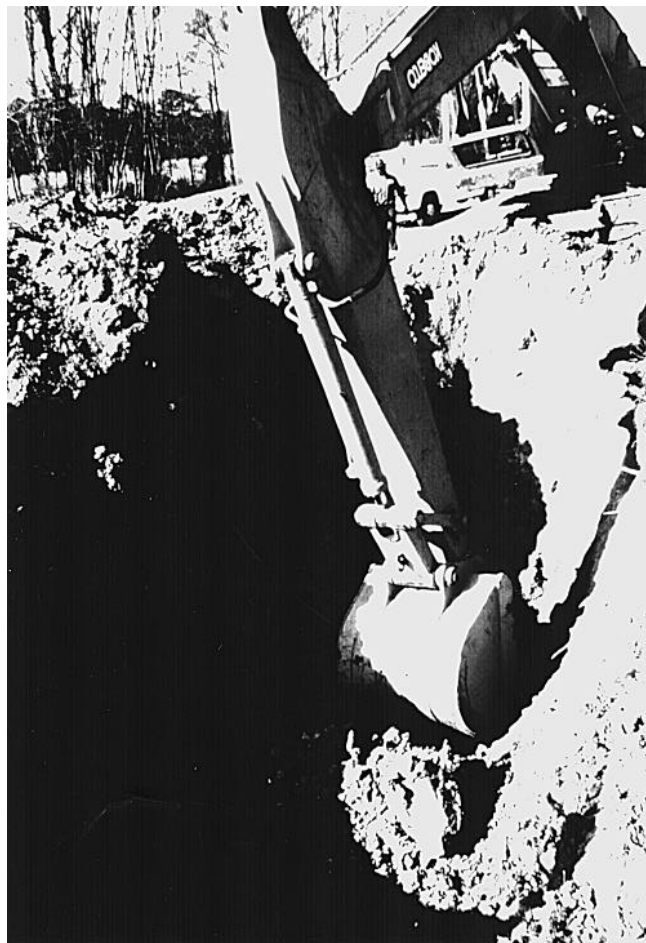


Figure 5. This is a photograph showing the excavation of the undifferentiated Yazoo Formation clay from the top of the *Basilosaurus* skeleton. Approximately 10 feet of overburden was removed to enable the excavation of the disarticulated skeleton.

Froede (1994). The Providence Sands exhibit high-angle cross-bedding and contain kaolin clay balls (rip-up clasts) along with apparent bedding surfaces. These deposits reflect a high-energy marine setting, possibly analogous to a beach environment. The Cretaceous Providence Formation is divided into 15 units (Donovan and Reinhardt, 1986) of which the uppermost is described as:

Unit 15: 16 ft (4.8 m); Fining-upward sand; pale yellowish-orange; very fine sand to pebbles (quartz, muscovite, heavy minerals, clay clasts); medium-scale tabular and trough cross-stratified sets scattered throughout; unit locally bioturbated, scattered distinct burrow fabrics *Ophiomorpha*, *Microcladichus*; clay clast lag at base, upper 2 ft (0.6 m) of unit is a massive, rooted clayey sand.

Overlying the Cretaceous Providence Formation is the Paleocene Clayton Formation. The Clayton is divided into two units (Donovan and Reinhardt, 1986), and is described as:

Unit 16: 3 ft (0.9 m); Pebbly sand; grayish- orange to pink; medium sand/pebbles (quartz, muscovite, heavy minerals); massive-bioturbated; undulatory base with scattered quartz pebbles concentrated in basal 1 ft (0.3 m) of unit.

Unit 17: 6 ft (1.8 m); very clayey sand; dark reddish brown; clay-granules (quartz); massive local ironstone development. (emphasis mine)

The reader will note that the Providence Formation unit 15 is similar in description to the base of the Clayton Formation (unit 16). The stratigraphic division between unit 15 and unit 16 was a subjective decision made by the investigators based on their own interpretation of the Clayton Formation (Donovan and Reinhardt, 1986; Donovan, 1993). The unit which this author suggests is an Ice Age deposit is the upper unit of the Clayton (unit 17) [Figure 6]. Note the complete change in lithology and the loss of bioturbation. This section lacks body fossils and as such is interpreted based on the loss of what are viewed as marine trace fossils. Hence, the uppermost layer (unit 17) then probably represents terrestrial weathering conditions which suggest that it was deposited following the recession of the Floodwaters.

Reids Bluff (Satilla Formation) in Florida

We now move to a locale where the Flood Event/Ice Age stratigraphic boundary can be easily misinterpreted. This outcrop is located at Reids Bluff, along the St. Marys River in Nassau County, Florida (Figure 1). Various studies have been undertaken at this site to understand its depositional history within the context of the late stages of the Pleistocene (e.g., Farrell and Henry, 1993; Huddlestun, 1988; Kussel and Jones, 1986; Pirkle, Pirkle, and Reynolds, 1991). This particular stratigraphic sequence represents a series of transgressive/regressive cycles which convey Flood Event/Ice Age boundary problems associated with a modern coastal environment (Figure 7). The outcrop rises 62.3 feet above the river and exposes Late Pleistocene to Holocene stratigraphic relationships which according to Rich and Pirkle (1993, p. 80) suggest:

... a classic transgressive/regressive sequence wherein a freshwater forest is overlain by brackish/marine strata which are in turn overlain by the Holocene sand ridge and forest.

Huddlestun (1988, pp. 134) cites Reids Bluff as his principal reference locality for the Satilla Formation, which he describes as:

... a heterogeneous unit that consists of variably fossiliferous, shelly sands and clays of offshore, inner continental shelf origin; prominently bedded to non-



Figure 6a.



Figure 6c.

Composite showing a generalized cross-section (6b) compared with the actual outcrop (top section (6a) - note person on right of photo for scale). The bottom photograph (6c) shows the darker Clayton Formation (Ice Age deposits) above the lighter Providence Formation (Flood Event deposits) as exposed in one of the nine canyons at Providence Canyon State Park.

bedded barrier island deposits (excluding the undifferentiated soft, incoherent, massive, structureless sands of probably aeolian origin that cap the barrier islands and emergent barrier islands); and marsh deposits.

The following compilation (Rich and Pirkle, 1993, pp. 74-75; Farrell and Henry, 1993, pp. 93-98) reflects the uniformitarian view regarding the changes in depositional environments exposed at this outcrop:

The fossils contained within these lowest clay layers suggest storm deposition. Above this marine unit is a sandy layer containing in situ (growth position) cypress tree stumps (*Taxodium distichum*). These trees and their surrounding sediments are buried beneath blue-gray clayey sediments which contain lenses of oyster shells (*Crassostera* sp.). This clayey layer is then overlain by 42.7 feet of quartz sand which suggests aeolian deposition.

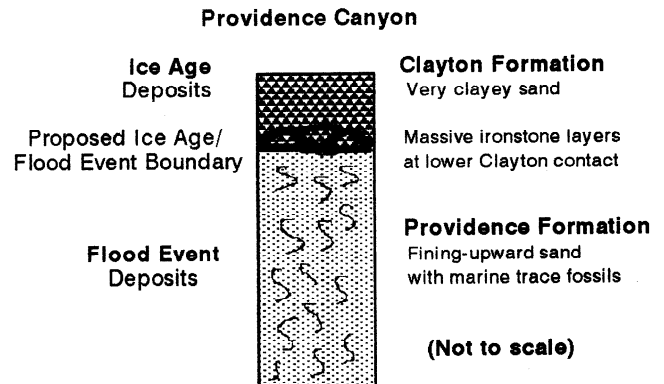


Figure 6b.

Any determination of the Flood Event/Ice Age boundary in a present day coastal environment along the Atlantic and Gulf Coasts could be complicated by stacked marine and freshwater sedimentary deposits. This illustrates the need for an in-depth understanding of the regional stratigraphy before field work is conducted. It would appear that the Flood Event/Ice Age boundary should lie between the lowest marine facies and the overlying cypress tree stumps. However, despite the cyclic stacked nature of freshwater and marine deposits exposed at Reids Bluff, this locality is totally composed of Ice Age deposits (Figure 2 - location 3). There are no Flood deposits exposed at this outcrop despite the presence of the marine layers. This conclusion follows from an understanding of the overall geology of the Georgia coastal plain, which beautifully displays the transgressions and regressions associated with the Middle to Upper Ice Age Timeframe.

According to Herrick (1965) the Pleistocene deposits are easily identified in Georgia by the numerous fluvio-marine terraces, which correspond laterally across the state (see also MacNeil, 1950). Currently there are seven terraces recognized along the Georgia coastal plain (Figure 3). The Reids Bluff outcrop correlates to the Pamlico terrace. This outcrop represents only the upper-most section of the Ice Age Timeframe deposits (Figure 2 - location 3). Hence, the boundary separating Flood Event deposits from those of the overlying Ice Age would actually lie well below the Reids Bluff outcrop (Figure 2). Only through the evaluation of well logs and cores taken from considerable depth could we then attempt to determine the exact depth/location of the Flood Event/Ice Age boundary at this location.

More work remains in delineating the complexity of the sea-level changes which occurred in Georgia during the Ice Age Timeframe. These transgressions and regressions are mappable and form sequences (Figure 3) which can be analyzed using sequence stratigraphic methods [using Ice Age Timeframe eustatic sequences all within the Young-Earth Flood Model - see Froede, 1994].



Figure 7a.



Figure 7c.

Composite showing a generalized stratigraphic cross-section of Reids Bluff, Nassau County, Florida (7b), compared with the actual outcrop, 7a, [Modified from Pirkle, Pirkle, and Reynolds (1991, p. 33)]. The bottom photograph, 7c, provides scale. On 7b, letters correspond to eustatic sea-level facies changes suggested by the author: A- Lowstand facies, B- Transgressive facies, C- Highstand facies, D- Regressive facies, E- Lowstand facies. Note that each one of these sea-level rise (i.e., B, C, and D) facies does not require any significant period of time for development, rather only drowned conditions. Units B and D actually better fit with a storm depositional environment while the unit C paleoenvironment probably was the only one which actually existed. Hence, the transgressive/regressive cycle is highly interpretive.

Discussion

Most if not all of the surface deposits exposed in Area C reflect deposition in a marine setting (Floodwater deposits-e.g., Yazoo and Providence Formations). These marine deposits correlate to the slow withdrawal of the Floodwaters during the Upper Flood Event Timeframe. These marine Flood deposits (Upper Cretaceous through most of the Cenozoic) and their inferred or apparent cyclicity reflect tectonic and glacial episodes which might correlate on a basal scale, via sequence stratigraphic concepts (Froede, 1994). However, at this time insufficient physical evidence

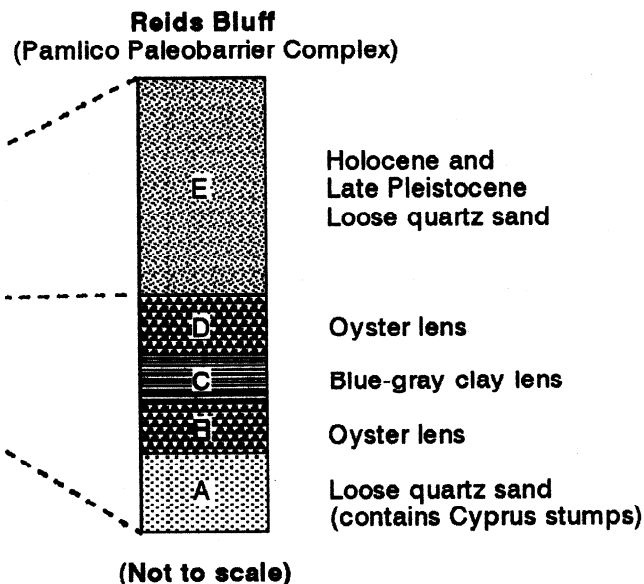


Figure 7b.

exists to support a regional much less global correlation of marine transgressions and regressions within a sequence stratigraphic framework as some have suggested (Davison, 1995).

Ice Age deposits overlie the previously deposited Flood Event sediments (Figure 2) reflecting the change from marine to continental (i.e., terrestrial) depositional environments. Surficial fluvial deposits are suggested as serving as the first indication of a transition between a marine and continental setting.

Conclusions

The determination of Flood vs. Ice Age deposits can be accomplished assuming that the Floodwaters retreated slowly from the North American continent. Various sedimentary sources (e.g., volcanics, carbonates, elastics, etc.) contributed to the transition from the marine to the continental environmental setting as it is found on the Southeastern Coastal Plain. A study of these sediments, including other paleo-indicators, e.g., fossils, trace fossils, paleosols, etc., will allow us to approximate the changes in the environment (e.g., marine versus freshwater) and mark the transition from the close of the Flood into the Ice Age. Further refinement of this transition along with a comparison between regions will help to determine the local, regional, and perhaps even global boundary demarcating the Flood Event and Ice Age Timeframe deposits as we reconstruct Earth history within the constraints of the creationist stratigraphic column.

Appendix

The determination of the Flood/Ice Age boundary **MUST** be made on a site or small regional basis. Uniformitarian in-

formation on a specific site or small area can be used to help make this determination. However, it must be realized that the interpretive framework in which the uniformitarian scientist conducted their work is not acceptable within the Young-Earth Flood Model. Hence, the physical information will be the same for both models, but the interpretation will be different.

For the Southeastern Coastal Plain, the physical evidences available to make the determination between Flood-water and Ice Age deposits (e.g., paleosols, root traces, freshwater fossils, etc.) will be found within the upper portions of the stratigraphic column (top few inches to several hundred feet).

Presently marine deposits extend out basin-ward from the shoreline. Marine sediments continue to be deposited. The determination of the Flood/post-Flood boundary in an off-shore setting requires an investigation of greater detail than would be required for sediments found on the continent.

Glossary

Accommodation Space - A term used within sequence stratigraphy to define the space made available within a basin for water storage and/or additional sedimentary deposition. Without sufficient accommodation space basins would fill with sediments and/or waters would overflow the basin.

Fall Line - The boundary between the Piedmont and Coastal Plain, where the more resistant rocks of the Piedmont Plateau stand out in contrast to the weaker rocks of the Coastal Plain. As a result, numerous streams descend from the Piedmont Plateau onto the Coastal Plain over a series of rapids or small waterfalls at this boundary (Thombury, 1965, p. 92).

Interstade - A warmer substage of a glacial stage, marked by a temporary retreat of the ice (Bates and Jackson, 1987, p. 341). Within Creationist usage it refers to the time within the Ice Age Timeframe when the continental glaciers receded due to a warming trend. Sea-level would rise during this period.

Sea-level Highstand - A term used to define when sea-level is at its maximum elevation — not as a function of tides. This maximum is attained when the continental glaciers receded or totally disappear, hence supplying additional waters to the oceans.

Sea-level Lowstand - A term used to define when sea-level is at its lowest elevation — not as a function of tides. This sea-level minimum is attained when the continental glaciers grow and incorporate additional waters through precipitation, hence drawing additional waters from the oceans.

Stade - A substage of a glacial stage marked by a glacial readvance (Bates and Jackson, 1987, p. 639). For cre-

ationist usage it refers to the time in the Ice Age Timeframe when the continental glaciers advanced with the addition of snow, and generally cooler and wetter global conditions. Sea-level would fall during this period.

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Quote

Isaiah 55:10-13

- 10 As the rain and the snow come down from heaven, and do not return to it without watering the earth and making it bud and flourish, so that it yield seed for the sower and bread for the eater,
- 11 so is my word that goes out from my mouth: It will not return to me empty, but will accomplish what I desire and achieve the purpose for which I sent it.
- 12 You will go out in joy and be led forth in peace; the mountains and hills will burst into song before you, and all the trees of the field will clap their hands.
- 13 Instead of the thornbush will grow the pine tree, and instead of briars the myrtle will grow. This will be for the LORD'S renown, for an everlasting sign, which will not be destroyed.

PREDATORS AND PARADISE, ONE MORE TIME

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Abstract

Without question, God's intended diet for His perfect creation was vegetarian. A re-examination of man's moral failure, God's foreknowledge, and the chronology of Earth's sixth day may aid in understanding both the form and function of the predatory animals in the less-than-perfect world in which we live.

Introduction

"For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse" (Romans 1:20). When Paul wrote these words defining men's accountability to God, neither he nor those to whom he was writing had ever seen wolves living with lambs or lions eating straw like cattle (Isaiah 11:6, 7). Those animals we consider predators now were predators then as well (Acts 20:29). Even so, it was this fallen creation order which Paul said pointed men to God as their Creator. There may indeed seem to be a tension between the created order with its obviously vegetarian diet (Genesis 1:30) and the "real" world which we occupy, but it is certainly not without resolution.

Specializations for Predation

The power, speed, stealth, and beauty of predatory animals captivate many of us. The 250 ft/sec (76 meters/sec) stoop of the falcon, the virtually silent flight of owls (made possible by serrations on the leading edges of their primary flight feathers), insectivorous bats' echolocation, heat-sensing organs in some groups of snakes, and the webs of spiders are just a few of countless phenomena which have two things in common: We cannot imagine their belonging to inhabitants of a benign vegetarian paradise, devoid of disease, competition, and predation. Secondly, perhaps even more eloquently than the creatures possessing them, they proclaim DESIGN. It is no wonder Tyler (1996, p. 1) writes, "Today, the carnivorous animals seem to be such an important part of the food chain that we cannot imagine them to have lived in any other way." For all practical purposes, we do not need to do so.

"God saw all that he had made, and it was very good . . . Thus the heavens and the earth were completed in all their vast array" (Genesis 1:31a, 2:1). "Through him all things were made; without him nothing was made that has been made" (John 1:3). Sometimes I fear that we as creationists have become entangled in the food web and its implications in our desire to prolong unnecessarily that period of time during which God exacted a vegetarian diet from His created order. Some of the things He made had talons and

claws, fangs and hooked beaks, incredible visual and auditory acuity, along with a potential for stealth. To date, no one has better verbalized this concept than Stambaugh (1991, p. 136) who introduced "variability within structure." This view holds that the predators' arsenal was complete at the conclusion of Creation, but was not used for killing of prey until after the Fall of man.

The Transition

Assuming that we somewhat uniformly accept the fact of the Fall, it is vital for the point of this paper to attempt to establish its timing. Morris (1976, p. 116) and Stambaugh (1991, p. 133) both feel that man's tenure in Eden was brief, and there is certainly biblical evidence for such a view. Eve was not even named until after her disobedience (Genesis 4:1). There is no scriptural basis for their ever having spent a single night within the confines of the Garden.

Coupling these facts with human nature as we know it (Jeremiah 17:9) introduces the very real possibility that *man may have fallen on the same day as his (and the terrestrial animals') creation*. The biological ramifications of this proposed cascading of events are significant. Just as the countless symbiotic relationships all around us attest to a short creation interval, so an abbreviated time span between Creation and the Fall would allow animals physically and mentally equipped for a carnivorous lifestyle to capture and consume the prey with which they were matched in the food web without the necessity of starving, estivating, hibernating, mutating, or ingesting food for which their digestive tracts were simply never designed.

Obligate carnivores and herbivores exist at opposite ends of the food web, and the differences between them extend far beyond their dentition. Regarding birds, Snyder and Terry (1986, p. 190) write, "Beak, esophagus, proventriculus, ventriculus, and intestines show 'adaptations' that fit the feeding habits of the species." Monogastrism, a short tract, and a relatively simple normal flora (as found in snakes, all of which are obligate carnivores) must be contrasted with the ruminants, whose extensive (over 40m) tract relies on fermentation, supporting a dynamic and complex microbial population. Creationists, as advocates of limited variation, may be well advised to be as intellectually honest about the existence of a common diet in the past as we would have our evolutionist colleagues to be about their common ancestor.

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Accommodation to God's Plan

Could God have foreseen our disobedience and made biological allowances for our existence in a less-than-perfect world? Nowhere in Scripture do we find that God was ever surprised, nor are we to assume that our first parents' sin caught Him unawares (John 2:24-5). On the contrary, a Redeemer was present at Creation (John 1:1-4), as was also a sacrifice, foreshadowing Christ's sacrifice for us on Calvary (Genesis 3:21, Revelation 13:8). The world in which we live is actually, because of sin, God's second best, and is very much in need of that Redeemer. Through Him we regain our initial relationship with our Creator and view the death and disease of this world from God's perspective. Just as the geologic and fossil records bear witness to antediluvian depravity and God's judgment thereon, so predation, disease, and death daily bear witness to the enormity of man's rebellion in Eden.

A legitimate criticism of the foregoing could be based on how God could look at His creation at the close of Earth's sixth day and call it good if created kinds of recent introduction were stalking and killing others. God's greatest work, however, was not the food web, the immune system and tissue regeneration (neither one of which should have a use in Paradise), mitosis, or even the human brain, but REDEMPTION. Eddins and Young (1991, p. 561) write, "Redemption in Christ *completes creation* (emphasis mine), carrying out the purposes of God and making final, complete salvation possible."

Many years ago Kepler (Leith, 1975, p. 62-62) wrote,

Hence every deeply religious man will most carefully refrain from twisting God's word in the most obvious matters so that it denies God's handiwork in nature. When he has understood the most delicately harmonious coordination of the celestial motions, let him ask

himself whether sufficiently correct and sufficiently productive reasons have been discovered for the agreement between the word of God and the hand of God, or whether there is any advantage in rejecting this agreement and by means of censorship destroying this glorification of the boundless beauty of the divine handiwork.

This same principle must apply to our biological inquiries as well.

Conclusion

Because of Its Authorship, the Scripture has absolute integrity and requires no defense. What does demand defense is the relevance of our message to an ever more technical and cynical society. This paper is an attempt to preserve the unity of Scripture (six-day Creation, no death before the Fall) and the observable world of living things around us, God's handiwork.

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Book Announcement

Designs in the Living World Second Edition

Lane P. Lester, Dennis L. Englin, and George F. Howe

This is a 240-page creationist biology textbook that is being used for the second year at two Christian colleges. It is written at the introductory level and is suitable for high school use as well. To reduce costs, it has line drawings and is looseleaf, 3-hole-punched, and shrink-wrapped. A laboratory manual is available separately.

