

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 17

SEPTEMBER, 1980

NUMBER 2



CREATION RESEARCH SOCIETY QUARTERLY

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VOLUME 17

SEPTEMBER, 1980

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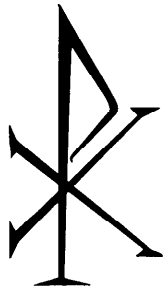
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Creation Research Society Quarterly is indexed in the *Christian Periodical Index*.



COVER ILLUSTRATION

The picture on the front cover is a view in Thornton Quarry, in the vicinity of Chicago. It is looking south-east, and shows the main tunnel under the R.R. tracks, east of the "core" area. The tunnel is about 105 feet high, the walls of the quarry, about 150. The heights can be compared with the two automobiles.

Thornton Quarry has been claimed to be an ancient coral reef. However, as is shown in an article by Mr. David B. D'Armond, elsewhere in this issue of the *Quarterly*, the deposit differs in many important ways from modern reefs. Hence the material of the deposit at Thornton Quarry is interpreted rather as having been swept into its present location by the Flood.

Mr. Jim Canon took this photograph, and Mr. D'Armond attended to getting it for the *Quarterly*.

CALL FOR ARTICLES

The special theme for the Annual issue of the *Quarterly*

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ly in June, 1981, will be: Precise Terminology and Creationist Foundations for Science.

As for the terminology, not only is it important to us, as to everyone, to say what we mean; but the matter is of especial interest to us as Creationists. For much of the belief in evolution is sustained by confusion: confusion of "micro-" and "macro-", of "species" and "kind", and in many other cases which could be mentioned.

As for the foundations, one of our aims is to re-evaluate science from a Creationist viewpoint. Our aim is not so much to tear down a false doctrine, although that may be necessary, as to build a true one. Hence the appropriateness of the topic is apparent. Something has been accomplished, but much remains to be done.

It is hoped that those who have thoughts on these subjects will consider writing something for the Annual Issue. Incidentally, publication in the Annual does not necessarily preclude presentation of the topic at our meeting at Ann Arbor next April, as is mentioned elsewhere in this issue.

Items intended for the Annual issue should reach the editor by 1 February, 1981.

PRESIDENT'S LETTER

Several features of the 1980 C.R.S. Board of Directors' meeting deserve special comment. Some excellent research papers were presented at the 1 p.m. meeting which was well attended. Questions and comments from the audience indicated a keen level of interest. Readers will find a list of the papers in Wayne Frair's report in this September issue. A call for papers for a similar research meeting will also be found in this issue. Please consider submitting a research paper or at least attending the session planned for Friday, April 10, 1981.

In the June issue readers discovered that the Board accepted John N. Moore's gracious offer to prepare a quarterly newsletter. Interested C.R.S. members and subscribers may still receive the remaining three issues of this newsletter by sending \$1.00 to C.R.S. Books, 5093 Williamsport Drive, Norcross, Georgia (30071). If you wish to receive the newsletter but are not a C.R.S. member or subscriber, simply write to the membership secretary, Dr. Wilbert Rusch, Sr., 2717 Cranbrook Rd., Ann Arbor, Michigan (48104) for an application blank. Take care of joining C.R.S. with Bill Rusch while at the same time sending \$1.00 to the Norcross, Georgia address of C.R.S. Books for the newsletter. This excellent

and timely report is sent *only* to those who are already members or subscribers of C.R.S.Q. Don't miss out on this extra feature now offered by C.R.S.

Sometimes creation minded scientists would like to find research or teaching positions in which they can openly express their creation ideas. Potential employers looking for such employees, or employees in search of such positions should write to Dr. John Klotz, Director of Graduate Studies, Concordia Seminary, St. Louis, MO 63105.

John has agreed to answer these letters and to help bring the right parties together. We hope this exciting employment aspect of C.R.S. will prove useful to many in months ahead.

Your C.R.S. Board of Directors stands ready to serve you in these matters mentioned and many others. Our main goal, however, is to produce a consistently excellent research quarterly in which creation scientists may present their findings to the reading public. We thank Editor Harold Armstrong for continuing to make that goal a reality.

Sincerely,
George F. Howe
President of C.R.S. Board of Directors

ANOTHER LOOK AT THE ARCHAEOPTERYX

C. BROWN*

Evolutionists have commonly maintained that the *Archaeopteryx* is a missing link between reptiles and birds. My own research, however, has revealed something very different.

The evolutionists argue, for instance, that the fact that the nasal passage is low down on the face of the *Archaeopteryx* shows clearly a link with reptiles. However, let us look at the *Brachiosaurus*, *Mesosaurus*, *Rhamphorhynchus*, and *Pteranodon*. The last two of these were flying reptiles. Now consider three reptiles of the sea: *Ichthyosaurus*, *Plesiosaurus*, and *Kromosaurus*. All have one thing in common: that their nasal passages are high up. On the other hand, look at some modern birds. The Dominican Gull, Brown Skua, Common Gull, White-Fronted Goose, and Grey-lag Goose all have their nasal passages half way or almost half way down.

Species like the many Petrels, for instance the Southern Giant Petrel and Northern Giant Petrel, have their nasal passages three quarters of the way down. The Great Skua has them three quarters of the way down; the Antarctic Fulmar half way down. There are several extinct birds having the passages half way down. Others, having them half to three quarters of the way down, could be mentioned; but these examples should be enough.

Clearly then, nasal passages which are up or down prove nothing as to whether the *Archaeopteryx* was part reptile.

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Evolutionists had long maintained that the *Archaeopteryx* had solid bones, as most reptiles do; but it has lately been shown that the bones were hollow, like those of most birds.

It is true that some reptiles have hollow bones, and some birds solid. But, then, that proves no more than does the location of the nasal passages. Again, reptiles have no wishbone, but the *Archaeopteryx* has. Yet some birds, such as the *Ratites* (Emu, Ostrich, etc.) have no wishbone. Are we to conclude because of this that these birds are part reptile? The question is, just where do you draw the line!

Now what about those teeth which the *Archaeopteryx* is said to possess? There are a number of modern birds which have what can only be described as toothed projections. These include the Sawbill, the Pink-Footed Goose, the Grey-lag, and the White-fronted Goose, to name just a few. There seems no reason why a bird, which needs them for its way of life, should not have teeth, toothed projections, or something of the sort. Clearly some modern birds, even in this respect, have something of the characteristics of the *Archaeopteryx*.

The *Archaeopteryx* had relatively large eyes; and some have seized upon this as evidence of a close relationship to reptiles. However, there are a number of modern birds which have large enough eyes. These include the many species of Owl, the Great Bustard, the Stone Curlew, the Secretary Bird, and some of the Bower Birds, to mention just a few examples.

The *Archaeopteryx* also had a sternum and a pubis.

(Continued on page 109)

THORNTON QUARRY DEPOSITS: A FOSSIL CORAL REEF OR A CATASTROPHIC FLOOD DEPOSIT? A PRELIMINARY STUDY

DAVID B. D'ARMOND*

Received 14 February, 1980

Thornton Quarry, the world's largest working commercial limestone quarry, is made up of massive deposits of fossil-bearing, dolomitized limestone. Because of the high concentration of fossil corals, brachiopods, crinoids and other shallow marine organisms, it has long been viewed as an ancient coral reef of Silurian age (approximately 410 million years) and is often compared to modern reefs for similarity. However, in a brief review of evolutionist literature, it readily can be discerned that these deposits are not comparable to modern reefs and that the standard uniformitarian view is both misleading and imaginary.

The actual facts instead readily submit themselves to a flood-geology interpretation, making the Thornton deposits of probable mid-Flood origin, influenced by tidal effects during the Flood. It is suggested that these tidal effects have been greatly underestimated by many creationists, but when coupled with tsunami effects, these become powerful agents for massive erosion, deposition and cyclical deposits. Deposits underlying Thornton probably reflect such activity. A Catastrophic Wave-Action Model of deposition is proposed.

Introduction

Over the past several years the Midwest Center of the Institute for Creation Research has conducted fossil-hunting field trips for creation enthusiasts from Chicago and vicinity among the richly fossiliferous limestone deposits of Thornton Quarry. Because each tour was accompanied by an evolution-oriented presentation by the company geologist, it became desirable to research and develop a scientifically sound creationist alternative. This writer conducted a limited literature search on the Thornton deposits; and while this search was not exhaustive, it revealed a number of surprising facts that clearly confirm the error of the standard evolutionary "fossil-reef" view. This report is identified as a preliminary study not only because the literature search was limited, but also since very few field investigations were involved. It is hoped that this report will encourage other researchers into more complete studies, both in the field and in the pertinent literature. It is further hoped that this preliminary study may provide useful guidelines for future investigations.

Geographically, Thornton Quarry is located in the extreme south of the Chicago metropolitan area, in the city limits of Thornton (see Fig. 1), immediately east and south of the intersection of Illinois Highway 1 in Harvey and Interstate 294 (Tri-State Tollway). This quarry, the world's largest working commercial limestone quarry, is operated by Material Services Corporation, a division of General Dynamics Corporation. This facility mines, crushes and processes more than seven million tons of limestone each year (or nearly 22,000 tons per day) and produces approximately 60 different marketable products. Material Services Corporation maintains an open policy toward the public for the purpose of tours and fossil collecting (see Fig. 2). Such tours stress proper personal and group safety pro-

cedures. Rock hounds and fossil-hunting groups are accompanied by a company representative into freshly blasted areas that are a collector's paradise. Each person is allowed to take home as many specimens as he or she can carry.

Geological Setting

The Thornton limestone deposits form a body nearly circular in shape and over two square miles in area.¹ Vertically, the commercial-grade stone extends from just below the surface of the ground to a depth of 400 feet.² The body consists of highly fossiliferous limestone that has been dolomitized, thus exhibiting some recrystallization. Dated by its fossil content, the deposit is identified by standard evolutionary means as an ancient coral reef of Silurian age, approximately 410 million years old. The surrounding Silurian deposits are both of thick-bedded and thin-bedded massive limestone deposits, formed, for the most part, in a shallow marine environment.³

The Thornton deposit is one of dozens of such deposits scattered throughout Illinois, Indiana, northwestern Ohio, eastern Michigan, eastern Wisconsin and eastern Iowa. A few other "reef" deposits of the same age occur in small areas of Ontario, New Brunswick and the Districts of Franklin and Keewatin, Canada. All of these deposits are Silurian in age and are further sub-classified as "Niagaran" age within the Silurian time period (the name being derived from outcrops at Niagara Falls). These "reefs" are further described as forming an evolving (in Niagaran time), wedge-shaped, coral reef archipelago positioned offshore from an ancient shoreline.⁴ (See Fig. 3.)

In the Chicago area, the overlying strata is Pleistocene in age, principally glacial deposits directly over the Silurian limestones. The underlying strata, as shown in well-drilling logs (Fig. 17), consists of up to 2500 feet of massive limestone, sandstone and shale deposits of Cambrian and Ordovician age, which in turn overlie a basement of Precambrian granite.⁵ The importance of these deposits to a creationist view cannot be overemphasized and will be discussed later.

The main point of interest in the descriptions of the Thornton deposits is that they are likened to modern

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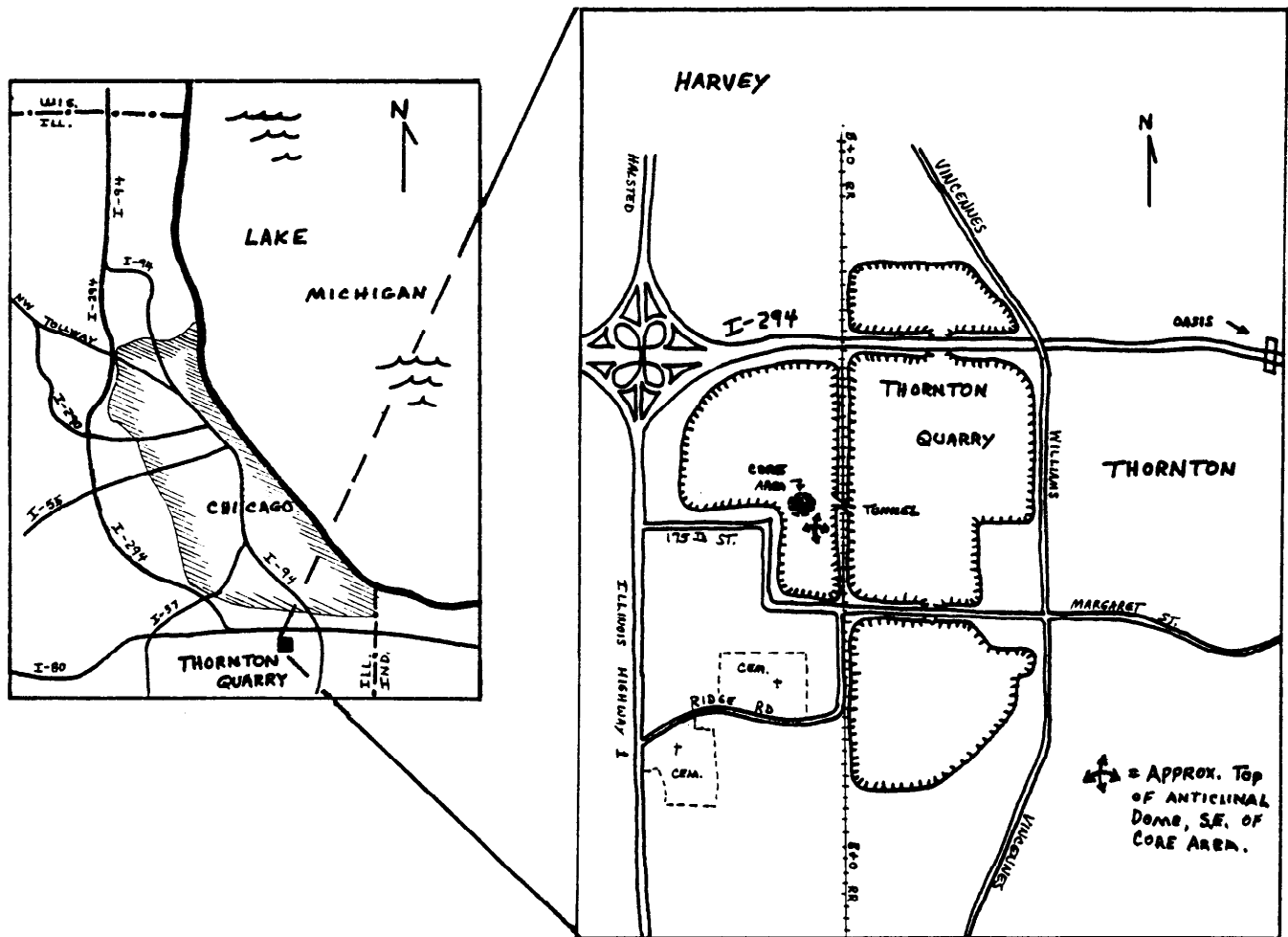


Figure 1. Map view of Thornton Quarry, located south of Chicago. The extent of quarrying operations shown is as of October, 1979.

coral reef formations. A map view of Thornton by one investigator (see Fig. 4) suggests the existence of ecological zonations. (It might be noted at this point that hydrodynamic sorting* could yield a similar fossil distribution.) Since all evolutionary writers consider the Niagaran deposits to be ancient remains of coral reefs, comparable in most ways to modern reefs, we need to review the nature of modern reefs, their growth characteristics and their requirements for formation in order to establish a basis for comparison with the Thornton deposits.

Modern Reef Deposits

Three dominant kinds of coral reefs appear throughout the world: fringing, barrier and atoll.⁶ Fringing reefs grow outward from the coastlines of islands, producing shallow waters only a few feet deep extending for several miles out from the island (see Fig. 5). The most active area of coral growth is not on the top of such platforms but on the steep outer edges.

Barrier reefs differ from fringing reefs in that the lagoonal waters are no longer shallow, but may be up to

180 feet in depth, the reefs forming natural barriers to navigation. In both the barrier and atoll reefs, coral and algae grow profusely upward toward the sunlight, surviving only in warm ($68^{\circ} - 93^{\circ}$) and shallow waters. A famous example of a barrier reef is the Great Barrier Reef of Australia, extending over 1200 miles in length.

Atolls are coral reefs that enclose lagoonal waters with no visible evidence of the underlying island. An example of these are the Bikini and Eniwetok Atolls. Charles Darwin in 1837 was the first to propose a theory about possible interrelationships between the types of reefs. He believed that corals started building on hard-rock substrate in shallow areas around undersea mountains whose peaks formed islands. Over long periods of time, he reasoned, the surrounding ocean floor would begin to subside isostatically, coinciding with the accumulation of sheer weight of reef materials from its rapid upward growth. Thus a fringing reef, growing upward as the sea floor subsided, would become a barrier reef and finally a coral atoll, with the underlying island subsiding below sea level, as can be traced in Fig. 5. While Darwin's theory is perhaps the most widely known, modern theory of reef formation combines his theory with those of Sir John Murray (who suggested that extinct underwater volcanoes were the underlying structures) and Professor

*Hydrodynamic sorting is the sorting of particles of similar sizes, shapes, and densities by the force of water, different types or sizes being deposited in relation to different velocities of the water.



Figure 2. One of the ICR-Midwest Center fossil hunts in Thornton Quarry. The company geologist is espousing reef evolution. This photograph is courtesy of Mr. Jim Canon.



Figure 3. Ancient coral reef archipelago, outlined by dashed lines. Niagara age "reefs" are indicated by dots and black areas. Note the large areas adjacent to Hudson Bay. Modified after Lowenstam, Reference 4.

Reginald Daly (who felt that reef growth and ocean water levels were determined by "glacial control") and others. Darwin's ideas, however, are still regarded as the most significant.

It is important to note the upward and outward growth of the reef (or reef core, as it is often called). A coral animal (polyp) secretes an exoskeleton of limestone (corallite). Inside this skeleton are formed radial partitions called septa. As a coral polyp grows upward, it continues to expand its secreted exoskeleton upward, closing off its lower chambers by secreting floors over them. As this process continues, more and more empty chambers are closed off as the coral continues its upward growth.⁷

The obvious result of this kind of upward growth in the reef core is the presence of highly organized growth structures throughout the depths of the core. This result has been confirmed by core drillings made in coral reef areas such as Eniwetok in the late 1940's which showed an orderly sequence of coral skeletons for over 4,000 feet in depth.⁸ Thus the reef core is a highly ordered, growth-oriented, non-bedded structure (see Fig. 6).

In addition to the core itself, bedded deposits of talus develop on both the steep seaward side and on the shallow landward lagoonal side. This debris is wave-eroded material from the reef in the areas where the reef actually reaches the surface of the water. Seaward side deposits are of coarse material and lie at a steeper bedding angle than the finer lagoonal deposits. Nevins has

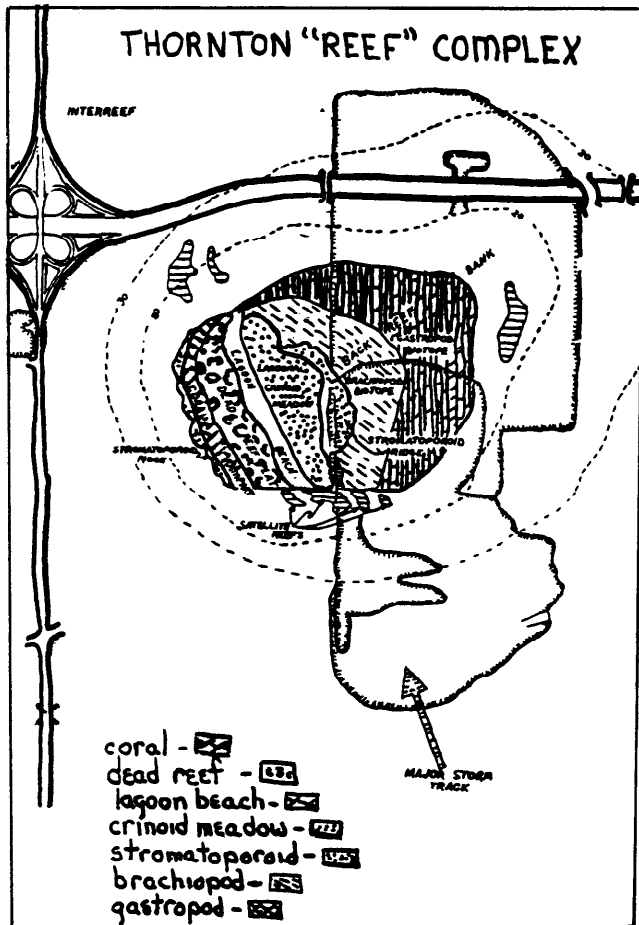


Figure 4. Thornton "reef" complex, modified after Ingels, Reference 1. Statistical sampling suggested this pattern to Ingels. The "reef core" is on the left, represented by the Dead Reef Flat, the Coral Rampart, and by the Stromatoporoid crescent. It forms an elongated crescent.

pointed out that there exists a maximum limit to the angle of dip of these bedding planes which probably may not exceed much over 20° due to the buoyancy of the material in water, thus creating a low angle of repose.⁹

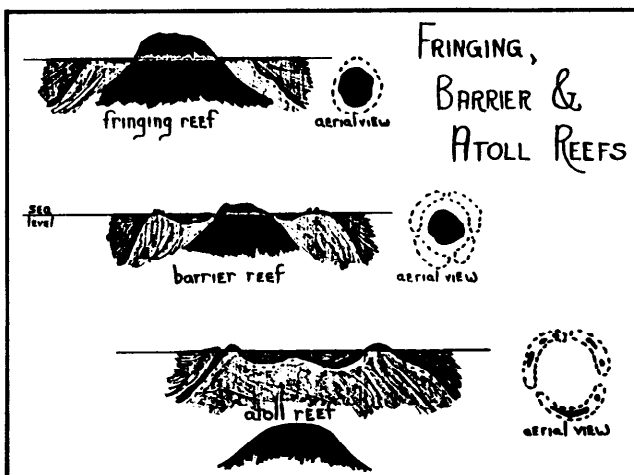


Figure 5. Modern types of coral reef. Drawn after Cowen, Reference 6.