The retail price is \$40.00 postpaid, but school teachers and homeschoolers may purchase a copy for \$24.00 postpaid. Send your check payable to...

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MARK TWAIN AND ORIGINS

DON B. DEYOUNG*

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Abstract

Mark Twain wrote many statements on the topics of Biblical history, creation, and evolution. Some of his well known quotations are here compiled and documented. Twain poked fun at both creation and evolution with equal wit. Some of his critiques from a century ago are quite contemporary. Unfortunately, at the close of his life Twain displayed a strong hostility toward the Creator.

Introduction

Mark Twain (Samuel Langhorne Clemens, 1835-1910) did not show partiality in his humorous satire. Every topic was fair game for his pen, including creation and evolution. Twain's delightful writing style still brings smiles a century later, even to the targets of his jesting. Twain lived during a time when the influence of the evolutionary worldview was growing rapidly. As a result, he was enamored with the ideas of his contemporary Charles Darwin (1809-1882). Previous studies have reviewed the influence of evolution on popular literature (Bergman, 1992).

Once Twain was told that Darwin often read himself to sleep with *Tom Sawyer* (1876) and *The Adventures of Huckleberry Finn* (1884). Twain replied that "If he had helped put that great brain when weary to sleep, he was glad of it" (Smith, 1972, p. 274). Twain briefly met Charles Darwin in August 1879, the same week he also heard Charles Spurgeon preach (Paine, 1935, p. 155). Incidentally, Mark Twain's personal life did not provide evidence for the racial prejudice that some modern critics have claimed. In fact one of Twain's best friends was a black farmer named John T. Lewis (Thomasson, 1985).

The following sections give an overview of Twain's thoughts related to creation and evolution, together with occasional editorial comments. My search was not exhaustive; Twain's writings are voluminous. He was clearly influenced by the Bible more than any other book. Raised in a frontier Presbyterian church, Twain unfortunately became extremely negative toward organized religion as promoted in his day. During his last years, especially in writing *Letters from the Earth*, Twain raged against his misguided concept of God. Much of this contentious material remained unpublished until recent years; in fact some Twain writings still remain unpublished.

This literature survey will serve three purposes. First, it gathers and documents numerous quotes that have occasionally appeared in origins literature, including the *CRS Quarterly*. Second, the quotes demonstrate the healthy skepticism that existed toward science during the lifetimes of Darwin and Twain, a critical view now largely lost. Third,

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Mark Twain's humor brings temporary relief to the serious tensions that exist between creation and evolution. Whether or not one agrees with Mark Twain, all will agree that he wrote with style and imagination. The quotes are listed in several categories, and also in general order of publication date. For this reason some of the given dates are after Twain's lifetime.

Anthropology

As concerns the proud paleontological trophy, the 'flint hatchet' and its companion the 'flint knife,' I am compelled again to differ with the other scientists. I cannot think that the so-called 'flint knife' is a knife at all. I cannot defuse my mind of the impression that it is a file. No knife ever had such a scandalous blade as that.

Our Earliest Ancestors, 1870
Chambers Journal Chapter, Ch. 4

In this essay Twain expresses suspicion about scientific claims to understand the past. This particular satire concerns paleontologists who describe minute details concerning the social life of primitive people on the basis of a single bone or artifact.

Man is the only Animal that blushes. Or needs to.

Following the Equator, 1897
Vol. I. Pudd'nhead Wilson's New
Calendar, Heading of Ch. 27

It obliges me to renounce my allegiance to the Darwinian theory of the Ascent of Man from the Lower Animals; since it now seems plain to me that that theory ought to be vacated in favor of a new and truer one . . . the Descent of Man from the Higher Animals.

The Lowest Animals, 1897
Essay

Man was made at the end of the week's work, when God was tired.

Notebook, 1867
(Paine, 1935)

Such is the human race. Often it does seem such a pity that Noah didn't miss the boat.

Christian Science, 1907
Book 2, Chapter 7

Of all the creatures that were made he [man] is the most detestable. Of the entire brood he is the only one—the solitary one—that possesses malice. That is the basest of all instincts, passions, vices—the most hateful . . . He is the only creature that inflicts pain for sport, knowing it to be pain . . . Also, in all the list he is the only creature that has a nasty mind.

Autobiography, Volume I, 1924
(Paine, 1924)

What a good thing Adam had. When he said a good thing he knew nobody had said it before.

Notebook, 1867
(Paine, 1935)

Let us be grateful to Adam our benefactor. He cut us out of the "blessing" of idleness and won for us the "curse" of labor.

Notebook, 1867 Paine, 1935)

I believe that our Heavenly Father invented man because he was disappointed in the monkey.

Autobiography, 1924
(Neider, 1959)

In 1879 Mark Twain began a campaign to memorialize Adam and Eve. He seriously planned for a giant statue of our first parents to be erected in the Holy Land. However, fundraising efforts were not encouraging so he eventually dropped the project.

Astronomy

I have been reading some new arguments to prove that the world is very old, and that the six days of creation were six immensely long periods. For instance, according to Genesis, the stars were made when the world was, yet this writer mentions the significant fact that there are stars within reach of our telescopes whose light requires 50,000 years to traverse the wastes of space and come to our earth.

The Love Letters of Mark Twain, 1949
(Wecter, 1949)

It is quite manifest that [God] believed his fresh-made skies were diamond sown with those myriad of twinkling stars the moment his first-day's sun sank below the horizon; whereas, in fact not a single star winked in that black vault until three years and a half after that memorable week's formidable industries had been completed. Then one star appeared, all solitary and

alone, and began to blink. Three years later another one appeared. The two blinked together for more than four years before a third joined them. At the end of the first hundred years there were not yet twenty-five stars twinkling in the wide wastes of those gloomy skies. At the end of a thousand years not enough stars were yet visible to make a show. At the end of a million years only half of the present array had sent their light over the telescopic frontiers, and it took another million for the rest to follow suit, as the vulgar phrase goes. There being at that time no telescope, their advent was not observed.

Letters from the Earth, Letter V, 1866
(DeVoto, 1962)

Twain here discusses the creation of stars. He attempts to reveal the conflict between star creation and observation. Twain's reasoning is that if stars are far distant, then Adam and Eve would not have seen them for years, (The nearest night star, Alpha Centauri, is actually 4.3 light years away instead of 3.5 light years). Twain has made the classic error of confusing large distance with a large time scale. In the big bang theory time and distance are necessarily equivalent because of slow expansion, but not in creation. God can make a vast universe quickly. When Adam and Eve looked at the sky on the sixth night of creation, they saw myriads of freshly-made stars, similar to our current skies.

It is lovely to live on a raft. We had the sky up there, all speckled with stars, and we used to lay on our backs and look up at them, and discuss about whether they was made or only just happened. Jim he allowed they was made, but I allowed they happened; I judged it would have took too long to make so many. Jim said the moon could 'a' laid them; well, that looked kind of reasonable, so I didn't say nothing against it, because I've seen a frog lay most as many, so of course it could be done. We used to watch the stars that fell, too, and see them streak down. Jim allowed they'd got spoiled and was hove out of the nest.

Adventures of Huckleberry Finn
1884

It was the novel Huckleberry Finn which firmly established Twain's reputation as a writer. The novel is filled with his experiences as a steamboat pilot on the Mississippi River.

General Science

The researches of many commentators have already thrown much darkness on this subject, and it is probable that, if they continue, we shall soon know nothing at all.

Our Earliest Ancestors, 1870
Chambers Journal

Probable northeast to southwest winds, varying to the southward and westward and eastward, and points between, high and low barometer sweeping around from place to place, probable areas of rain, snow, hail, and drought, succeeded or preceded by earthquakes, with thunder and lightning. But it is possible that the program may be wholly changed in the meantime.

New England Weather, 1876

Twain gave this humorous weather report during a dinner speech for the New England Society. Weather prediction has made considerable progress since then. However, today we realize that long-range weather is ruled by chaos theory. This means that there are too many variables involved for any computer model to be entirely accurate with forecasts. Only the Creator, who controls all the variables, knows future weather exactly.

The Scientist. He will spend thirty years in building up a mountain range of facts with the intent to prove a certain theory; then he is so happy in his achievement that as a rule he overlooks the main chief fact of all—that his accumulation proves an entirely different thing.

The Bee, Essay
(Neider, 1963)

Scientists have odious manners, except when you prop up their theory; then you can borrow money from them.

As Concerns Interpreting the
Deity, Essay
(Neider, 1963)

A scientist will never show any kindness for a theory which he did not start himself.

A Tramp Abroad, 1880

[Alfred Russell] Wallace says the whole universe was made to take care of and keep steady this little floating mote in the center of it, which we call the world. It looks like a good deal of trouble for such a small result, but it's dangerous to dispute with a learned astronomer like Wallace. Still, I don't think we ought to decide too soon about it—not until the returns are all in.

Mark Twain's Letters
(Paine, 1917)

Wallace (1823-1913) was a naturalist and contemporary of Darwin. These two men jointly announced the original idea of natural selection in 1858. Although Wallace was not an astronomer, he wrote and spoke on all aspects of science.

Genesis Flood

. . . everybody is hard at work; the shipyard so crowded that the men hinder each other; everybody hurrying or being hurried; the rush and confusion and

shouting and wrangling are astonishing to people like our family, who have always been used to a quiet country life. Hundreds and hundreds of new men have been put on, this morning, for time is pressing us cruelly. The Ark ought to have been done fully a month ago—oh, yes, two months ago—but first one thing and then another delayed us; mainly the scarcity of gopher wood; and secondarily the strike.

These horrible creatures have come in even greater crowds than usual, today, to look at the Ark, and prow over it and make fun of it. They ask questions, and when they are told it is a boat, they laugh, and ask where the water is, out here in the dry plain. When we say the Lord is going to send the water from heaven and drown all the world, they mock again, and say, "Tell it to the Marines."

Letters from the Earth, 1866
Passages from Shem's Diary
(Baetzhöld, 1995, p. 108)

Regarding Noah's Ark, Twain let his imagination run wild. He also composed humorous diaries from the viewpoints of Adam, Eve, and Methuselah.

If he had known all the requirements in the beginning, he would have been aware that what was needed was a fleet of Arks. But he did not know how many kinds of creatures there were, neither did his Chief. So he had no kangaroo, and no 'possum, and no Gila Monster, and no ornithorhynchus, and lacked a multitude of other indispensable blessings which a loving Creator had provided for man and forgotten about, they having long ago wandered to a side of his world which he had never seen and with whose affairs he was not acquainted.

And so every one of them came within a hair of getting drowned. They only escaped by an accident: there was not water enough to go around. Only enough was provided to flood one small corner of the globe—the rest of the globe was not then known, and was supposed to be non-existent.

Letters from the Earth, Letter V, 1866

Twain here portrays God as absent-minded and unfair to Noah. It is sad to read Twain's sarcasm concerning the great Flood. Most likely, his early Bible teaching had been without any personal application or apologetics evidence. Twain's father was known as a freethinker, one who rejects authority, especially in religion (Wiggins, 1964, p. 86). Thus Twain certainly heard Biblical doctrine questioned as a youth. Note Twain's false assumptions of ark size limitations, absent animals, and a local deluge. Many criticisms of

the Genesis Flood story are fully dealt with in the book by John Woodmorappe (1996).

The ark was a peculiarly fantastic device. A man of reputation who should contrive so inadequate a thing for such a purpose would cease to be admired. There was no way to propel it, no way to steer it, no way to get the leakage water out of it; if there was room for all the necessary animals, there was certainly not room for provender enough for them during so long a voyage.

God of the Bible vs.
God of the Present Day, 1870

Mark Twain voices identical criticisms of Noah's ark to those still heard today. It is typical that critics do not take time to seriously study the Bible passages in question. If they would make the effort, answers would be found to their questions.

Mr. Darwin invented the theory [survival of the fittest] . . . but the Ornithorhynchus [platypus] was the first one to put it to actual experiment and prove that it could be done. Hence it should have as much of the credit as Mr. Darwin. It was never on the Ark; you will find no mention of it there; it nobly stayed out and worked the theory. On the face of the Noachian deluge innumerable forest trees were floating. Upon these the ornithorhynchus voyaged in peace.

Following the Equator, 1897
The Naturalist and the ornithorhynchus

Creationist Steve Austin has popularized the idea of large floating log mats during the Flood. Here we see a similar proposal by Twain a century ago. He imagined a floating island habitat for certain creatures during the year of the Flood.

As for the Dinosaur, Noah's conscience was easy; it was not named in his cargo-list and the boys were not aware that there was such a creature. He said he could not blame himself for not knowing about the Dinosaur, because it was an American animal, and America had not then been discovered.

Adam's Soliloquy, 1905
(Baetzhöld, 1995, p. 121)

This dinosaur reference was inspired by a display at the New York American Museum of Natural History which Twain visited. A brontosaurus (actually an apatosaurus) discovered in Wyoming in 1894 had been reconstructed and placed in the fossil hall with great fanfare.

Geology

In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred

and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi River was upward of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long, and Cairo and New Orleans will have joined their streets together, and be plodding comfortable along under a single mayor and a mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.

Life on the Mississippi, 1883
Cut-offs and Stephen, Ch.17

. . . a causeway, hundreds of miles wide and thousands of miles long, joined Australia to Africa, and the animals of the two countries were alike, and all belonged to that remote geological epoch known to science as the Old Red Grindstone post-pleosaurian.

Following the Equator, 1897
The Naturalist and the ornithorhynchus

Twain had been a practical geologist while working as a silver prospector in Nevada. He respected geology but was skeptical of the inconceivable stretches of time and separate eras which geologists proclaimed. In a short piece, "Some Learned Fables, for Good Old Boys and Girls" (1874), Twain also railed against the conclusions of archaeologists, paleontologists, and geologists.

There is the 'advanced' school of thinkers [who] applied natural laws to the interpretation of all miracles, somewhat on the plan of the people who make the six days of creation geological epochs.

The Writings of Mark Twain, 1907

Theology

It ain't those parts of the Bible that I can't understand that bother me, it is the parts that I do understand.

A sin takes on new and real terrors when there seems a chance that it is going to be found out.

Unpublished statements
(Ayres, 1987, p. 24)

Who taught those ancient [Bible] writers their simplicity of language, their felicity of expression, their pathos, and, above all, their faculty of sinking themselves entirely out of sight of the reader and making the

narrative stand out alone and seem to tell itself? Shakespeare is always present when one reads his book; Macaulay is present when we follow the march of his stately sentences; but the Old Testament writers are hidden from view.

The Innocents Abroad, 1869

During the last day or two I [Eve] have taken all the work of naming things off his [Adam's] hands, and this has been a great relief to him, for he has no gift in that line . . . When the dodo came along he thought it was a wildcat.

Eve's Diary, 1905.

When this particular passage was published, the London Westminster Gazette took Twain to task for wrongly crediting Eve with naming the animals instead of Adam. Twain responded, "The Westminster man is unaware of the privileges of our profession . . . we are independent of facts; we care nothing of them . . . we would even distort the facts of the multiplication-table, let alone the facts of Genesis... If I had felt it best to turn the whole fable of creation inside out, I would have done it without compunction" (Baetzhöld, 1995, p.133).

She engages herself in many foolish things; among others, to study out why the animals called lions and tigers live on grass and flowers, when, as she says, the sort of teeth they wear would indicate that they were intended to eat each other. This is foolish, because to do that would be to kill each other, and that would introduce what, as I understand it, is called "death"; and death, as I have been told, has not yet entered the Park. Which is a pity, on some accounts.

Extracts from Adam's Diary, 1893

Here Twain shows an understanding of the serious problem of requiring death before the curse, as promoted by theistic evolution and old-earth creation.

The Being who to me is the real God is the One who created this majestic universe and rules it. He is the only originator of thoughts; thoughts suggested from within, not from without . . . He is the only creator. He is the perfect artisan, the perfect artist.

Notebook
(Paine, 1935)

At age 63, this quote shows that Twain was not quite the atheist that he is sometimes accused of. His view of God at this time was closely tied to the laws and patterns observed in nature.

The Bible is full of interest. It has noble poetry in it; and some clever fables; and some blood-drenched his-

tory; and some good morals; and a wealth of obscenity; and upwards of a thousand lies.

Letters from Earth, 1909 Letter 3

Twain wrote this last statement one year before he died. He increasingly raged against the Bible and God as he neared the close of his life. Twain was strongly influenced by Thomas Paine's *The Age of Reason*. The result was an appallingly deficient view of Christianity and the Bible. This is especially sad since Twain once claimed to have read the entire Bible by age 15 (Baetzhöld, 1995, p. xvi).

According to the book and its servants the universe is only six thousand years old. It is only within the last hundred years that studious, inquiring minds have found out that it is nearer a hundred million.

Letters from Earth, 1909
Letter 5

Note that Twain tends to give more authority to scientists than to preachers or to the Bible itself. Since Twain's time the assumed age of the universe has increased by 150 times, to 15 billion years instead of 100 million years

Adam was but human—this explains it all. He did not want the apple for the apple's sake, he wanted it only because it was forbidden. The mistake was in not forbidding the serpent; then he would have eaten the serpent.

Pudd'nhead Wilson, Ch. 2, 1894

There is no other life; life itself is only a vision and a dream for nothing exists but space and you. If there was an all-powerful God, he would have made all good, and not bad.

Autobiography, 1924 (Neider, 1959)

Conclusion

Mark Twain was uniquely gifted in causing his readers laugh at themselves. Neither religion nor science escaped his wit. In his later years, Twain was increasingly embittered toward the Bible and Christianity. His personal misfortunes may have been partially responsible. His oldest daughter, Susy, died in 1896, followed by his wife, Livy, in 1904. Twain also faced continuing problems with bankruptcy and was betrayed in business by close friends.

Mark Twain wrote a final statement just days before he died of heart disease in 1910:

Death, the only immortal who treats us all alike, whose pity and whose peace and whose refuge are for all—the soiled and the pure, the rich and poor, the loved and unloved (Ayres, 1987, p1. 56).

Twain now realized that for him, the time for humor was past. And so it is for everyone who considers the meaning of life. As many have discovered, only Scripture provides satisfying answers.

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Note: Generally I have referenced the Twain quotes by original title, chapter, and publication date without page numbers. Mark Twain's work is available in so many editions that page numbers are not useful.

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LETTERS TO THE EDITOR

Homo erectus and Modern Humans Do Not Demonstrate an Evolutionary Sequence

Malcolm Bowden and I have some minor disagreements regarding some of the human fossil material. I am disappointed that he has not allowed the matter to rest. To respond to his second letter forces me to criticize the work of a Christian brother, which I do not enjoy doing.

There are two serious weaknesses in Bowden's evaluation of the human fossil material. The first is his apparent obsession with fakes and frauds. Almost one-fourth of his book, *Ape-Men*, is devoted to Piltdown. Piltdown no longer deserves that much attention. It is a non-issue among evolutionists and should be with creationists also. We no longer get mileage from Piltdown, and using it makes it look as if the only material we have is about 100 years old. The other "fakes" that Bowden dwells on are equally non-productive. Does Bowden honestly think that he has given an adequate creationist response to the human fossil material by dwelling on a few "fakes"? He almost seems to imply that all of the human fossil material is questionable. If that is the impression he is trying to give, he has an ethical problem, because that is not true. He will not win over many people by implying that every evolutionist deals in fraud. The approach Bowden has taken is unwise and unnecessary.

In my book, *Bones of Contention* (Lubenow, 1992), I demonstrated that even if we assume (for the sake of argument) that all of the human fossil material is genuine (with the exception of Piltdown) the concept of human evolution is still falsified. My basic thrust was that *Homo erectus* and modern humans do not constitute an evolutionary sequence but were living at the same time as contemporaries. My work has received remarkable confirmation in the 13 De-

cember 1996 issue of *Science* (Gibbons, 1996; Swisher et al., 1996). With the redating of the Java Solo skulls, evolutionists have finally admitted that some *Homo erectus* individuals were living as contemporaries with modern humans. This evidence will precipitate a tremendous debate among evolutionists because it presents real problems for human evolution.

A second major flaw in Bowden's work is his seeming obsession with the human fossils that were discovered in the early part of this century, especially the Java and the Peking material. Everyone knows that this material was recovered before strict scientific methods were in place. Further, the Peking material was forever lost. Bowden is certainly welcome to his opinion on that material, but any opinion on that material will remain subjective and unprovable. It is also well known that the Java material is poorly dated. Dubois and von Koenigswald, who recovered most of it, hired national workers. They did not themselves see all of the material *in situ*. It was for these reasons that I did not dwell on Java/Peking material in *Bones of Contention*. Instead, I dealt with the more than 200 *Homo erectus* fossils that have been discovered more recently under more exacting conditions.

It is for these reasons that evolutionists, themselves, do not use the Java and Peking material as evidence for human evolution as much as they used to. They also tend to stress the more recent evidence. Thus, Bowden's insistence that much of the Java and Peking material is "fake" may possibly be true, but it is almost irrelevant. That is not where the action is. In the war between human evolution and human creation, Bowden is all alone on his own little battlefield. He is capable of doing much good, but he needs to get on a battlefield where there is some action. If anyone is still interested in whether or not some of the Java and Peking fossils are frauds, they are certainly free to read Bowden's work

and to evaluate the evidence for themselves. Since some of the more recently recovered *Homo erectus* material is very similar to the Java and Peking material, it certainly challenges Bowden's claim that that material is fraudulent.

I confess that I am still mystified by both of Bowden's letters. Although it was not his intent, they reveal tremendous areas in which we are in full agreement. I fault him for trying to make a big issue of what is no longer a big issue anywhere but in his own mind.

Bowden has every right to criticize my work. However, he owes me the Christian courtesy of carefully reading my work first. It is hard for me to believe that he has actually read *Bones of Contention*. Further, he has quoted me out of context regarding the importance of brain size in the human fossils. His implications regarding the quality of my research and my rather naive acceptance of evolutionist statements do not deserve comment.