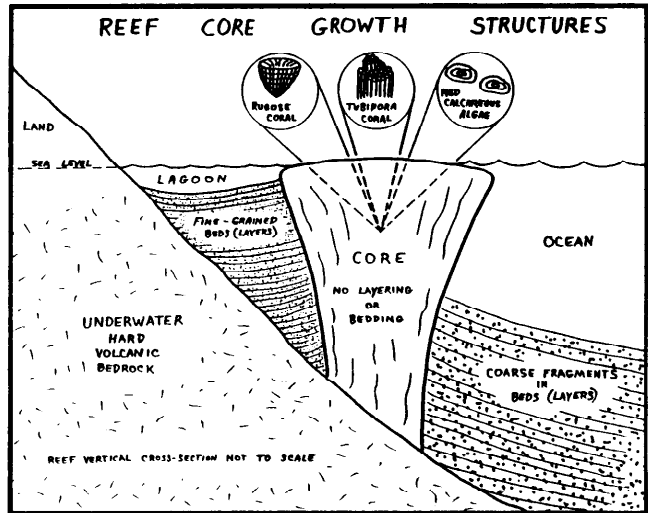


Figure 6. Typical structures found in a reef core. The flanks develop bedded deposits. In many cases the core may be actually V-shaped, as a result of upward and outward growth.

It is also important that corals, by themselves, cannot successfully withstand the continuous pounding action of surf. Only when growing in conjunction with surf-resistant algae (such as red calcareous algae) can a reef continue to grow in the face of continuous erosion. Modern reefs commonly contain between 50 to 80 percent red calcareous algae.¹⁰

It is also essential that pioneer populations of reefs get started on *hard* bedrock, for without this kind of footing a colony could never develop.¹¹ One final notable characteristic of modern reefs is that they grow upward and outward primarily along the periphery of the reef.¹² This suggests that the cross-section of a reef should look similar to a molar tooth: a nearly vertical wedge with a narrow root and a broad top.

In summary, a modern reef exhibits the following characteristics:

- 1) distinct and highly ordered growth structure in the core: no bedding present;
- 2) shallow dipping, bedded talus slopes on flanks of core;
- 3) a high percentage of reef-forming algae (50-80%);
- 4) solid, anchored, hard bedrock as initial foothold and growth points;
- 5) a V-shaped growth profile of the reef as a whole.

Conflicts in the Thornton "Reef" Deposits

It is now possible for us to compare directly, point by point, the characteristics of the Thornton deposits with those of modern reefs as described above.

1. REEF CORE STRUCTURE. Ingels, in his study of Thornton, points out that the non-bedded core area is "characterized by massive, structureless to highly coralliferous, finely crystalline dolomite..."¹³ It is notable that no growth structures are mentioned in the core area. Others have commented that the core growth structures have been destroyed by the recrystallization of the limestone into dolomite, and Ingels shows a

similar line of thought when he tries to explain the absence of algae fossils in the core:

"Inability to recognize algae, because of dolomitization, allows their role in the reef development to go undiscovered."¹⁴

He thus assigns to stromatoporoids the role of binding agents commonly associated with reef-forming algae. (For a discussion of the problems of stromatoporoids as reef-formers, see Nevins.⁹) It is interesting to note that some algae fossils are found in Thornton, though infrequently, and that details are well preserved. In further contradiction, Ingels himself makes the observation:

"However, examination of the dolomitized fossils shows that in many cases the preservation of morphologic detail is excellent . . ."¹⁵

It becomes apparent, then, that even with excellent morphological detail preserved in the dolomitized rock, the "structureless" core area means that no growth structures are found in the core. It is therefore probably not a "core" at all.

2. TALUS SLOPE ANGLE OF DIP. Flank deposits have been reported by Ingels as variable between 34 to

45 degrees. In some places, bedding planes show dips as great as 50 degrees. It can be readily seen that these dips are very steep and beyond the normal angle of repose in a marine environment. Figure 7 is a photograph looking to the west, of the wall supporting the B&O Railroad tracks that run north-south through the center of the quarry (see Fig. 1). The black lines on the photograph trace bedding planes. Figure 7.1 gives a more extensive view of the same wall, showing more clearly the dips of the strata on each side of the top of the dome, or "core" area. The "core" lies just west of the tunnel. (Tunnel height is approximately 105 feet while the height of the wall is about 150 feet.)

A more serious problem arises from the fact that the size of the "core" is far smaller than Ingels predicted. Part of the "core" or top of the dome has been mined away leaving a remarkable east-west cross-sectional view of the actual rock structures (see Fig. 7.2) near the center of the "core." Combining the north-south cross-section in Fig. 7.1 with the east-west cross-section shown in the photograph of Fig. 7.2, it is obvious that the so-called "core" is indeed very small, especially

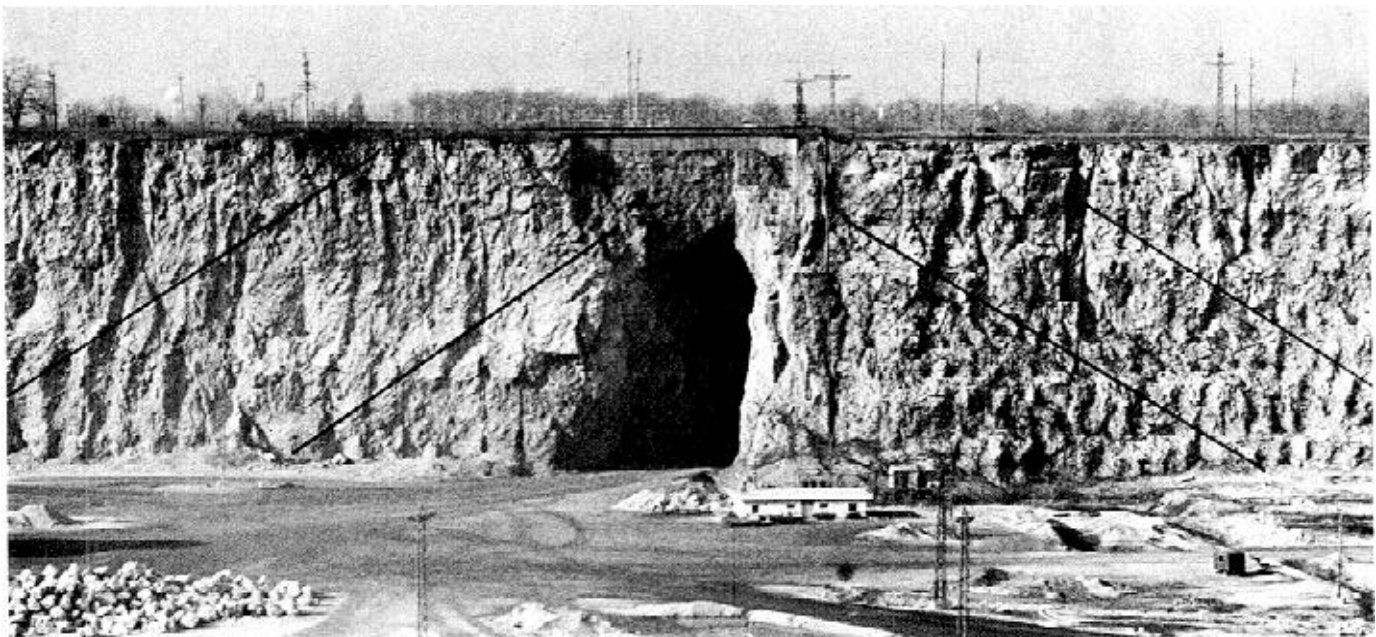


Figure 7. Photograph showing the opposing steep dips on each side of the crest of the anticline, which the location of the tunnel approximates. Drill and blast marks, along with weathering, have obscured the bedding planes in the photograph to the point that they are not very visible, but at close range they can be seen clearly. This anticline is actually a dome, bedded deposits dipping away from the crest in all directions. Photograph courtesy of Mr. Carl Mueller.

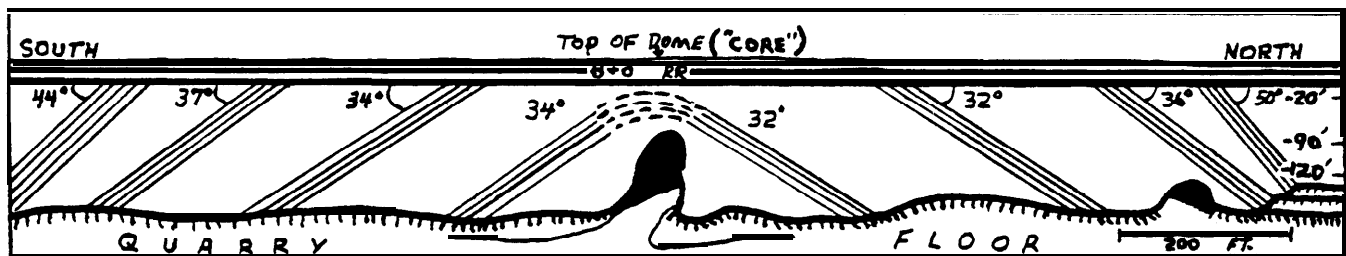


Figure 7.1 Cross-section view of the west wall in the main pit (same view as in the photograph in Fig. 7) showing more of the wall and the varying angles of dip of bedding planes on each side of the tunnel. The "core" or the "top of the dome" is located immediately west of the tunnel (refer to Fig. 1). To appreciate the vast size of the quarrying operation, note that the height of the wall is approximately 150 feet, and the height of the tunnel is about 105 feet.



Figure 7.2. Photograph showing the center of the "core" or "top of the dome" and the steeply dipping bedding planes dipping in opposite directions. (The black has been added here to emphasize them, but they are readily visible in the rock.) The reef block is roughly outlined by the dotted black line. The boulders at the base of the wall, on the right side of the picture, are as large as full-sized automobiles. Photograph by Mr. Jim Canon.

compared to that described by Ingels (see Fig. 4). A close look at the photograph in Fig. 7.2 clearly shows that the steeply dipping strata converge to points over the "core." Thus, the "core" can in no way be the source of the sediments which formed the layered deposits that are stratigraphically *above* the "core." But the basic fact of true coral reefs is that the flank deposits *are* derived from the reef core and that these deposits are stratigraphically *beside* the reef core as in Fig. 6. Therefore, all of the deposits exposed by quarrying thus far are not flank deposits at all, since nearly all layers of sediment are stratigraphically above the "core." Extrapolating the lines representing bedding planes in Fig. 7.1 to their points of convergence above the tunnel suggests that these sediments at one time overlaid the core area by several hundred feet, before they were eroded to their present-day level. This is powerful evidence that the so-called "core" is not a true reef core at all, but is an allochthonous reef block, having no roots. This block became the focal point for subsequent deposits, which buried it layer after layer in a catastrophic environment. Simply stated, the dips of the bedding planes provide abundant and powerful evidence against the evolutionary "fossil reef" hypothesis.

3. REEF-FORMING ALGAE. As has already been noted, except for some isolated, non-reef-forming algal fossils, the reef-forming red calcareous algae are not found in the Thornton deposits, nor are they found in any of the Niagaran "reefs." Over half of the core area in each "reef" should be algae. Lowenstam clearly points out that this is a major problem:

"It is perhaps worth stressing that the enormous biomass of the Niagaran reefs was, as that of modern reefs, basically dependent upon a plant (algae) foundation. Yet so far, we have no definite records of this vital element of the Niagaran reefs."¹⁶

A further problem appears in the fact that pieces of crinoid stems are found throughout the Thornton deposit and are heavily concentrated near the "surf zone" (refer to Fig. 4). First of all, crinoids are fragile animals (sea lilies) and cannot be one of the reef-formers. Secondly, only stem fragments are found with other crinoid parts such as calyces and cirri nearly always totally missing. In a true crinoid meadow all parts of crinoids would be easily found, including nearly complete specimens of the entire animal. But this is not the case in these deposits. This absence of parts suggests that these fragments are not *in situ* deposits, as has

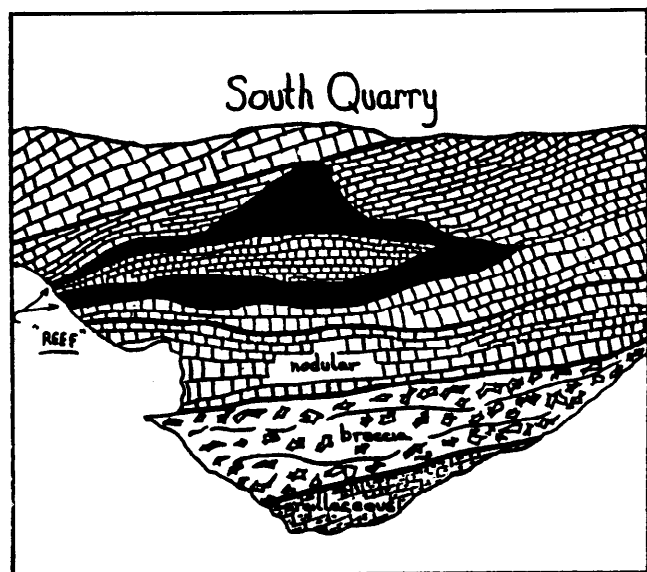


Figure 8. Cross-section view of the South Quarry according to Ingels' interpretation. (Reference 1.) The dark area depicts "reef core".

been proposed, but that they exhibit both transport and sorting, creating a deposit of uniformly sized and uniformly dense crinoid stems. Therefore, since algae are missing in the "reef," and since abundant crinoid stems are found in the "surf zone," the fossil reef interpretation once again appears to be in error.

4. **SOLID REEF FOUNDATION ROCK.** There is no solid footing upon which the pioneer coral colonies started, not only at Thornton, but at any of the Niagaran reefs. Lowenstam reveals:

"Reef bases wherever observed are 'rooted' in sedimentary rocks . . .

Nowhere in the region is there evidence of a hard substrate. Hence, reef building throughout the archipelago occurred on unconsolidated bottoms. The unconsolidated nature of the substrated is further corroborated by evidence that a number of reefs in northeastern Illinois and northern Indiana have settled into the argillaceous bottom deposits."¹⁷

Lowenstam, obviously believing that the evolution of coral reefs is true, says, in effect, that since it is there, and since evolution is true, reefs grew where it is impossible for reefs to grow. He evidently feels that more explanation is needed, since reefs really need a hard substrate:

"Solid objects were doubtlessly required before the pioneer population could gain a foothold on the muddy or sandy bottoms. At first skeletal remains and, after the formation of wave-resistant reefs, dislodged reef pebbles and blocks, *must have served this function for no other attachment sites suitable for reef organisms have been located in the sediments.*"¹⁸ (emphases added)

Obviously then, lacking footholds, a reef could not have formed until a reef had formed to supply footholds!! Suffice it to say that the entire deposit at Thornton, as well as those of the archipelago, are not *in situ*, but are allochthonous.

5. **REEF CORE SHAPE.** Following the excavation of the "core" area during quarrying operations, the observed "core" area was found to be neither the size nor the shape described by Ingels. Indeed, the South Quarry core is depicted by Ingels as an inverted V—which is opposite to the usual and normal expectations (see Fig. 8). Of course, *any* shape of a reef core can be accounted for theoretically if an appropriate set of evolutionary assumptions is made. But once again the evidence from modern reefs does not appear to fit with the Niagaran "reef" deposits.

6. **FOSSIL TAR DEPOSITS.** Fossil tar deposits, known as Albertite and locally called Asphaltum, are riddled throughout the Thornton deposits, including the "core" area.¹⁹ Since such fossilization requires rapid burial at some depth, these fossil remains of animals should not be found in any part of the "reef," particularly because of the long periods of time involved in forming debris to any significant depth. Animal remains would be entirely scavenged or decayed long before they could be buried. Thus, in order for the Albertite to be formed, there must first be quick burial of animal parts. Therefore, the entire "core" and flank areas give strong evidence that the formation of the Thornton deposits was rapid and catastrophic, not at all a slow, time-consuming process.

CONCLUSION. None of the criteria listed for a modern coral reef is met in the actual physical facts of the Thornton deposits. How then might these deposits be better interpreted according to the facts discussed above?

A Creationist Alternative—the Catastrophic Wave-Action Model

Each of the points in which the physical facts of the Thornton deposit do not match the corresponding properties of modern reefs is, in fact, a direct evidence for an allochthonous flood-deposit interpretation. It is clear from the foregoing evidence that the Thornton deposits are not reef deposits. There are no *in situ* growth structures or reef-forming algae because the deposit is not *in situ*. Further evidence of transport and sorting can be seen in the so-called ecological zonations that are described by Ingels. Abundance of crinoid stems in "high-surf areas" is better explained by sorting. The ubiquitous fossil tar deposits speak of *rapid* burial at a fair depth. The total lack of a foundation of hard-rock substrate for initial reef footholds indicates that the deposit, again, is allochthonous. The remainder of this paper is devoted to setting forth broad outlines of depositional forces and events. Finely detailed descriptions of how this deposition may have taken place is properly relegated to future in-depth investigations.

However, the very significant *underlying* deposits provide important clues to this overall nature of deposition, especially those deposits preceding the actual emplacement of the Thornton "reef" materials. Before discussing the forces and the mechanisms of this massive deposition, it might be well to review certain Biblical data related to geologic activity prior to the Flood of Noah.

1. *No rain erosion or deposition prior to the Flood.* Genesis 2:5 and Hebrews 11:7 indicate that prior to the Flood rain had not occurred, so as Noah built the ark, he was exercising faith concerning things not seen as yet. Therefore, prior to the Flood there could be no erosion and redeposition caused by rainfall.

2. *Only minor depositions by rivers prior to the Flood.* Psalm 104:6-9 tells us of mountains rising and valleys deepening to receive the Flood waters. The clear implication is that topographic relief was at a minimum before the Flood, certainly far less than at present. Flowing water derives its energy from its elevation above sea level: the higher the elevation, the greater the imparted erosive energy in those waters. Therefore, much more stream erosion and redeposition is occurring at present than in antediluvian days. In view of the relative insignificance of present-day worldwide deposition, it is clear that pre-Flood deposition would have to be of even less significance. Once the Flood began, these small antediluvian deposits would probably have quickly eroded away for the most part.

3. *No major wave (or wind) erosion prior to the Flood.* Because of the effects of a water-vapor canopy and its accompanying greenhouse effect,²⁰ there would be only minor movements of air to create wind storms or stormy seas, so that, once again, wave erosion, possibly the most significant form of erosion in the antediluvian world, would still be relatively unimportant. Clearly, forces required to achieve fossilization were not in operation, except possibly in the minutest dimensions.

In summarizing these antediluvian conditions, one realizes that only the smallest deposits would be found from this period, if at all, and would essentially be non-fossiliferous deposits over Precambrian basement rocks. Also, since the earth's Pleistocene deposits are possibly the only post-Flood erosion and redeposition, then the rest of the earth's sedimentary structures would have to be attributed to forces related to the Flood. Most of these forces are given to us directly, i.e., the breaking up of the fountains of the great deep (volcanism and earthquakes), heavy and prolonged rainfall (Genesis 7:11), a mighty wind over the surface of the earth (Genesis 8:1), great tectonic earth movements creating more earthquakes and volcanism (Psalm 104:6-9), and heavy and prolonged water runoff erosion (Genesis 8:5, 13). Our discussion will center on the various types of wave forces generated by such catastrophic events, and their role in forming and shaping the sedimentary structures of the earth.

Tsunamis

It is of particular interest to note the oceanic effects of deposition and erosion due to forces operating uniquely during the Flood. The breaking up of the "fountains of the great deep" is recognized as having been the starting point for unparalleled volcanism and earth movements (earthquakes and landslides). When such phenomena occur under water, destructive seismic sea-

wave trains are generated that are commonly called tsunamis. These waves are often erroneously called "tidal waves" but the term "tsunami" is equally a misnomer, as the world-renowned oceanographer Willard Bascom humorously points out:

"The general public has long referred to these waves as tidal waves, much to the annoyance of American oceanographers who are acutely aware that there is no connection with the tides. In an effort to straighten out the matter they adopted the Japanese word tsunami, which now is in general use. Later they discovered that tsunami merely means tidal wave in Japanese, but at least the annoyance has been shifted overseas."²¹

Seismic sea waves, or tsunamis, are long period waves (on the order of 1,000 seconds) and possess wavelengths as long as 150 miles. In the deep ocean, these waves may be only a foot or two in height, but travel with speeds approaching 500 miles per hour. Bascom points out that such waves have little effect until they approach shallow waters where they become transformed into "rampaging monsters," reaching up to *135 feet in height*. Another oceanographer, Bernstein, shows that tsunami devastation is further increased by the fact that tsunamis travel in wave "trains" or series of up to 15 destructive waves, the third and eighth waves usually the most destructive. In some extreme cases these wave trains may have wavelengths as long as 600 miles.²² These repeating waves would pass by a particular point from between every 15 minutes to over an hour, depending upon the wavelength (measured from wave crest to wave crest).

The arrival of the first wave of a tsunami is often so deceptive that it can easily cost the lives of unsuspecting people. The first wave is often no more than a sharp swell, hardly noticeable, but is followed by a great and tremendous "suck" of water away from the shore, as the first wave trough arrives. Reefs are left high and dry, and people, amazed at the spectacle of a denuded beach, unsuspectingly run out to inspect flopping stranded fish and other bottom features, only to find themselves looking up at a huge and fatal wall of water. Once again, people may be trapped by the successive waves if they believe that after the first big wave it is all over, when in reality, the biggest waves are yet to come. Entire cities and hundreds of thousands of lives have been totally destroyed by a single tsunami wave train. A recent tsunami in Indonesia in July, 1979, wiped out four villages and scooped up tons of mud and sand *off the sea floor* and buried the villages, killing all inhabitants. These waves were small—only 30 feet high and traveling at 90 miles per hour.²³ In Hilo, Hawaii, where tsunamis hit on the average of once every 25 years, huge masses of coral reef were reported to have been torn loose from the sea floor and piled up on beaches.²² In the 1923 Sagami Bay tsunami, Japanese fishermen hauled in thousands of fish scooped ashore *from a depth of 3,000 feet!*²²

The mechanism of waves and wave train travel are shown in figures 9 and 10.²⁴ As a wave passes a point occupied by a water particle, a rotational motion is set up, and the water particle never travels laterally more than the diameter of its circle of rotation (orbit) describ-

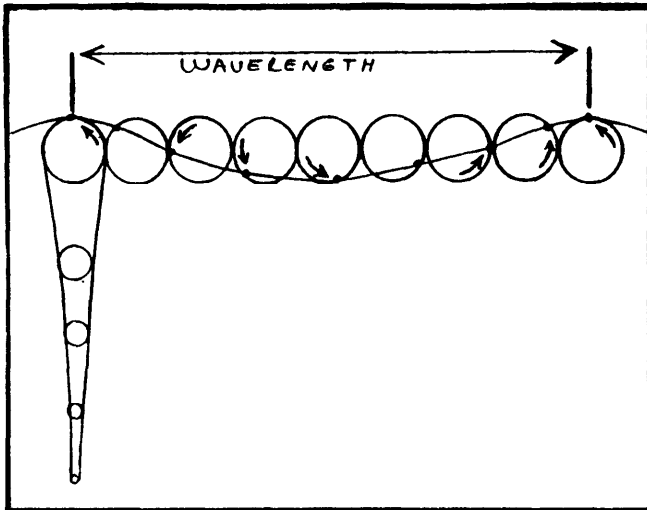


Figure 9. Water particles move in orbits as a wave passes by. As discussed by Bascom, Reference 24. For a discussion of the movements of water particles in other types of wave, see Clark and Voss, Reference 38.

ed by one wavelength (see Fig. 9). Furthermore, in some cases, the wave travels as a train of waves, the energy stored in the first wave being used up in setting water particles in motion in advance of the traveling wave train. Since the energy in a wave train is conserved, a wave appears at the end of the train at the same time as the frontal wave is disappearing (see Fig. 10). This, by analogy, explains why a first wave of a tsunami may move through shallow water relatively unnoticed, having been partially dissipated during the advance of the wave train.

When waves enter increasingly shallow waters, friction slows the wave front down and "piling up" of water occurs, heightening and steepening the wave until it becomes unstable and the wave breaks, changing from a wave of rotation to a wave of translation where water particle orbits are broken. Also a downhill flow of water along the bottom occurs in front of and into the breaking wave crest²⁵ (see Fig. 11). This process sheds light on the tremendous "suck" of water, with its

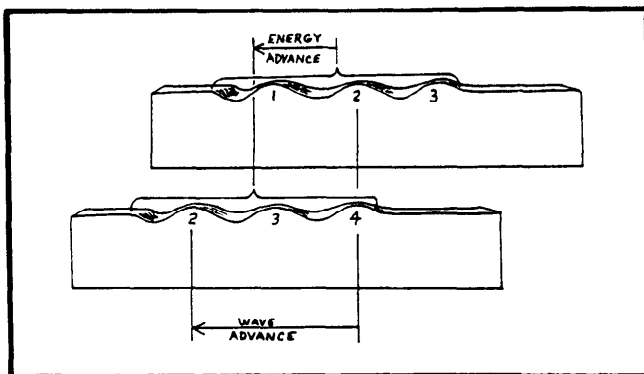


Figure 10. Moving train of waves advances at only half the speed of its individual waves. At the top is the wave train in its first position. At the bottom the train, and its energy, have moved only half as far as wave 2 has. Meanwhile wave 1 has died, but wave 4 has formed at the rear of the train to replace it. As explained by Bascom, Reference 24.

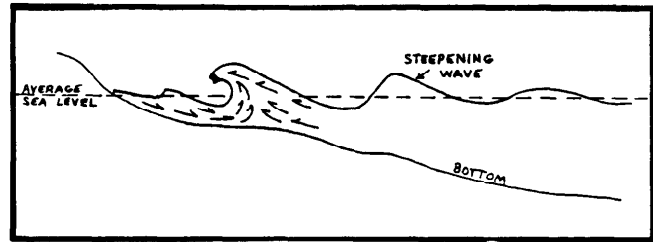


Figure 11. The flow of water in a breaking wave. Modified after Bascom, Reference 21.

powerful erosive force, that precedes the arrival of a mountainous tsunami crest.

It should be obvious that the events of the Flood, i.e., submarine volcanism, earthquakes and landslides, would be inestimably more frequent and of much greater magnitude than those of the present times, possibly producing tsunami trains by the thousands all over the world, with magnitudes greater than 135 feet, dwarfing present-day tsunamis. Since the destructive (erosional and depositional) aspects of tsunamis occur in shallow water, it follows that no part of a continental mass would be exempt from tsunamis, since shallow-water stages would at some time exist for all land areas, both for the *submerging* and *emerging* stages of continents during the Flood (see Fig. 12). This is the first and most significant implication of the effects of tsunamis during the year of the Flood.

Secondly, deposits would occur from a variety of directions with different source material areas for each seismic wave train. A seismic wave train would radiate out in all directions from the epicenter, or point-source of the submarine earth shock. Thirdly, with simultaneous or nearly simultaneous earth movements, resulting tsunami deposits may occur in conjunction with other deposits to form what is commonly referred to in geologic terms as *facies deposits* (see Fig. 13). Facies are areas where two (or more) rock types blend in, or interfinger with one another. These rock units are usually geologically time-equivalent, but represent different source areas for their sediments. Simultaneous tsunamis easily explain such facies. Earth upheavals and movements of nearly simultaneous occurrence would have been commonplace during the year of the

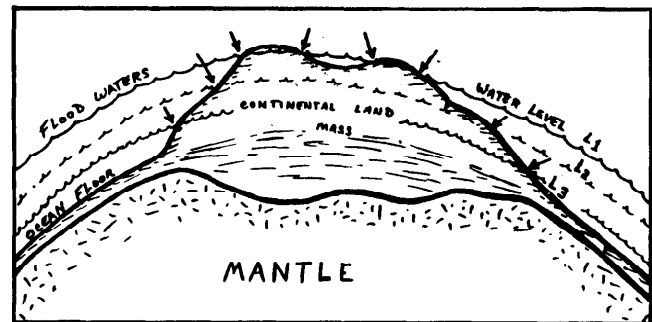


Figure 12. Cross-section (not to scale) of continental land masses at different stages (indicated by L₁, L₂, and L₃) of submergence by Flood waters. Arrows point to areas devastated by giant tsunamis generated by the great earth movements of the Flood. As the water level changed, no area of any continent would have been exempt from erosion and deposition by the tsunamis.

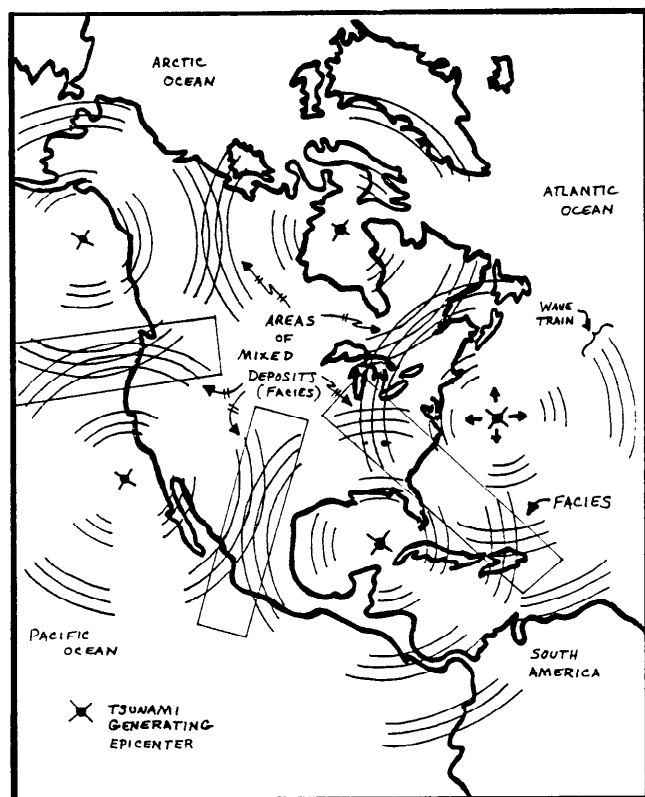


Figure 13. Facies deposits could have resulted from simultaneous, or nearly so, tsunamis originating from widely diverse areas. Sudden underwater crustal movements, occurring by the thousands during the Flood year, generated tsunami waves which picked up sediments and redeposited them as the energies of the waves were dissipated. As the waves traversed differing areas, e.g. continental or marine, and collided with one another, an intermixing of lithologic types would have occurred. Six such areas of mixing are shown here, four of them being outlined in the three rectangles. The wave trains would have radiated outward in all directions from the respective epicenters.

Flood, with a final burst of activity at the close with the raising of the mountains and deepening of the valleys to receive the Flood waters as described in Psalm 104. This deepening can be interpreted to mean that ocean basins, once small, were enlarged and downfaulted to their present size and depth. Such processes would have generated a whole new series of tsunami deposits. The continental upthrusting at this time would have created great runoff erosion on the emerging, draining land masses. The resulting scouring action and redeposition of already once-deposited materials would create the effect of "older" deposits being placed on top of younger deposits, as in the cases of so-called inverted strata.

Finally, the areas covered by such deposits from giant Flood-related tsunamis would vary in size from small deposits of a few square miles to an upward limit of tens and perhaps hundreds, of square miles. As described above, such waves would yield the ideal conditions needed for fossilization—rapid and complete burial—and would easily match the conditions cited by Whitcomb and Morris of instances of rapid burial and fossilization. An excellent example of this is the estimated one billion red herring buried in a four-square-mile area in Miocene deposits in California.²⁶

The application of tsunamis to the Thornton deposit and to the whole of the Niagaran "reef" archipelago of Lowenstam can be explained as follows. Using the ancient shorelines suggested by modern geologists, the reef archipelago is seen to present an ancient shoreline that could have received tsunami deposits from offshore shoal and reef areas (see Figs. 14 and 14.1). The archipelago deposits could actually represent a series of seismic sea waves occurring within a short period of time. Interestingly enough, reference to modern shoal areas provides us with some striking similarities to the inferred ancient landform (see Fig. 15). For instance, a tsunami-generating epicenter in or near Hudson Bay would be easily analogous to a hypothetical epicenter near the Great Bahama Bank shoal and reef areas. The shorelines of Florida, Cuba, and Mexico would be

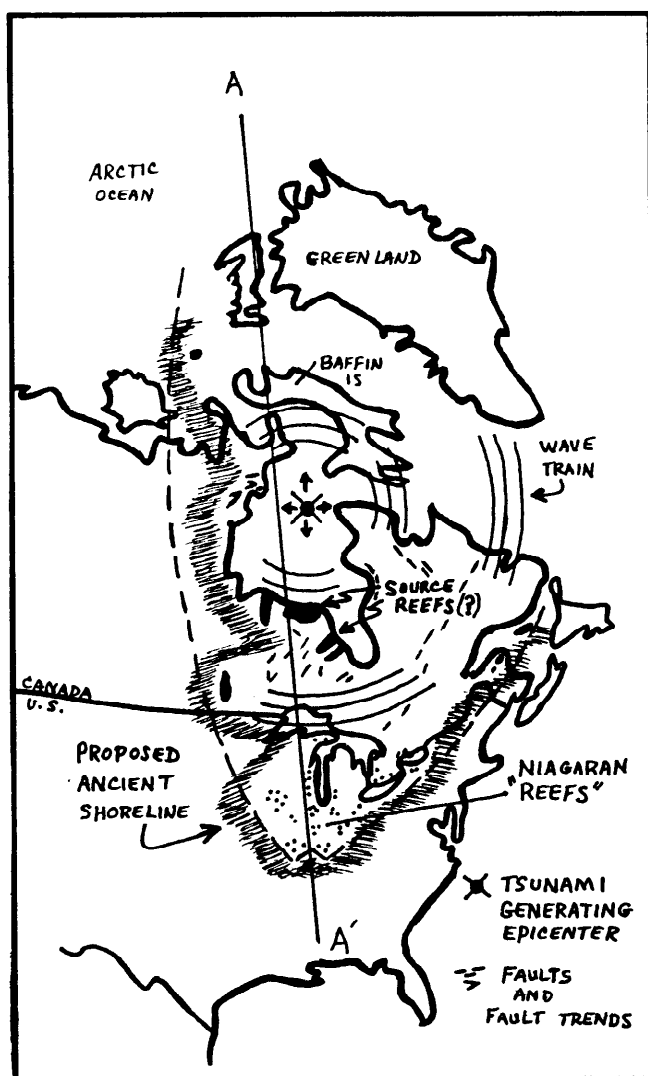


Figure 14. Possible source of archipelago "reef" deposits. Tsunamis generated in the general area of Hudson Bay could have torn loose ancient coral reefs (growing on "Precambrian" bedrock) and transported the material to final resting-places along the ancient shoreline. The location of the suggested ancient shoreline and its relationship to the coral deposits is intended to show the possibilities, and is not claimed to be accurate in detail. The tectonics are after Badgley, Reference 35.

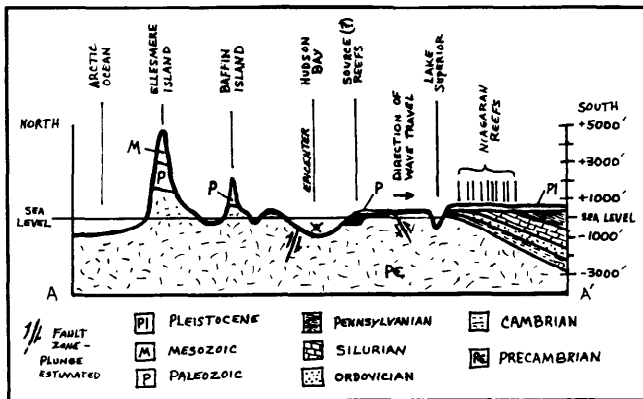


Figure 14.1. A vertical cross-section along the north-south line A-A' in Figure 14. Geological formations are depicted, including a "basin" containing sedimentary deposits south of the Great Lakes, reaching to a depth of 3,000 feet. Topography and geology according to References 36 and 37, respectively. Note that the vertical scale is greatly exaggerated.

analogous to the ancient shoreline represented by the archipelago arc, acting as receiving areas for sediments dislodged by giant tsunamis.

Storm Surges or Storm waves

Another type of destructive sea wave of astonishing power is the storm surge or storm wave, which is associated with high winds of long duration, such as found in gales, hurricanes and typhoons. The great wind of Genesis 8:1 that evidently helped to abate the water from the land must have intensified the magnitude of normal storm surge destructive power. While areas thus affected would be considerably smaller and more localized than those affected by tsunamis, the erosive effects on exposed shorelines

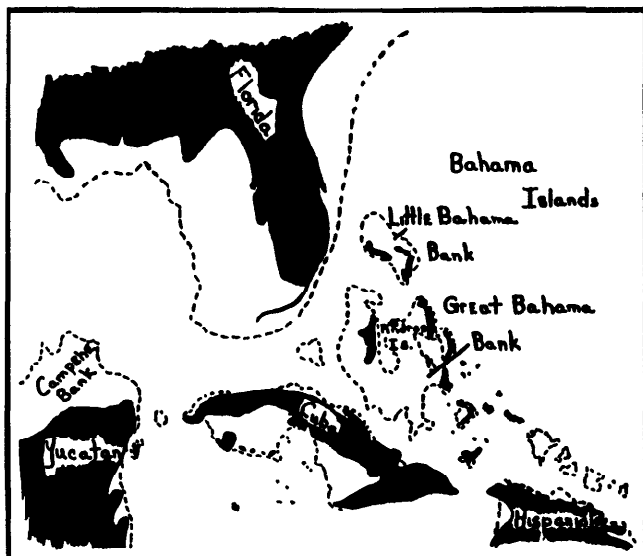


Figure 15. Modern shoal areas in the Caribbean Sea and vicinity may be analogous to certain pre-Flood landforms. Those pre-Flood landforms served as sources of material which, transported by Flood-sized giant tsunamis, was deposited in the Great Lakes region as the allochthonous deposits which are called Niagaran "reefs".

would have been disastrous. Waves of nearly 125 feet in height have been seen in modern storm surges which have thrown rock masses about as if they were pebbles. Bascom cites various events where rock and concrete breakwater fragments weighing over 2600 tons were tossed about, with a calculated wave pressure of 6340 pounds per square foot. In another case the instantaneous wave pressure was computed at 2500 psf. The highest wave pressure measurement on record occurred at Dieppe, France, in 1938 with calculated instantaneous pressures of 12,700 psf.²⁷

Although storm surges are smaller in scope than tsunamis, an understanding of them can play an important role in deciphering localized Flood deposits in the geologic record. Storm surge deposits (and erosion) would have affected the earth the most during the last half of the Flood. It is particularly interesting to note that wind-driven wave energies increase exponentially with wind velocity (see Fig. 16). It follows that the violent, high-velocity winds caused by sharp temperature differentials produced by the collapse of the water-vapor canopy³² would have produced spectacular storm surges.

Tidal Waves

We now come to the phenomenon which may prove to be the most significant of the Flood-related agents of erosion and deposition. At the outset, let us recognize that present-day tides are mild and relatively unspectacular as an erosional and depositional agent. However, today's tides are trapped between continental masses, producing unusual and restrictive influences on

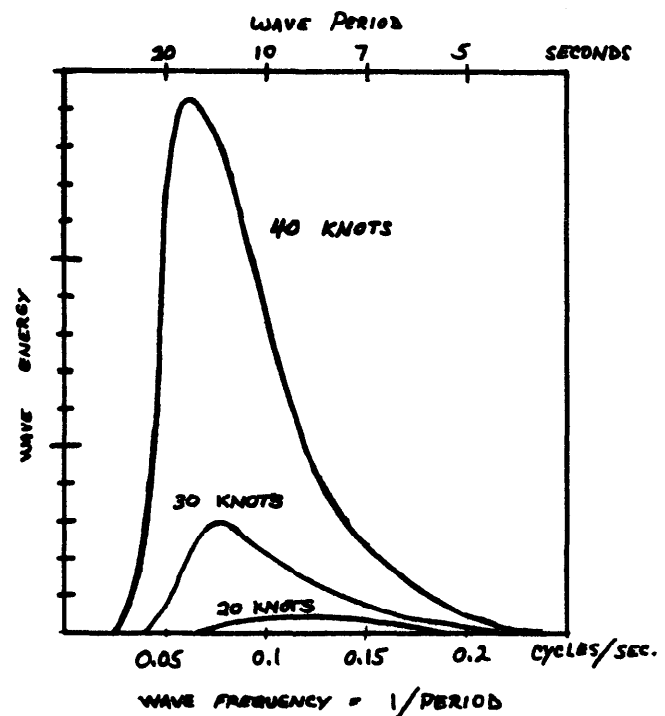


Figure 16. How the wave energy depends on the frequency or period, and on the wind speed. As the wind speed increases from 20 to 40 knots, the wave energies increase exponentially. As shown by Bascom, Reference 21, p. 51.

tidal movements, whereas during the Flood, tidal movements would have been unhindered, for the most part, by continental masses. Conceivably, the same astronomical forces acting on today's oceans would have produced results very different during the Noahic Flood.

There are many depositional features in the sedimentary rocks of the earth that simply cannot yield themselves to a tsunami, storm surge, or any other conventional explanation. The deposits directly underlying the Thornton Quarry deposits are just such deposits and are of particular interest to this discussion. We cannot attempt to explain the origin of the Thornton deposits without also dealing with the rest of the geological formations underneath, and therefore it is of utmost importance to address their origins as well.

Underlying the Thornton deposits are massive formations of Cambrian and Ordovician strata. As previously mentioned, well-log data show these formations to consist of limestones, sandstones, and shales, some of which are highly fossiliferous, and extending to a depth estimated at nearly 2500 feet in the Chicago area. These deposits continue to deepen to the south as the Precambrian basement rocks form a basin, an ancient landform, in which the sediments accumulated. These deposits occurred prior to the emplacement of the Niagaran "reefs." One of the smaller of these formations is the St. Peter Sandstone, which will be briefly discussed (see Fig. 17).

The St. Peter Sandstone has long been an object of interest to geologists because of its purely-sorted, well-rounded quartz sand covering a vast area (see Fig. 18). The St. Peter formation covers over 225,000 square miles and portions of eleven states, averaging 75 feet in thickness.²⁸ The St. Peter Sandstone is famous commercially for a variety of industrial uses including glass manufacturing because of its exceptional purity and uniformity. But of primary interest to us is the sheer size of this highly sorted, single deposit. Remembering that this is a *smaller* member of the formations underlying

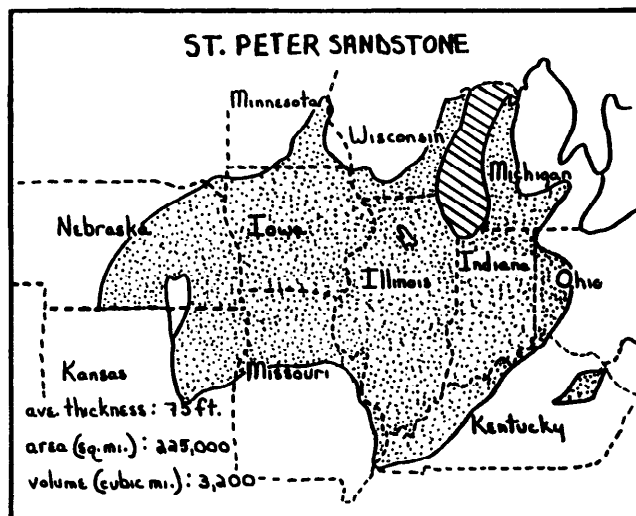


Figure 18. Extent of the St. Peter Sandstone, Reference 28.

Thornton, it becomes obvious that we must deal with geological forces of much greater significance, affecting much larger geographical areas, than agents such as rivers and streams, tsunamis, turbidity currents, underwater landslides, etc.

This brings us to the wave form called (correctly, this time!) tidal waves—especially as related to the shallow-water effects generated by global tides. A brief description of the forces operating in gravity waves (tides) follows. As previously stated, the purpose of this paper is not to explore exhaustively any phenomena, but as a preliminary study it is designed to stimulate further research by able investigators. Those desiring a more complete description of tidal forces and related phenomena will find a wealth of information in the references cited. The following discussion will be appropriately abbreviated.