In the interests of clarity, let me state that when I refer to the "human fossil material" I am referring to the material known as (1) anatomically modern *Homo sapiens*, (2) the Neanderthals, (3) archaic *Homo sapiens*, and (4) *Homo erectus*. The evidence indicates that all of these forms are fully human and should be so classified. (We recognize the possibility that some of the material assigned by evolutionists to those categories may not belong there, and that some material assigned elsewhere may belong in those categories.)

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Homo erectus – Further Comments

May I respond further to Dr. Lubenow's reply (Lubenow, 1997) regarding certain statements he makes?

1. Brain capacities

I must maintain that ALL the Peking Lower Cave skulls discovered and publicized are those of apes. Dr. Lubenow quotes an average cranial capacity of 1050 cc which places them within the range of a human skull.

On page 104 in my *Ape-men: Fact or Fallacy* (Bowden, 1981) I examined the reports of all the five craniums. The most complete was the Locus E skull which was only 915 c.c. and even its discoverer, Dr. Davidson Black, admitted that it was of "grossly triangular shape like that of monkeys, rather than oval-shaped, as in man" (Bowden, 1981, p. 97).

How were most of these capacities obtained? This becomes obvious when the skull used for the 'reconstruction'

of "Nellie" is examined (Figure 1, Figure 22 in Bowden, 1981). The plaster of Paris between the pieces has opened out the small pieces of the (ape) skull so that its measured brain capacity of 1,015 c.c.'s is just nicely half way between that of apes (c500 c.c.) and humans (c1,500 c.c.).

Surprisingly, Dr. Lubenow himself has admitted that capacity is no indication of ability for he states "Those brain size charts are meaningless." (Lubenow, 1992).

2. Morphology

In order to support his views, Dr. Lubenow quotes several authorities who claim that certain *H. erectus* fossils are like other fossils (Pekin and Java) that I reject. What is surprising is that these experts are all evolutionists to a man but their biased viewpoint he still accepts as reliable.

In the extensive reading necessary for my "Ape-man" book, I spent many hours in the library of the British Natural History Museum studying numerous books and reports, every one of which was written by an evolutionist. It was at all times vital to distinguish between what they actually found and what their interpretation was. Usually their 'interpretation' was worthless as it had to conform to the evolutionists' theory of man's rise from the apes. If I did quote their views, it was usually to highlight how baseless they were.

Discovering links between different skulls is all part of the stock-in trade of the evolutionists. These links are proposed so that the steady "progress of man's evolution" could be formulated to indoctrinate the public. Most frequently, fossils of small parts of ape skulls are always claimed to have human features. It is usually a little more difficult to attribute ape features to a human skull (e.g. Swanscombe man).

It is therefore a little surprising that Dr. Lubenow should quote these 'experts' as authoritative.

It requires only a brief glance through my "Ape-men" book to see that ALL so-called intermediaries between man and ape are totally fraudulent, some being just as fraudulent in their different ways as Piltdown was eventually admitted to be.

Dr. Lubenow suggests that we are more in agreement than it may appear. I can only reiterate that from my research I have no doubt whatsoever that all the Peking Lower Cave fossils are nothing but apes, as is the Java skull and all the *Pithecanthropines*.

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TAXONOMY OF PRIMATES

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Abstract

The membership criteria for grouping organisms into baramins are not the same, or of the same importance for all researchers. The hybridization criterion for existing animals is the most common and explanatory, because it supposes the integration of practically every criterion proposed by the different authors. Taking the basic criterion of hybridization and getting support from the other criteria, I propose a baraminology for the Primate order.

Introduction

From the original proposal of Marsh (1941) on the denomination of the created types or baramins—(meaning bara: created and min: kind) researchers have prescribed a variety of membership criteria to identify these groups of organisms. The first membership criterion was that of hybridization in 1945 (Marsh, 1976). In 1970, Jones proposed the pattern of behavior as a membership criterion, considering unjustified the criterion of Marsh (Jones, 1982). In 1984, Lester and Bohlin relegated the hybridization criterion to a secondary plane, against other criteria proposed by them. They also proposed a new name for the created types: “prototype,” that has not been followed.

The reproductive criterion of hybridization has been considered fundamental, though the support of other criteria proposed by the different authors is still important. In 1990, ReMine proposed his “Discontinuity Systematics” in which hybridization was the basic criterion. Also in 1990, Wise expanded “Discontinuity Systematics” by considering the membership criteria useful for defining a baramin in the context of a young earth, without forgetting hybridization as very important (Wise, 1990, 1992). Marsh had already left clear the moment from which an organismal cross was considered hybridization: “...When the chromosome groups of both parents take part in formation of the early blastomeres of the embryo” (Marsh, 1976, p. 37), that is the moment corresponding to when the maternal genetic control gives way to embryonic genetic control of the development and of the morphology from the DNA of both parents (Marsh, 1976; Scherer, 1994). With the basic criterion of hybridization and, finding support from other criteria, I approach the taxonomy of Primates.

Methods

My review and usage of membership criteria is partial, emphasizing the conflicting points in order to demonstrate that the use of a single criterion alone can produce misleading results, and to illustrate the merit of various criteria relative to the hybridization criterion.

In spite of the difficulties of using these criteria by themselves, I have used them as very helpful references. Only in

the case of hybridization has an exhaustive review been made.

When we study the morphologic criterion, we consider continuity of the fossil remains across geological periods, though this is a consideration that needs an eucladistic analysis (Wise, 1992). Only in those cases where we specify a continuity can a monobaramin be identified. For example, *Cebupithecia*, a fossil genus from the Miocene, represents great similarity with the current genus *Pithecia*, and both are considered members of the same monobaramin.

Hybridization records are taken from the research of Gray (1972), and from the *Zoological Record*. The criterion given by Marsh (1976) considers hybridization as a valid indicator, rejecting dubious cases. The list of the species of primates and their taxonomy has been taken from MacDonald (1991), Corbet and Hill (1991), and Aguirre (1995). Even if hybridization has not been observed, it is possible to hypothesize a potential cross on the basis of other hybridizations. If A and B hybridize with C, then A and B belong to the same holobaramin, and can or may hybridize, according to the criteria of Marsh (1976; Scherer, 1994).

Molecular Criterion

Diverse methods, possessing different degrees of precision, define differences between proteins. Electrophoresis techniques give less information than the immunologic and sequence studies. The change of an amino-acid is more easily detected through these last two techniques. Even then, the techniques do not allow investigators to easily differentiate what changes are primitive and which are derivative (Dene, Goodman, and Prychodko, 1977).

A study of 23 different proteins from the Hominoidea superfamily by Bruce and Ayala (1979) places the orangutan closer to the chimpanzee and gorilla than to the Asian gibbons. The orangutan remains at the same distance from man, the chimpanzee, and the gorilla. However, in a study of the sequence of myoglobin, position 23 of the protein chain is occupied by serine, as in all primates with the exception of chimpanzees, gorillas and men. In hominoids position 110 is cysteine, while the orangutan has serine, like Old World monkeys (Romero-Herrera, Lehmann, Castillo, Josey, and Friday, 1976). Not all molecular studies coincide when one attempts the taxonomic placement of the different species of

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living hominoids, but it is clear that the differences correspond to those that exist only at a species level in other taxa (Bruce and Ayala, 1979).

Using the method of Nei and Roychoudhury (1974) for establishing the genetic distance between *Homo* and *Pan*, King and Wilson have found that this distance is $D = 0.62$, while Bruce and Ayala found that the distance was $D = 0.386$ (Bruce and Ayala, 1979). The difference between genetic distances was attributed to the different conditions under which the electrophoresis was done (Bruce and Ayala, 1979). Since 18 of the proteins analyzed by both investigation teams were the same, the difference was attributed to the dissimilar conditions under which the electrophoresis was performed. King and Wilson (1975) studied 20 loci; Bruce and Ayala (1979) 22 loci. According to Bruce and Ayala (1979), the marked difference in the genetic distances does not seem justified by the analyzed proteins.

Many biological characteristics can be involved in explaining the differences of genetic distances between species. Some indicated by Avise and Aquadro (1982) are the rate of mutation, chromosome number, and the size of the population or fecundity.

The immunologic analysis of serum is another method to determine the similarities and differences between species. A phenogram made using immunodiffusion analysis between serums of primates shows that Strepsirhini form a group of their own, apart from the rest including *Tarsius*, and within this suborder the differences are quite outstanding.

The differences by immunodiffusion in the family Lorisidae, between its *Loris*, *Galago*, and *Nycticebus* genera is approximately the same magnitude as the difference between the Catarrhini and Platyrrhini infraorders. The families Cheirogaleidae, Indriidae and Lemuridae, of the Lemuriformes infraorder are very different. The two genera of the family Lorisidae, *Arctocebus* and *Perodicticus* are found at a distance similar to the distance that separates Platyrrhini genera such as *Callicebus* and *Aotes*. *Tarsius* gives a greater signal by immunodiffusion with Strepsirhini than with Haplorhini, and the amino acids sequence of its hemoglobin and the nucleotides of the β -globin cluster (Koop et al., 1989) also supports a path of proximity between *Tarsius* and Strepsirhini. The differences between gorilla and man are a little greater than those which separate *Hylobates lar* from *H. syndactylus* (Dene et al., 1977). Therefore it is evident that the differences between proteins and anatomical characteristics, in the compared taxa, have unlike proportions.

On the other hand, sequencing of proteins permits a comparison between species that does not always reflect what one would expect. Although, we may frequently find a certain correspondence between the morphologic difference and the substitution of amino-acids in a protein, it is not always like this. For example, the relaxin hormone differs between the *Balaenoptera acurostrata* and *B. edeni* whales by

three residues, while the difference of relaxin between the *B. edeni* and the pig, *Sus scrofa*, is only one residue (Schwabe, Bullesbach, Heyn, and Yoshioka, 1989).

We will not discuss the protein molecular clock, performed from the sequencing of proteins, or from other methods of analysis of proteins, because it is an evolutionist view that links protein variation with geologic time. One will only say that, it has not been possible to establish a satisfactory clock, as Scherer (1990) emphasizes: "It can neither be used as a tool for dating phylogenetic splits nor as reliable supportive evidence for any particular phylogenetic hypothesis."

The DNA molecule carries the necessary information to synthesize proteins, therefore, its changes can be conveyed to the proteins it will codify.

For this reason, the DNA molecule analysis can avoid some of the problems that may rise in analysis of proteins. Even so, two proteins with the same amino-acid sequence may be codified by genes with dissimilar nucleotides; this is due to degeneracy of the code. Comparative DNA sequencing cannot confirm whether or not a given mutation has always been present, since back mutations are possible. The possibilities include: nucleotide Z $\rightarrow$ nucleotide X $\rightarrow$ nucleotide Z, or nucleotide Z $\rightarrow$ nucleotide X $\rightarrow$ nucleotide Y $\rightarrow$ nucleotide Z, or other different substitutions of nucleotides. Hence, when sequences of DNA are compared we may find complications in the interpretation of nucleotide substitutions.

Sibley and Ahlquist (1984) have indicated that even though genes, proteins, or morphologic characters vary with different rates: "If one could obtain average rate value for a large enough sample of proteins, individual DNA sequences, or morphological characters, they too should exhibit an uniform average rate of change." This average rate may be obtained, at least theoretically, with certain ease, by comparing large DNA molecules, complete genomes, or DNA—DNA hybridization (Sibley and Ahlquist, 1984).

The hybridization of the DNA takes advantage of the property by which the double helix can be separated into two chains and then gathered again. Theoretically, this method permits the global differences between genomes of different species to be assessed by separating the chains from the double helix by heating, and gathering the heterologous chains of the species studied while the temperature descends.

The temperature needed to separate the heterologous chains, is inferior with respect to the homologous chains, due to the maladjustment between nitrogenous bases that do not hydrogen bond. This heterologous hybridization would permit one to evince the average of the total differences of the genomes, since the number of molecules handled is very high.

However, it is difficult to make the theories coincide with reality, and the same Δt is not always found when we com-

pare the same genomes in different experiments (Dickerman, 1991).

Kouznetsov and Ivanov (1991) have found that mRNA poly (A+), highly homologous in different species of wild forest mice, were carrying information for very different proteins as electromorphs. This indicates that the similarity between these molecules carrying the information does not always mean a similarity in the protein molecules they give place, and this presents more difficulties to the interpretation of nucleic acid and protein variation.

The study of highly repeated DNA sequences has been another way to investigate the relationships between species, but it also has drawbacks. The study of these DNA sequences in the Galaginae subfamily has revealed that their species are found to be very close. The species *Perodicticus potto* belonging to the subfamily Lorisinae presents a pattern of highly repeated DNA sequences very similar to that of the subfamily Galaginae. Both subfamilies, Lorisinae and Galaginae make up the family Lorisidae. The species *Microcebus murinus* belonging to the family Cheirogaleidae, taxonomically close to the family Lorisidae, had considerable differences with the pattern of highly repeated DNA sequences of the family Lorisidae (Crovella, Masters, and Rumpler, 1994).

On the contrary, in the family Lemuridae, each species possesses its own pattern of repeated sequences (Crovella et al., 1994) which hinders the interpretation of the results of greater or smaller similarity without further studies.

On the other hand, we have the relationship between molecular changes and morphological variation. Larson (1989) has suggested that both kinds of change seem to be unrelated. In the class Amphibia, we observe only a few corporal morphological patterns, though their degree of protein variation may be very high. On the contrary, in the class Mammalia 'we observe a great variety of morphological patterns (horses, bats, dolphins, men, etc.), but their degree of protein variation is inferior to that of the amphibians' (Larson, 1989). Within the same taxon we also find this maladjustment between morphological and molecular variation. In the genus *Tropheus*, a cichlid fish, the endemic inhabitants of Lake Tanganyika present a great genetic divergence with scarce morphological variation, opposite to what happens with other species of lakes Malawi and Victory (Sturmbauer and Meyer, 1992).

The genetic differences between the chimpanzee and man are scarce, insufficient to separate them beyond the species (King and Wilson, 1975; Bruce and Ayala, 1979). Approximately 99% of the polypeptide sequences of both are equal, whether in sequence analysis or by polypeptide comparison of the reactions between their serums. Comparisons of the DNA through heterologous hybridization chains reveal very small differences. In sister species of *Drosophila* the Δt for the separation of heterologous chains, with respect to the homologous is 3° C. The Δt between mammalian genera is

greater, but it is very small between the chimpanzee and man at 1.1° C. However, many hold that the morphological distance, ecological differences and that of behavior locate both chimpanzee and man perfectly into different families (King and Wilson, 1975; Bruce and Ayala, 1979; Harvey and Clutton-Brock, 1985).

The fact that molecular and morphological variations do not happen at the same rate has caused some researchers to conclude that changes in the proteins of different species are not very relevant as an explanation of their morphological or behavioral differences. The relevant molecular differences would have to be due to the differences in genetic regulation. A small change in a regulatory sequence could cause large morphological changes (Wilson, Maxson, and Sarich, 1974a; Wilson, Sarich, and Maxson, 1974b; King and Wilson, 1975).

An experiment by Wilson et al. (1974a), whose goal was to verify this hypothesis, used immunological techniques to analyze proteins of different species of anurans or mammals capable of hybridizing. They supposed a priori that the species capable of crossing have proteins very similar or the same. However, they found that although this was true for mammals the same did not occur with anurans.

From this we might conclude that the compatibilities between the development programs of species are not necessarily reflected by differences in the kinds of proteins that are commonly analyzed. Therefore, the analysis of these proteins can only have a relative worth.

The changes in regulatory systems have been related to the chromosome structure. In mammals there is a greater variability in the chromosomes, as well as in their anatomy, with respect to that found in anurans (Wilson et al., 1974b). In birds a relationship was found between a uniform chromosome structure and a uniform morphology, as it happens with anurans. Also, the potential for interspecific hybridization in birds and frogs is much greater than in mammals. Morphologic change and the loss of the capacity for hybridization may therefore be directly related with the changes in the patterns of gene expression (Prager and Wilson, 1975).

The revision by Dickinson (1991) about genetic regulation between species of the genus *Drosophila*, reveals that there is nothing conclusive. The production of a protein can vary between sister species up to two orders of magnitude.

The study of homeotic genes, directly implicated in the morphologic determination of the animal, might provide evidence for a more direct relation between genes and morphology.

Chromosomes and Species

It is generally accepted that each species possesses a particular karyotype, and that the karyotypical differences between species are proportional to the distances between them. However, it does not seem that this affirmation could

be generalized, which may prevent us from clearly establishing a relationship of proximity between species by studying only the karyotype.

Species of the two genera of the family Camelidae, order Artiodactyla, possess identical karyotypes (Bunch, Foote, and Maciulis, 1985). Hybridization between the species of the New World, (llama, guanaco, alpaca, and vicuna) is possible. The same also happens with the species of the Old World camel Bactrian and dromedary.

The genus *Muntiacus*, of the family Cervidae is, however, highly variable as far as karyotype is concerned. The bottom most diploid number found in Mammals is six chromosomes for the female of the *Muntiacus muntjak* and seven chromosomes for the male. The species *Muntiacus reevesi* possesses $2n = 46$ chromosomes, but both species hybridize (Yang, Carter, Shi, and Ferguson-Smith, 1995).

The chromosomal differences between both species do not alter their function, neither their structure, nor their genetics. Dutrillaux exposes the case of a human patient with just one chromosome resulting from the fusion of 46 (Dutrillaux, 1979).

In the family Cercopithecidae the karyotypical differences are due largely to chromosomal fissions and fusions. The chromosome number in the genera *Papio*, *Macaca*, *Cercocebus* and *Cynopithecus* is 42 compared to 70 of the genus *Cercopithecus* (Dutrillaux, 1979; Dutrillaux, Biemont, Viegas-Pequinot, and Laurent, 1979), with which all hybridize. All these genera could be a superspecies, that would comprise an important morphological diversity, in contrast to what occurs with other groups of Primates with variable karyotypes, and greater anatomical uniformity.

In the family Callitrichidae, *Cebuella pygmea* possesses a karyotype much closer to *Callithrix jachus* than the latter to *Callithrix emiliae*, which is indicative of the proximity of both genera : *Cebuella* and *Callithrix*.

Microcebus, *Cheirogaleus*, and *Allocebus*, of the family Cheirogaleidae possess a very similar karyotype. The genus *Phaner*, presents, however, the karyotype with greater differences with respect to other genera of the family Cheirogaleidae (Rumpler et al., 1995).

The banding of the chromosomes in Pongidae and man reveals a high degree of identity, 18 of 33 chromosomes pairs are practically indistinguishable between them, and the rest possess very limited variations. (Yunis and Prakash, 1982). In the family Lemuridae, however, two subspecies, *Lemur fulvus collaris* and *Lemur fulvus albocollaris* differ by eight Robertsonian translocations, and still hybridize (Dutrillaux, 1979). In *Drosophila*, sister species with homosequential polytenes cannot hybridize (Dutrillaux, 1979).

The hylobatid karyotype is radically different from the rest of Primates with a diploid number of 38, 44, 50 and 52 chromosomes. By chromosome banding greater differences are found between the different species (Koehler, Arnold, Weinberg, Tofanelli, and Stanyon, 1995). Their morphology

remains similar (Figure 1), which is opposite to what occurs in Cercopithecidae.

Hybridization techniques *in situ* between DNA libraries and chromosomes are another complement to the chromosomal analysis. This technique reveals a very high molecular correspondence between chromosomes of Cercopithecidae and those of man (Wiemberg, Stanyon, Jouch, and Cremer, 1992), opposite to what occurs upon comparing Hylobatidae with man (Koehler et al., 1995). This allows us to doubt whether there is enough proximity between gibbons and humans to include them in the same superfamily, Hominoidea.

The Morphologic Criterion

The cranium is the bony structure most used in anatomical comparison between vertebrates, and therefore their taxonomy. The motive is the complex interaction between the bones that compose it and the soft tissues with which they interact, generally very sensitive, brain and organs of the senses among others. This motivates its stability, especially in the base of the cranium (Enlow, 1992). Dentition also presents a special stability.

In the order Primates, the auditory bulla formed by the petrosal and the ectotympanic, the rounded form of the promontory, the loss of the medial branch of the artery internal carotid, and the formation of a bony channel for the lateral branch of the same are considered as apomorphic (i.e., derived) features of the basicranium (Aguirre, 1995).

To establish the classification we use mainly the bony structure in the otic region, the tracings of its circulatory net in the basicranium, and the nasal bone fundamentally (Aguirre, 1995).

According to these characteristics, the animals with the greatest similarities would be found within the order Carnivore (Aguirre, 1995). It becomes evident that few anatomical characteristics cannot be used as the only differentiation criterion.

Characteristics of the postcranial skeleton and even of the soft tissues help define the differences between species or superior taxa.

The origin of the order Primates is not justified by the fossil record as descendant of some less specialized mammal, nor that man emerged by evolution from some type of monkey, as pointed out by Cheek (1981).

The Plesiadapiformes group, which many consider small Primates, includes exclusively Paleocene fossils. Their incorporation among Primates is due to certain trends in the dentition and the otic region. However, they present dental adjustments more characteristic to other orders, as Insectivora, Rodentia, and even with the family Carpolestidae, within the Marsupials (Aguirre, 1995).

The ocular orbits of these animals are not closed and remain located on the side. The incisors are separated by a wide diastema of the premolar and molar teeth. They do not

present opposable thumbs, have claws, and furthermore their crania are flattened (Fleagle, 1988). It has been suggested that they present a greater similarity with the Dermoptera order mostly on the basis of recent fossil finds involving hard bones (Aguirre, 1995).

After the anatomical relationships are established, the Plesiadapiformes are found estranged of the rest of the Primates even in their basicranial circulatory pattern (Szalay, 1975). Neither can we find intermediate stratomorphs to join the Plesiadapiformes with some taxon of the Primates (Fleagle, 1988). Hence, we prefer to leave them out of the order Primates, and not to consider them in our classification.

In the suborder Strepsirhini are grouped an extinct infraorder, the Adapiformes, and the infraorder Lemuriformes. The Adapiformes have only one family, belonging to the Eocene. The Lemuriformes have current representatives, with continuity from the Miocene. The fossil record presents a discontinuity between Adapiformes and Lemuriformes.

The Adapiformes are grouped into one isolated family, Adapidae. The Lemuriformes includes eight families. Three of them are already extinct. The Lorisidae, with current representatives, has continuity back to the beginning of the Miocene (Aguirre, 1995).

The suborder Haplorhini includes the Primates with an independent ear opening of the bulla, the thickening of the stapedial branch of the internal carotid artery, a replacement of the rhinarium of the Strepsirhini by a pilose nose, and an increase in the cerebral volume and cranial capacity. In this suborder three infraorders are differentiated: Tarsiiformes, Platyrrhini and Catarrhini. The Tarsiiformes are grouped into two families, Omomyidae, extinct and with continuity throughout Eocene and beginning of the Oligocene, and Tarsiidae, with only one current representative and without continuity with the known fossil record (Aguirre, 1995).

The infraorder Platyrrhini groups the South American monkeys into two families. The first is Cebidae, which channels to its current representatives with fossil specimens until the Oligocene. The fossils of the genus *Dolichocebus* of the Oligocene, *Neosaimiri* and *Saimiri bernensis* present great similarity with the genera *Cebus* and *Saimiri* (Delson and Rosenberger, 1984; Fleagle, 1988). *Cebupithecia*, of the Miocene, is very similar to the current genus *Pithecia* (Fleagle, 1988). *Aotus dindensis* of the Miocene is almost identical to representatives of the current genera *Aotus* (Fleagle, 1988), and *Stirtonia*, of the Miocene, possesses many of the characters of the current genera *Alouatta* (Fleagle, 1988). *Tremacebus* of the Oligocene presents a great similarity with *Callicebus* and current *Aotus* (Fleagle, 1988), and a close proximity to the current *Aotus* for Delson and Rosenberger (1984).

Recently a very complete skeleton of a *Protopithecus* has been found which was a giant primate of the Pleistocene. The preliminary investigations on this fossil reveal that the cranium is very similar to the *Alouatta* genus, and its post-

cranial skeleton to the genera *Ateles*, *Brachyteles*, and *Lagothrix* (Hartwig and Cartelle, 1996). This may mean that all these genera are part of a single holobaramin, and that they emerged as variations of *Protopithecus*.

A genus, *Branisella*, appears isolated in the Oligocene without clear relationships with the rest of monkeys in the New World. A second family of Platyrrhini, Callitrichidae contains only current representatives of great anatomical uniformity, and has been called "Anatomical Complex of the Marmoset" (Delson and Rosenberger, 1984). Additionally *Cebuella* and *Callithrix*, belonging to the family Callitrichidae share a particular physiological attribute: intrauterine placental anastomoses formation between heterosexual twins (Benirschke, Anderson, and Brownhill, 1962). One must emphasize that the remains of Platyrrhini do not occupy more than a "shoe box" (Fleagle, 1988).

The infraorder Catarrhini groups all the European, Asian and African monkeys. In the early Egyptian Oligocene, begins the fossil record of the greatly diverse Catarrhini, all belonging to the family Parapithecidae. Another two extinct families, Oreopithecidae and Pliopithecidae are located in the Miocene. The family Cercopithecidae is currently very diversified, with continuity until the Miocene. In this family two subfamilies are differentiated, Colobinae and Cercopithecinae. These may correspond to two different monobaramins, although we cannot determine whether they belong to a single holobaramin. The fossils attributed to the subfamily Colobinae are not very similar to the current representatives, opposite to what occurs with the fossils that are attributed to the subfamily Cercopithecinae (Fleagle, 1988). Some authors have emphasized the great similarity between the remains attributed to extinct *Macaca* and current representatives of this same genera, to the extent of being practically indistinguishable in many cases (Delson and Rosenberger, 1984; Fleagle, 1988).

The fossil remains assigned to the genera *Papio*, *Cercocebus* and *Theropithecus*, all belonging to the subfamily Cercopithecinae, also present a close similitude with current representatives of these same genera, but present greater anatomical specialization (Fleagle, 1988). This family Cercopithecidae presents some additional difficulties involving the identification of the fossil remains. To determine which subfamily the taxa belong to, the current representatives are compared by characters of their soft tissues, such as the stomach or the bags of the cheeks. Unfortunately, these characters cannot be recognized, at least with ease, in the fossils.

The family Hylobatidae descends with continuity from Miocene representatives, if the fossils of *Dendropithecus* are accepted as hylobatids (Aguirre, 1995). Similarly, the family Pongidae, whose most ancient representative would be *Proconsul* descends from the Miocene.

The case of the hominids deserves an independent mention, because it is a group that we consider polybaraminic.

In the order Primates, the only occasion we can use the Scriptures as a baraminologic membership criterion is to differentiate man from the rest of the biota. Man was created on the sixth day (Genesis 1:26, 27) independently of the rest of the animals. Are the *Australopithecus*, *H. habilis* and *H. erectus* part of that sixth day of the creation?

When the first fossil of *Australopithecus africanus* was discovered, the child Taung, Dart (1925) saw in him anatomical characters more advanced than those of Primates, and considered it an intermediate in the evolution towards man. However, not everyone found those characteristics superior to those of monkeys (Keith, Smith, Woodward and Duckworth, 1925). Not until the 1950's were the *Australopithecines* considered by a majority as evolutionary intermediate towards man. Around this time the Piltdown man was discovered to be a fraud. Broom found indications in postcranial remains of *Australopithecus*, that these would have been bipeds (Verhaegen, 1994).

The Piltdown fraud showed a simian dentition and jaw and a human brain; the Taung child showed the opposite. When the evidence vanished for the man from Piltdown, *Australopithecus* had the road free as intermediate in human evolution (Verhaegen, 1994). However, Verhaegen (1994) considers the placement of the *Australopithecus* in the base of the human evolutionary line as nothing more than a prejudice. Bipedalism does not guarantee human affinity, although all and only humans are bipeds at present. After an examination of *Australopithecine* anatomy Verhaegen (1994) located their origin with the current anthropomorphs. The common ancestor of humans and anthropomorphs would have been more similar to both than they are to each other. Whether this idea is right or wrong will not be analyzed here, but with the Scriptural basis we consider that the *Australopithecines* are monkeys with greater or smaller degree of bipedalism (Mehlert, 1996).

Gibson considers that the anthropomorphs may possibly be degenerated forms of humans (Gibson, 1986). We do not share this opinion because it has not been possible to find out whether human sexual cells interact with those of anthropomorphs (Bedford, 1981), and it has never been demonstrated that these and man may have hybridized (Marsh, 1973). We also do not believe that *Homo habilis* presents human characteristics in its anatomy or behavior (Lubenow, 1992; García-Pozuelo-Ramos, 1993; Verhaegen, 1994).

Homo erectus presents every human characteristic. Anatomically they seem capable of speech, possess bipedalism and human corporal proportions, and have a brain of the size and structure of human beings. Furthermore it has been demonstrated that they are stewards and handlers of human instruments, in addition to using fire (Lubenow, 1992; García-Pozuelo-Ramos, 1993).

It does seem that there are degeneracy signs in *H. erectus*, but as a result of natural variation in humans, accepted by

most creationists. The Neanderthals do not deserve greater commentary; they are human. From all of this we conclude that *H. erectus*, *H. sapiens neandertalensis* and *H. sapiens sapiens* certify a holobaramin (Figure 2).

We consider *H. habilis* and *Australopithecus* to be a unique monobaramin (Figure 3) (Lubenow, 1992; García-Pozuelo-Ramos, 1993; Verhaegen, 1994) in which a great variability is presented, with differentiation into robust and gracile forms. The *Australopithecines* may form a monobaramin near the anthropomorphs, though this must be confirmed.

Chromosomal and protein comparisons, would group *Pan* and *Gorilla* into the same monobaramin. However, with these criteria alone, man would form part of the same monobaramin though the anatomical differences, ecological differences, and behavioral differences have determined that man be classified in a different family.

The analysis of Primate fossils that are presently known to date could increase the number of families and subfamilies of the order Primates to double those existing. Broadly speaking, we consider the subfamily or in some cases the family as equivalent to a holobaramin, (to consider the different membership criterion and Figure 4), and we believe this is a conservative measure. The fossils indicate that the Primates gather an intrabaraminic diversification, but that the number of holobaramins has not had to surpass more than 30.

The Hybridization Criterion

The most determinant criterion to establish the ownership to a holobaramin is that of hybridization. However, we cannot use hybridization with fossils. The importance of the hybridization criterion comes from the fact that it compels a biochemistry compatibility, chromosomal, morphological, etc. that is manifested in a correct development. Simply put it integrates all other affiliation criteria.

Proposed by Marsh (1941), this criterion goes beyond the mere ovum/sperm interaction, since this can occur between very different species and without genetic relationship. The hamster oocyte permits in its interior the entry of sperms of many species of mammals, included marsupials, and even fowl (Samour, Moore, and Smith, 1986). After the introduction of human sperm in an egg of a hamster, free of the zona pellucida, it is possible to transform chromatin from human sperm into first-cleavage mitotic chromosomes that can be karyotyped (Brandriff and Gordon, 1989). However, all these gametic interactions between different animals only reflect the existence of common mechanisms of superficial interaction. The information carried by the DNA of both gametes to form the new being does not behave as a whole. The human sperm is capable of joining to the covers of the gibbon ovum, though it does not interact with the ova of sub-hominoids such as *Macaca* or *Papio* or of other mammals (Bedford, 1977).



Figure 1. Skulls (casts) of *Hylobates syndactylus* male (left) and *Hylobates lar* female (right). The differences do not go beyond those inherent of sexual dimorphism in other species.



Figure 2a. Skull (cast) of present Australian aborigine, *H. sapiens sapiens*. b. Skull (cast) of *H. sapiens neanderthalensis*, La Ferrassie I. c. Skull (cast) of *H. erectus* KNM-ER 3733. All of these *Homo* share morphologic and behavioral characteristics that allows us to group them as humans.



Figure 2b. See caption 2a.



Figure 2c. See caption 2a.



Figure 3a. Skull (cast) of *A. africanus*, Sts 5. b. Skull (cast) of *H. habilis*, O.H.24. The similar morphologic characteristics allows us to place them in the same monobaramin.



Figure 3b. See caption 3a.

ORDER PRIMATES (182 species)*

SUBORDER STREPSIRHINI

+INFRAORDER ADAPIFORMES

+FAMILY Adapidae

INFRAORDER LEMURIFORMES

+FAMILY Megaladapidae

+FAMILY Palaeopropitacidae

+FAMILY Archaeolemuridae

FAMILY Lorisidae

Subfamily Lorisinae

Subfamily Galaginae (M)

FAMILY Daubentonidae (unique specie)

FAMILY Indriidae

FAMILY Lemuridae

Subfamily Lemurinae

Subfamily Lepilemurinae

Subfamily Hapalemurinae

FAMILY Cheirogaleidae (C)

SUBORDER HAPLORHINI

INFRAORDER TARSIIFORMES

+FAMILY Omomyidae

FAMILY Tarsiidae (Three species in one genus)

INFRAORDER PLATYRRHINI

FAMILY Cebidae

FAMILY Callitrichidae (c)^a

INFRAORDER CATARRHINI

+FAMILY Parapithecidae

+FAMILY Oreopithecidae

+FAMILY Pliopithecidae

FAMILY Cercopithecidae

Subfamily Cercopithecinae (H)

Subfamily Colobinae

FAMILY Hylobatidae (H)

FAMILY Pongidae (M,C)

FAMILY Hominidae (S)

Bold words belongs to monobaramin or holobaramin.

* MacDonald, 1991.

+ Extinct taxon.

M Monobaramin by molecular criterion.

C Monobaramin by chromosomal criterion.

^a "Marmoset Anatomical Complex" Morphological unity.

H Monobaramin by hybridization criterion.

S Holobaramin by Scriptural criterion.

Figure 4.

The order Primates groups 12 families with current representatives (MacDonald, 1991), and eight extinct families (Aguirre, 1995). The *Lemur* genus is the only member of the family Lemuridae known to hybridize because no data is available for the other two genera (Gray, 1972; Warter and Rumpel, 1985). We have found no hybridization data for the families Cheirogaleidae, Indriidae, Daubentonidae, Lorisidae and Tarsiidae. In the family Callitrichidae there are five genera (MacDonald, 1991), of which two, *Callithrix* and *Saguinus* possess species that hybridize within the genus, but not between genera (Gray, 1972). In the family

Cebidae, with 11 genera, four hybridize between species of the same genus, including *Cebus*, *Pithecia*, *Chiropotes* and *Ateles* (Gray, 1972; Rossan and Baerg, 1976).

The family Cercopithecidae includes 14 genera. Hybridization occurs between species of different genera, and thus we can establish a continuous line between *Cercopithecus*, *Macaca*, *Theropithecus*, *Allenopithecus*, *Erithrocebus*, *Papio* and *Cercocebus*. In the genus *Semnopithecus* there is hybridization between species within the genus. In the subfamily Cercopithecinae all the genera hybridize mutually or through third parties, except the genus *Miopithecus*, of which there have been no reported cases of hybridization. (Gray, 1972; Matsubayashi, Hirai, Watanabe, Ohkura and Nozawa, 1978; Ledbetter, Grant, and Kuehl, 1979; Muleris, Gautier, Lombard, and Dutrillaux, 1985).

In the family Hylobatidae, all the current representatives hybridize mutually (Gray, 1972; Shafer and Myers, 1976; Wolkin and Myers, 1980). In the Pongidae hybridization has only been reported between the two representatives of the *Pan* genus (Vervaecke and Elsacker, 1992).

Conclusions

We have analyzed the data available in the fields of molecular biology, anatomy, and physiology to attempt to determine the discontinuities between different holobaramins of the order Primates. We have emphasized the difficulties of using only one criterion. In addition to the methodological difficulties and those of interpretation, the studies that have been accomplished up until now are based on the continuity prejudice of the theory of evolution. This forces us to design some experiments or to think over observations with the purpose of getting some objective results.

With the available data, it is difficult to offer a definitive baraminology in this mammalian order, though some preliminary results are given that permit a program of systematic investigation of the discontinuities (Figure 4). It is necessary to generate a eucladistic reappraisal (Wise, 1992) of the order Primates to assure the anatomical relationships, but we believe the number of holobaramins has not surpassed more than 30, if they correspond with families or subfamilies. At least, it seems we can deduce this from the analysis we have presented. However, if the proposal of Wise (1992), that there may be three or four holobaramins for each order is generalizable, then the holobaramins of the order Primates would correspond approximately to the taxon infraorder.

Since hybridization is the more reliable criterion, efforts should be centered in the search of species capable of hybridization following the criterion of Marsh (1976). The hybridizations will serve to calibrate the rest of the membership criteria. Once the molecular, chromosomal, anatomical, or other kind of membership criteria variations are established for a holobaramin, we can compare these variations with other species whose ability for hybridization has not

been determined. The comparison has to be done using statistical methods (Wise, 1992). The greatest variability found in the characters studied, we think, should be considered as the most reliable reference. Thus, we think that the morphologic variability in the sub-family Cercopithecinae is a better calibrated reference than the reference of morphologic variation in the family Hylobatidae.

Later, we will have to determine the taxa to which a calibrated membership criterion can be applied. The morphologic variability in Cercopithecinae could serve as a reference to determine other holobaramins. In any case, a single membership criterion, other than the hybridization criterion, may not be enough to reliably establish monobaraminic continuity.

Investigation of the hybridization criterion must be a high priority, although it will evidently be costly. To optimize resources, the most fruitful options need to be found, as Wise (1995) has indicated for the field of transitional forms in the fossil record, and their utilization for establishment of continuity lines.

In the research of discontinuity by hybridization, investigation is needed to find the continuity or discontinuity between genera of the subfamily Colobinae, and between this subfamily and its sister Cercopithecinae, which can be considered a monobaramin (Hartwig-Scherer, 1993).

In the suborder Strepsirhini, information is needed about the unity or disunity between the representatives of the family Lorisidae and its relationship to the family Cheirogaleidae, and in addition the relationships of these two families with the family Lemuridae. In the suborder Haplorhini, the relationships between the genera of the family Cebidae and of this family with Callitrichidae need to be investigated.

In the family Pongidae one must establish the relationships between its three anthropomorphic genera.

It is also necessary to find the relationship between New World Primates and Old World Primates. It seems reasonable that New World Primates would diversify from one or several populations of the Old World. Another possibility is that the ancestors of New World Primates, survivors of the Flood settled exclusively in the land colonized and that now corresponds with the American continent.

We do not discount the idea that hybridization capacity between members of a same holobaramin is lost with time. However, with well-calibrated accessory criteria the determination of holobaramins should be possible, something that still seems precipitate in the order Primates. What seems impossible is that those species belonging to different holobaramins could hybridize. As outlined by Marsh (1981), if God creates separately, He would have done so that discontinuity continues to exist

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LETTERS TO THE EDITOR

Formation of Santa Elena Canyon: The Rising Cake Model

I just read the article on the Santa Elena Canyon by Williams and Howe (CRSQ 33:89-98). I am a physician, not a geologist; however I would like to simply pass on an observation.

When my wife bakes one of her outstanding chocolate cakes, it sometimes rises so fast that the top fissures, and a "canyon" is formed on the surface. Because of the baking (hardening) process, the fissure remains.

I have not been to see the Santa Elena Canyon, but I have seen the Canyon de Chelly in the N.E. corner of Arizona and also the Grand Canyon. The Canyon de Chelly very much appears to have formed in manner similar to the rising cake model, although the Grand Canyon (less) apparently fits, too.

From the photographs (Fig. 3b, especially, of the article), I suggest Santa Elena Canyon formed in similar fashion. There was an abrupt uplifting of the land mass so that tensile forces on the surface exceeded cohesive forces of the hardening sediments, and so a fissure formed. Indeed, such an event may have occurred twice, following the same irregular defect already once established as the land mass continued to rise (thus the shelf, or the wider top half of the canyon). Water had nothing to do with it. The rivers at the bottom of these canyons are there passively, i.e., following the opening in the rock at the lowest level. What I am saying is that erosion did not cause these canyons; a lift and fissuring did.

Possibly also involved in this fissuring process is rapid dehydration. The baking process causes not only the batter to rise, but water in the mix to evaporate. I have often seen mud fissures and cracks that look exactly like what one sees in Fig. 3a of the article, when mud dries rapidly in the heat of the sun. Possibly rapid removal of water from within the sediments of this rising land mass aided the fissuring process at these canyons.

I wonder, too, if the Terlingua originally carried the Flood run-off. After the fissure formed, water from the west had a route to the Terlingua, and then the source of the Terlingua dried up, leaving the present geography.

What do you think? May the Lord bless you!

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Deriving Vardiman's Sedimentation Equation

Equation 1 in Vardiman (1996) leads to some rather startling conclusions. However, postulating this equation seems somewhat ad hoc in character. Is there a more acceptable

differential equation that is derived from first principles, is known to give a good approximation for actual natural system behavior, and that yields acceptable and useful laboratory predictions? Consider the general equation

$$\frac{dQ}{dt} = BQ(t) + A, \quad (1)$$

where A and B are to be determined from direct physical or boundary conditions. For $A = 0$, equation (1) models (bacteriological) growth if $B > 0$, and the radioactive decay if $B < 0$. If $B < 0$ and $A > 0$, then (1) models the simplest Newton Law of cooling. It has been shown recently that if $B < 0$ and $A > 0$, then (1) also serves as a basic survival model for an infectious disease.

More significantly for this research, if $B < 0$ and $A > 0$, then (1) can also model the basic homogeneous (i.e., well-mixed) mixing of possibly different concentrations of material. In this case, $Q(t)$ is the amount of sediment (in water) relative to a standard configuration at time t , where the amount of mixture and sediment are known at a particular moment. Further, the mixture is entering the configuration and being removed at a constant rate and the sediment within the inflow is of a constant concentration. In all cases, these models are but good approximations for actual natural system behavior since the constraints are not, usually, met and averages are utilized. For mixing, (1) is but the difference of two rates of change, inflow minus outflow. The A , in this case, represents the average rate of change of the amount of sediment entering the configuration. Considering a standard configuration such as a cylinder with a fixed base area, then $Q(t)$ would be directly proportional to the cylinder's height $y(t)$. Further, B is expressed in reciprocal time units and can be replaced by the concept of relaxation time τ to account for discontinuous behavior prior to that time. Clearly, (1) has numerous applications and predicts successfully the behavior of many natural systems.

As mentioned, let $B = -1/\tau$ and substitute $y(t) = Q(t)$, where y represents the height of the sediment layer above a fixed reference point. Solving equations (1) yields

$$y(t) = C \exp\left(-\frac{t}{\tau}\right) + A\tau. \quad (2)$$

One boundary condition is $y(0) = 0$. This yields $C = -A\tau$. Substituting into (2) yields

$$y(t) = A\tau\left[1 - \exp\left(-\frac{t}{\tau}\right)\right], \quad (3)$$

and note that $dy/dt = A \exp(-t/\tau)$. Equation (3) and its derivative are of the exact same form as Equation 1 and 4, respectively, in Vardiman (1996) and the analysis can continue from this point in the exact same manner. Equation (1) above, with the indicated substitutions, is less ad hoc than Equation 1 in Vardiman (1996) for, in general, it does successfully model many well known natural systems and

would be a more likely model for sediment accumulation for $t \geq \tau$. For these reasons, I suggest that Equation 1 and the above derivation should replace Vardiman's equations (1) through (4). I note that this derivation will be used as a modeling example in differential equation classes at the U.S. Naval Academy.