Without a doubt, the amount of energy involved in tidal movements dwarfs anything discussed thus far. Tides are incredibly complex phenomena, but the major driving forces are astronomical gravitational attractions, primarily from the moon and secondarily from the sun. It may seem strange that the sun's influence on tides is only about forty-six percent as strong as the moon's, especially when the gravitational force of the sun is so much larger than the moon's gravitational force. The answer lies in two facts: 1) the moon is much closer to the earth than is the sun; and 2) tide-raising forces are horizontal forces, known as "tractive" forces, which are exerted on waters *not* directly under the moon, pulling them toward a point that is under the moon. The tractive tide-raising forces are inversely proportional to the *cube* of the astronomical distances, whereas the strength of simple gravitational attraction varies inversely with the square of the distance. Even though the sun is 27,000,000 times as massive as the moon, the effect of the cube of the distance to the sun (93,000,000 miles) greatly outweighs its gravitational force when compared to the cube of the distance to the moon (239,000 miles average) and the moon's gravitational force. Thus the moon, being much closer, has the dominating effect on the tides.²⁹ (The inverse cube rela-

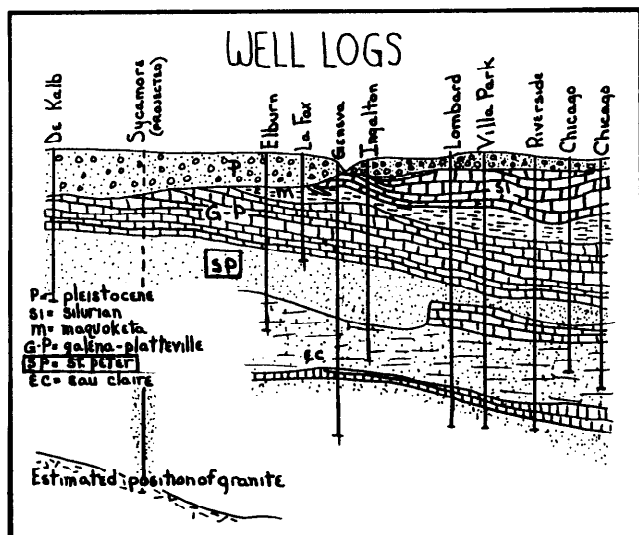


Figure 17. Well-log data on sediments underlying the Silurian "reef" deposits. Modified after Bretz, Reference 3.

tionship also explains, incidentally, why planets, even when in "super-conjunction" with one another and the sun, would have little effect upon either ocean tides or land tides on the earth.)

It is easy to see why a tidal bulge forms on the side of the earth facing the moon, but it is not so obvious why a similar tidal bulge forms on the opposite side of the earth. The answer becomes apparent when we realize that since the earth and the moon attract one another, they revolve about a common center of gravity as an earth-moon system. Thus the moon does not revolve around the center of the earth. Rather, both the earth and the moon revolve around this common center of gravity which is located under the surface of the earth, about 3,000 miles from its center (see Fig. 19). Simplistically speaking, the movement about the common center of gravity, or center of mass, produces a centrifugal force that tends to hurl the oceans into space on the side of the earth opposite the moon. Of course, the earth's gravitation prevents such a catastrophic occurrence, but a second tidal bulge is thus produced. Because of the complexity of the forces involved in producing the second tidal bulge, different writers will use different illustrations to explain how the second bulge is formed, in an effort to simplify concepts. For further study, a good analysis of these complex forces is given by Dr. Edward Clancy, chairman of the Mount Holyoke College physics department, on pages 12-23 in his book *The Tides: Pulse of the Earth*, published in 1968 by Doubleday & Co., New York.

Since the moon's orbit is actually inclined from the axis of the earth, the moon will move alternately from the Tropic of Cancer to the Tropic of Capricorn (see Fig. 20). The result of this alternate movement is that the area of the earth affected by the highest water will alternate between the limits of the declination of the moon, or approximately between the limits of the two Tropics. Polar tides are minimal.

As is apparent from Fig. 19, if the earth were totally inundated, water would exist as two huge bulges on the

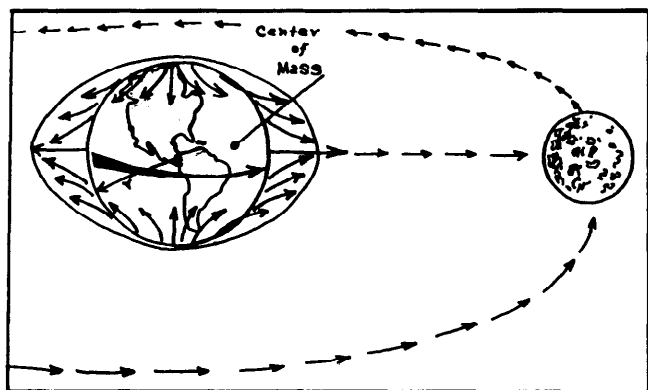


Figure 19. How the water, as a result of the attraction of the moon, bulges to produce the tides. Here the moon is shown in the earth's equatorial plane; under those circumstances the highest tides would be expected at or near the equator. The effect of the sun, being less, modifies that of the moon, either helping it to cause spring tides, or counteracting it to cause neaps. This drawing is not to scale; in particular, the bulges are greatly exaggerated. The arrows toward the moon indicate its gravitational pull; those the other way the forces causing the other bulge.

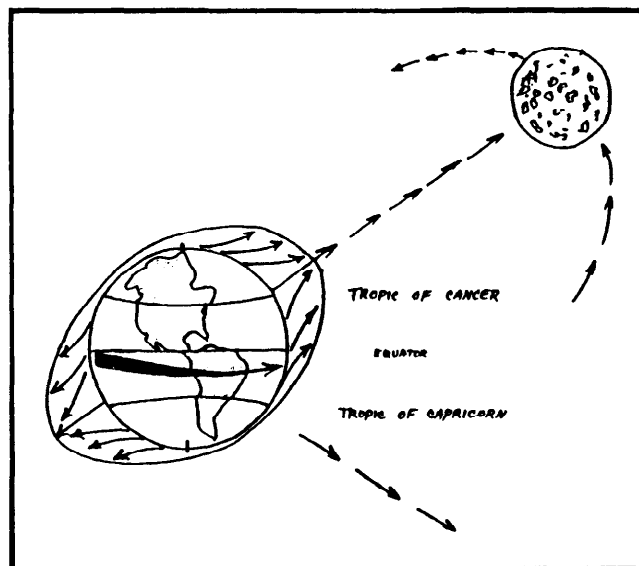


Figure 20. The highest tides—the greatest bulges—would move north and south, approximately between the tropics of Cancer and Capricorn, about once a month, because of the inclination of the moon's orbit to the plane of the equator. (The plane of the moon's orbit shifts, moreover; but probably not much in the one year of the Flood.) Modified after Bascom, Reference 21, p. 89.

earth, and as the earth rotated once completely in 24 hours, a point on the earth would pass through these two bulges of water. Actually, since the moon's orbit is in the same direction as the earth's rotation, but at a much slower rate, the given point on earth would travel slightly farther, and so take longer, to pass through both bulges completely—a total time of 24 hours 50 minutes. (The relative direction of travel of tides on the surface of the earth would be from east to west.) Since the circumference of the earth is approximately 24,900 miles and the full rotation time for a given particle to intersect the same high water bulge twice is 24.833 hours, then the velocity of the crest of the tidal bulge over a

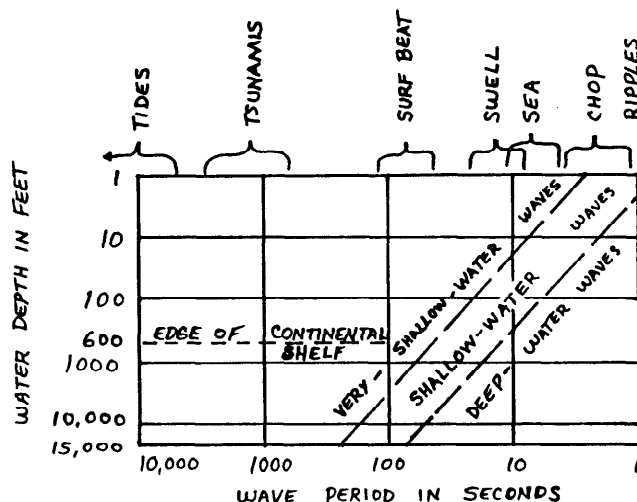


Figure 21. Chart identifying waves by types. Tides and tsunamis are both very-shallow-water (in the sense that the water is shallow compared with the great wavelengths) waves of very high velocity and long wave period. After Bascom, Reference 21, p. 66.

given point on the earth is nearly 1003 miles per hour. In terms of wave period and wavelength, the wave period, from crest to crest, would be 12 hours 25 minutes (44,700 seconds) and the wavelength would be approximately 12,450 miles (see Fig. 21). In theory, this would be true if the oceans averaged 14 miles in depth. However, with an average depth of only two miles, the speed of the tidal crests in an inundated world would be between 800 to 1,000 miles per hour, with shorter wavelengths and periods.

These long-period waves of high velocity on an inundated earth clearly resemble the tsunamis (which also are long-period, high-velocity waves), but on a much larger scale. The shallow-water effects of these tidal waves, as with tsunamis, cause a steepening and heightening of the waves as bottom friction slows them. *Like* tsunamis, the effects of tidal bulges are negligible in deep water but increase rapidly in shallow areas. *Unlike* tsunamis, which gain their energy by single impulses, storing that energy in the wave train until it is dissipated, the tidal wave has energy continuously being imparted to it by the gravitational tractive forces of the moon and sun, so that in conditions that cause dissipation of energy, the tidal wave's energy will be operating much longer. Again, unlike tsunamis, which have a point source (epicenter) and travel in a radiating circular pattern, the tidal wave front travels more linearly, even though it may be altered gyroscopically by the earth's spin (the Coriolis effect).

The normal question at this point is, "Why don't we see such great effects in our present day world due to tidal movements?" The answer appears to lie in at least two areas. First, continental land masses effectively contain tides within each ocean basin and completely prevent the formation of a single wavelength, while on an inundated earth not only could complete wavelengths form, but they would be free to resonate, increasing their effects. Secondly, the frustrated tidal movements of today's oceans are dominated by the Coriolis effect, or gyroscopic effect, of the rotating earth. A look at cotidal charts of the Atlantic Ocean reveals that since the tides cannot circle the earth, the Coriolis effect causes a circling of the high tide fronts within the ocean basin that looks like the system of cyclonic movements so common in our atmosphere³⁰ (see Fig. 22). Cotidal charts in the Pacific and Indian Oceans show similar circulations.

Because of the difficulties in actually measuring tidal depths in the deep oceans, cotidal charts are somewhat hypothetical, but the rotational effects are well established. As in Fig. 22, the point of intersecting lines is a hypothetical point of no tidal elevation change, called an amphidromic point, while each radiating line represents sequentially the position of highest tide with the passing hours. It is interesting to note that while the Coriolis effect produces clockwise *ocean currents* in the Northern Hemisphere, the direction of high tide movement is just the opposite.

It should be noted at this point that with a vertical rise or fall in tidal elevations there are generated powerful underwater lateral currents called tidal currents. It is these strong currents, covering perhaps hundreds of miles in breadth on an inundated world (responding

also to the Coriolis tidal movements as well as the primary vertical tidal movements), that may be responsible for vast areas of sorting and deposition during the Flood. It is these currents, enhanced by the greatly magnified and resonating tidal wavelengths, that could sort and uniformly deposit such large-scale formations such as the St. Peter Sandstone. Tsunamis, volcanic activity, underwater landslides, etc., would be the primary agents for scooping up or stirring up vast amounts of heavy sediments, so that the highly energized tidal environment could hold this material in partial suspension as it transported it over large areas. With the nearly continuous occurrences of catastrophic phenomena—earthquakes, tsunamis, storm surges, volcanism—a great abundance of sediments, rock fragments, soil, chemical precipitates, volcanic ash, and plant and animal remains would have been freshly injected into the Flood waters on nearly a continuous basis. Temporary lulls in such activity would probably coincide with the deposition of the larger formations, while periods of renewed and increased activity would coincide with periods of erosion of freshly deposited materials.

It is particularly noteworthy that by far the thickest deposits occur *only on the continental land masses*, while deposits in ocean basins are quite minor by comparison. This situation confirms the fact that the shallow-water effects of the forces of the Flood are enormously more energetic and potent than anything occurring in deep water. It may at first seem quite odd that the greatest depths of deposition would occur on the already-elevated continental mass, but, in fact, this situation is clearly dictated by the physics of the forces acting in water, as they are brought to points of focus in shallowing waters, finally impinging in multiplied fury at the land/water interfaces.

An interesting theoretical adjunct to tidal wave discussions is related to the dampening effect of reflected waves of differing wavelengths. Modern tidal theory treats most wave systems as standing waves of oscillation, operating in an environment enclosed on at least 3 sides. Even large bodies of water are treated as enclosed "channels" with a land barrier at one or both ends. This obviously suits the present-day situation, but in the Flood environment, with no land barriers from which to reflect, many of the standing waves of different periods and wavelengths, tsunamis included, would gradually dissipate one another, transferring their energies into the dominant oscillations travelling around the world. A wave model for a completely inundated world would have to include "channels" of infinite length in order to begin to explain wave behavior during the Flood. The result of waves traveling in infinitely long "channels," in many cases, would be to enhance and further amplify the existing dominant waves (i.e., tides) traveling unopposed around the earth.

In view of the foregoing discussions, the hypothetical results of tides moving on a totally flooded earth, having continents as the shallow-water areas, are as follows.

- 1) Tidal waves would be able to establish completed wavelengths, able to resonate around the earth producing amplified high crests and low

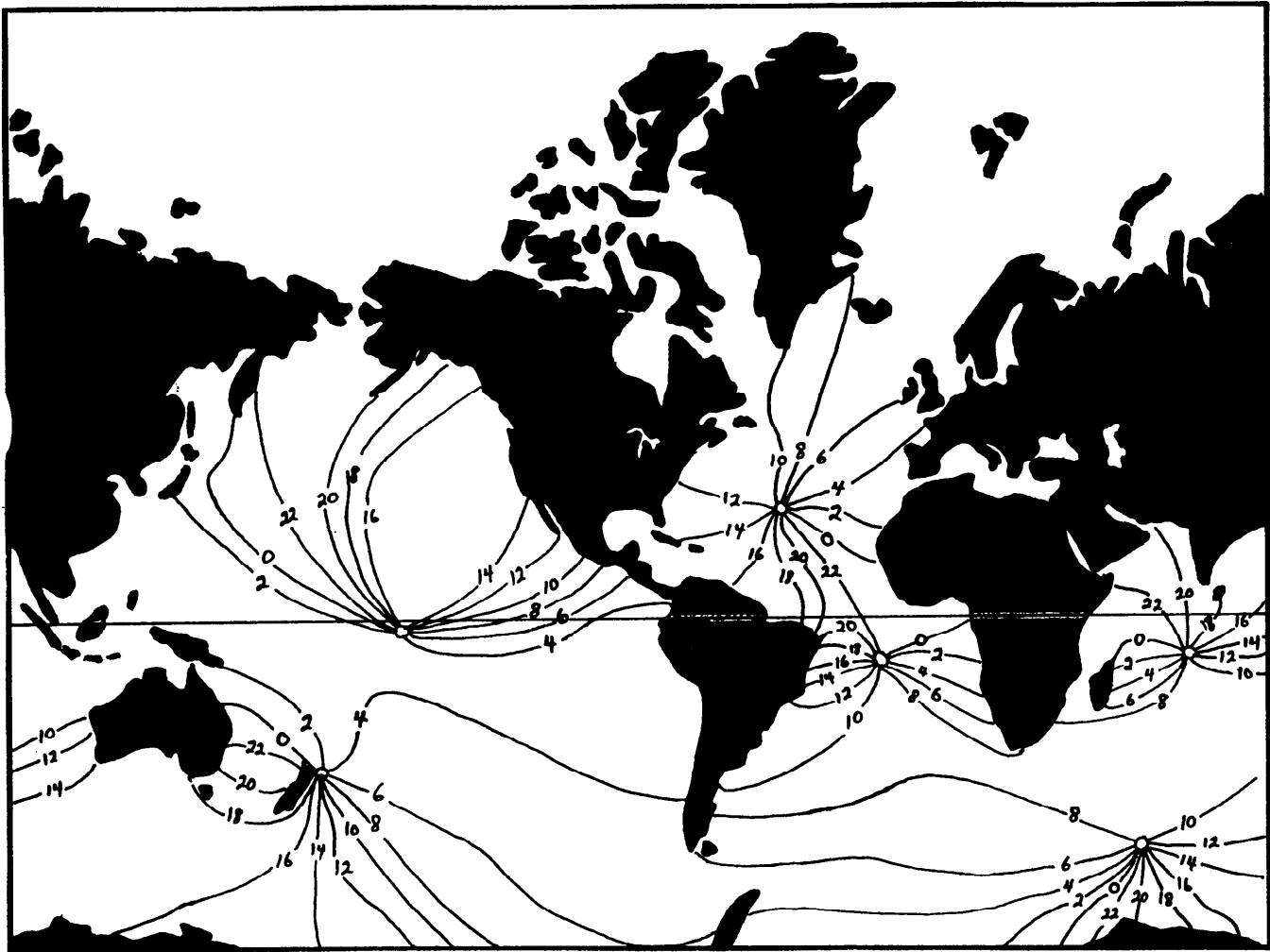


Figure 22. Cotidal chart of the high tides in the oceans. The tides, being trapped in the ocean basins, rotate in each basin, (rather as if the numbered lines were spokes of a somewhat distorted wheel) due to the Coriolis effect, i.e., the effect of the earth's rotation. The amphidromic points, the points to which the numbered lines converge, have no tidal elevation change, while each radiating line represents the passage of high tide at a different hour of the day. On a certain day, for instance, along a line marked "O" the high tide would come at midnight, along the line marked "2" at 2 A.M., etc. It is interesting to notice that, on the whole, the numbers go around clockwise in the Southern Hemisphere, counter-clockwise in the Northern. After Macmillan, Reference 30, p. 70.

troughs, with a crest velocity approaching 1,000 miles per hour.

2) Since tidal waters can represent waves of translation as well as waves of rotation, shallow-water effects similar to but less pronounced than those produced by tsunamis might be expected, transporting and depositing huge amounts of sediments.

3) Tsunami-like shallow-water effects would not lose their energy as fast as actual tsunamis would, due to continuously imparted gravitational energy, so that depositional effects would continue longer and cover much larger geographical areas.

4) The Coriolis effect, causing cyclonic movements in tidal waters, would influence the direction of transport and deposition of sediments. Such giant circulation of waters could conceivably be as large as the continental United States. The Coriolis effect provides an obvious

solution to the problem that many of the earth's deposits exhibit differing directions of transport and deposition.

5) Swift and powerful lateral tidal currents, perhaps covering areas of hundreds of miles across, would be generated by the unusual vertical tidal movements and aided by the Coriolis effect. Such currents could scour, sort and evenly redeposit entire regions over short periods of time, being the most important of the depositional agents of tidal forces.

6) Tidal forces probably would not be able to match other forces (tsunamis, storm surges, earthquakes, volcanism) in their destructive and erosional capabilities, but tidal phenomena would be the primary agents for carrying vast amounts of sediments and causing deposits of great uniformity covering hundreds of thousands of square miles. Much of the sediments carried by tidal currents would be derived from tsunami activity. No

other depositional agent can adequately explain large formations.

7) The cyclical effects of the passage of two bulges of water each day, with all of the above phenomena occurring each time, would give rise to cyclical bedding.

8) The changing position of the moon from one Tropic to the other in its inclined and elliptical orbit about the earth, with the accompanying changes in tidal depths and energies, would give rise to rhythmic changes *within* such cyclically bedded structures, as in *cyclothems*.

9) The sheer weight of the bulges of water in the amplified tides of the Flood would cause isostatic adjustments, which in turn would trigger earthquakes, causing additional tsunamis.

10) With such extreme oceanic movements, and with the mixing of changing and totally different underwater zones, chemical precipitation of limestones, dolostones and even many of the so-called evaporites could have occurred due to rapidly changing temperatures, pH and chemical concentrations, particularly in volcanic areas. It is interesting to note that some chemically precipitated limestone has been observed not to differ in crystalline structure from biogenetically produced limestone.³¹

11) All of the above effects would have their most dramatic results in the shallow waters of continental regions, with only small, incidental effects in deeper oceanic regions. Thus sedimentation on continents (and erosion) would occur at several times the order of magnitude as in deeper waters. This fits current observations of continental and oceanic deposits.

12) These effects would be at their height primarily during the deepest part of the Flood. The emergence of land masses would quickly diminish the above listed results, particularly when enough land arose to disrupt the tidal wavelengths.

Synthesis

It is now possible to synthesize a working hypothesis for the formation of the Thornton "reef" deposits and the underlying strata. By the mechanisms outlined above, it appears that the massive Cambrian and Ordovician strata underlying Thornton, including the St. Peter Sandstone formation, is primarily a mid-Flood deposit. Plant and animal materials, along with sediments broken loose by earthquakes, volcanoes, tsunamis and other forces were deposited in final form by the massive tidal action of the Flood during the months of deepest inundation. Judging from the direction of transport and deposition ascribed by modern geologists to the sediments underlying the Thornton "reef" deposits,³³ it appears that this direction may be interpreted as being the result of tidal wavefronts driven by the Coriolis effect, which created massive tidal currents that swept over shoal areas and Canadian Shield areas into deeper basins (see Fig. 23). Thus, the deep underlying massive sediments may be relegated to

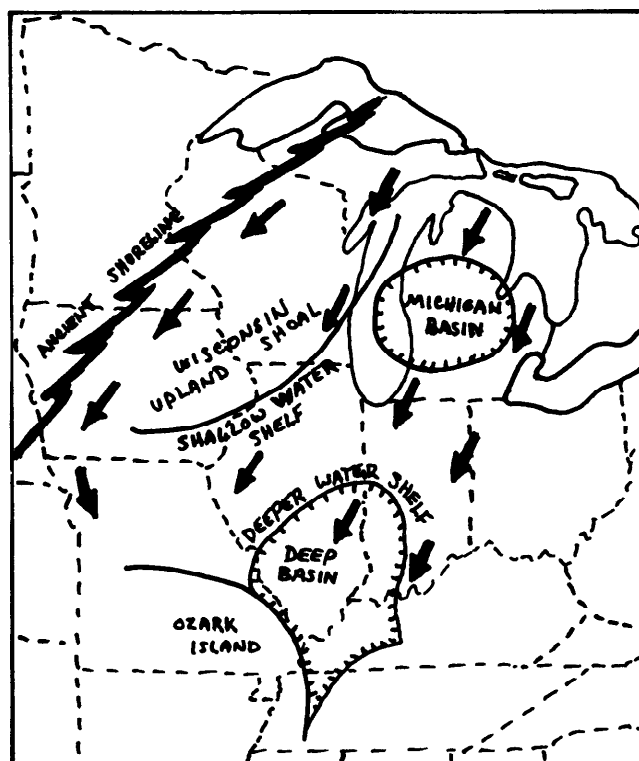


Figure 23. Direction of deposition over basement rocks into the basin areas of Illinois, Indiana, and Michigan. The arrows show the general direction of the transportation of materials to form the St. Peter Sandstone. (The ancient shoreline shown here is as proposed by Dapples to explain the direction of deposition in uniformitarian terms.) As the midwest area basin was filled with Cambrian, Ordovician, and Silurian sediments, and as the continental land mass began to emerge from the Flood, a new shoreline emerged to receive the Niagaran "reef" deposits, which were probably brought by tsunami-type waves. (Refer to Figure 14.) This is a composite drawing, with information from Dapples, Reference 33, and Lowenstam, Reference 34.

the action of tidal waves and currents in the Catastrophic-Wave Action Model. Tidal waves and currents would also be primarily responsible for massive limestone deposits, derived from chemical precipitation occurring with rapidly changing temperature, pH and chemical conditions. The purity of precipitation deposits would be enhanced by a rapid rate of chemical precipitation, while longer periods of deposition would greatly increase the chances of contamination by other materials.

Following the mid-Flood deposition attributed to tidal effects, a rapid emergence of continental land masses started to occur, triggering additional violent crustal movements which, in turn, caused large numbers of tsunamis to sweep over newly emergent shorelines. The newly formed Silurian deposits, being uplifted, became a shoreline area capable of receiving coral reef fragments torn loose and transported by tsunami-type waves. The source area for these reef materials could have been actual antediluvian reefs growing on Precambrian basement rocks in the general area of present-day Hudson Bay. It could also be that the very large area of reef deposits embedded in the Paleozoic sediments on the southern edge of Hudson

Bay (refer to Fig. 14) are actual reefs with footholds on the underlying Precambrian, that were in place before the Flood. At any rate, the allochthonous reef deposits at Thornton and elsewhere along the archipelago are most probably the result of tsunami wave deposition.

It is also during this time that the great wind of Genesis 8 would have been in operation and thus storm surge deposits also could have been expected in the area. Such deposits might be represented by the material piled on top of the Thornton reef blocks, causing moderate anticlinal dips throughout the area. The continuing emergence of the continental land masses would have uplifted these deposits, and probably would have caused steepening of the angles of dip to their present attitudes. And finally, a thin layer of Pleistocene sediments covered the area as a result of a brief glacial period.

Thus, it can be seen that the Catastrophic-Wave Action Model can be effectively used to offer explanations of all the deposits at Thornton, from the allochthonous reef deposits and all of the underlying massive strata down to the Precambrian basement rocks. The incorporation of three catastrophic wave-types conforms well to the forces in action during the Flood, as revealed by Scripture. While no doubt there are weaknesses and deficiencies in the model as presently developed, it nevertheless provides a unified approach for explaining much of the sedimentary structures of the earth, as well as those of the Thornton area. A topic deserving investigation in relation to Flood deposits would be turbidity, or density, currents. Their role could be very significant in localized areas.

With the synthesis completed, an outline of the summary points of this paper follows.

Summary Points

A. Thornton Quarry deposits cannot be true reef deposits for the following reasons:

- 1) no solid footing available for reef growth;
- 2) "reef core" does not exhibit growth structures;
- 3) red calcareous algae, the main reef builder, is totally missing;
- 4) flank deposits are too steep for underwater angle of repose; and the "core" could not be the source of deposits that are stratigraphically above the core, nor the domelike structure;
- 5) actual exposed reef shape does not correspond to modern reefs;
- 6) similar massive shallow-water limestone deposits are not occurring in today's reefs;
- 7) the ubiquitous fossil "tar" depicts rapid and complete burial of animals before they could decay—not like the slow processes of a reef.

B. The destructive forces given in the Scriptural Flood account are these:

- 1) torrential rain—great erosion;
- 2) breaking up of fountains of the great deep—volcanism, earthquakes, landslides creating gigantic and innumerable tsunamis, turbidity currents, etc.;
- 3) a great wind—produced storm surges; and

was probably also the primary source for late-Flood eolian deposits;

4) abating waters—great runoff erosion and redeposition creating canyons and deltas.

C. Mechanisms for massive flood deposits coinciding with and resulting from Biblical Flood events are these:

1) greatly magnified tsunamis, yielding localized catastrophic deposits up to hundreds of square miles;

2) enormous storm surges, yielding localized catastrophic deposits up to tens of square miles;

3) massive tidal undulations unrestricted by continental masses, yielding massive deposits over large areas (hundreds of thousands of square miles) and is the primary source of cyclical bedding.

D. Synthesis of Thornton Quarry deposit formation is as follows:

1) massive underlying deposits are result of tidal effects of Flood;

2) "reef" deposit is result of localized tsunami wave trains and possibly storm surges;

3) final folding of strata was result of final uplift tectonics;

4) Pleistocene deposits resulted from short, vigorous glacial period following the Flood.

Conclusion

This preliminary study on possible origins of Thornton Quarry deposits was done in an attempt to give creationists a reasonable alternative to the usual evolutionary hypothesis. While the conclusions of this study are also hypothetical, it should be noted that a satisfying synthesis of the origin of the Thornton deposits can be made from all of the known facts. These deposits do not fit the evolutionist requirement for a reef, but do fit the Biblical data given on the Flood, and the physical facts of the tremendous power and force available in highly energized and unrestrained waters. Thus, this synthesis is very satisfying from the standpoint that it can incorporate and assimilate such a variety of facts and phenomena. There is a wealth of creationist explanations and understandings available in the use of the Catastrophic Wave-Action Model.

This writer feels that the role of the tides and other wave phenomena have been too long underestimated or ignored by many creationists. Such sources of enormous power as outlined in this model should be investigated in depth. A greater understanding of the mechanisms of the Flood should not only increase our appreciation of the acts of God, but also may lead to the development of practical fields of endeavor such as "exploration Flood geology." A better understanding of the true nature of the world's deposits could lead to unique insights into the science of locating deposits of precious resources. Without a doubt, further research needs to be done on the Thornton deposits, in particular, but also in general topics such as the precipitation of limestones, evaporites, mechanics of ocean waves and turbidity currents, to name a few.

I submit the Catastrophic Wave-Action Model to researchers in creationism to test these ideas, to enlarge

upon them, to refute those that are in error and to discover new ideas that can give us a better understanding of the past record of earth's history that is preserved in the rocks. This writer is confident that all future discoveries ultimately will support the truth of the Word of God, and it is toward that purpose that these ideas have been presented.

Acknowledgements

Miss Jan Klopke, an art major at the College of DuPage, Glen Ellyn, Illinois, drew many of the illustrations.

The author wishes to thank also the following people who reviewed the manuscript and offered many valuable suggestions: Mrs. Ralph Boersma, West Chicago, Illinois; Mr. Jim Canon, Wheaton, Illinois; Dr. Phillip Passon, Glen Ellyn, Illinois; and Dr. M.E. Clark, University of Illinois, Urbana, Illinois.

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Panorama of Science

(Continued from page 136)

of one hundred names are given, which overlap in these regions. For instance, the geographical name "Ada" is found in Hungary, in Africa, and in India.⁶

It will be recalled, in this connection, that the vicinity of Hungary has yielded some of the oldest archaeological remains found in Europe.

Is it possible that this community of names is a relic of the dispersal, after the Flood or after the incident at Babel? Creationists might find a worth-while field of investigation here.

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AFTER THEIR KIND AND IN HIS IMAGE

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Received 23 May, 1979

A central point in the foundation of Creation Science is the immutability of biological types; these types regarded to be natural species. Limits imposed by a lack of interfertility define a natural species; i.e., two different natural species cannot reproduce (except possibly to yield infertile hybrids). Although not defined in the Bible, "kind," as used in the first chapter of Genesis, is generally assumed to be equivalent to a natural species—capable of wide variation but only within fixed and frequently unknown limits. This assumption is based on the idea of reproduction "after its kind."

In addition to kinds, the Book of Genesis speaks of created groups such as cattle, fowl, etc. If fertility were not the criterion, one might ask whether kinds exist within the fowl group, for instance, or whether multiple fowl groups exist within a kind. However, this turns out to be somewhat academic since a close reading of the biblical text reveals that the accepted meaning of "kind" is unsubstantiated, and the true meaning is far from being clear—possibly even beyond our understanding.

Consider Genesis 1:25.

And God made the beast of the earth after his kind, and everything that creepeth upon the earth after his kind . . .

The organisms were *created* after their kind. *Nothing* is

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said about their subsequently *propagating* after their kind.

The statement about plant life in Genesis 1:11 seems at first to uphold the traditional concept of "propagation after its kind."

And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after its kind, whose seed is in itself . . .

Unlike the foregoing verse, the meaning seen in this verse is strongly influenced by the sentence structure and the punctuation (supplied by the translator). It must be read as follows for compatibility:

. . . Let the earth bring forth grass, the herb, the seed-yielder, and the fruit tree, the fruit-yielder, after his kind, whose seed is in itself . . .

This reading finds further emphasis by its absence from Genesis 1:27.

So God created man in his own image, in the image of God created he him; male and female created he them.

"Kind" (Hebrew: *min*) is therefore not a biological entity but a concept—a design—after which plants and animals were created. Plants and animals were created from a design in the mind of God: man was created in the image of God.

The Biblical biological (reproducing) entities as created are cattle, fowl, man, etc. This relaxes the presently perceived limits of variation but has no impact on the essence of creationist thought; i.e., the specific separate creation of fully developed life forms.

THE EFFECT OF ELEVATED ATMOSPHERIC PRESSURE ON LIVING THINGS

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Received 15 February, 1980

The effects of increased pressure on the maximum voluntary ventilation, and the toxic or narcotic effects of individual atmospheric gases at sufficiently high partial pressures, are described. These matters could have been very important before the Flood if, as some believe, a vapor canopy then caused the atmospheric pressure to be considerably higher than it is now.

It has been pointed out that an antediluvian vapor canopy would result in a higher atmospheric pressure than we currently have.^{5,13} This fact has been used to both curse and bless the concept of a vapor canopy. However, these discussions have generally failed to examine what real (if any) limits exist for life as we know it. It is the purpose of this paper to present some of what is known about the interaction of atmospheric pressure and life.

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The present atmosphere is composed of 21% oxygen, 78% nitrogen, and 1% miscellaneous gases. At sea level, these gases exert a nominal pressure of 14.7 psi (pounds per square inch) which is the same as 1 ATA (atmosphere absolute). Each of the constituent gases contributes to the total pressure in proportion to its concentration. Thus the pO_2 (partial pressure of oxygen) equals 0.21 ATA, and the pN_2 is 0.78 ATA. Changing the pressure of a gas mixture proportionally changes the partial pressures of each of the constituent gases. Consequently, if air at 1 ATA were compressed to 2 ATA, the pO_2 would increase to 0.42 ATA.

Changing the atmospheric pressure effects living

things in two ways. The pressure by itself has an effect and the change in the partial pressure of the constituent gases has a different effect.

Pressure

Life can exist at quite high pressures. In the deepest parts of the ocean where pressures of 1,000 ATA exist, life has been found which ranges from bacteria to fish.¹⁰ Interestingly, these animals are so well designed for pressure that they usually cannot be brought alive to the surface. However, life at these pressures may only be possible to gill-breathing and lower life forms. Lung-breathing animals are much more limited.

As the pressure of a gas increases at constant temperature, Boyle's Law states that its volume must decrease, and as a consequence the density of the gas must increase. This increase in density causes an increase in the Reynold's number for the flow.

$$\text{Reynold's number} = \text{velocity} \times \text{diameter} \times \frac{\text{density}}{\text{viscosity}} \quad (1)$$

Reynold's number is a dimensionless measure of the probability of turbulence in a flow system. As the Reynold's number increases, the probability of turbulence increases until a critical value is reached where turbulence is essentially assured.

From equation (1) it can be seen that since velocity and diameter in the lungs is fairly constant, and the viscosity of gases changes very little until very high pressures are reached, the Reynold's number is a direct function of the gas density. The increasing turbulence in the windpipe and lungs causes a decrease in the maximum voluntary ventilation (MVV). This is a measure of the ability of an individual to move air into and out of his lungs and has the unit of liters per minute. The decrease in MVV with pressure is shown in Figure 1. By 6ATA, the encroaching MVV line has all but eliminated the possibility of the unduly heavy class of work. A person simply cannot move the air into and out of his lungs fast enough to do this class of work at this pressure. At higher pressures, the capacity for work is decreased still more. It is partly for this very reason that deep sea divers use a mixture of helium and oxygen (He-O₂). The helium is a less dense gas than the nitrogen it replaces and so restores some of the MVV. However, the MVV is not restored indefinitely. A 99% He-1% O₂ mix at 40 ATA has the same limiting MVV as air at 6 ATA.¹⁵

The use of He-O₂ mixtures presents two more problems. First, since the gas is less dense, the vocal chords vibrate faster and the sounds made are shifted upwards in pitch. This causes the so called "Donald Duck Effect" which degrades vocal communication. The second problem is that helium has approximately a six-fold higher specific heat than nitrogen. As a result, body heat is rapidly carried away and people are constantly cold.

Partial Pressures

As the pressure of a mixed gas increases, the partial pressure of its constituent gases is likewise increased. The consequence of increasing the partial pressures of

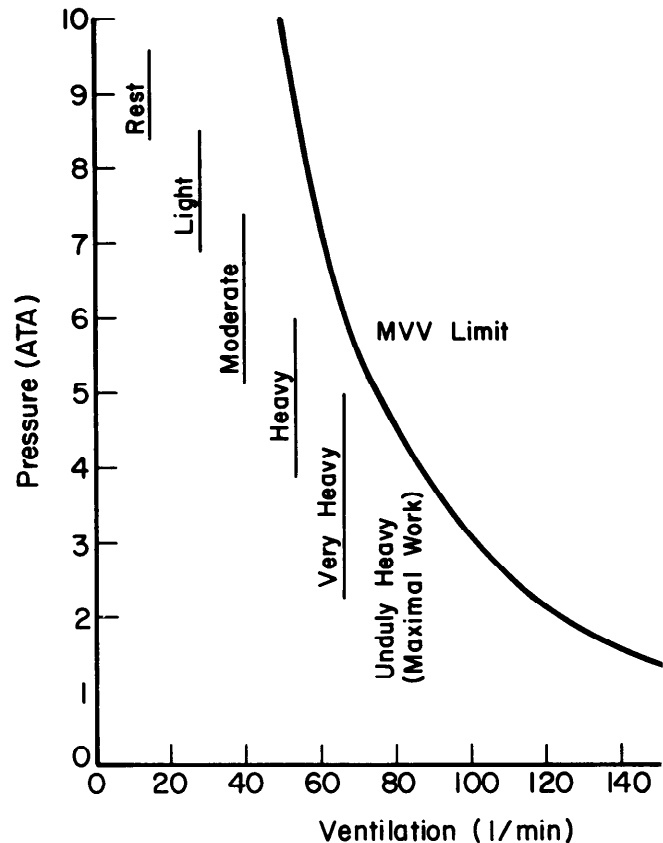


Figure 1. Limitation of MVV in air with increasing pressure. Work classifications are based on Christensen's classification of industrial work. Comparative examples of type of work are: desk work—lower light, cycling 5 MPH—upper light, Tennis—upper moderate, ditch digging—heavy, cycling 13 MPH—very heavy, chopping wood—lower unduly heavy. Adapted from Lanphier¹⁵ and Pike and Brown.²²

atmospheric gases is different for each gas. It is generally assumed that there is little interaction between the gases so that the effects of nitrogen, for example, are the same regardless of the oxygen partial pressure. It is the partial pressure of the gas in question which determines if there will be adverse effects. Thus, animals and men have lived at pressures ranging from 122 ATA with .17-.4% oxygen to 100% oxygen at pressures of less than one atmosphere.^{6,12,17}

I. Nitrogen

With the advent of deep scuba diving, the clinical problems of excess nitrogen have become well-known even though the physiological basis is not well understood. The two problems with nitrogen are a decompression syndrome, popularly known as "the bends", and the intoxicating effects of nitrogen under pressure, referred to as nitrogen narcosis. The narcotic effects of nitrogen increase with pressure. Symptoms of euphoria and irresponsibility begin to show in divers and caisson workers at 130 feet (5 ATA) when breathing compressed air which has a nitrogen partial pressure of 4 ATA. At a partial pressure of 3.2 ATA, there is a measurable decrement in the performance of tasks.^{3,16}

This narcotic effect of nitrogen is the second reason deep sea divers use He-O₂ mixtures, as helium is less toxic than nitrogen.

Hydrogen and neon are both present as trace gases in the atmosphere and are less toxic than nitrogen.² However, hydrogen is explosive; and neon has a greater density than nitrogen so the MVV problem is worse. Hydrogen and neon are, therefore, considered poor choices for reducing the narcotic effects at high pressures.

II. Oxygen

The toxic effects of oxygen are directed towards the central nervous system or the tissue depending on the partial pressure to which the individual is exposed. At pressures above 2-3 ATA of pure oxygen, there is a short and extremely variable latent period followed by convulsions.^{1,14} This central nervous system effect rarely, if ever, occurs below 2-3 ATA oxygen. At lower oxygen pressures, there is the possibility of tissue damage, particularly to the lungs.^{7,14} A number of studies have been summarized by Welch, *et al.*²⁵ on the oxygen tolerance of humans. Most of these studies measured the latent period as the time before the onset of substernal pain which is considered the earliest symptom of impending lung damage. As shown in Figure 2, there is a rapid increase in the latent period as the pressure of oxygen is reduced. However, the tolerance at any given oxygen

pressure is also quite dependent on the individual. Welch, *et al.*²⁵ list one study where one of eight subjects showed toxic effects after nine days at 0.22 ATA oxygen. Yet, in this case, the oxygen pressure was barely above normal. The atmosphere used for space travel is 100% oxygen at 5 psi (0.34 ATA) and no toxic effects have been reported among the astronauts breathing this atmosphere for 2 weeks,^{18,19} nor animals for eight months.¹² It has been shown that other tissues can also be affected by increased oxygen pressure. At oxygen pressures approaching 1 ATA, observations included a temporary decrease in metabolic rate in rats at 2 ATA O₂,⁴ and an increase in blood urea in rats and humans.^{11,24}

Most of the studies on oxygen toxicity have used adult humans or adult animals. There is, however, a very important effect of oxygen on the eyes of certain neonatal animals. It has been found that excess oxygen causes abnormal growth of the blood vessels in the retina causing detachment of the retina and consequent blindness (retrolental fibroplasia).²⁰ Work with newborn mice has shown that 0.4 ATA of oxygen causes blindness in 10% of the animals after 10 days. Keeping them at this pressure of oxygen until their eyes are developed at 14 days results in 21% blindness.^{9,21} It is not known what the maximum oxygen pressure is that would allow the mice's eyes to develop without blindness.

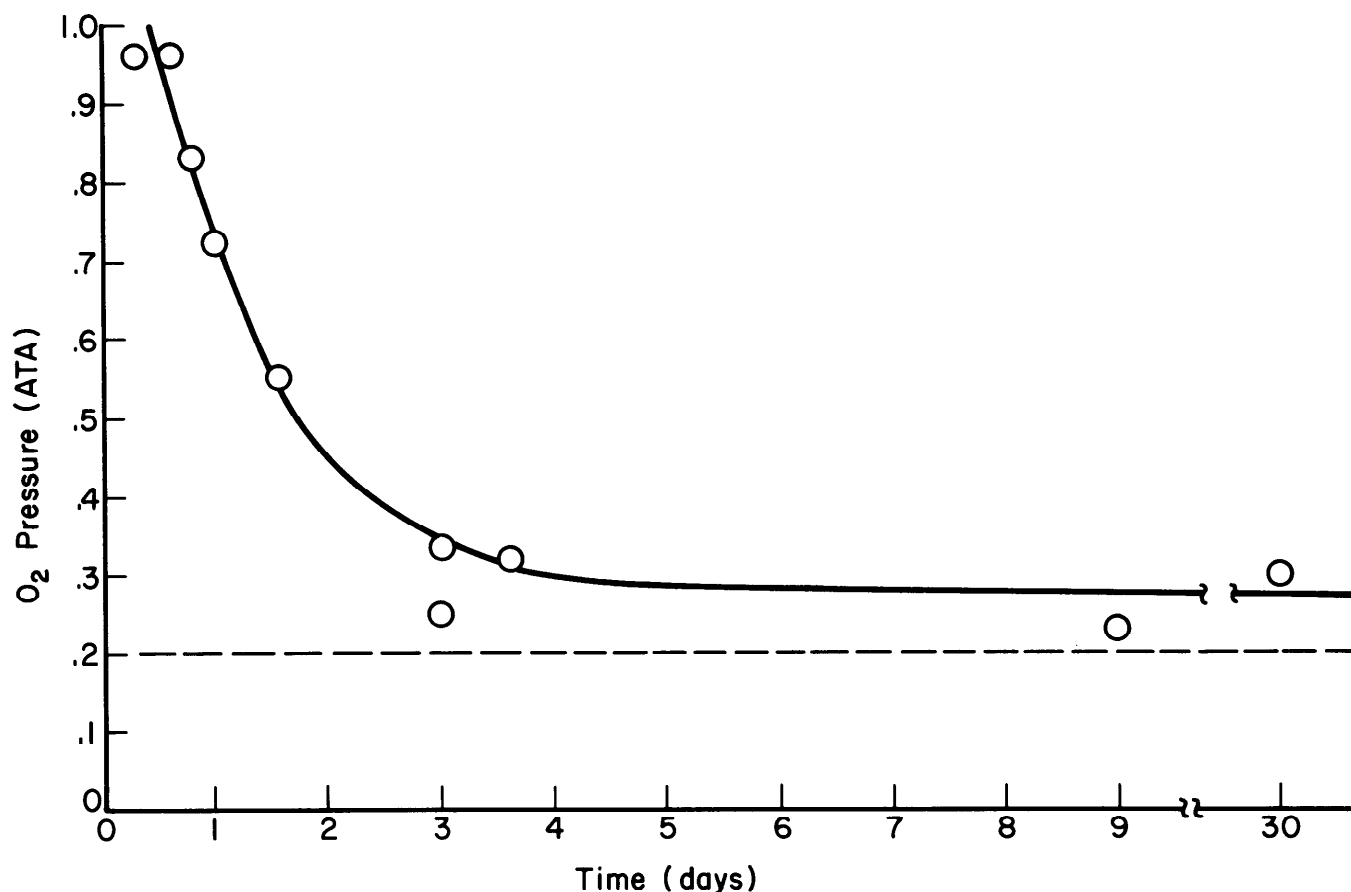


Figure 2. Oxygen tolerance in adult humans as determined by onset of substernal pain. The dashed line indicates the sea level pO₂. Adapted from Lambertsen¹⁴ and Welch, *et al.*²⁵

Toxic effects of oxygen have also been demonstrated in plants, insects, frog eggs, analids, bacteria, protozoa, and chick embryos.⁸

III. Carbon Dioxide

The level of carbon dioxide in our present atmosphere is about 0.04% (4×10^{-4} ATA). It has been reported that breathing up to 1.5% CO₂ (0.015 ATA) produces no adverse effects.²³ Above this level people become progressively more uncomfortable in breathing until about 0.1 ATA when mental effects similar to anoxia begin to show. In addition it has been observed that when the MVV is decreased there is a tendency to breathe shallowly (hypoventilate) and retain CO₂. This is termed 'hypercapnia' and is a great problem for divers as it can result in loss of consciousness.