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Devonian Fish and Amphibians: An Update

This letter is an update of my paper (Brown, 1996) due in part to the editor calling attention to a new discovery (Ahlberg, 1995). Readers will need to check Table I in my last paper for the timeline for Devonian fish and amphibians according to uniformitarianism. The latest discovery is a tetrapod known by the name of *Elginerpeton pancheni* and is viewed to be about 373 million years old. The Devonian rocks are viewed to be about 400 million years old. The oldest type of fish involved in this story are dated at 390 million years old. From the evolutionary viewpoint, these fish must have spent many millions of years branching off and producing other species of fish. Among them would be the Panderichthyids, which appear at about 380 million years. Prior to this discovery, the oldest amphibian was dated at about 370 million years ago. If we allow a history of at least three million years, then we reach 373 million years. If we allow the transitional fish 10 million years to transform into the amphibian (some may argue for longer, but it does not matter for our argument), then this fish would not have fully evolved at 380 million years. Our amphibian would have been around for at least three million years before the 10 million years were finished. Now we have the oldest tetrapod existing at about 373 million years. If we suppose that it had a history of at least, for example, three million years, then that would bring us to 376 million years ago. Thus, any fossil from within the 10 million years from 380 to 370 million years would not be acceptable. These fossils thus do not present a reasonable scenario for the evolution from fish to amphibian.

The other main points of my last paper involved support for the gene-theme model and the law of symmetric variation.

The Gene-Theme Model

What I have called the gene-theme model involves the following. God either created all the features shared among

certain kinds, such as those shared by fish and amphibians, or God created some of them while others resulted from adaptation utilizing the organism's variation potential. The genes involved could be similar, the same, or completely different, it does not matter. The above data involving fish and amphibians firmly supports this view of the origin of shared features.

The Law of Symmetric Variation

The way amino acids are coded and arranged into families ensures that some changes in the bases that code for amino acids will produce the same amino acid and therefore symmetric changes, a term supported by one of Britain's leading mathematicians, Ian Stewart (1994). Other changes via mutation will produce a variation within the chemical group or family to which it belongs, giving a variational change. Any change which takes amino acids beyond the group to which they belong will either be repaired by the system, if undesirable, or allowed to remain, if not harmful. Anything that is unhelpful, and is not returned to the symmetric position by the repair system could result in the organism's removal from the population. All other genetic changes are merely vehicle systems for the law. Among the many aspects of cells affected by the law of symmetric variation are the cell membrane proteins, microtubules, microfilaments, polysomes, ribosomes, stress fibers in the cell walls, and cell-adhesion molecules, which help to produce form (Brown, 1987).

The law also involves itself in the production of chemical gradients in the development of embryos by causing the polarization of the egg and thus the position of formation. In other words, it is involved yet again in the production of form. In support of the view that genetic make-up is largely responsible for form, I offer the paper of Nusslein-Volhard (1996). The law of symmetric variation maintains organisms within their own Genesis kinds. The gene-theme model and the law of symmetric variation are very much on the right track in their respective roles.

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Lyell's Ideas Reevaluated in the Light of Linear End Members

Retirement from the practice of engineering geology allows occasional time to reflect on the evolution-creation issue by rereading old geology textbooks in an effort to understand the advance of evolution from a 19th century theory to the currently considered, fundamental principle that guides so many of the sciences today. One of my old textbooks is *Elements of Geology* by Charles Lyell, printed in 1861 by S. C. Hayes, 439 Market Street, Philadelphia, T. Ellwood Zell, Publisher. The book must be a reprinting of an earlier, copyright-protected, original work because on the back side of the title page it states, "Entered according to the act of Congress, in the year 1839, by James Kay, Jun. & Brother) in the clerk's office of the district court of the United States in and for the eastern district of Pennsylvania."

The year 1839 antedates Charles Darwin's *On the Origin of Species* by 20 years. Since British geologist, Charles Lyell, and British biologist, Charles Darwin, were British friends, the friendship and respective dates of publication by each suggest that Darwin was very receptive to Lyell's acknowledged clarity of oral argument and written argument, years before Darwin published *On the Origin of Species*. Lyell's pre-1859 publications include an original 1830 work *Principles of Geology* and later volumes and revised editions. It is widely accepted that Darwin read Lyell's *Principles of Geology* prior to his scientific adventure to South America on the Beagle commencing 1831.

It is the brilliant Charles Lyell who is celebrated for using uniformitarianism—a "present is the key to the past" opinion developed in 1788 by Scottish geologist, James Hutton—as an offensive weapon in the battle against the popularly held 18th century belief known as catastrophism. Catastrophists claimed that earth's observable geological architecture was of relatively recent making. A principal proponent of catastrophism was Baron Georges Cuvier, an equally brilliant 18th century and early 19th century French naturalist who is acknowledged by many to be the father of comparative anatomy. He also believed in creation. Catastrophists interpreted fossil and stratigraphic evidence in the Paris Basin of France as revealing a geological history where each of a succession of creation intervals was followed shortly thereafter by a catastrophic (extinction) episode.

Lyell used uniformitarianism to vanquish catastrophism. To Lyell, Hutton's uniformitarianism principle was evidence of the vastness of geological time, though in the early part of the 19th century, the term "vastness of geological time" was obviously of a qualitative value. As a direct result of Lyell's "vastness of geologic time" opinion, Charles Darwin was issued a scientific imprimatur; i.e. a license, sanctioned by Charles Lyell and the scientific community, to publish

the theory of evolution which challenged a then prevailing, religious imprimatur sanctioned by the Roman Catholic Church regarding short term creation and flood geology.

Charles Lyell was a geological giant who continues to be respected by the western scientific world. Lyell's scholarly reputation is earned because he contributed significantly to early 19th century and middle 19th century geology at a time when geologists were largely self-taught; a time when geological theories were proposed with rapidity only to be discarded with equal rapidity. Error, however, crept into Lyell's studies, in my opinion, because he theorized based on a minimum of geological data from a small part of the Northern Hemisphere; western Europe. Lyell can be challenged for many of his scientific proposals particularly those that deal with geologic time. Critiques of Lyell's works are based on prevailing scientific comprehensions not known to Lyell, but useful presently in that these data reveal that Lyell's 1830's understanding of geological time was a mere theory as was Darwin's biological theory in 1859. In the 20th century the two theories were somehow transformed into truth.

It is recommended that geologists reconsider geological time by allowing for an establishment of studies involving a multiplicity of hypotheses. This can be accomplished using two contrary explanations placed at the ends of a linear scale. On the far left of the scale, for example, there could be an end member defined as Lyellian geological time with its later modifications—the modern geological column. Lyellian geological time is described as the simple stacking of sedimentary formation—with corresponding fossil content—on sedimentary formation into a nowhere-to-be-found-in-the-world geological architecture that became the 19th century's, scientifically approved abutment for stabilizing Darwinian biological, high-rise architecture. Within the biological, high-rise architecture were essentially different life forms living on different floors of two buildings known respectively as *On the Origin of Species* (constructed, 1859) and *Descent of Man* (constructed, 1871). Darwinian biological architecture is also nowhere-to-be-found-in-the-world.

Opposing Lyellian geological time is a 20th century, awareness factor. Those textbook-stacked sedimentary formations and their constituent fossils were found at or near the earth's surface, and they were spread horizontally across continental surfaces. Many years after Lyell's dominance of the geological world, it was determined that there were hitherto unknown, subsurface formations of differing lithological and faunal content that lay beneath the surficial formations. At any one location, these subsurface formations were found to be truly stacked one on another, downwards to a basal sedimentary formation. Beneath the basal sedimentary formation is basement rock, mostly of crystalline (metamorphic or igneous) character.

Furthermore, across all continents, there are basal formations representing all of the currently acknowledged, geological periods that rest directly on Pre-Cambrian basement rock. Later 19th century geologists proposed a theoretical structure known as the “Great Unconformity” in a vain attempt to explain why formations from each of the geological periods within the variably aged, Paleozoic, Mesozoic and Cenozoic Eras rested directly on so old a Pre-Cambrian, basement rock. As a result of the modern classification of sedimentary strata there are hundreds of millions of years of missing geological time everywhere. The term is little used currently.

On the far right of the proposed linear scale, therefore, the contrary end member presumes that each of the basal formations could have been deposited contemporaneously thus negating the existence of Paleozoic, Mesozoic and Cenozoic time. Earth’s sedimentary history is more likely of short duration because both surface and subsurface sedimentary formations and their fossil constituents could have been deposited contemporaneously on different parts of a continent. The evidence for the far right proposal is especially known in North America because petroleum geologists searched for petroleum, using deeply penetrating, drilling equipment; it became known because of the post-Darwinian development of geophysical instruments. The geological and geophysical studies added to our comprehension of the geologic architecture of the planet and questioned the accuracy of the geological column imported from Great Britain to North America. It called to question the validity of other geological features known as paraconformities and peneplanes. For the far right member, paraconformities and peneplanes do not exist.

Between the two end members described above there should be sufficient linear length to allow for a multiplicity of other explanations on the subject of geological time. Geological data, recently found, or to be found in the future, can be applied against the two end members. The results of the superposing of newer data on the end members would then result in “refined” theories that would correspond to a point located somewhere between the end members but closer to one end member. The relative truth about Earth’s history could be understood at the least, temporarily, by the location of the preponderance of evidentiary points on that linear scale.

Following are examples of other end member linear scales, in part critical of Lyellian geology. Alternative end members were conceived to challenge both Lyellian and Darwinian beliefs.

It is common knowledge among geologists that Charles Lyell was a leader in developing geological time within a supposed Cenozoic Era. In 1830, Lyell proposed Pliocene, Miocene and Eocene time units (epochs) to be part of the Tertiary Period of the Cenozoic Era. The units were separated based on the percentage of marine fossil shells found

in sedimentary formations in western Europe, whose descendants still live in European seas. Those formations with the greatest percentage of fossiliferous, modern species were quite naturally determined to be younger formations; those with fewer representatives were older. It was determined, later, however, that the percentage of living species in fossil form was not a satisfactory basis to assess a formation’s age, for a number of reasons. Yet the Tertiary names were retained as time and time-rock units and geologic time for the Cenozoic Era was expanded by adding Paleocene, Oligocene, Pleistocene and Quaternary time.

It is common knowledge among modern geologists that neither the early 19th century geologists nor coexisting conchologists understood much about marine environments. In Lyell’s *Elements of Geology*, Lyell recognizes three marine environments, namely the arctic, temperate and tropical. These three environments were known to exhibit differing shelled creatures, the inference being that temperature played a role in the kind of shells that could live in the respective marine environments.

Lyell does not admit in his early writings to the existence of yet other contemporary, marine environments probably because the science now known as oceanography did not exist as a completely separate scientific study. The latest understandings about marine environments suggest that in the arctic, temperate and tropical environments of Lyell there are further subdivisions as the near-shore, littoral environment, followed by progressively deeper, neritic, bathyal, abyssal and hadal environments within which are forms living in this, the Quaternary, that are so astonishingly different in bodily structure. The deeper one travels beneath the sea, the more “primitive” seem the denizens.

Additional sub-sets of environments exist to identify forms that live on the ocean bottom (benthic communities) or in the waters above the bottom (planktonic and nektonic life-forms). Based on modern oceanographic understandings it is possible for bottom dwelling pelecypods and gastropods to live in shallow water environments in the arctic; and continue to be found in progressively colder, deeper waters as one travels southerly to the Equator; and then these rise to be near the shoreline in the Antarctic.

Based on the discussion above, another end member linear scale can be established. On the far left is an expanded Lyellian belief that fossil content alone can be used to determine Paleozoic, Mesozoic and Cenozoic geologic time. On the far right would be a uniformitarianism belief that differing fossil suites mean differing contemporaneous environments.

An example for specific linear scale study could be the presumed Cambrian-dated, Burgess Shale and fauna, of Field, British Columbia, Canada. On the far left of the scale would be the belief that these peculiar fauna evolved prior to and during Cambrian time. The life forms lived and died

millions of years before the appearance of younger, Paleozoic and Mesozoic marine life and still younger life assigned to the Cenozoic Era. On the far right would be the belief that these peculiar Burgess Shale fauna are representative of a hadal benthic environment that existed contemporaneously with Paleozoic and Mesozoic shells and supposedly, yet younger Cenozoic shells, because each form was created to live in a restricted marine environment. Barriers existed that held benthic marine life to the ocean bottom within their own environment.

What can we say about the age relationships of gigantic reptilians of the Mesozoic Era and gigantic mammals of the Cenozoic Era? An end member linear scale can be constructed. On the far left is the belief that peculiar environmental conditions, including volcanism, brought about the demise of gigantic dinosaurs at the end of the Cretaceous Period. Later, in the Tertiary Period, similar peculiar environmental conditions caused the demise of gigantic mammals, as the titanotheres. Fossils of both life forms seemingly associate with look-alike red-bed lithology except that the extinction of gigantic dinosaurs occurred millions of years before the extinction of gigantic mammals.

On the far right, in contrast, the geographic distribution of vertebrate fossils across continents suggest that gigantic dinosaurs and gigantic mammals lived in respective, restrictive, contemporary, essentially continental and/or near shore environments and that both life forms could have suffered extinction during one interval of catastrophic time.

In a paleontology class I recall being taught that older, siliceously structured sponges evolved into calcareous forms. This belief in evolution can be placed at the far left end of a linear scale. At the far right would be the 20th century oceanographic belief that calcareous sponges are found in shallower and warmer marine waters while siliceous sponges are in deep and colder waters.

In a paleontology class, I was taught that penguins were birds that had lost their ability to fly and took to the oceans during evolutionary time. This then is the far left position on a linear scale. The far right position would be that penguin fossils everywhere in the southern hemisphere were created as non-flying creatures with no evidence of evolution and no evidence of migration into the northern hemisphere. Fossil penguins suggest the existence of an Antarctic environment in the geologic past.

Similar linear scales can be laid out for the ratites; the ostrich, emu and rhea. On the far left, the birds evolved from flying forms. On the far right, the ancestors never flew.

During my college days, I was taught that there were about a dozen mountain building episodes spread throughout geologic time. Some were identified as minor disturbances, others as orogenies, and others as major revolutions. This belief can be put to use as the far left member of a linear scale. On the far right can be a belief that there was one mountain building episode causing variable effects on rock

formations, across continents. In simple words, mountain building occurred across different geographical and geological parts of each continent, at the same time.

As for Ice Ages the far left position can be represented by the belief that there were several Ice Ages going back beyond Cambrian times. The far right position could be that there was one Ice Age and that ice grooved and striated all manner of rocks, sedimentary, metamorphic and igneous.

Another far left end member could claim that the four stages of ice drift (the Nebraskan, Kansan, Illinoian and Wisconsin stages of North America) existed during the Pleistocene Ice Age. The far right could claim that there was one stage within which were independently moving parts.

Many end member linear scales could be constructed to study continental drift and its relationship to mountain building.

Consider the distribution of oil fields over space and time. An end member, linear scale can be established. On the far left would be the belief that oil fields correspond with the millions of years dates assigned to the Paleozoic, Mesozoic and Cenozoic formations that hold oil. On the far-right would be the belief that oil fields are of the same age thus suggesting that the formations containing the oil are probably of equivalent age.

Consider the effect of time on the transmission of oil in sedimentary strata. On the far left would be the belief that not much happens chemically or physically to oil during its millions of years existence in sedimentary strata. Contrary far right belief is that over millions of years, petroleum would have lost its constituent gases and volatiles so that there would be nothing left to pump out of the formations. Oil, therefore, cannot remain in sedimentary rock for millions of years.

Consider evolution, On the far left would be the belief that we have progression with millions of years of time from a single animal cell, or plant cell, or a cell somewhere between animal and plant, into multi-celled complexities, resulting in differing life forms over millions of years; whose evolutionary highlight is *Homo Sapiens*. On the far right would be the belief that all life forms were created contemporaneously to live within spatially created, restrictive environments and that the larger life forms, the dinosaurs and titanotheres have become extinct with time; and, in fact, all life forms are on a collision course to total extinction over which *Homo sapiens* has little environmental control.

Linear scales in geology and related fields have just been introduced. While the notion of multiple working hypotheses is as old as geology, the concept of linear end members is relatively new. Try it: you'll like it!

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CRS DIRECT—A NEW WAY OF GIVING — LAB DIRECTOR'S REPORT

JOHN R. MEYER,* Director of the CRS Van Andel Creation Research Center

Over the past few years we have had several CRS members and friends ask us if we could establish a direct, electronic fund-transfer program to assist them in their goals of regular support for origins' research. This program benefits the donor in the following ways:

1. Once we receive your authorization, you do not need to write another check each month.
2. It saves you time and postage. No more monthly check writing.
3. It takes the place of a monthly reminder from us and helps keep your mail uncluttered.

This service helps out the Research Center in that:

1. It assures us of a steady stream of support in keeping with your commitment. Because of our size, it is not cost effective for us to send out a monthly fund raising letter. The production of a monthly letter to 3,000 friends and CRS members would be time consuming and expensive.
2. It will allow us to budget our funds much more accurately throughout the year. In the past, most of our financial support has come in during the last month of the year. This has made budgeting and yearly planning very difficult.

*John R. Meyer, Van Andel Creation Research Center, 6801 N. Highway 89, Chino Valley, AZ 86323.

3. We are using the services of the Evangelical Christian Credit Union. This is one of the largest Christian financial institutions, and it serves many major Christian organizations.

4. Since the Credit Union takes care of most of the transactions and most of the paper work, we will be free to spend more time in creation research. This program has now been instituted and it is of great benefit both to donors and our Research Center.

— By the time you read this column, we will have had 40 alumni who have joined us in riding the high country and the wild places of the United States. Watch for announcements of future Creation Quest outings.

— As you may know by now, The Jay and Betty Van Andel Foundation has provided the funds for a new research-quality greenhouse. We give our sincere thanks to them for providing this superb facility. So far as we know, this is the only greenhouse in the world dedicated to origins' research from a creationist perspective. By the time you read this report, we will have a number of botanical research projects up and running.

— If you are interested in pursuing advanced origins research projects, please write for our bulletin entitled, *Research Projects at the Van Andel Creation Research Center*.

BOOK REVIEWS

Darwin's Black Box: The Biochemical Challenge to Evolution by Michael J. Behe. 1996. The Free Press (Simon & Schuster), New York. 307 pages. Hardcover \$25.00.

Reviewed by Wayne Frair*

When I was a college biology major struggling with issues of faith, science, and the Bible, I needed a book like this, but none was available to me. So if I could prescribe college curriculums, this volume would be required reading for all biology and science education instructors and students. The writing is another of an increasing tally of publications which like an enlarging magnet is tugging scientists and students of science (some fighting and kicking) toward a creationist center.

The work authoritatively was written by a Lehigh University biochemistry professor. He is a man with a message! Stated simply it is that life at the biochemical level presents a testimony for intelligent design. No longer may biologists be content with parroting the simplistic evolutionary dictum that small "chance" mutations selected by nature have fashioned living things with their macroscopic and even microscopic components. In other words macroevolutionary darwinism is dead or at best suspect.

Behe's examples include the eye, flagellum, gated transport through a cell membrane, blood clotting, ATP, DNA, the immune system, photosynthesis, and the origin of life. For any of these to function there must be a certain "irreducible complexity" just as a minimum number of interacting parts are required before a mouse trap can catch a mouse. The individual parts by themselves are ineffective. Something more than chance is indispensable for constructing the parts and putting them together into a functioning system. Intelligent design is requisite, but this does not necessarily mean God. However, Behe opposes the argument "that science should avoid theories which smack of the supernatural" because this would constitute an "artificial restriction on science" (p. 251).

Author Behe has a Roman Catholic background, but he expresses considerable toleration of various worldviews consistent with the intelligent design concept. Behe is an evolutionist, but I think a very uncomfortable one. He emphasizes that the evolutionary community has not wrestled seriously with biochemical complexity. For example, in his discussion of "key problems with gradualistic evolution of the immune system" he concludes that "their proffered solutions are really just a disguised shrug of their shoulders" (p. 137). He refers to evolution as "a wand to wave over mysteries" (p. 181). He further affirms that "molecular evolution has not published, and so it should perish" (p.186), and he believes that William Paley's design argument basically still is valid.

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Darwin's Black Box has been called by some a "god of the gaps" piece of literature. But I perceive it as a challenging and heuristic work. Did life start as a cell containing all the implicit design for the extinct and extant biosphere; did it advance by great leaps as Behe speculates? The gauntlet is down for twenty-first century scientists to re-evaluate their hypotheses and theories about the origin of living things.

The term black box refers to what Charles Darwin and other evolutionists did not understand about inner workings of evolutionary processes, that is, cellular phenomena. An analogy could be the lack of knowledge many drivers have regarding the engines under hoods of their cars. Behe basically is challenging his readers to consider components of the cellular engines of life, and see, in the now open box of a cell, what is obvious to him—intelligent design.

Christian creationists recognize that God (Jesus Christ) is the Designer and Creator of unrelated types of life. As scientists continue opening more and more of the black boxes, an understanding of His creation is expanded. Faith in God should not be founded on what is not understood; but rather, God should be recognized as the Creator of the multiform components of multiplex life. As realization of the macroscopic, microscopic, and molecular levels of this existence is augmented so is an admiration of The Intelligent Designer (Romans 1:19, 20).

Meteorite Craters by Kathleen Mark. 1987. University of Arizona Press. Tucson. 288 pages. Softcover \$19.95.

Reviewed by Carl R. Froede, Jr.*

This book presents a comprehensive, non-technical history of the recognition of many meteorite craters found across the Earth. The author documents several sites where terrestrial models once were suggested to explain the strata encountered, none of which completely satisfied all of the physical evidences. These same sites are then presented within the framework of an extraterrestrial impact where it is shown that all of the pieces come together with a common solution. It is most interesting to read of the variability between craters as a function of the materials and conditions in which they occurred.

The author discussed how field data was gathered and assimilated within the framework of the controversial impact model in an effort to provide a reasonable and rational explanation. Although this is not a creationist work, the author provides the template by which creation science should be conducted. We must originate new and innovative methods and concepts in defining the physical world around us—all of which must work within the energy and time frames of the Biblical record of Earth history. Much of our work is de-

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fined outside of the realm of standard uniformitarian physical processes.

This book documents numerous impact features which span the uniformitarian stratigraphic column. The origin of the meteors remains defined within the planetary accretion model which views the collision of space objects many billions of years ago as the process by which the terrestrial planets were formed. A Young-Earth Flood Model approach to these issues of origin and timing of meteorite craters has

been discussed (Froede and DeYoung, 1996). Within this proposal, these impact features and associated debris speak to a time during the Flood when the Earth was being bombarded by extraterrestrial objects. I recommended this book to anyone interested in impact craters.

Reference

CRSQ—Creation Research Society Quarterly.

Froede, C. R., Jr., and D. B. DeYoung. 1996. Impact events within the young-earth Flood model. *CRSQ* 33:23-34.

ERRATA

All of the following changes are for Volume 34, Number 1, June 1997:

On inside front cover change Wino to Winona, next to the last line.

On p. 1, line 17, capitalize Belief and delete question mark.

On p. 8, line 29, change Cornet to Comet.

On p. 22, column 2, letter title, change *Home* to *Homo*.

On p. 27, column 1, line 13 from top, change measared to measured.

On p. 28, column 1, line 6, change clbcks to clocks.

The Gospel of John 1:1-3

The WORD of God spoke.

Spoke in that Eternal City,

The City in a Dimension of Time and Space

Which is not our Dimension of Time and Space.

Outside of our Space,

Outside of our Time,

Outside of our Reality, He spoke.

“GO!” He said.

The Worlds, the Galaxies, the Universes,

Flowed from His fingers,

Emanated from His aura,

Dripped from His lips.

Laughing, chuckling, babbling,

They tumbled,

Tumbled out into Empty Space which had not been Space.

Into Time which had not been Time

Into Eternity which had not been Eternal.

“The Morning Stars sang together,
And all the Sons of God shouted for joy.”

The vast reaches of empty Space

Which cannot transmit sound,

Transmitted sound.

That song which cannot be sung,

Was sung.

That which cannot be heard,

Was heard.

And God saw everything that He had made,

And said, “It is good!”

Thomas H. Price

1/21/97

MINUTES OF 1997

CREATION RESEARCH SOCIETY BOARD OF DIRECTORS MEETING

On Thursday, 10 April, 1997 a meeting of the Board of Directors (BOD) was held at Wyndham Gardens Hotel, Albuquerque, New Mexico, from 2000 hours to 2130 hours to set up the agendas for the committee meetings for the next day. On Friday, 11 April, between the hours of 0815 and 1700 the following committees met: Finance, Research, Quarterly Editorial, CRSnet, Publications, Constitution/By-laws and Advanced Planning, and VanAndel Creation Research Center. On Friday evening a large public meeting was held at a Baptist church with Don DeYoung and Duane Gish as the main speakers. Poster presentations were made by certain other CRS Board members.

On Saturday, 12 April, 1997 the closed business meeting of the BOD was called to order at 0815 hours. Members present were T. Aufdemberge, D. Boylan, E. Chaffin, D. DeYoung, W. Frair, R. Gentet, D. Gish, R. Goette, G. Howe, R. Humphreys, D. Kaufmann, L. Lester, J. Meyer, D. Rodabaugh, E. Williams, and G. Wolfrom.

The minutes of the 1996 BOD meeting were accepted. Secretary Kaufmann reported that the following people were elected for a three-year term on the BOD: E. Chaffin, L. Lester, D. Rodabaugh, and G. Wolfrom. The Treasurer's report by Gentet was presented and accepted.

The membership report by Wolfrom was given as follows: total membership for 1996/97 was 1601 (615 voting, 640 sustaining, 329 subscriber and 17 student). It was noted that a number of new members joined after locating CRS on the Internet. The CRSnet report was given by Lester.

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MORE HUMAN-LIKE TRACK IMPRESSIONS FOUND WITH THE TRACKS OF DINOSAURS IN THE KAYENTA FORMATION OF ARIZONA: PART I: MAPPING, DESCRIPTION, AND COMPARISON TO DINOSAUR TRACKWAYS

JEREMY AULDANEY,* PAUL O. ROSNAU,** EDWIN BACK,*** AND NORMAN DAVIS****

Received 3 July 1995; Revised 1 March 1997

Abstract

This is a two-part presentation of research on the quasihuman ichnofossils (supposed human tracks) found in strata with the tracks of dinosaurs near Tuba City, Arizona. The material for study was collected on field trips made on June 21-27 and October 15-18, 1990 and June 1-6, 1995. This project is a continuation of previous research at Site 2. We give some corrections concerning tracks at Site 1 (See Rosnau, Auldane, Howe and Waisgerber, 1989a, b).

Photographs, maps, descriptions, reevaluations and additional discoveries at the two main ichnofossil areas at Site 2 (H6 and H7) are presented for the first time. We compare contemporary human trackways and dinosaur trackways to the quasihuman ichnofossils in the "Downhill Trail." The results indicate the humanoid ichnofossil impressions match modern human tracks and not dinosaurs for size, stride and shape. In an appendix we present corrections concerning certain tracks.

In Part II we will present evidence from photomicrographic analysis. We will compare modern human tracks to quasihuman ichnofossils and describe additional newfound humanoid tracks at Site 2. We will present the authors' updated conclusions and answer criticisms of our work.

Introduction to Ichnology (The Study of Fossil Tracks)

Our research sites lie in the Early Jurassic Kayenta Formation and are located off highway 160, 10km southwest of Tuba City, AZ. The quasihuman features at Site 2 are in crossbedded sandstone dunes which also contain dinosaur tracks. These dunes as well as the sandstone plateau that is our Site 1 are part of the well-known Kayenta dinosaur track layer. For more topographic information see Rosnau et al. (1989a).

How fossil tracks are preserved is a mystery to many. A recognized expert on ichnofossils, Martin Lockley (1991), claims previous explanations are incorrect:

[The answer is] avoided by specialists describing dinosaur tracks. A simple answer, that the track-bearing layer was buried through geologic time, turning to rock without the destruction of the footprints, is inadequate because it does not explain how the tracks survived the burial and preservation process.

Lockley maintains that the oft-repeated claim that tracks became hard in the sun before the next layer was deposited has been made by scientists to "cover up their own lack of understanding." He then offers his own theory that when:

feet sink into a soft substrate, they leave impressions in layers below the surface. . . such tracks are called undertracks . . . because they are already buried at the

time they are made, their preservation potential is very high. The influx of subsequent tides or floods poses little threat of erosion to an impression already nestled a few centimeters below the exposed surface (p. 22).

Yet even Lockley's explanation is inadequate because most fossil tracks are not underprints, as evidenced by fossil ripple marks and mudcracks found in the same horizon at most fossil track sites, including the research Sites 1 and 2 near Tuba City, AZ.

How Are Fossil Tracks Actually Preserved?

The sandstone track layers share a lithifying mineral with common portland cement, calcite. There is no mystery how tracks and bones are preserved in a limy sand mixture; such a stratum would harden rapidly.

Fossil tracks are sometimes covered by a fine powdered volcanic ash. At some locations, such as Sites 1 and 2 at Tuba City, the ash consolidates by fluvial action into a clay layer. Soft clay layers protect the harder track for a time, but easily erode back, leaving the tracks exposed.

Ichnofossils indicate rapid, cataclysmic burial, especially when there are mass burials of bones found over them. Our discovery of bones, teeth and *Unio* clams over the tracks at Tuba City is a typical example of the mixture of tracks with fossils (Rosnau et al., 1989b, pp. 83, 89, Figs. 49, 50, 51). Welles (1954, 1970, 1984) described the discovery of the first three partial skeletons of a new carnivorous dinosaur named *Dilophosaurus* midst the dinosaur tracks of our Site 1.

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Fossil tracks were largely ignored until 1980 because of the difficulties they posed to evolution theory. In the late 1980s paleontologist Jerry MacDonald found tracks that “look almost simian” and others that “look just like bear tracks” plus probable bird tracks in a stratum also rich with the tracks of Permian pelycosaurs. The location is New Mexico’s Robledo Mountains. Stewart (1992, p.78) dismisses the out-of-place tracks as *problematica*, but Lockley (1991, p. i) states, “Billions of dinosaur tracks have been found in recent years” and “fossil footprints are neither rare nor insignificant as previously supposed.” Mass fossilization of billions of tracks is not going on today, and rapid burial is indicative of cataclysm.

The Purpose of Humanoid Track Study at Tuba City, AZ

The human-like impressions near Tuba City were discovered because many people independently saw them and thought that they resembled human tracks. Navajos pointed out some at Site 1 to us as “cave man tracks.” We asked Navajos herding sheep near Site 2 what they thought the quasihuman impressions were. They said simply: “man tracks.”

Did humans and dinosaurs live contemporaneously? Our purpose is to determine if the quasihuman ichnofossils are the impressions of concretions or real human tracks.

Caution in Identification Designation of Tracks

In our previous paper (Rosnau et al., 1989b, p. 77) we explained that the term “quasihuman ichnofossils” was to be used to convey the proper degree of objectivity and even uncertainty involved in trying to deal with marks and imprints in rocks. Here we will follow this principle and when we use the terms “footprints,” “tracks,” “toes” they are not to be taken as implying positive identification but only as referring to appearance, until we finally attain absolute verification one way or another (Rosnau et al., 1989a, p. 42).

Update of Humanoid Ichnofossil Discovery at Tuba City—A History

In 1924 Samuel Hubbard, Curator of Archaeology at the Oakland Museum in California led an expedition to Arizona to study evidence for the coexistence of men and prehistoric animals. He was accompanied by one of the top paleontologists of the 1930s — Charles W. Gilmore, Curator of Vertebrate Paleontology, United States National Museum. Gilmore was the same scientist who studied putative humanoid tracks near Berea, KY, tracks in sandstone dated as Carboniferous (“Human-like tracks,” 1938, p. 278; “Geology and ethnology disagree,” 1938, p. 372) He wrote the classic and first scientific report on the now famous so-called “amphibian” and “unknown reptile” tracks in the Conino sandstone formation (Gilmore, 1926).

While on this Doheny Scientific Expedition, Hubbard and Gilmore studied the dinosaur tracks near Tuba City, Arizona. The photographs of Gilmore with some of the tracks show they are a match for *Anchisauripus* (*Kayentapus hopii*) above Moenkopi village. The tracks measured 46.6 cm (16 inches) long by 35.5 cm (14 inches) wide with a 142.2 cm (52 inch) stride from heel to heel.

Hubbard (1924, p. 35) states that

when making the casts of the dinosaur tracks. . . I found what looks exactly like a wolf track. . . . Unfortunately it was on the broken edge of the area containing the dinosaur tracks and was not accompanied by a succession of other wolf tracks, hence I can not offer it as evidence beyond a reasonable doubt . . . In light of this however, I predict that some day an area will be uncovered showing dinosaur tracks associated with animal tracks.*

Hubbard’s prediction was fulfilled in 1969 when Eryl Cummings experienced engine trouble in his small plane and was forced to land near the Moenkopi Wash southwest of Tuba City. Walking around the area, Cummings spotted fossil impressions of what appeared to be the barefoot tracks of a child, three in all, in trail. Each track was about 20 centimeters (eight inches) long and exhibited human toe impressions. The child’s trail was followed by a trail of small three-toed dinosaur tracks about 15 centimeters (six inches) long, as if the child was leading the dinosaur like a dog. All these tracks were headed north (Rosnau et al., 1989a, p. 43; Auldaney, 1992, p. 138).

In 1984 Lorraine Austin told Rosnau about some possible human tracks she had seen at what is now track Site 1. She stopped (like many tourists do) at the dinosaur track site on Moenave Road just off Highway 160, 10 km southwest of Tuba City, also known as the University of California at Berkeley’s Museum of Paleontology Site V67239. She found human-like tracks among the dozens of dinosaur tracks there.

Rosnau, W. Horrmann and R. Freborg decided to look for the tracks seen by Austin. They spotted several humanoid impressions in the sandstone base stratum along the Moenave Road. To the southwest they saw humanoid and dinosaur tracks in sandstone slabs embedded in sand. One of the impressions resembled a human right hand, another a child’s right foot. We identified both these impressions as imprint number 2 (Rosnau et al., 1989a, Figs. 1, 2, 3, 4; 1989b, Table I).

In 1985 Auldaney studied Site 1 at Tuba City and found a humanoid track-like impression we later identified as number 6. It was a child-size double impression (a print on top of a print?) with two heels and clear toe-like impressions. Still another set of toe-like impressions lay in the left side of this loose rock slab. This impression number 6 was found in

*Hubbard believed contemporary mammals and dinosaurs coexisted.

stride with other child-size, track-like features, which we labeled 5 and 4. When a 12-year-old child placed his foot in each of the double impressions, his foot, including the toes, fit the impression.

For more information on the history of the Tuba City finds, see Rosnau et al., 1989a, pp. 43-44.

New Discoveries and Data

Humanoid Track with Toe Prints

Our most astonishing discovery in 1990 was that of a humanoid feature with five distinct toe-like impressions. While searching for possible impressions which might have been overlooked in area H6 (a mound we dubbed the Classic Track area for its holotype shod footprints) Auldane took a stride from impression 48 in its apparent direction of travel. His foot came to a small upraised mound of sandstone with a smooth top. The impression atop the mound had five indentations, which, incidentally, fit his toes for width and size. The track appeared to be a compressed spot around which the softer sandstone had eroded away. What was left was what appeared to be the impression of the front

half of a bare foot on a pedestal of sandstone. We labeled this impression 48-1. (See Figures 3 and 4.) In 1995 we found this impression had eroded to broken bits and sand.

Current Data on the Downhill Trail

Our field research of June 21 to 27, 1990 netted 41 new quasihuman ichnofossils at Site 2, for a total of 98 at Sites 1 and 2. Previously discovered impressions were restudied, photographed and mapped in more detail.

The Downhill Trail, described in our previous report (Rosnau et al., 1989b, Table VI, Fig. 23) as five impressions in Area H7, Site 2, we now see to consist of 15 impressions. It is the longest and clearest of the six putative humanoid trackways we have found. Its key impression we nicknamed the Downhill Slide (no. 51). This barefoot impression can be found by walking from the Classic Track (no. 39 in Area H6) on a line 75° west of south for a distance of 57 meters (approximately 67 paces). The Downhill Trail appears to have been made by a person picking his way up and down soft, wet and slippery sand dunes in a right-left pattern. See Table I and Figures 7-13 for details of the Downhill Trail.

TABLE I. The Downhill Trail, area H7, originally seen as a trail of 5 tracks, which we numbered 49-53, on closer examination is seen to consist of 15 tracks, beginning with 49-5. The table reads from south to north in the direction of travel. Use with the map in Figure 5. N.P. = no photo herewith; ? = periphery uncertain; NM = no measurement taken.

Imprint Number	Size (cm) (Length x width of ball)	Stride length	Comments	Figure Number(s)
49-5	34 x 9.5	39	Clear right foot depression with clear big toe.	N.P
49-4	32 x 9	80	Faint left foot depression with slightly deeper ball. Left foot toe angle shows up only in low angle light.	N.P
49-3	? x 9	42	Faint heel, sliding into depression, high arch, deep ball with right foot toe angle in soft mud which possibly oozed back into the track, causing obliteration of detail and shrinkage in size.	6, 7
49-2	? x 9	52	Ball only with a left foot toe angle with a short stride as if picking one's way on soft slippery mud, which oozes back leaving only a white outline and no depression. The obliterated depression is similar to human-like tracks in the bed of the Paluxy river in Texas, where some tracks appear as an outline of "whitish calcite etching on the toes due to the weight of the individual who made the print" (Morris, 1980, p. 33).	7
49-1	? x ?	50	This print, like 49-2, is preserved only as a white discoloration in the sandstone. It was covered by a loose nodule and was not visible when we first examined the trail. By 1990 erosion exposed the calcite discoloration associated with many tracks at Site 2.	7
49	28? x 9	52	A clear left foot slipping left in soft mud.	7, 8
50	?x?	52	Possible ball only with a clear big toe of a right foot.	8
51	32 x 13?	73	This was the first impression found in the actual downhill section of "Downhill Trail" and is the clearest impression in the trail. It is the "Downhill Slide" of a left foot on a 40-degree-angle slope. In our previous reports this impression was measured to the toe-like nodule hole eroded just behind the toe area. The real big toe, in our estimation, shows up in low angle light together with the other four toes. Thus we have corrected the length of this impression from 27 cm to 32 cm and its width to approximately 13 cm because the periphery at the ball of the foot is faint. See Rosnau et al., 1989b, p. 81, Table VI.	9
52	31? x 10	44	A sliding track gouging out mud in front of the toes. The angle could indicate the right foot of a person catching his balance while descending the 40-degree-slope. In low angle light the track has a faint heel. We now measure this impression to be 31 cm instead of 27 cm long, but even this must remain only an estimation because of the faintness of the heel area.	10, 8
53	33? x 12?	51	The toe area can be seen only in low angle light; thus only rough estimate of length was possible. Due to the sliding which occurred in track 51 which was stopped by track 52, the greatest amount of weight in track 53 would be in the heel. The width was estimated from the heel only in our last report because it was the only visible part. Here the ball is faint and the measurement of width is questionable but close.	10, 8

TABLE I. The Downhill Trail continued.

Imprint Number	Size (cm) (Length x width of ball)	Stride length	Comments	Figure Number(s)
53-1	34 x?	64	This impression is very faint but matches the human foot. It and 53-2 show a comfortable stride. It is in a lower possibly dryer layer than the tracks before 52. See the line on the map, Figure 5, between tracks 51 and 52; that is the end of a layer of mud (now sandstone) that appears to have flowed down over the mounds. We found strong evidence for crossbedded mudflow by spotting a half-covered quasihuman ichnofossil in Area H4, which we did not number but can be seen in Figure 11b.	11a, 8
53-2	35? x ?	NM	In high angle light this is a clear elongate depression. It is also in the same possibly hard, dry layer as 53-1 and is also shallow with no details. It also appears to be a sliding impression, causing it to become longer.	12, 8
53-3	NM	NM	An impression shaped like an "8".	12, 13, 8
53-4	NM	NM	Left foot with distinct periphery.	13
53-5	NM	NM	S-shaped impression with faint heel and right foot straddle in stride with 53-4.	13

Comparing the Downhill Trail to Modern Human Stride

Stride measurements were performed for a person 177 cm (5 feet 9-1/2 inches) tall. These are presented in Table II.

Comparison of the data of Table II with the stride lengths of the Downhill Trail shows that the stride between impressions 49-5 and 49-4 fits a human standing position. The step between 49-4 and 49-3 is an average stride as made by a person walking. The intervals between 49-3 and 49-2; 49-2 and 49-1; 49-1 and 49; 49 and 50; and 50 and 51 are the very short stride of someone moving slowly, perhaps picking his way cautiously on a slippery substrate. The step between 51 and 52 is between a slow and a normal walking stride. The paces separating 52 and 53, 53 and 53-1 are very short strides. These follow the Downhill Slide track (no. 51) perhaps they are short because the person was having trouble with his balance. The step from 53-1 to 53-2 is longer than a slow walk, but shorter than a normal walk. This may have occurred because the walker was coming out of a slide.

Table II. Auldaney measured his own stride. His height is 177 cm (5'9"). These are measurement ranges and maximums.

Slow Walk	53 to 59 cm
Normal walk	77 to 79 cm
Average run	115 to 170 cm
Fast run	173 to 188 cm
Longest reaching step while standing	137 cm maximum
Standing jump	196 cm maximum

These experiments were performed on a flat dry concrete surface using wet shoes. Different speeds were used to study stride length. Measurements were made of the water marks left on the dry concrete. These stride measurements consisted of at least six consecutive strides measured from heel to heel. The longest reaching step and jump experiments were repeated several times to obtain the maximum.

Comparison of these data with the stride lengths of the quasihuman impressions in the Downhill Trail (see Table III and Figure 5) indicates that a human is capable of producing them during normal locomotion.

Comparing the Downhill Trail to Dinosaur Trackways

Dinosaur trackways were recorded by paleontologist Samuel Welles* and by us at four undisputed dinosaur track-sites near Tuba City, Arizona: (1) the area near our Site 1 on Moenave Road (U.C. Berkeley site V67239), (2) a site west of our Site 2, (3) a site on the north edge of Site 2, and (4) a site above Moenkopi Village south of Tuba City, U. C. Berkeley's Site V6898 (Welles, 1971; Auldaney field notes, 1990). The data indicate that the Downhill Trail human-like impressions are different from any of these dinosaur trails; see Table III. *Eubrontes* (*Dilophosauripus williamsi*) has a much wider foot and a longer stride. *Anchisauripus* (*Kayentapus hopii*) also has a much wider foot and a very long stride to which a man even at a fast run falls short (see Tables II and III). *Anomoepus* (*Hopuchnus shingi*) has too short a foot and has an amazingly long stride for its size. The small *Grallator* tracks found near Site 2 have too short and too wide a foot. All the dinosaur tracks are wide and tri-dactyl, unlike the narrow quasi-human ichnofossils which show no sign of three toes. The stride of *Eubrontes* (*Dilophosauripus williamsi*) at Site 1 is 106 cm, too short for a human running and too long for a person walking.

If the human-like impressions were produced by dinosaurs and if we have erred in our interpretation of these impressions, as Kuban alleged in the interpretation of some of the elongate tracks at Glen Rose, Texas, then the Tuba City elongate impressions should reveal the same evidence of dinosaur digits as noticed by Kuban. Kuban (1989) maintains that:

... elongate tracks on the site [at Glen Rose] typically show indistinct digit impressions; however, slight depressions and/or coloration features indicate (three toes) dinosaurian digits on at least some tracks in each trail (p. 66).

Out of all the elongate impressions at Sites 1 and 2 at Tuba City we found only one impression (at Site 1) which had three claw-like toes, impression 17 (see Rosnau et al.,

*Of the University of California at Berkeley.

Table III. Here our data on human-like tracks in the Downhill Trail are compared to average measurements of dinosaur trackways in the same horizon. All measurements are in centimeters. Avg = average. SD = standard deviation. n = number of individual tracks or strides measured.