IV. Conclusions

The most restrictive oxygen pressure is set by the incidence of blindness in some newborn animals. While the maximum partial pressure of oxygen that does not cause retrolental fibroplasia is not known, it is apparent that less than a doubling of the present atmospheric pressure would be allowed. It would be possible to increase the atmospheric pressure by holding the pO₂ at the maximum allowable and filling out the pressure with nitrogen or some other filler gas. In doing this, the narcotic effects of the filler gas, the MVV, and a mechanism to alter the composition of the atmosphere during the flood must be considered.

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Another Look at the Archaeopteryx (Continued from page 87)

Up to the present time, a keel has not been found. The feathers were the same as those of modern birds.¹ The claws also are found on a modern bird: the Hoatzin of South America, at least on the young birds.² The toes were well adapted for perching on branches. The knee joint bent forward, as does that of the pigeon.

The vertebrae come up behind the head, and not somewhat under the head (as do a pigeon's). This characteristic is found also in the Pelican, Mute Swan, Heron, Flamingo, Egyptian Vulture, Gannet, Guillemot, Red-Throated Diver, and many other birds.

Many of the birds just mentioned, like those mentioned earlier in connection with the nasal passages, are sea or water birds. It is interesting to notice that the fossils found were in sediment, believed to have been laid down by a shallow sea which is said to have covered the region at one time. What connection there may be between this fact and the sea or water birds mentioned before I do not know.

In summary—it is clear that the *Archaeopteryx* needs more than a second look, before it is called the missing link between reptiles and birds.

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GRACIOUS SCIENCE AND INTERFERING SCIENCE

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Received 7 January, 1980

It is argued that the concept of truth is a moral one. Science is considered to have to do with truth. Consequently science is a moral activity, that is, one to which moral standards and criteria apply. Some consequences of this viewpoint are suggested.

In all disciplines of human knowledge and action it is impossible to proceed without presuppositions. Some of the more important and common are: that truth exists, that the external world exists, that the thinking person exists. The importance of presuppositions appears when we consider that every one of the 'common' ones just listed has been challenged by one or another thinker. Human actions are not 'instinctive'. They are guided always by an underlying foundation of presuppositions.

It is the purpose of this paper to challenge one such presupposition in the world of science, to show its deleterious cultural effects, and to propose grounds for a better clearing along with renewed meaning to the entire enterprise. The presupposition and its implications is that scientific endeavor is 'amoral' or 'value-free' with the corollary that valuing only appears when scientific results are put into practical technical applications.

The thesis is that *all* human actions and thoughts have a value structure or else none have. Man is fundamentally a choosing and deciding being. There is no action or thought process which is a-moral, without a productive or non-productive value for both the self and others.

For example, in the scientific community the very adoption of the empirical, materialistic scientific method as the criterion (often the *only* criterion) for truth is a value judgment and a decision in the face of other options in both past and current human history. Furthermore, it is a value judgment to approach the world mathematically. For instance, it is considered worthy and important to know the rate of acceleration of the force of gravity. Obviously, that rate prevailed prior to Newton's mathematical clearing of it. Millions of men *still* do not consciously understand the rate and live well without that knowledge. Finally, there is nothing observed in the world which would give rise to a necessary understanding of the object of science as "to ameliorate the condition of man, by adding to the advantages which he naturally possesses." (Elements of Natural Philosophy, 1808)

Scientific endeavor speaks much of truth and rationality in the world, however, the final dominance of truth and the very existence of rationality are challenged by such concepts as 'evolving' laws of nature and the Hegelian concept of truth . . . both leading to imprecision of knowledge and a new ontology.

We conclude that men constantly take actions and constantly think and, in *all* of these actions and thoughts, they are valuing and selecting out of many options the way they will go—furthermore they are con-

stantly called upon to answer for their ways. For every missile built, someone wants to build a hospital or a freeway.

In the scientific community, the moral nature of *every* action (choosing this experiment over that, choosing to use this drug for cancer or that) is established by the fact that science cannot function without truth claims. Truth is a moral issue; therefore, *all* scientific endeavor, *theory* or practice, is moral. Only if truth is a-moral can science claim to be a-moral.

Let us move from this general position statement to an examination of three structures of the current scientific enterprise: leading current presuppositions, leading current goals, and leading current final ends or purposes.

There are five major categories in the realm of presuppositions. Two of these appear to be virtually unquestioned, while the other three are under hot dispute at this hour of history.

1. All men see the same world. This sounds innocuous but it is hardly so. This means that all men looking at an action of their own or others will concur upon and understand it in the same way. There is only one way to *truly* see the world. That way is the empirical, disinterested and detached 'I think, therefore I am' ego of Descartes. Most especially it asserts that the mind of man is not fallen and does not see reality with distortions. (The depth of this problem becomes clear when we see evolutionists looking at the *fallen* world and making pronouncements and judgments about its past and its future based in this non-revelatory perspective. Without revelation, the sin structure of current entropic reality will be overlooked or justified.)

2. The mathematical approach to the seen is pre-eminent. Poetry is acknowledged to be 'nice' and a 'cultural accompaniment' and Proverbs has some 'interesting' ideas—but when the nitty-gritty is sought—give me the numbers. "I guide my life by the numbers, not the Spirit". This is the motto.

3. The function of the scientific establishment is to 'ameliorate the human condition.' Again, unfallen minds are assumed and it is further assumed (contrary to the historical record!) that we *know* what ameliorates the human condition—usually some form of "men live by bread and things alone."

In addition, the amelioration of the human condition assumes that the environment (not the human heart!) is hostile to humanity and must be constantly interfered with to better it. Despite the abundance of sunlight, air and green plants without which we would live not a day—the environment is 'hostile'! One suspects this is a Satanic deception to take our mind from the real problem—the heart of everyman.

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4. This is an outworking of number three in the effort of "progress" to perfect and control the imperfect and chaotic 'mystery' of things outside the self so that, by dominating them, it shall be proven that their existence did not arise from an intelligent source other than the human mind. Philosophical absurdity is allowed here in the interest of emotional revolt against the Creator . . . the absurdity that a chance, chaotic, meaningless environment could accidentally throw up a creature interested in ordering and rationalizing it and finding meaning for it. (Could this problem be the source of the speculation that we came to the earth from another world—where presumably evolution was not so chaotic?)

5. The final presupposition of science ruled early day science before it abandoned its roots in desacralized creation and entered in blind *hubris* and apostasy into a Creator-less reality. I refer to the understanding that the study of the created world gave glory to its Creator. The end of science in this model is "to think God's thoughts after Him." Now it is to impose whatever the imagination of man can conceive on a meaningless, random chaos. In its final outworking, this view leads to absurdity, nihilism, and gigantic *hubris*.

On the foundation of this presuppositional structure, we have a deep rift in the scientific community regarding goals and final ends or purposes. This rift exposes the valuing structure of all science for the law-abiding structure of the universe cannot exist in a structureless, chance-grounded understanding. There are two quite different understandings of ends possible as one faces the *same* basic data regarding the universe.

1. To make evolving man the Lord over both "nature" and the "unfortunate" ignorance of his more "backward" and "gentle" fellowmen . . . those who have not adopted the vicious no-holds-barred use of

science for tyranny. This dominance will be gained by constantly improving the functioning (*never* purposes) of the mechanical and human 'parts' in a grandly grinding ant-hill with no destiny but to be crushed to make way for a grander one. With this goal, it is assumed that life has only short-range gratification aims and there is no eternal *telos* for existence.

2. To understand the majestic wisdom of the Creator in His Creation and to live graciously within the contours of a fallen creation with thanksgiving to God for His proleptic deliverance in Jesus Christ from the Second Law of Thermodynamics. (The evolving man solution has no solution to the 2nd Law—in fact, the massive use of energy to improve function merely sets the world up for a gigantic collapse in which we are now beginning to participate.)

The final ends or *telos* of human existing on this planet take their foundations from this difference in *spiritual* attitude running right through the heart of the scientific enterprise. On the one hand, we have men whose spirit seeks to use science for power, greed, dominance, lust and who seek to glorify man and live with grand exploitation of 'nature' as though they were gods. This is interfering science.

On the other hand are those scientists of humility before the majesty of the Creator of the universe who understand by revelation what man's true condition is and that, at his best, he reaches nowhere near the glory of God. These scientists seek to glorify the Creator in their work and to live graciously before Him, manifesting the fruits of the Spirit, while they and all believers await the deliverance of the earth from the vanity of the Law of Entropy through the Personal Appearance of the Lord of the Universe, Jesus Christ, the Righteous. This is gracious science.

A CRITICAL LOOK AT PLATE TECTONICS AND CONTINENTAL DRIFT

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Received 18 January, 1980

Years ago, at the University, I was asked to lead the negative side of a debate on continental drift. We won; not, I hasten to add, because of my leadership, but, I believe, on the strength of the arguments presented. Since then much new evidence has come to light, which can at least be interpreted in favor of drift and plate tectonics. Consequently, there has been a drift toward their acceptance. However, the head structural geologist at a university, with whom I discussed this, was not ready to adopt the theory. "Be not the first by whom the new is tried, nor yet the last to lay the old aside". He cited Wesson, who enumerated some 75 objections to the hypothesis, which as yet have not been answered.¹

Half a century ago Alfred Wegener put forth his hypothesis of continental drift. This idea arose from the fact, first noted by Sir Francis Bacon in the seventeenth century, that the outlines of the continents appear almost capable of being fitted together like pieces of a puzzle. Wegener proposed that the present continents are the separated parts of a vast, original land mass which was called Pangea.

In the modern theory Pangea is supposed to have begun to break up and its parts to drift apart about 200

million years ago. The northern part, called Laurasia, comprised what are now North America, Europe, and Asia. The southern part, called Gondwana, comprised the lands which became South America, Africa, India, Australia, and Antarctica. The various pieces are believed to have travelled thousands of miles to their present positions. The most astonishing journey proposed in this theory is that of India, which is assumed to have moved about 4,000 miles to bump into Asia proper and thrust up the Himalayan ranges and Tibetan plateau.

Great expenditure of energy surely would be required to move continents; and the British geologist, Arthur Holmes, tried to account for the motive power needed

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by suggesting the existence of convection currents in the earth's outer mantle. Solid and fluid substances when warmed tend to expand and become less dense. This lighter substance then rises through the overlying cooler, denser material, producing a rising, spreading current called a convection current. Supposedly such currents moving in the mantle beneath the continents carried the continental blocks with them, producing continental drift.

Some years ago this writer participated on the negative side of a debate on continental drift. The negative side won, not because of my presence, but because prevailing scientific opinion at the time was that the available data fell short of being compelling evidence. Now the situation has changed quite rapidly as a result of much new observational data and the development of the theory of plate tectonics. In this interpretation, the continents are not considered to be the moving units, but rather ten or twelve comparatively rigid plates comprising the earth's crust. The movement of these plates is away from midocean ridges where new rock is being extruded from the mantle, while at the leading edges where plates collide, one plate descends under the other, being subducted into the mantle again. At the boundaries of plates relative motions produce earthquakes, volcanoes, geothermal areas, mountain belts, and zones of mineralization.

Many earth scientists believe that plate tectonics is a major scientific breakthrough, the answer to more problems and mysteries in geology than any other recent discovery. Some observational data both old and new have been correlated with the new interpretation. On the other hand, there are earth scientists who either are skeptical or reject the theory because of contradictory data which they cite.

Paleomagnetism and Ocean Spreading

The most important underlying support for plate tectonic theory is derived from comparatively recently discovered evidence that the ocean floors are spreading away from the sides of the 40,000 miles of midocean ridges which circle the globe. The most critical data in connection with this observation are measurements of paleomagnetism in the rocks of the ocean floor. This magnetization is supposed to have been impressed on the rocks by the earth's magnetic field, when they were originally formed. Strips, magnetized in opposite directions, can be found; and it is supposed that the earth's field reversed in direction between the times when these successive strips were formed. So this is interpreted as evidence that the earth's magnetic field has reversed many times in the past. Similar evidence of such reversals is also adduced from measurements of paleomagnetism in rocks on the continents. Assuming that the earth poles of rotation correspond fairly well with the magnetic poles, these field data are interpreted as evidence that the poles have wandered over the earth or that continents have wandered, splitting from the original Pangea and rearranging to produce the present geography. As mentioned earlier, this is supposed to have occurred over the past 200 million years. Spreading rates of from one to five centimeters per year

would account for the present width of the Atlantic Ocean.

Important criticisms have been leveled at the paleomagnetic data, however. The data are said to be very scattered and loosely grouped, resulting in low levels of confidence for the conclusions. Unknown sources of error appear to produce contradictions in some of the results. For example, pole wandering paths conflict when they are based on different sets of paleomagnetic data. Furthermore, it has been shown in the laboratory that initial magnetization of a rock can on occasion be the reverse of the surrounding field and that rocks can undergo self-reversal of their magnetization due to stresses. Besides, reversal of the earth's magnetic field is considered by some to be impossible, in view of the massive energy transformations that would be required.

San Andreas Fault

Movement along this notorious crack in the earth's crust is given as an example of what is meant by differential movement along plate boundaries. The section or plate west of the fault is moving northward, a right-lateral fault, translating the city of Los Angeles northwest about 2½ inches per year. The rocks on the two sides of the fault are elastically deformed by this movement, storing up energy like a stretched rubber band. When slipping finally takes place it is sudden, and an earthquake results. During the 1906 San Francisco quake the movement was about 21 feet. Movement along the Garlock fault, a branch of the San Andreas, was about 6 inches at the time of the San Fernando earthquake in 1971. The San Andreas fault is a strike-slip fault or what is now called in the terminology of plate tectonics, a transform fault.

Drift and Fossils

Fossil evidence is adduced in support of plate tectonic theory. Paleontologists claim that the same or very similar fossils are found on both sides of the Atlantic, in Brazil and Africa, for example. Thus there must have been a former land connection. It is said that in the Mesozoic Era land animals were similar all over the world, but in the Cenozoic Era divergence set in because of isolation of the continents. The Mesozoic reptiles seemed to be everywhere, similar. Such data fit the theory. On the other hand, the Indian and South American reptiles were similar even though India supposedly set adrift from Pangea in the Triassic period. If the two land masses were separated so early, how does one explain the similarity of the two groups of fossil reptiles?

The Mediterranean

Oceanography is a rather new science which has uncovered startling facts about the bottoms of oceans. The Mediterranean Sea is no exception. We now know that it was once an inland sea like the Great Salt Lake or rather, like ancient Lake Bonneville. Both Lake Bonneville and the Mediterranean drained and dried up, for great deposits of evaporites, salt, and fresh water fossils were left behind. Excavations have unearthed a fossil, sunken Rhone River channel and gorge which were

formed when ocean waters were much lower, too low for the Atlantic to overflow into the Mediterranean. The Nile delta was at one time 5,000 feet deeper than the present one, and buried channels have been found 1,300 feet below present sea level. Sub-aerial canyons and buried channels have been found in Algeria, Israel, and southern France. All of these facts are good evidence of a pre-Flood world in which the oceans were thousands of feet shallower than today. Just when or why this inland sea dried up is not clear from geological evidence alone, but the Mediterranean is now 10,000 feet deep.

Pacific Basin

The Pacific Ocean basin is considered to be a more permanent earth feature than the Atlantic or Indian oceans. The ridge and rift valley in the Pacific is not centered in the middle as in the case of the Atlantic, but along the east side, that is, our Pacific Coast. From this line the floor is supposed to move westward and be subducted in the island arcs near the western side of the Pacific, traveling thousands of miles.

A Critique

Many scientists have thrown their lot with the theory of plate tectonics, but some conservative ones are still examining the evidence somewhat critically, as is a friend of mine, a structural geologist at the University of Arizona. There still appear to be important discrepancies and overall lack of compelling evidence.

From the point of view of Biblical creation, the theory is as currently held definitely a uniformitarian, long-ages geological concept which contradicts the chronology of Genesis. At the current rate of ocean bottom spreading deduced from paleomagnetic data and standard geological time scales, the Atlantic would not be much wider than the lower reaches of the Amazon River in the few thousand years usually assigned to the age of the earth by creationists on the basis of the Biblical record. The subject, therefore, is an important one.

The secular scientific critics of plate tectonics find many problems with the theory. Perhaps the most formidable one is the failure to discover motive power adequate to move such vast sections of the earth's crust over the great distances involved. Another incongruity arises from the idea that Pangea only began to split about 200 million years ago, which is after some 96 percent of the supposed 4.6 billion years of earth history have passed. The energy for the process surely must have been that from radioactive decay of uranium and thorium, yet there was more of that energy flowing early in earth history, rather than late. Why, then, did plate tectonics not start much earlier? Feeling, perhaps, the force of this objection, some propose that there were previous cycles of coalescing and splitting up of the continents; but they can offer very little supporting evidence.

A. A. and Howard Meyerhoff have summarized some of the difficulties which the proponents of plate tectonics must solve before the idea can be more than a working hypothesis.

All proposed models for 'New Global Tectonics' are

seriously in error. Paleoclimatic data distributions on continents and shelves of ancient evaporites, carbonate rocks, coals, tillites, can be explained only if present positions of rotational axis, continents and ocean basins have been constant for at least 1,000 million years. Also distribution of fossil invertebrates and tetrapod faunas and floras likewise indicate constancy of position of the rotational axis, continents and ocean basins for at least 570 million years, or since Proterozoic time. Space requirements for the continents do not permit east-west movements since Archean time of more than 100-200 Km in the northern hemisphere. The north-south movements of continents are limited to a few hundred kilometers on the basis of paleoclimatic and paleontological data. Ocean basin studies show island arc trench fills where subduction supposedly takes place undeformed. Probably there is no such thing as subduction. Sediment fills in fracture rifts crossing mid-ocean ridges are also undeformed. Joides drilling results have been hailed as a remarkable confirmation of plate tectonics predictions. The first dating of the 'basement' basalts of Joides coreholes indicates that the 'basement' beneath Mesozoic rocks is late Tertiary or younger.

Meyerhoff then declares that "No physical theory known can explain plate tectonics."²⁻⁶ He says that most plate tectonics people ignore the Lomnitz Law.^{7,8} He explains that the facts in geology indicate that India has been in its present location since Proterozoic time; further, that there is no evidence that the poles have wandered. The carbonates and evaporites are symmetrical with the present thermal equator.

In the north where the land separations between Europe and North America are least, there are close biological or at least faunal links; while faunal diversity is greatest in the Southern hemisphere. In the northern hemisphere fossils are zoned according to their relations to the north pole. Meyerhoff sums up his thesis by wondering if perhaps some plate tectonics advocates at times pick favorable data while ignoring unfavorable. Might one extend that question to include most of evolutionary science?

Certain Arguments Against Continental Drift and Plate Tectonics

1. The notion is essentially an evolutionary one, involving long ages. It could not apply to the reference in Genesis 10:25, which says briefly that in Peleg's days the earth was divided. If India, for instance, had travelled all the way from Antarctica to its present location in Peleg's days, the result would have been a catastrophe far greater than the Flood in Noah's days. Besides, where would all the motive power have been found? Here, as elsewhere, Creationist and evolutionary notions do not mix very well.

2. If Africa had really travelled westward, as had been suggested on the grounds of the nature of the eastern shore, is it supposed to have travelled eastward at the same time, to leave a gap and form the Atlantic Ocean?

3. It is claimed that continents fit together like fingers in a glove to form Pangea. However, it should be noted that in order to get this perfect fit, some small pieces of the continents have to be left out.

4. The Appalachian and Rocky Mountains are not parallel, as they should be according to the Pangea notion.

5. Whence came all the power to move the continents? From radioactive disintegration? But there should have been more radioactive material, and hence more disintegration, in earlier times, back to Precambrian. Why, then, was there no motion until (as is stated) Cretaceous times?

6. If the present Atlantic Ocean did not exist until Cretaceous and later geological times, why are Cambrian fossils found in the north Atlantic?

7. The Stromatolite fossils, to mention just one kind, indicate stable continents in the past, as Meyerhoff has shown.

8. The evidence shows that in the Permian age the North Pole was in essentially the same location as it now is.

9. The only driving mechanism proposed for continental drift seems to be convection currents in the mantle and crust of the earth. But Jeffreys, Knopoff, and Tozer, citing the Lomnitz Law^{7,8} question whether such currents are possible.

10. The convection notion would require that the continents be stacked at the equator or at the poles.

11. There is at present no evidence for the subduction crustal movements. Yet they would be an essential part of the crustal shortening, and so would seem necessarily to go along with the drift.

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CONTINENTAL TILT

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Received 18 January, 1980

The continents are seen, to a large extent, to be tilted toward the Atlantic and Arctic Oceans, and to drain into them, the oceans being as it were catchbasins. It is suggested that that state of affairs dates to the conclusion of the Flood, when the continents were drained by being tilted thus. Other evidence, especially from the bottoms of the oceans and from the Arctic regions, points in the same direction.

Introduction

In Hebrew the first book of the Bible was called "In The Beginning". The Greeks translated this as "Genesis", by which name we still know the book. The testimony of Jesus Christ, who quoted many texts from Genesis, indicates that He considered the book as part of Holy Scripture, and authentic. It contains a sketch of the world's history covering many centuries. The early chapters cannot be placed in a historical setting, in the sense of correlating them with other historical accounts; for there are no others going back that far. So our only history of the antediluvian world is that written by Moses. Neither are there archaeological records (except possibly a few obscure and often disputed finds); only the mute testimony of the fossils, which is itself often obscure. We do have much geological testimony, written on the surfaces of the continents and on the ocean basins. It is the oceans, in particular, which can give us

much information about the great catastrophe which took place early in man's history.

What was this event? And what were the conditions on the surface of the Earth before and after?

A Catastrophe Widely Recognized

Oceanographic studies of the oceans, and geological studies of the continents, should tell us much about the changes which took place during the great catastrophe. For there was a catastrophe: one which changed the surface of the Earth from its antediluvian condition to that which we now see.