	Avg	SD	n
Human-like tracks in Downhill Trail at Site 2, Area H7			
Length	33	1.1	4
Width	9	0.4	6
Stride	54	12.8	11
Bipedal three-toed dinosaurs in the flat Kayenta track layer:			
<i>Eubrontes (Dilophosaripus)</i>			
Site 1 at Moenave Road (Welles, 1971, p. 29)			
Length	30	3.4	4
Width	26	3.5	4
Stride (not published)	—	—	—
<i>Eubrontes (Dilophosaurus)</i>			
Site 1 at Moenave Road (Auldaney, 1990)			
Length	32	2.5	8
Width	27	1.5	8
Stride	106	3.5	6
<i>Eubrontes (Dilophosaurus)</i> , large tracks north of Site 2 (Auldaney, 1990)			
Length	33	0.0	3
Width	27	1.0	3
Stride	119	0.0	2
<i>Anchisauripus (Kayentapus hopii)</i> above Moenkopi village (Welles, 1971, p. 32)			
Length	35	1.1	2
Width	29	0.3	5
Stride	189	1.5	4
<i>Anomoepus (Hopiichnus shingi)</i> above Moenkopi village (Welles, 1971, p. 36)			
Length	10	0.0	2
Width	10	0.7	2
Stride	191	11.3	2
<i>Grallator</i> , small tracks north of Site 2 (Auldaney, 1990)			
Length	16	2.2	10
Width	13	1.8	10
Stride	60	2.1	5

1989b, Fig. 39). It was clearly the sole exception to the rule and we interpreted it as a dinosaur skid track.

The great concentration of elongate humanoid ichnofossils at Tuba City is at Site 2. They lie in reddish brown, iron-stained crossbedded sandstone, which was covered with a softer tan sandstone now eroded away. If the humanoid ichnofossils were produced by dinosaurs walking on their metatarsi, they would clearly reveal three claw depressions infilled by lighter colored sediment. But there is no evidence of claw impressions nor are there any color variations in the

digit areas of the humanoid ichnofossils. Our brushing off loose sand infill from the toe region of elongate humanoid ichnofossils revealed no claw impressions or tridactyl digits.

Thus it is quite unlikely (if not impossible) that any of the quasihuman impressions were made by dinosaurs.

Recent Research at Area H6—Near the “Classic Print” (No. 39)

Upon close study we located several human-like foot impressions at area H6 in addition to the 12 reported earlier (Rosnau et al., 1989b, Table V). We present these new data in Table IV, plus more details on the 12 original impressions.

Conclusions

Evidence in favor of these quasihuman ichnofossils being human foot tracks continues to grow. In our next report (Part II) we will present additional evidence, along with the updated conclusions of each author.

The close proximity of man-like trackways to dinosaur trackways in the Kayenta is an amazing anachronism to standard geological theory of dinosaur extinction millions of years before humans supposedly appeared on earth. Our data, however, fit the Biblical implication (Genesis chapter 1) that all organisms were formed by God in relatively recent time and that they coexisted on earth.

Acknowledgements

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Appendix—Corrections of Previous Reports

Corrections to our second article in *CRSQ*, Vol. 26, December 1989: Impression 5 (Figure 1, page 78) is shown in the map as facing north. There is a small up push of mud where a small toe fits, showing that impression 5 faces south and is in stride with the double impression 6, also facing south, 30 cm (one foot) ahead in alignment with it. This was determined from in situ photographs, measuring from the toe of 6 to the heel of 5.

Table IV. Classic track mound, area H6, and related features. These features are presented in the order of their clarity of detail and relationship. Those which appear to be made by the same trackmaker are described in their order of direction of travel. Use with map Figure 14. NP = no photo herewith. N.M. = no measurements taken. ? = periphery uncertain.

Imprint Number	Size (cm) (Length x width of ball)	Comments	Figure Numbers
39	31 x 13	This is the first humanoid ichnofossil we discovered at Site 2. It is the clearest impression discovered thus far and serves as a holotype of shod foot impressions. We named it the "Classic Print" or "Classic Track." We use it as a reference point from which to map other features at Site 2. It is a putative right foot impression which appears to have been made by a soft-soled boot-like moccasin with a concave bottom.	15, 16
40	31 x 13	A putative left-foot track of which only the heel is exposed. The rest of the track is filled with sandstone, which appears to flow across the track. See a similar track in Figure 11b. This track was discovered by Auldaney in low angle light early in the morning. It reveals a shadowy outline identical in reverse to its mate, No. 39. It is 49 cm left of 39 and faces 49° west of north in a natural standing position with 39.	15, 16, 17
39-1	27 x 12	It has a resemblance to the Classic Print 39, except that it is a flat-bottomed impression and appears to have been made on firmer ground. It is parallel to 39 facing the opposite direction (67° east of south) and is 143 cm (4 feet) away from 39.	16
42-1 & 42-2	26 x ?	Three flat-bottomed impressions with sharp shoe-like lines of varying width were mapped and recorded in our last report and were all identified as 42 (Rosnau et al., December 1989a, p. 80). These impressions have been subdivided here and numbered from left to right: 42, 42-1, and 42-2. See 42 below.	17
41	21 x 7	A putative child's or woman's left-foot track facing west about 50 cm to the left of 40. This impression appears to be part of a partial trackway which includes 41, 42, 46, 47 (?), 48-2 and 48-3. No. 41 has a pointed appearance at the toes similar to impressions made by tennis shoes in mud where the inner side of the shoe toward the big toe receives the greatest amount of weight as a person tiptoes to avoid sinking in the mud.	18, 16, 17
42	26 x ?	This child-size impression is one of three recorded as 42 in Rosnau et al. (1989b). While examining photographs Auldaney noticed the similarity to 41 in both size and shape. Impressions 48-2 and 48-3 we interpreted as child's prints. They are possibly part of a trackway with 41, 42, 46, 47, 48-2, and 48-3.	17
46	19 x 6	Identical to 41, except it is shallower. It lies about 4.75 meters (15.6 feet) 45° west of south from 42.	19, 20
47	27 x 10	A putative right foot track facing south. It may or may not have been made by the same individual that created 46. It is not in line with a trackway well enough to tell.	20
48-2 & 48-3	17 x 9?	These are tracks in stride we noted as possible child's prints while mapping for this present paper. There is a possible trackway of the same individual making these and track 41 at right angles to the Classic Print's mate 40.	20
45	29 x 12	Putative left foot impression of a pair facing north at a natural angle to each other, with the left ahead of the right.	21
44	29 x 13	This is the putative right foot impression paired with 45.	21
45-1	27 x 13	A putative but clear left foot of a pair headed east, in stride with 45-2.	21
45-2	29 x 11	A poorly preserved putative right foot paired with 45-1. These two impressions intersect 45 and 44, thus forming what appears to be a human crossroads. No. 45-2 is 48 cm southwest of 45 and bearing 45° west of south.	21
45-3	25 x 10	This is an isolated putative right foot impression facing north. It appears to have been filled with water which flowed into or out of the impression forming a "fish-tailed" fan depression behind the heel, making the whole impression resemble a fish.	22
48-4	NM	This track-like impression is to the west of 48 but was not measured because it was outside the area we mapped. It is added to the map in Figure 14. The front part of this feature is eroded, along with the sandstone around it, leaving it on a pedestal like 48-1, just 66 cm (two feet) south of it.	20
48	24? x 13?	This impression was reported in Rosnau et al. (1989b) as 29 x 13. There is a discoloration, however, which may have been caused by compression which indicates it is 24 cm instead of 29. It appears to have been widened and distorted by erosion so that 13 cm width may be too large. It is in stride with 48-1.	20

Table IV. Continued

Imprint Number	Size (cm) (Length x width of ball)	Comments	Figure Numbers
48-1	? x 10	This feature displayed five toe-like holes. It appeared to be a left foot impression and faced southwest. Compression of the sand below it caused the harder sandstone with the impression in it to be left on a pedestal as the softer sand eroded from around it. Only the front half of the track remained as of 1990. It subsequently eroded away, but at the time of its discovery it exhibited five holes starting with a large toe and followed by four smaller toe-like holes. Modern barefoot tracks have similar downward holes formed when a person clenches his toes in the act of leaping forward in wet sand.	3, 4, 20
39-2	38 x 17	This is an isolated and eroded print facing 23° west of south about 3.5 meters (9 feet) east of the Classic Print 39 on the same mound just above loose alluvium filling a depression to the east and below it. The only thing left of this print is a hardened lithified rim.	N.P.
39-5	52(Slide) x 13	This is one of a pair of side-by-side tracks east of its mate facing northeast or southwest (the direction it is facing is uncertain). It appears to be a sliding impression facing southwest, its length longer than the foot that made it. This presumed slipping could also account for it being wider than its mate. There are six side-by-side impressions facing the same direction at Site 2.	23
39-6	27 x 10	This is the putative mate to 39-5, to the west. The northern end of this impression is covered by a sand dune layer flowing down over it and covering about 6 cm.	23
37	29 x 12	This is another pair of side-by-side track-like features facing north. They are about the same size if one disregards a mud splash in front of the left track. They are about 4 meters to the west of 39-5 and 39-6 and about 5 meters (15 feet) 45° east of north of the Classic Print 39 on the same mound.	24
54-1	30 x 12.?	This is the first track of a putative humanoid trackway of four impressions. We first noted it in 1990. It may be a left foot going south. It is about 4.25 m (14 feet) south 45° west of 45-1. There may be an obliterated track between this and the next impression, 54-2.	25
54-2	NM	Measurement of this feature is impossible because of distortion of the original soft, wet mud. All the humanoid elongate impressions in this putative trackway appear to be about the same size. This impression appears to be a right foot going south.	25
54-3	NM	There is an easy stride length from 54-2 to 54-3. We cannot determine the direction 54-3 is facing or whether it resembles a right or left foot.	25
54-4	NM	A possible right foot headed south.	25
39-3	NM	Isolated and eroded elongate impression that may be facing southeast	N.P.
39-4	NM	Vague and isolated elongate depression facing east, 5.25 meters east of 39.	N.P.
39-7	NM	Vague and isolated elongate depression.	N.P.

In Rosnau et al., 1989a impression 6 is shown in Figures 5 and 6, page 45. The photos for Figures 5 and 6 were regrettably transposed. Figure 5 shows the toe-like impressions in the side of the rock where all five indentations can be seen to match in size and length the toes of a 12-year-old child. What appears to be a double print (two putative heels) in the same rock (Figure 6) also fits a 12-year-old child and is in stride with child size impressions 5 and 4. Thus impressions 6, 5 and 4 form a putative trackway.

In Figure 6 the double track is photographed in an upright position vertical to the impression and at a 45° angle towards the putative toes or front part of the imprint. The toe-like features can be seen at the top of the picture, including where they appear to hinge. Also visible is a possible up

push in the hollow part of the smallest toe. In the same picture two heel-like impressions are visible toward the bottom of the photo. To the left of the double heels are a second set of toe-like impressions in the side of the rock in the lower left corner of the slab.

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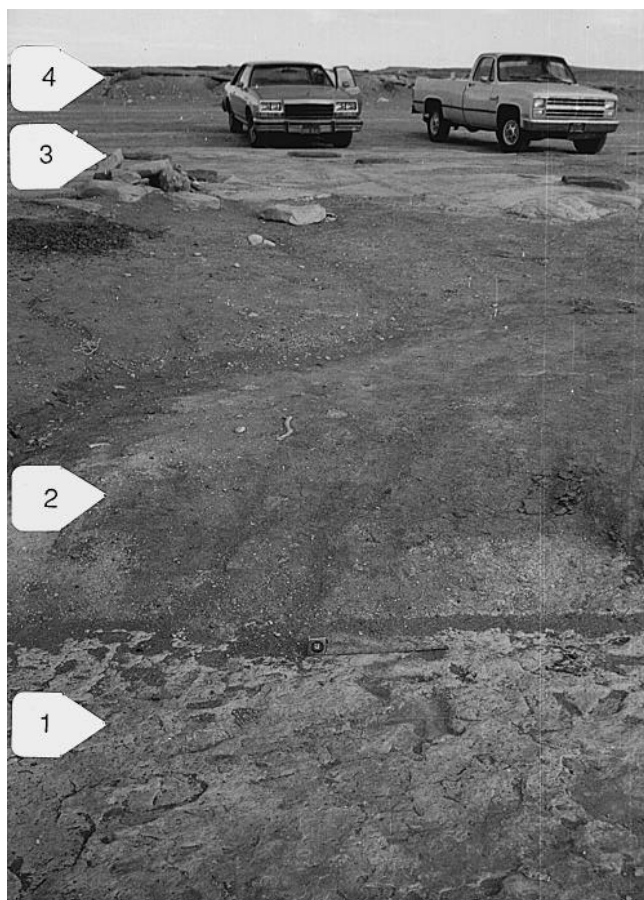


Figure 1. Strata at Site 1 next to Moenave Road near Tuba City, AZ, reading upwards. Arrow 1: Dinosaur track layer (sandstone). Arrow 2: Greenish-white bentonite grading up into reddish-brown bentonite (water-deposited volcanic ash). Arrow 3: Limy sandstone forming the bed of Moenave Road. Arrow 4: More reddish bentonite with conglomerate sandstone above. the sandstone, about 50 cm thick, contains internal casts of fossil *Unio* clams as well as the petrified bones and teeth of aquatic reptiles. In this stratum Welles excavated three *Dilophosaurus* dinosaur skeletons a short distance down the road. This same conglomerate at Site 2 contains petrified wood.



Figure 2. A few of the many dozens of tracks of a herd of bipedal carnosaurs, relatives of T-Rex, at the main dinosaur track area, Site 1, Tuba City, AZ.



Figure 3. By taking a stride from 48 Auldane found 48-1. The rear half has eroded away, but the front half exhibits impressions which match those of human toes.



Figure 4. A close-up of 48-1. To see its relationship to 48 See Figure 20.

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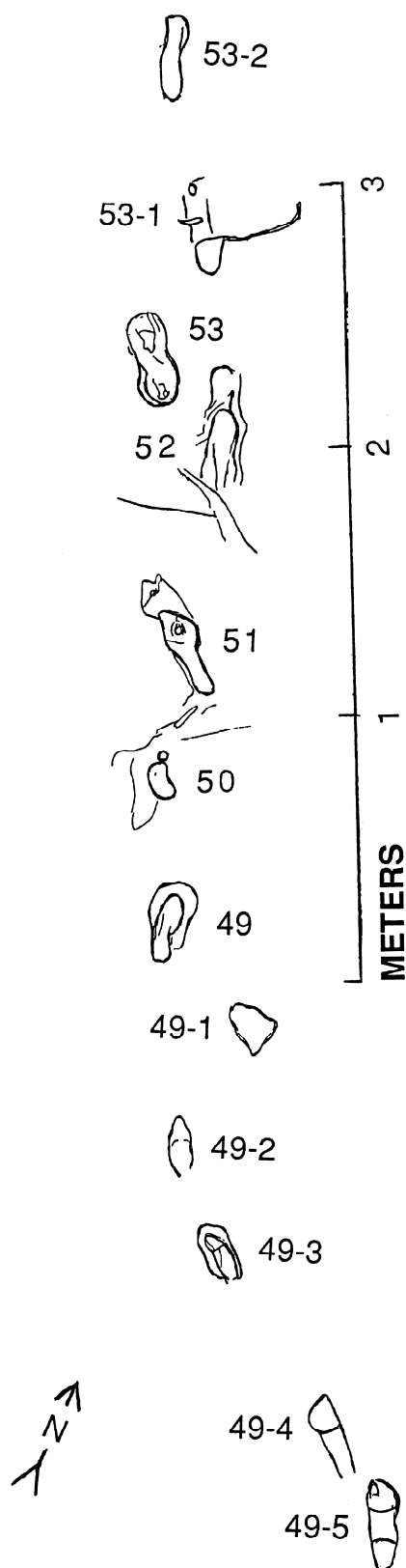


Figure 5. This is a detailed drawing of quasihuman footprints which constitute the Downhill Trail. Note the right-left pattern. The northernmost three impressions are not shown because we took no measurements of them.



Figure 6. Quasihuman ichnite 39-3 appears to be a barefoot track in soft mud, creating a distinct arch.



Figure 7. View of the Downhill Trail looking N 45° E. Quasihuman impressions 49-3 to 53-2 are in view. 49-3 is next to the shoe on the right, 49 is next to the shoe on the left. 49-2 and 49-1 can be seen between them. In this photo 49-1 is still covered by a nodule and was yet to be discovered. 50 is visible but 51 is hidden behind the downhill slope. 52 can be clearly seen, 53, 53-1 and 53-2 are invisible because of high sun angle.

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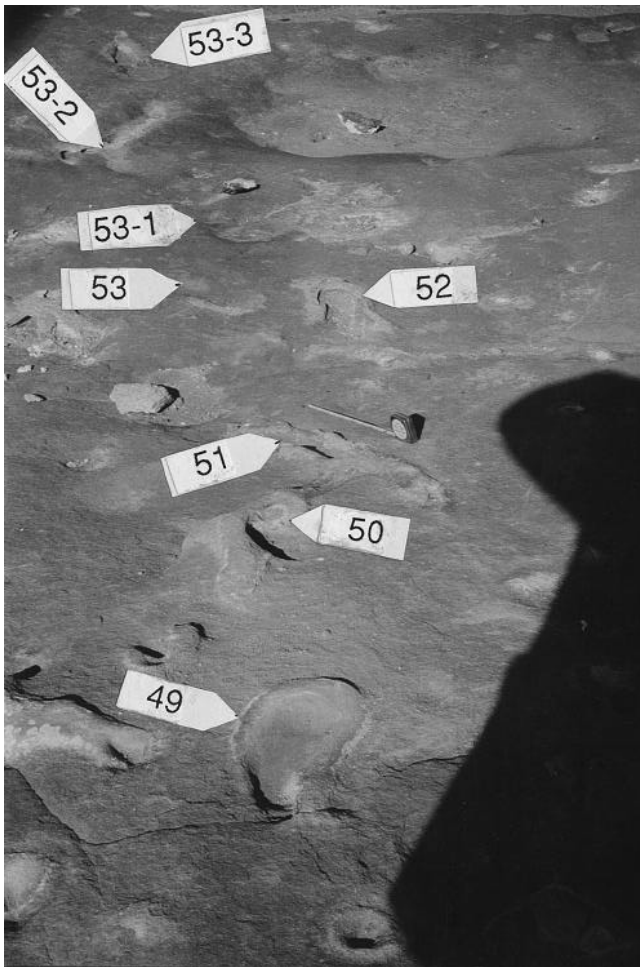


Figure 8. Putative human footprints in part of the Downhill Trail. Impression 49 is visible at the bottom, then 50 with its distinct big toe. No. 51, the Downhill Slide, is hidden behind a slope. No. 52 and its mud splashes is clearly visible. The heel of 53 and the indistinct impressions 53-1 and 53-2 can be seen as well as the figure 8-shaped 53-3. Notice that 53, 53-1, 53-2 and 53-3 veer to the left as if avoiding a puddle of water in the cavity to the right.



Figure 9. No. 51, the first discovered and most prominent of the quasihuman impressions of the Downhill Trail. Note what appears to be a mudsplash in front. The big toe has skidded downhill.



Figure 10. No. 52, lower right, appears to have brought the downhill slide to a halt, gouging out mud. No. 53, left, has a clear heel, but a faint toe area with toe-like impressions visible only in early morning light.

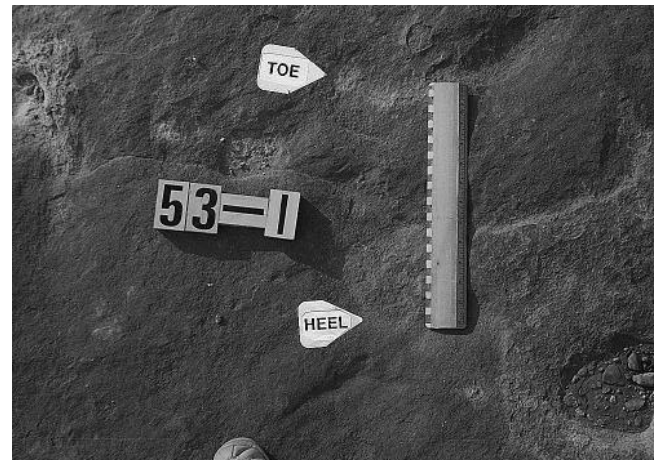


Figure 11a. Downhill Trail humanoid feature 53-1 was discovered by taking a stride from 53. It consists of slight depression with what appears to be a heel (next to ruler) and a right foot big toe-like feature filled with light-colored sandstone (arrow).



Figure 11b. The crossbedded sandstone formed into mounds at Site 2 is seen here flowing across a half exposed track-like feature in area H4. The situation is similar to that of impression 40, the putative mate of 39, where a flow of muddy sand covers the front of the feature, leaving what appears to be a heel print exposed. See Figure 15.

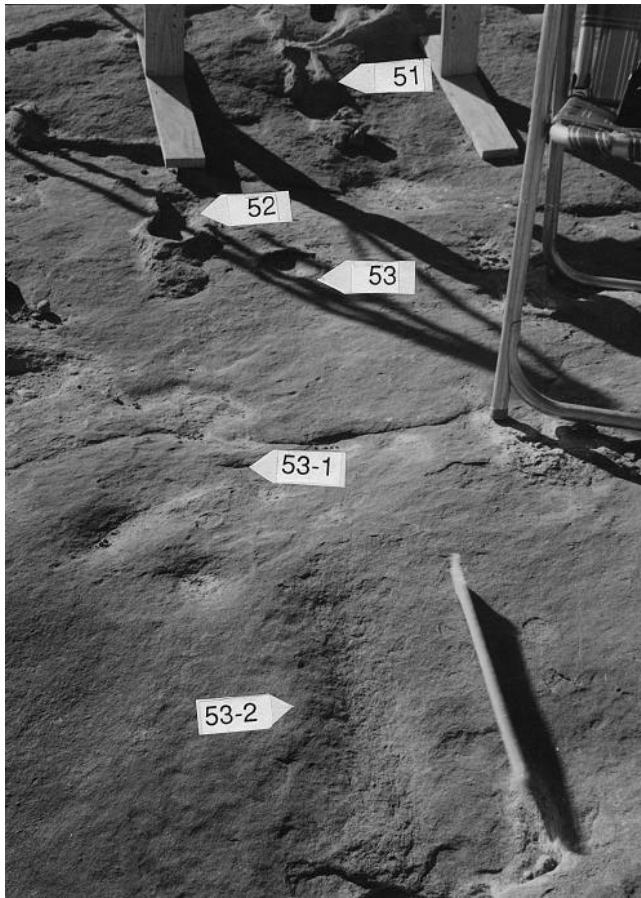


Figure 12. Putative human tracks near the end of the Downhill Trail. View is to the south. a featureless depression 53-2 is clearly visible with and early morning shadow, while 53-1 is difficult to see. In the background 53, 52 and 51 can be clearly seen.