Let us consider a typical uniformitarian opinion about the occurrence of catastrophic (whether or not that word be used) changes in the past, and the condition of the Earth before they happened.¹

Today it is generally accepted that the relatively short span of the Pleistocene brought greater changes to the face of the earth than any that occurred during the previous seventy million years of the Cenozoic Era. The present boundaries between land and sea were established, the earth attained

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the relief it has now, and much of the world's history was fashioned; and the physical and cultural evolution of man took place.²

As earth history goes we are living in a time of exceptionally rapid change, a time of geological unrest. Our era is characterized by emergent continents and deep ocean basins, by long ranges of lofty mountains too young to have been worn down by erosion. It is also marked by great diversity of climate from place to place and by drastic changes of climate over relatively short periods of time.³

The climate during most of the geological time seems to have been mild and remarkably uniform throughout the world, in contrast with the well-defined climatic zones of the present day. Probably this uniformity was a consequence of low continents, many broad seaways, and few or no mountains.⁴

The study of the ocean records shows that the onset of the Pleistocene was sudden and that the subsequent climatic changes came in abruptly. Mountains simply cannot rise and fall at such a preposterous rate; nevertheless the present topographic state of the earth, marked by strong contrast between continents and ocean basins, by the absence of shallow seas and by long ranges of lofty mountains—is very probably essential to the spread of continental ice sheets, though it is evidently not the sole cause. The cause was probably a combination or coincidence of some other factor of fluctuating effect, acting in conjunction with exceptional topography.⁵

The authors cited here have painted a picture of the Earth's history which is largely acceptable to Creationists, except for the assumption of long periods of time. Table 1 shows how much, in outline but not in detail, Creationists and uniformitarians, hold in common.

Evidence About the Catastrophe

It is quite evident that uniformitarian thought offers no consistent or plausible answers as to the nature and cause of the catastrophe, or catastrophic change. Both uniformitarians and Creationists, however, recognize that there was a catastrophe.

Creationists will look to the Bible for an outline of the catastrophe. If details are wanted, the testimony of nature, that is the state of the face of the Earth, needs to be considered.

I have found relief maps of the continents, and especially oceanographic maps, showing the details of the bottoms of the oceans, extremely helpful.⁶

Let us start by examining maps of South America, and of the adjacent Pacific Ocean. A range of mountains extends along the entire length of the west coast; and alongside this range is an ocean trench, deep enough that one might imagine that the mountains were taken out of it. All the rivers of any size in South America flow to the east and empty into the Atlantic Ocean. The surface of the continent is tilted toward the east.

Now consider North America. Here, too, is a range of

Table 1. Both Creationists and uniformitarians recognize a catastrophe.

<i>Antediluvian (Pliocene)</i>	<i>Sudden change</i>	<i>Present Time (Pleistocene)</i>
a) Shallow seas	1. Creationists refer to it as the time of the Flood—one year duration.	a) Boundaries between land and sea set up
b) Low continents		b) Physical and cultural development
c) Vast areas of continents flooded	2. Uniformitarians refer to it as the catastrophe or catastrophic change—usually no specific time given.	c) Land characterized by emerging continents
d) Seas and rivers teeming with life		d) Deep ocean basins
e) Mild climate		e) Long ranges of lofty mountains
f) Uniform climate		f) Diversity of climate from place to place over short periods of time
g) Heavy vegetation		g) Geological unrest
		h) Vast differences of vegetation in quantity and quality

mountains in the west, diverting all the rivers east of them into the Atlantic, some by way of the Gulf of Mexico and some through the Great Lakes, and the St. Lawrence. Again, the surface is tilted toward the east. The rivers east of the Appalachians also flow to the east.

The extreme north of North America will need to be considered a little later.

The continent of Africa, which directly faces the Americas across the Southern Atlantic, has its principal mountain system along the east coast. Drainage is not so predominantly in one direction as in some of the other continents. But two of the four great rivers flow west; the Nile would do so eventually were there not so much evaporation in the Mediterranean; and the great falls along it may show that the course of the Zambezi is, in a sense, anomalous.

In summary, then, a considerable part of the continents which surround the Atlantic are tilted toward the Atlantic, and drain into it.

Let us consider Europe and Asia together. They really form one continent, which has been called Eurasia. On this (combined) continent is the longest range of mountains on Earth, except, it is true, the ridge of mountains on the bottom of the Atlantic ocean. This chain of mountains runs more or less continuously from the Atlantic to the Pacific. Some facts about them are gathered in Table 2. It is notable that the farther east one goes, the wider is the continent and the higher the mountains.

In general, then, these mountains occupy much of the southern part of Eurasia, mostly from about 30° to 50°

Table 2. The various parts of the Eurasian mountain chain.

<i>Mountains</i>	<i>Location</i>	<i>North Latitude</i>	<i>Notable or highest mountain</i>
Pyrenees	Between Spain and France	40°–50°	Maximum altitude about 11,200 ft.
Alps	Most of southern Europe	40°–50°	Mt. Blanc 15,770 ft.
Anatolian and Caucasus Mountains	Turkey and the Caucasus	40°–50°	Mt. Ararat 16,946 ft.
Elbruz Mountains	Iran	35°–40°	Mt. Dama Vand 18,606 ft.
Himalayas and Hindustan Plateau	India, Tibet, and adjacent regions	30°–40°	Mt. Everest 29,028 ft.

north latitude. They turn northward at the North China Plain. This chain of mountains, extensive as it is, is relatively narrow in comparison with the size of the whole continent. Having this ridge of mountains toward the south, Eurasia, as a whole, is tilted toward the north. The direction of the great Siberian rivers, for instance, indicates this pattern, tilting toward and drainage into the Arctic Ocean.

It is worth while, at this point, to return to North America, and to notice that the extreme north, parts of Alaska and Canada, are tilted toward the north. The great Mackenzie River shows the drainage into the Arctic Ocean, set by this tilt.

The continents, then, form a huge basin around the Arctic Ocean, and eventually around the North Pole. The southern boundary of this basin would be around 65° north latitude.

As already noticed, the Americas and Africa, especially, form another basin, although a much more open and broken one, around the Atlantic.

Submarine Evidence

It is suggested, then, that this tilt of the continents toward an ocean was established at the end of the Flood; that it was, in fact, the means of emptying the water off the land. There should still remain, then, evidence of flood-water flowing over the continental shelves, especially in the Atlantic and Arctic Oceans.

Such evidence does exist. Shepard, for instance, while he does not mention the Flood, describes in detail the undersea canyons which could have been made only by the action of running water. He points out that these canyons resemble the great canyons on land.

We will not attempt to describe these canyons and the various other types of marine valley. We wish to emphasize that these canyons are world-wide.⁷

These canyons can serve as proof that there was a Flood, and that at its conclusion the method of freeing the continents of water was by tilting them. The water, pouring off the newly raised land, carved out the can-

yons. Further evidence is to be found in the great amount of material deposited on the bottom of the ocean basin. Only a world-wide flood could do work on such a scale.

The transportation of sand and near-shore organic materials down the canyons and adjoining fan valleys has been proven by numerous cores.

Some of the sand layers along canyon axes are graded, most are not, although well sorted.

Much evidence exists of the transportation of shallow-water foraminifera along the axes of the canyons into great depth. Wood fragments and mats of kelp and sea grass are carried sea-ward along the canyon walls.

We know that sand and accompanying finer sediments occur widely in the ocean basins and are in fact the dominant type of sediment in the broad deep basins of the Atlantic.⁸

Much of this material is granite sand. Granite sand cannot be made at the bottom of the oceans. Chemical decay of silicate materials associated with quartz in granitic rocks must occur in order that quartz crystals may be released as sand. The generation of quartz sand by the disintegration of granitic rocks at the bottom of the ocean is ruled out, even if such rocks did occur there. Actually, according to geophysical theory and observation they do not occur there. The granite sand found on the bottom of the sea must have been washed off the continental surfaces.

The sands in cores from deep stations contain shells of foraminifera that have never been found living anywhere but in shallow water. This strongly suggests that before reaching the abyssal depths the sand passed over the continental shelves.⁹

Another form of deposition occurring is the deltas of such rivers as the Mississippi. The huge fans outside the delta-front troughs of the Ganges, the Mississippi, and the Congo Canyon indicate long-continued existence of a channel across the shelves in these areas. No such accumulation could have been formed by the short periods of low sea level during the Pleistocene.¹⁰

In other words, only a world-wide flood could have accomplished all of this in the short time available.

The Great Arctic Sump

There is additional evidence of the Flood, besides the tilt of the continents, the submarine deposits, and the many other things mentioned above, which, I believe, has never been mentioned before, at least in quite this context.

I shall call this new evidence, found in the polar regions north of 60° latitude, "The Great Arctic Sump".

Here in the Arctic north of 60° latitude we will find great mounds of animal remains, many in a good state of preservation. These are mixed with mud, sand, vegetation, usually in a frozen condition. The conditions found in Alaska are believed to be contemporary with those in Siberia.¹¹

There were formed, in fact, during or at the end of the

Flood, a ring of mounds around the North Pole, a little north of the Arctic Circle. This ring was later removed from many places by the ice sheets which covered large areas of North America and Europe.

The formation of this deposit can be ascribed to a complex series of causes which acted during the Flood. First of all, there being no land in the way, the tides caused huge waves, more or less in resonance, to travel around the Earth.^{12,13} It is true that the primary effect of a wave is just to cause the water to move back and forth; but it can also tend to drag the water bodily along, to some extent, and thus cause a current. Thus a very strong current encircled the Earth, being strongest at or near the Equator. Things carried along in that current would tend to be carried to the north or south, just as in a stream floating objects collect in a backwater. The Coriolis effect, the interaction of currents and the Earth's rotation, may have helped here also. Currents due to differences of temperature of the water may have been important then, as now; and the fact that there was no land in the way would likely make them much stronger.

The result, then, was that much debris of the Flood: bodies of animals, vegetation, wood, mud, salt, etc., was carried to the north (and south, likely; but we are interested in the north, where some of this material remains) and deposited there, around 60° north latitude.

Such mounds of debris are found in Alaska, and in parts of Siberia. And the National Geographic map of Canada calls such mounds, at about 65° north, "Refugum", placing the time of their formation about 12,000 years ago.

Similar conditions have been found on the islands, usually called the New Siberian Islands, off the Arctic coast of Siberia.

The remains on these islands and along the coast of Siberia are abundant. These remains were located in mud.¹¹

Water at a fairly high velocity will carry mud, sand, and gravel.¹⁴

Possible Subsequent Catastrophes

Once the tilt of the continents had been established, at the close of the Flood, the stage may have been set for subsequent catastrophic events, lesser in extent but still devastating. It has been suggested, for instance, that water trapped from the Flood may have formed a vast inland sea in North America, and that the rush of water when that sea eventually broke the barriers holding it in may have excavated some of the great canyons.¹⁵ Maybe something similar happened in Asia, possibly hundreds of years after the Flood; and such a catastrophe might have left some of the remains of mammoths, especially those which are well preserved.

Conclusions

It has been suggested that the present tilts, and patterns of drainage, found on the continents, may provide a clue as to what happened at the end of the Flood. Moreover, they may suggest where to look for other evidence of the Flood.

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THE FARADAY-DISC DYNAMO AND GEOMAGNETISM

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Received 29 October, 1979.

The Faraday-disc dynamo has been put forward as a model to explain the variation with time of the earth's magnetic field. Evolutionists, especially, have claimed that this model explains the reversals of the field, which are believed to have occurred in the past; and that the model is consistent with the evolutionary doctrine. In this article the model is investigated in detail. The conclusion is that the magnetic field generated by the Faraday-disc dynamo never reverses; rather it decays exponentially. This exponential decay of the earth's field is a feature of the theory of geomagnetism proposed by Barnes. That theory offers one of the strongest proofs of a recent Creation. Thus the evolutionists' model is actually evidence, not for uniformitarianism, but rather for a recent Creation.

I. Introduction

There are two opposing explanations for the origin of the earth's magnetic field. The explanation consistent with the vast ages of evolution is the dynamo theory.¹⁻³ The explanation consistent with a recent creation is the Barnes theory.⁴⁻⁸

In both theories, the earth is believed to have a molten electrically conducting core (although the Barnes theory would not require that it be molten). Electrical currents are thought to flow in this conducting core. The earth's core is essentially a giant electromagnet. From this point on, the Barnes theory and the dynamo theory offer different explanations for two magnetic phenomena: 1) the slow decrease of the strength of the earth's magnetic field, and 2) reversed magnetized rocks.

A. Decreasing Geomagnetic Field: Barnes Theory

In the Barnes theory, the electrical currents in the earth's core all circulate in the same direction. These currents decrease with time, because of resistance leading to energy loss via electrical heating. Barnes showed that the measured rate of decay of the earth's magnetic field results from his model when a reasonable value for the electrical conductivity of the earth's core is used.⁹ It is a major triumph for the Barnes model that its numerical predictions for the decay of the earth's magnetic field match the measured field better than any other theory.¹⁰

According to the Barnes theory, the earth's magnetic field must have been much greater in the past in order to decay down to its present value. The half life of the decay is approximately 1,400 years. At that rate only 50,000 years ago, the magnetic field of the earth would have exceeded the strongest magnetic fields known in the universe. The electrical heating in the earth's core would be 10,000 times the heat produced by the sun now. The earth would have exploded instantly, if it had ever been in such a condition. Thus, the Barnes theory shows that the earth could not have been in existence more than about 10,000 years, at the most.

The Barnes theory rests on the solid ground of electrodynamics. Lamb^{11,12} and Barnes,¹³ obtained an exact solution for the rigorous equations that describe electrodynamics, Maxwell's equations. So far, the Barnes theory offers everything one could want from an ex-

planation. It has an exact theoretical foundation, and it has the best agreement with the experimental data.

The magnetic field of the Barnes model has never reversed direction, although it does decay. If there ever did come a time at which the earth's magnetic field tried to reverse direction, the field would have to pass through zero magnetic field for a while. The only way a zero magnetic field would exist is if the core currents were zero. However, once the core currents were zero, they would remain zero forever, because there is nothing to start them up again in the reversed direction. A current flow cannot just begin itself. Therefore, if the Barnes model is correct, the earth's magnetic field has not reversed itself in the past at any time.

The only evidence not in agreement with the Barnes model is reverse magnetized rock. If the earth's magnetic field has never changed directions in the past, how could these rocks have become reversed magnetized? The Barnes model in itself contains no explanation. One can suggest possible causes of anomalous magnetism; for example, a rock could be reversed magnetized by a lightning strike. However such happenings would not be an integral part of the Barnes theory.

B. Reversed Magnetized Rock: The Dynamo Theory

Almost all rock that contains magnetic material is found oriented with the magnetization of the magnetic material pointing in the general direction of the earth's north pole. It is usually assumed (without proof) that these rocks used to be molten, and that their magnetization lined up with the direction of the earth's magnetic field at the time they cooled below the Curie temperature.¹⁴ The Curie temperature is the temperature at which the magnetism in a magnetic material essentially freezes. There are however, regions, roughly parallel to the longitude lines on either side of the mid-Atlantic ridge, in which the magnetization in rocks is found to point toward the earth's south pole.

Advocates of the dynamo theory cling to these rocks. They insist that the existence of reversed magnetized rocks is sufficient proof that the earth's magnetic field has reversed itself many times in the past. How these postulated field reversals could have occurred has never been explained theoretically. There has been much theoretical work spent on the dynamo model; but so far, no theory has been adequate to explain field reversals.¹⁵

The dynamo theory alleges that the electric currents in the earth's core somehow self-energize themselves and change themselves. Every million years or so the

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currents will interact with themselves so that the direction of the magnetic field they produce is reversed. Then, they supply themselves with energy necessary to maintain themselves over the next million years. Then the currents interact with themselves again so as to reverse the magnetic field another time. The cycle repeats itself again and again throughout the alleged evolutionary age of the earth.

Slowly, over the millions of years of geologic time, molten material is thought to emerge from the mid-Atlantic ridge. The material solidifies with the rock magnetism pointing toward whichever pole happens to be the magnetic north pole during that million year period, say pointing south. Then the magnetic poles reverse. During the next million years, fresh magnetic material is forced from the mid-Atlantic ridge, and the old material is pushed away from the ridge. This emergence of fresh material and sea floor spreading of old material as the magnetic field reverses each million years is supposed to account for the magnetically striped regions in the floor of the Atlantic Ocean. These regions consist of narrow stripes stretching almost from pole to pole. One stripe has rocks magnetized pointing north. The adjacent stripes have rocks magnetized south.

C. Choice of Theories: The Faraday Disk Dynamo

How did the dynamo theory with its non-conservation of energy, violation of the laws of electrodynamics, and lack of theoretical foundation, ever

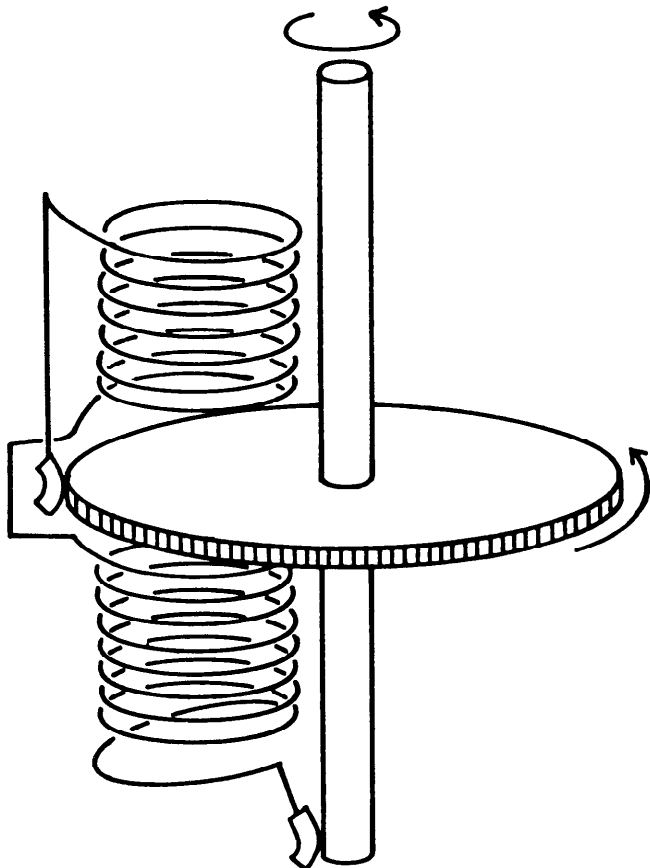


Figure 1. The Faraday-disk dynamo.

gain the almost universal acceptance of interested scientists? Why has Barnes' model with its solid theoretical foundation and excellent agreement between theory and data been ignored?

Dynamo theorists have a most persuasive, over-used example that they claim demonstrates the possibility of field reversals. Their example is the Faraday disk dynamo. The Faraday disk dynamo as built for e.g. lab. demonstration, is the arrangement shown in Fig. 1. Part of its appeal is its simplicity. Dynamo theorists claim that just as the current in the rotating disk produces a magnetic field which in turn induces a current in the disk, so can molten material in the earth act. The current and the magnetic field interact with one another and support one another. Dynamo theorists claim that this coupled interaction allows field reversals. They claim theoretical support from the fact that the equations governing the motion involve the square of the magnitude of the magnetic field, not the first power. Thus, they say, the field could reverse directions and still be described by the same equations.

This article examines the Faraday disk dynamo theoretically using well-known laws of electrodynamics. The results of this research are noteworthy. As stated in the abstract, the Faraday disk dynamo actually produces a *decaying* magnetic field rather than a reversing one. The interaction between the magnetic field and the currents can cause the rotating disk to reverse rotational directions once at most. Whether or not the disk undergoes its one allowed rotational reversal, the magnetic field *never* reverses. Thus, the Faraday disk dynamo, grasped so tightly by evolutionists, ironically supports the recent creation model of Barnes. The remainder of this article is devoted to a rigorous mathematical analysis of the electrodynamics governing the Faraday disk dynamo. This analysis is the only way to prove or disprove the alleged field reversals.

II. Equations of Motion

The Faraday disk dynamo (which can be built as a man-made device) is illustrated in Figure 1. The motion of the rotating conducting disk through the magnetic field B induces a current i according to Faraday's law. The electric current is used in an electromagnet to generate the magnetic field B according to Ampere's law. The magnetic field coupled to the rotating disk constitutes the simple Faraday disk dynamo.

The following symbols refer to the Faraday disk dynamo in Figure 1. $i = i(t)$ = the instantaneous current flowing through the disk and electromagnet; R = the total resistance of the electrical circuit composed of disk, electromagnet, external wires, and contacts; L = the inductance of the electromagnet; n = the number of turns per unit length in the electromagnet; r = the radius of the disk; μ_0 = the permeability of free space; τ = the torque on the disk due to electromagnetic effects; I = the moment of inertia of the disk; ϵ_I = the E.M.F. generated in the portion of the disk passing through the magnetic field; ϵ_L = the self-inductance E.M.F. of the electromagnet; and ω = the angular velocity of the disk ($\omega = 2\pi/\tau$).

The Faraday disk dynamo is equivalent electrically to

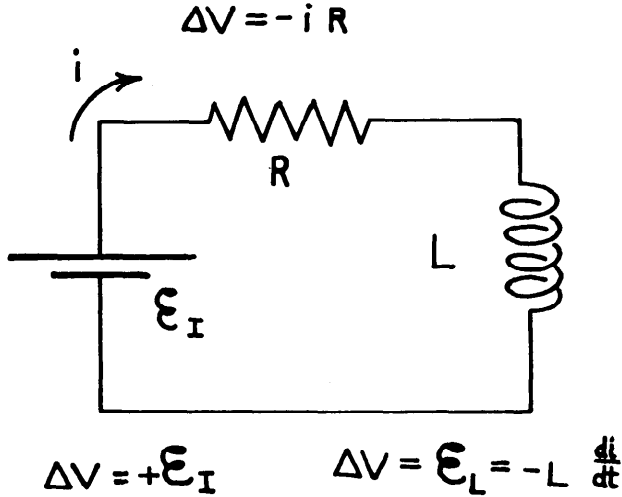


Figure 2. The electrical circuit equivalent to the Faraday-disc dynamo of Figure 1.

the electrical circuit shown in Figure 2. The current flow in the circuit is determined by Kirchhoff's voltage law,

$$\epsilon_I - R + \epsilon_L = 0. \quad (1)$$

Faraday's law gives

$$|\epsilon_I| = |d\Phi_B/dt| = B|dA/dt| = B \cdot \frac{1}{2} r \omega r,$$

or

$$\epsilon_I = \frac{1}{2} r^2 \omega B. \quad (2)$$

Ampere's law gives

$$B = \mu_0 n i. \quad (3)$$

The self-inductance L is defined by the equation

$$\epsilon_L = -L di/dt. \quad (4)$$

When equations (2), (3), and (4) are substituted into the circuit equation (1), the current i is determined by the relation

$$(\frac{1}{2} r^2 \omega \mu_0 n - R) i - L \frac{di}{dt} = 0. \quad (5a)$$

Multiplying this equation by i yields

$$(\frac{1}{2} r^2 \mu_0 n \omega - R) (i^2) - \frac{L}{2} \frac{d(i^2)}{dt} = 0. \quad (5b)$$

The solution to equation (5a) is not a simple exponential, because the coefficient of the term linear in i contains the angular velocity ω of the wheel, and ω can vary with time.