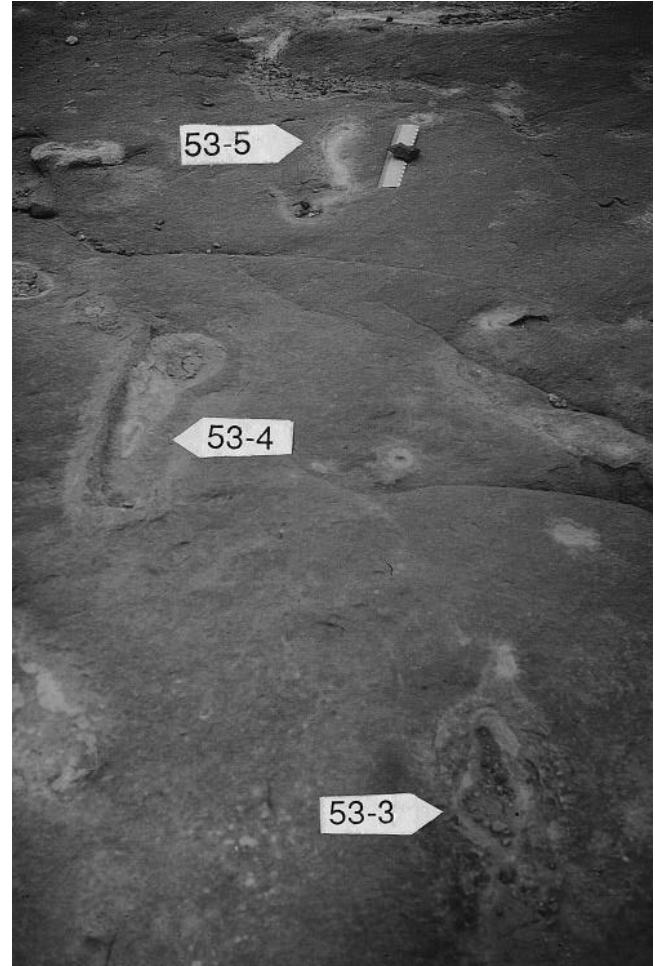


Figure 13. Humanoid impressions of the Downhill Trail looking north. No. 53-3 (a figure 8-shaped impression) is at lower right, followed by 53-4 and the S-shaped 53-5 next to ruler.

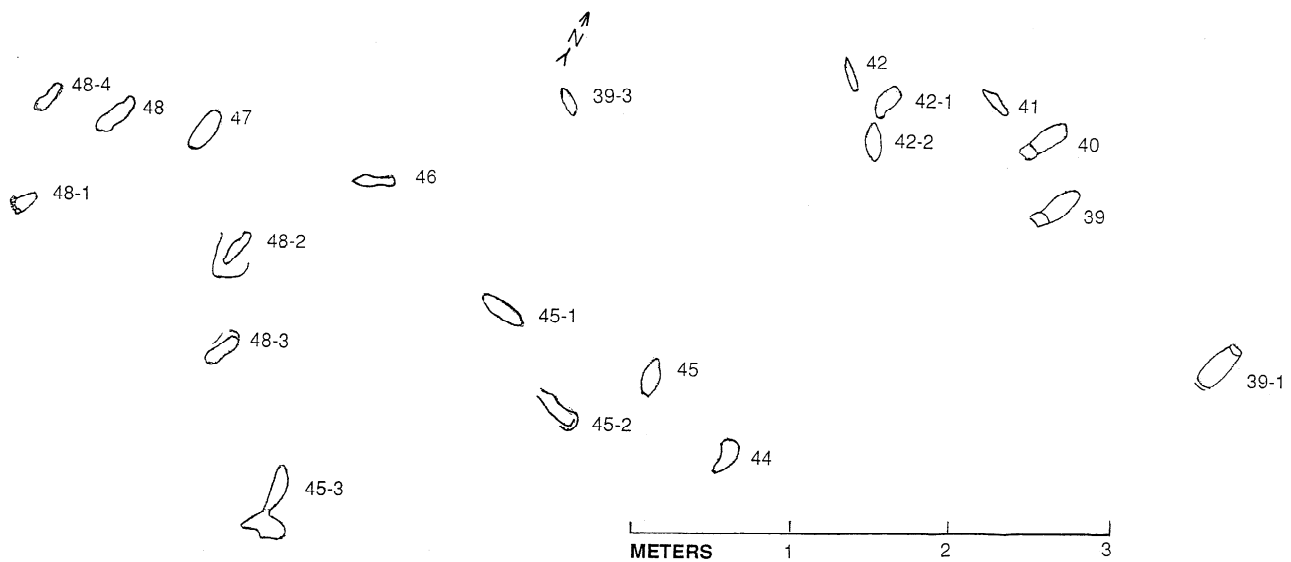


Figure 14. A detailed drawing of the Classic Track mound, its namesake being the holotype shod footprint No. 39. On this mound is a concentration of elongate impressions which resemble human tracks.



Figure 15. The Classic Track 39 is seen on the right and what appears to be its mate 4 on the left. No. 39 serves us as a holotype of shod humanoid foot impressions and as a reference point for mapping other features at Site 2. This photo was taken in 1989, a few seconds after we discovered 40. Revealed in the early morning shadows 40 is a reverse duplicate of 39. By noontime only the putative heel, which has eroded out, can be seen. The front of 40 remains filled from a once-overlying stratum of mud. see Figure 11b.

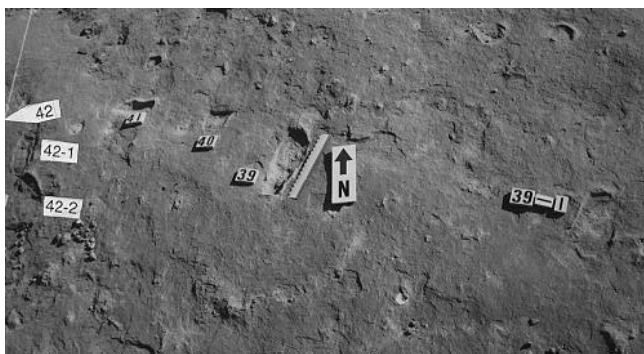


Figure 16. Putative humanoid track 39, the Classic Track, is visible in the center of the photo. What resembles its mate (40) is above that number to the left. No. 39-1, facing the opposite direction and four feet away, is seen at the right. It is similar in shape to 39. No. 41, the first impression of a putative child's or woman's trackway, is at right angles to 40. Humanoid track-like features 42-1 and 42-2 below it are visible at the center of the left edge of the photo.

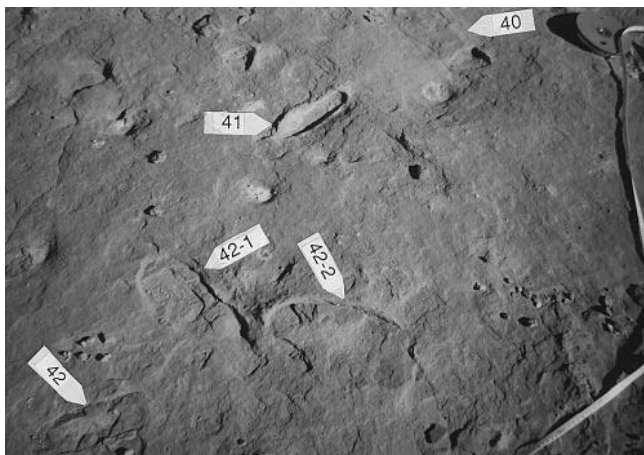


Figure 17. Humanoid feature 40, possible mate to Classic Track 39, is in the upper right while 41 is at a right angle to it, on the left. In the lower center note 42-2 to its left. In the lower left corner note 42, which could be in stride with 41.



Figure 18. Closeup of putative child's or woman's track 41. Note similarity to impression 46, Figure 19.



Figure 19. Closeup of putative child's or woman's track 46.



Figure 20. Humanoid impression 46 is at the upper right. Photo shows the continuation of a putative child's/woman's trackway, 47, 48-2 and 48-3. To the left of 47 is 48, within a stride of 48-1. 48-1 has clear toe-like impressions. To the left of 48 is an unmarked print, 48-4.

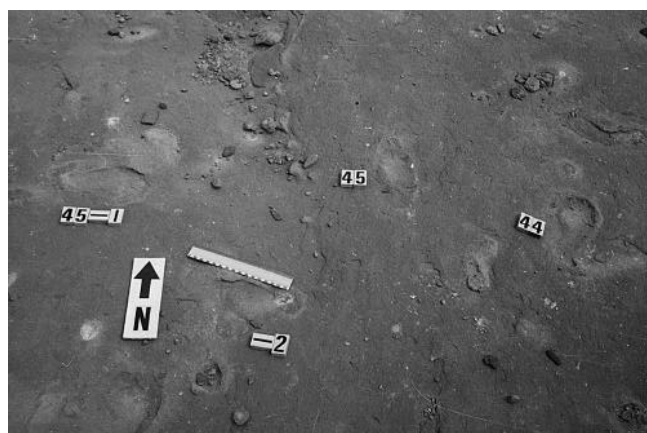


Figure 21. A possible crossroads of quasihuman tracks. No. 45-1 is seemingly in stride with 45-2, both facing east. No. 44 seems to be in stride with 45, facing north.



Figure 22. Fish-tailed imprint facing north. It appears to have been filled with water which flowed in or out of what looks like the heel.



Figure 23. One of six pairs of side-by-side quasihuman prints discovered to date. This pair is N 80°E of the Classic Track 39, as distant as 45-3. See map, Figure 14.



Figure 24. Another pair of side-by-side quasihuman impressions, print 37, northeast of the Classic Track 39, and as distant as 45. See map, Figure 14.

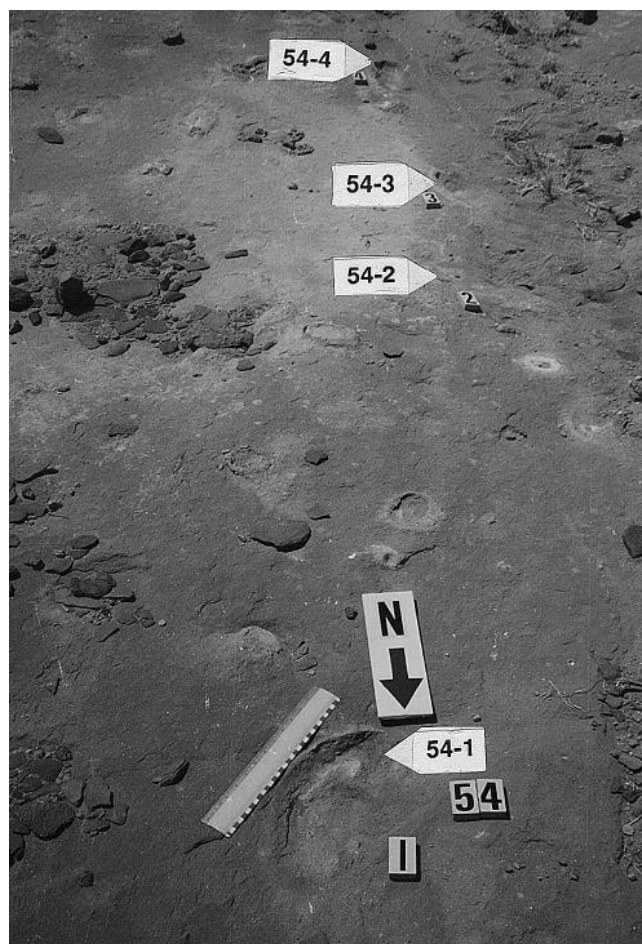


Figure 25. A quasihuman trackway discovered in June 1990 southwest of 48-2 and about as distant from 48-2 as 39. See map, Figure 14. The putative trackway consists of 54-1, a possible left print, followed by space where a track may have eroded away; 54-2, a possible right foot; 54-3, an elongate impression; and 54-4, a possible right foot impression.

MINUTES

Continued from page 114

Editor Chaffin reported that there has been a substantial flow of articles and other items for publication. He indicated that his computer has assisted in the daily work and in the preparation of the Keyword Index.

The Financial Committee report resulted in several actions. It was passed that Quarterly page charges for research articles will be paid to the General Fund from June 1992 to the present. It was passed that the budget approved in 1997 be extended to 1998 until the 1998 BOD meeting. The quarterly editorial report was given by the editor, E. Chaffin.

The Research Committee report was given by DeYoung. It was passed that the guidelines for research projects require that the principle investigator must be a CRS member. The Publications Committee report by R. Goette resulted in the following actions. It was passed that the Executive Committee be authorized to confer with Wolfrom to produce *CDROMs* of back issues of the *CRSQ* for sale as soon as possible, if it appears to be economically feasible. Wolfrom was authorized to spend up to \$6000 to get back issues of *CRSQ* onto *CDROM*. It was passed to make a charge of \$100/page to the Publication Fund every time *CRSQ* devotes advertising to CRS books.

The VACRC Committee report resulted in two actions. A balanced budget for VACRC was passed for 1997. J. Meyer was authorized to open an account for Electronic Funds Transfer (EFT) with the Evangelical Christian Credit Union for use by the VACRC Director. The report of the Constitution/Bylaws/Advanced Planning Committee resulted in the

passage of a motion to treat the proposed actions to change the bylaws as notice to the BOD. This will result in a vote at the 1998 BOD meeting.

A new letterhead format for our CRS stationery was approved. It was decided to continue to use the Concordia Historical Institute (CHI) to house the CRS archives and to allocate to CHI the funds necessary to organize the CRS archives in a proper catalogued manner. Gary Locklair was nominated for the BOD election in 1998. The following people were also nominated for the BOD election in 1998: D. DeYoung, R. Goette, R. Humphreys, D. Kaufmann, and E. Williams.

The officers elected for 1997/98 were President, E. Williams; Vice President, D. DeYoung; Secretary, D. Kaufmann; Membership Secretary, G. Wolfrom; Treasurer, R. Gentet; and Financial Secretary, T. Aufdemberge. The contract of J. Meyer as Director of VACRC was renewed for the 1997/98 year. D. Kaufmann was authorized to hold a CRS hospitality hour at the International Congress on Creation at Pittsburgh in 1998. The mileage charge for automobile use traveling to BOD meetings was raised from 28 cents to 31.5 cents per mile effective immediately. The 1997 budget was adopted.

President Williams was authorized to negotiate with the Institute for Creation Research to have our 1998 BOD meeting in San Diego. The dates will be 28-30 May, 1998. The meeting was adjourned at 1350 hours.

Respectfully submitted,
David A. Kaufmann, Secretary

PHOTO ESSAY (Back Cover) Rock Spires (Pseudo-hoodoos) Fit Flood Model

CARL R. FROEDE, JR.

Rock spires (Pseudo-hoodoos) in Warren Point Sandstone Member of the Gizzard Formation along Lookout Mountain, GA. These columns of rock are capped and protected from erosion by a sandstone which is more resistant than the underlying iron rich sandstone layers which weather more easily and quickly creating the narrow shapes. These are extremely rare weathering features east of the Mississippi River due to the large amounts of water available for destruction of these types of features. The fact that they exist would tend to support a more recent formation via erosion and would better fit within the time frames of the young-earth Flood model (Ice Age Timeframe).

Quote — Contrasting Views of Natural Law

Second, there is no "natural law" waiting to be discovered out there (pace Clarence Thomas in his recent testimony). Legal systems are human inventions, based on a history of human thought and practice.

Gould, Stephen Jay. 1992. Impeaching a self-appointed judge (Book review of *Darwin on Trial* by Phillip E. Johnson) *Scientific American* 267(1):118-121.

Quote

But for it [the Bible] we could not know right from wrong. All things most desirable for man's welfare, here and hereafter, are to be found portrayed in it.

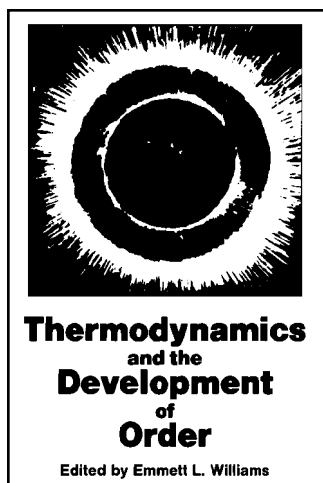
Lincoln, Abraham. 1864. Remarks upon the Holy Scriptures, in receiving the present of a Bible from a negro delegation [September 7, 1864]. In Miller, M. M., editor. 1907. *Life and works of Abraham Lincoln* in ten volumes. The Current Literature Publishing company. New York. Volume VI. pp. 209-210.

Quote

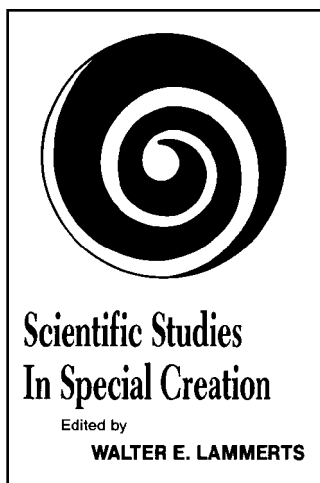
Human DNA is like a computer program but far, far more advanced than any software we've ever created.

Gates, Bill. 1995. *The Road Ahead*. Penguin Books. New York. p. 228.

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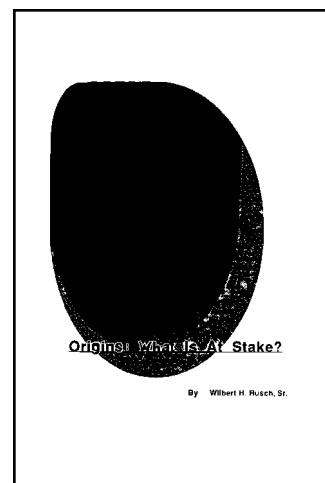
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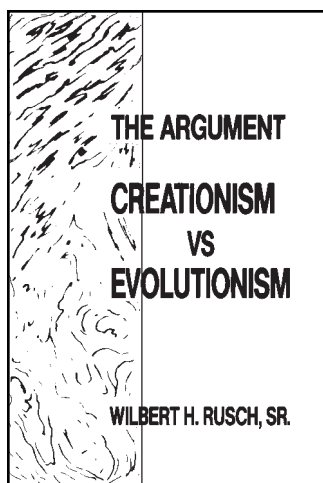
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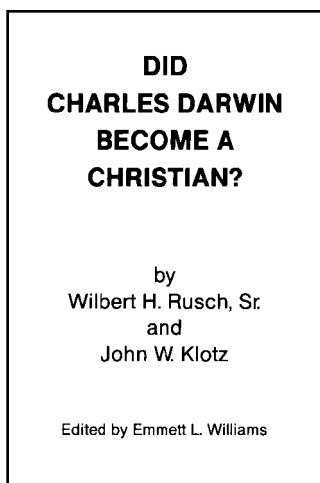
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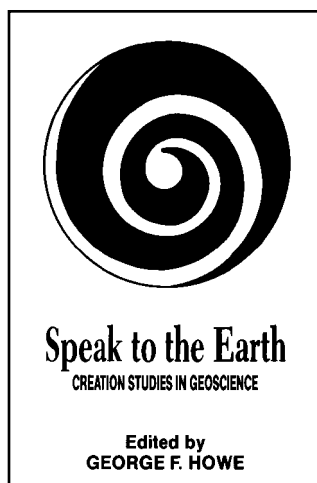
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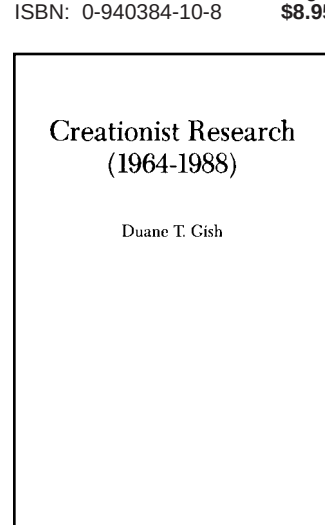
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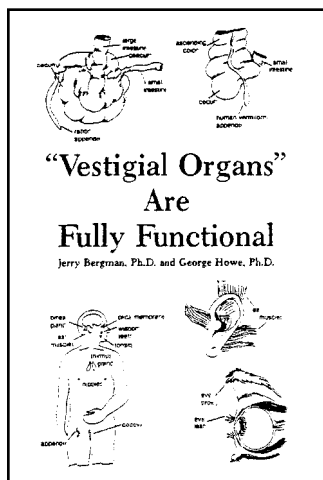
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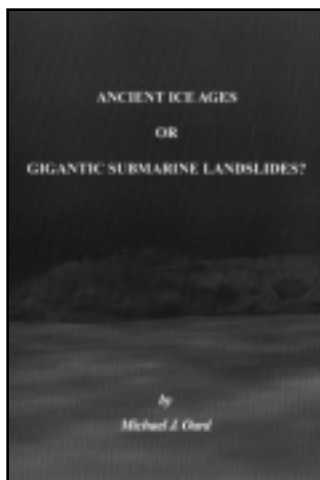
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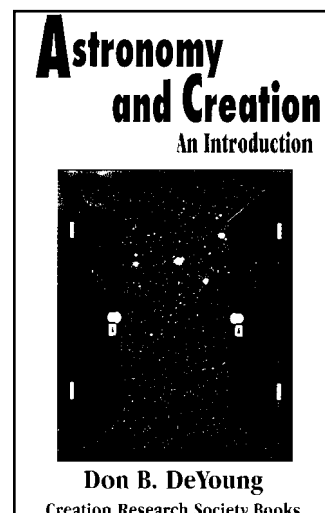
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