The variation of ω is determined by the laws of rotational mechanics. The motion of the current-carrying conductor through the magnetic field results in a retarding torque on the disk. The retarding force ΔF on a thin strip of the disk through which the current flows between radii ℓ and $\ell + \Delta \ell$ is $|\Delta F| = i B \Delta \ell$. Therefore, the retarding torque on the thin strip is $|\Delta \tau| = i B \int_{\ell}^{\ell + \Delta \ell} \ell d\ell = \frac{1}{2} i B r^2$. When the expression for B in equation (3) is used,

$$|\tau| = \frac{1}{2} \mu_0 n r^2 i^2. \quad (6)$$

Since this torque is a retarding torque, the motion of the disk is given by $-\tau = I d\omega/dt$, or:

$$i^2 = - \frac{2I}{\mu_0 n r^2} \frac{d\omega}{dt}. \quad (7)$$

III. Constant Angular Velocity Solution

If one turns the disk (in a model as made for laboratory demonstrations) by hand in a way such that he forces ω to be a constant, the current flow can be determined from equation (5a) alone. However, three cases must be considered, corresponding to the algebraic signs $+$, $-$, or 0 of the coefficient of the i term in equation (5a).

Case 1: The disk turns slowly ($\omega < 2R/r^2 \mu_0 n$). Equation (5a) can be written as

$$\frac{di}{dt} = - \frac{i}{T^*} \quad (8)$$

where

$$T^* = \frac{L}{|\frac{1}{2} r^2 \omega \mu_0 n - R|}. \quad (9)$$

The solution of equation (8) is

$$i(t) = i_0 e^{-t/T^*}. \quad (10)$$

This decreasing exponential is shown as curve 1 in Figure 3. The current dies out, because the disk turns too slowly to generate enough current to maintain the magnetic field.

The power expended by the external agent forcing the disk to turn at a constant angular velocity is

$$P = \tau \omega. \quad (11)$$

When equations (6) and (11) are used in the above formula, the power expended by the external agent is

$$P = \frac{1}{2} \mu_0 n r^2 i_0^2 e^{-t/2T^*}. \quad (12)$$

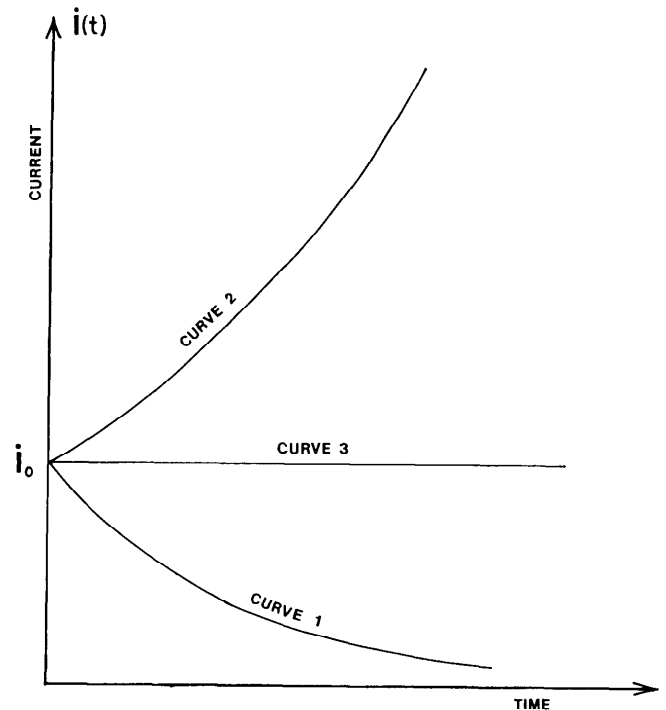


Figure 3. Behavior, as a function of time, of the current in the disc of a Faraday-disc dynamo, turning at a constant angular velocity.

Consequently, the disk becomes easier and easier to turn as the current dies out.

Case 2: The disk turns rapidly ($\omega > 2R/r^2\mu_0 n$). Equation (5a) can be written as

$$\frac{di}{dt} = + \frac{i}{T^*} \quad (13)$$

The solution of equation (13) is

$$i(t) = i_0 e^{t/T^*}. \quad (14)$$

This increasing exponential is shown as curve 2 in Figure 3. The current continually grows, because the disk turns so rapidly that more than steady state current is produced.

The power expended by the external agent is found to be

$$P = \frac{1}{2} \mu_0 n r^2 i_0^2 e^{t/2T^*}. \quad (15)$$

This runaway solution corresponds to a physically unrealistic situation. To force the disk to maintain its high constant angular velocity, the external agent must supply exponentially increasing amounts of power. Eventually, a practical limit would be reached. Thus, case 2 must be ruled out as a physically possible solution for the long-term behavior of the dynamo, even though it is mathematically correct. Of course, for short periods of time, the external agent could supply the exponentially increasing power required.

Case 3: The disk rotates with $\omega = 2R/r^2\mu_0 n$. Equations (5a), (7), and (11) yield

$$i = i_0 = \text{constant},$$

$$P = \frac{1}{2} \mu_0 n r^2 i_0^2 = \text{constant}.$$

The external agent supplies constant power. The current generated in the disk is just right to produce exactly the magnetic field needed to generate the current. This solution is represented as curve 3 in Figure 3.

An estimate of the numerical value for the angular velocity separating these three cases can be made using $n = 1000$ turns/m, $r = 0.1$ m, $L = 10$ henry, $\mu_0 = 1.26 \times 10^{-6}$ henry/m, and $R = 10$ ohm. For these values, $\omega = 2R/r^2\mu_0 n = 1.6 \times 10^6$ rad/sec which corresponds to one quarter of a million revolutions per second. For a laboratory-sized dynamo, only case 1 would be reasonable. For a dynamo the size of the earth's core, $\omega = 2R/r^2\mu_0 n$ might correspond to a number on the order of one revolution per day, so that all three cases might correspond to reasonable values for ω for a restricted period of time. Even so, for the earth-sized dynamo, case 2 must still be rejected as a physically unrealistic solution for the long-term behavior for the dynamo.

In all three cases, an unanswered question is the origin of the original current and magnetic field. In the laboratory, this original magnetic field and current could be produced by quickly withdrawing a bar magnet from the coil of wire. However, the origin of the earth's magnetic field cannot be explained by such a mechanism.

It might be added that laboratory models may have a permanent magnet, not an electromagnet. Obviously, however, that would not help the case of the earth's magnetism. For it is a magnetic field which has to be explained. Any field introduced to explain it would have

in turn to be explained, and so on to infinity; one would fall into an infinite regress.

IV. Free-Running Dynamo

If there is no external agent to supply power to the dynamo, it must power itself. (Or, rather, dissipate the energy originally imparted to it, then stop.) The flow of current is governed by equation (5b), the magnetic field is given in terms of that current by equation (3), and the motion of the disk is governed by equation (7). When the mechanical equation (7) and the electromagnetic equation (5b) are combined, the result is

$$\left(\frac{r^2\mu_0 n}{L} \omega - \frac{2R}{L} \right) \frac{d\omega}{dt} - \frac{d^2\omega}{dt^2} = 0. \quad (16)$$

The substitutions $T = L/R = a$ time constant; $u = \omega T$; $a = r^2\mu_0 n/L = a$ pure number; and $x = t/T$, reduce the coupled equation to the dimensionless form

$$(au - 2) \frac{du}{dx} - \frac{d^2u}{dx^2} = 0. \quad (17)$$

Letting $y = u - 2/a$ the coupled equation becomes

$$\frac{d}{dx} \left(\frac{1}{2} y^2 - \frac{1}{a} \frac{dy}{dx} \right) = 0, \quad (18)$$

or

$$\frac{1}{2} y^2 - \frac{1}{a} \frac{dy}{dx} = c', \quad (19)$$

where c' is a constant of integration. The final integral of equation (19) depends on the sign of the integration constant, c' . Fortunately, the sign of c' can be determined from mechanical considerations. It was shown above that dy/dx is proportional to $d\omega/dt$; in fact $dy/dx = T^2 d\omega/dt$.

The torque equation (7) requires

$$\frac{d\omega}{dt} = - \frac{\mu_0 n r^2 i^2}{2L} < 0. \quad (20)$$

Thus,

$$\frac{dy}{dx} = - \frac{T^2 \mu_0 n r^2 i^2}{2L} < 0. \quad (21)$$

Therefore, c' in equation (19) is equal to the sum of two non-negative terms, $\frac{1}{2} y^2$ and $-(1/a)(dy/dx)$, so c' must be a non-negative constant. Therefore, equation (19) will be written as

$$\frac{1}{2} y^2 - \frac{1}{a} \frac{dy}{dx} = \frac{1}{2} c^2. \quad (22)$$

Physically, the sign of c is determined by the condition that the disk always experience a resistive electromagnetic force. For this reason, even $c = 0$ is excluded in equation (22). Equation (22) is solved as follows:

$$\begin{aligned} \int_{y_0}^y \frac{dy'}{(y'^2 - c^2)} &= \frac{a}{2} \int_0^x dx', \\ - \frac{1}{c} \left\{ \tanh^{-1} \left(\frac{y}{c} \right) - \tanh^{-1} \left(\frac{y_0}{c} \right) \right\} &= \frac{ax}{2}, \\ y &= c \tanh \left[- \frac{acx}{2} + \tanh^{-1} \left(\frac{y_0}{c} \right) \right]. \end{aligned} \quad (22')$$

When the definitions around equation (17) are used, the above solution in terms of the original quantities is

$$\omega = \frac{c}{T} \tanh \left\{ -\frac{act}{2T} + \tanh^{-1} \left(\frac{\omega_0 T}{c} - \frac{2}{ac} \right) \right\} + \frac{2}{aT}. \quad (23)$$

When this solution for ω is substituted back into equation (7), the current i is found to be

$$i = \pm \frac{c}{T} \left(\frac{I}{L} \right)^{1/2} \operatorname{sech} \left\{ -\frac{act}{2T} + \tanh^{-1} \left(\frac{\omega_0 T}{c} - \frac{2}{ac} \right) \right\}. \quad (24)$$

The $\pm$ sign ambiguity describes the fact that the current could flow in either direction, and it is a mathematical consequence of equation (7) determining i^2 , not i directly. Equation (24) is used to determine the constant of integration c in terms of the initial current i_0 as follows:

$$i_0 = \pm \frac{c}{T} \left(\frac{I}{L} \right)^{1/2} \operatorname{sech} \left\{ 0 + \tanh^{-1} \left(\frac{\omega_0 T}{c} - \frac{2}{ac} \right) \right\}. \quad (24')$$

Use of the identity $\tanh^2 \theta = 1 - \operatorname{sech}^2 \theta$, with $\theta = \tanh^{-1} (\omega_0 T/c - 2/ac)$, yields

$$c = \left[(\omega_0 T - \frac{2}{a})^2 + \frac{LT^2 i_0^2}{I} \right]^{1/2}. \quad (25)$$

It is interesting to note that the current will undoubtedly die out, since equation (24) predicts $i \rightarrow 0$ as $t \rightarrow +\infty$, but the disk will probably continue to rotate. The final angular velocity ω_f as given by equation (23) in the $t \rightarrow +\infty$ limit is

$$\omega_f = \frac{(2/a - c)}{T}. \quad (26)$$

Thus, the disk will (1) slow down, but continue to rotate in the same direction if $2/a > c$, (2) slow to an eventual stop if $2/a = c$, or (3) reverse direction once and only once approaching a constant reverse rotational velocity if $2/a < c$. Which of these three fates awaits the disk is determined by the properties of the material, the geometry of the disk and coil, and by the initial values of angular velocity and current (or magnetic field). However, the current i as given by equation (24) along with the magnetic field (which is proportional to i by equation (3)), *never* reverses direction. The $\pm$ sign ambiguity in equation (24) does not indicate or allow a current or a field reversal. Rather this sign ambiguity indicates that the initial current and magnetic field could be in either direction, regardless of the direction of rotation of the disk. However, once the direction of the current and magnetic field are determined from the initial conditions, the sign ambiguity is removed, and there is neither current nor field reversal.

It is instructive, though, to examine the unphysical solution obtained with a negative integration constant c' in equation (21), say $c' = -1/2k^2$ where k is a real constant. In this case, equation (21) becomes $y^{1/2} - (1/a)(dy/dx) = -k^2/2$. The solution is obtained as follows:

$$\int_{y_0}^y \frac{dy'}{(k^2 + y'^2)} = \frac{a}{2} \int_{x_0}^x dx'$$

$$\begin{aligned} \frac{1}{k} \{ \tan^{-1} \left(\frac{y}{k} \right) - \tan^{-1} \left(\frac{y_0}{k} \right) \} &= \frac{ax}{2} \\ y &= k \tan \left\{ \frac{kax}{2} + \tan^{-1} \left(\frac{y_0}{k} \right) \right\}. \end{aligned} \quad (27)$$

In terms of the definitions around equations (16) and (17) this solution is

$$\omega = \frac{k}{T} \tan \left\{ \frac{kax}{2T} + \tan^{-1} \left(\frac{\omega_0 T}{k} - \frac{2}{ka} \right) \right\} + \frac{2}{aT}. \quad (28)$$

When this solution for ω is substituted back into equation (7), the current i is found to be

$$i = (-1)^{1/2} \left(\frac{I}{L} \right)^{1/2} \left\{ \frac{k}{T} \sec \left(\frac{kax}{2T} \right) + \tan^{-1} \left(\frac{\omega_0 T}{k} - \frac{2}{ka} \right) \right\}. \quad (29)$$

The magnetic field B , from equation (3), is proportional to this current i . In this case, if the result were meaningful, both the magnetic field and the current would reverse each time the argument of the trig function increases by π , or $\Delta t = 2\pi T/ka$. However, the physically fictitious nature of this mathematically correct solution is evident. The current is proportional to $(-1)^{1/2}$ and so it is purely imaginary. Thus, although there are mathematically acceptable reversing-field solutions, there are no physically acceptable ones.

V. Conclusions

The Faraday disk dynamo provides a solvable, simple model of the dynamo theory advanced to explain the source of the earth's magnetic field. The coupled electromagnetic and mechanical effects are clearly illustrated by the Faraday disk dynamo. To this extent, the Faraday disk dynamo shows the possibility of geomagnetism from a rotating dynamo effect in the earth's core. It does not prove that such a dynamo in fact exists. However, the field reversals hoped for by the paleomagnetists are denied by the disk dynamo. Although there are field-reversing solutions, such as equation (29), that are mathematically correct, these field-reversing solutions are purely imaginary, hence unphysical or physically impossible. The only mathematically real, hence physically possible, solutions are given by equations (23) and (24). These solutions allow a reversal of the disk's motion once, but never a reversal of the magnetic field direction. Thus, some explanation other than geomagnetic field reversals should be sought to explain reversed magnetized rocks. A return to the recent creation geomagnetic model of Lamb as revised by Barnes would offer a better explanation of geomagnetism. These models at least explain the observed decrease in the strength of the earth's magnetic field over the past century and a half. These are known magnetic field strengths measured at known times, not inferred from reverse magnetized rocks whose reverse magnetism could be due to other effects.

(Continued on page 117)

A PROPOSAL FOR A NEW CREATIONIST DISCIPLINE

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Received 28 January, 1980

It is suggested that it may be useful to formalize some ideas, which have hitherto been largely implicit in many Creationist writings, to a greater extent than has been done. Especially is this so of parts of genetics, which are of great importance to Creationism.

Introduction

One of the interesting aspects of creation studies is that they are not without rich theoretical content. To illustrate consider the analytical studies in geology concerning the Deluge, glaciation and the water canopy; in astronomy concerning the age of the universe and solar system, the structure of stars and galaxies; and in physics in the cases of the electromagnetic field, the nature of light and a mathematical model of the electron. Although many aspects of these studies cannot be proven in a strict scientific sense they are, nevertheless, of great value for they demonstrate the reasonableness and credibility of the general creationist position, that it fits the known data quite well and that it is in harmony with all the established principles of science.

It is also observed, however, that there is no comparable theoretical content for creationist biology and some may claim that none is needed. Yet in an area in which so much favourable evidence for the creation viewpoint has been brought to light, one might expect some sort of rigorous framework to correlate and interpret data and make predictions. Such a framework would be centered on a core discipline like genetics but would have sufficient breadth to be the basis for research and experimentation in several branches of biology. After all what is closer to the heart of the creation/evolution controversy than biology, especially genetics? Why then should biology be without a comprehensive theoretical framework?

In this paper it is suggested that creationists' wide-ranging biological results be formalized into a general yet basic theoretical structure. Such a new perspective would not only help discredit evolution, but more importantly would be beneficial to the overall creation model and thus to science.

The Central Feature of the New Model

If it is granted then that such a model would be desirable, what form would it take? What would be its chief characteristics? To determine this it will be appropriate to sample recent creationist literature to discern, if not a pattern, at least some common denominators.

H.R. Siegler¹ reprinted Fleeming Jenkin's criticism of Darwinism, maintaining that that critique is still valid today. Briefly, Jenkin likened the basic kind to a sphere with an original stock or type at the center; out of this center radiated the variations in all directions. He noted that a "tendency of reversion" (throwbacks) becomes

increasingly stronger as the surface of the sphere is approached, thus preventing attainment of the limit by deflecting the variations in all other directions, particularly toward the center. (The reader is almost tempted to refer to the "tendency of reversion" as a *principle* of reversion and in fact F.L. Marsh has formally labelled this fundamental fact as the Principle of Limited Variation.²)

In a later paper Siegler³ proposed a creationist taxonomy, one using the existing categories but with the addition of *baramin* (from the Hebrew *bara*, create and *min*, kind; coined by Marsh). He further gave criteria for defining or identifying the created kinds. The *baramin*, then, would be the unit of interest.

Howe⁴ wrote about the biogeographical studies to help identify the created kinds in the conventional taxonomic categories, and suggested how the created kinds formed sub-taxa in different geographies.

Lammerts⁵ examined the probability of recombining recessive mutations using a mathematical argument from evolutionary population genetics. Assuming Hardy-Weinberg equilibrium, he showed that the probability of such a recombination to produce a presumably "good" feature is exceedingly small.

Poettcker⁶ catalogued seventeen genetics problems facing the modern evolution model and noted that the data fit better into the concept of a created kind with variations.

Finally, Ouweneel⁷ outlined the weaknesses of the two major theories of population genetics and established that creationists have much to hope from theoretical genetics.

The examples could be multiplied but these suffice to suggest a trend, or at least a commonality, of researchers focusing increasingly on the created kind with its variations and fixity, rather than examining specific organisms, mutations or natural selection *per se* and that diverse arguments, including those of population genetics theory, are brought to bear on the matter. Certainly emphasizing "basic kinds" is not new to the creation model, indeed it is foundational to it; but the arguments fall short of proposing what is proposed here, namely, *baramin genetics* or creationist population genetics. This new discipline is the counterpart of evolutionary population theory in which the base unit is usually the species to which the *assumed* principle of (macro-) evolution, i.e., unlimited variation, is applied. On the other hand the central feature of *baramin genetics* is that the created kind is the base unit of investigation to which the *observed* principle of limited variation is applied.⁸

Why has this not been proposed before? There are at least two reasons: 1) there has not been general agreement about the criteria to be used for identifying

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baramin; and 2) it is quite difficult to recognize baramin in the conventional taxonomic categories. Yet with the recent contributions from creationists, such as those mentioned above, at least the process of clarifying can be started. Perhaps not all baramin can be identified but it is expected that many members from many baramin can be determined at the very least. Research in baramin genetics should help facilitate and stimulate needed research in taxonomy and other related areas.

Some Definitions and Other Features

Having provided the basis for the new discipline one may now begin constructing the rest of the framework by a careful definition of terms and by noting some other features.

In baramin genetics the created kinds are viewed in a dual fashion. First, they are seen as biological units in terms of chromosomes, genes and DNA; but, secondly, they are viewed as sources of genetic information. Although viewing the gene as a source of information is not new, creationists have not made much use of this approach. Bass⁹ reports that Lewontin has shown from mathematical genetics that the information content of the genome cannot increase! Surely such an argument as this can be exploited more fully. For example, can it be shown that the information content of the genome, or baramin, actually decreases? By approaching the study of baramin genetics in terms of information, the door is opened to measuring the entropy of the system (baramin) since in a very real sense such information is isolated from that of all other systems. Thus an important part of creationist biology can be linked to physics via information theory.

Having observed this duality, the following terms are defined: A *baramin* is a group of organisms capable of true fertilization.^{10,11} Also, it is a group of organisms capable of exchanging information with one another; the gene pool constituting such a group is a pool of information which is mixed or combined. *No exchange of (genetic) information can ever occur between baramin.*

A *variation* is a different way of combining the genetic make-up of the original stock (basic type) so as to produce a novelty. In terms of information content it is the number of distinct ways of combining units of information (alleles) of the original stock.

There are four different kinds of variation:

- a.) A *new variation* (or variant) is a combination of alleles (units of information) not currently found in the baramin.
- b.) An *old variation* (or variant) is a combination of alleles other than the original stock which is currently found in the baramin.
- c.) A *positive variation* is a non-mutant variation, i.e., any mutations it may have are recessive. It is phenotypically "wild" type.
- d.) A *negative variation* is a mutant variation, i.e., one or more mutations are dominant or co-dominant. It is a mutant phenotype.

The *environment* is the set of restrictions facing (or imposed on) the baramin.

Natural selection is the interaction between the environment and the genome of the organism resulting in

the removal of unsuitable variants. In this paper such a result is called *differential elimination*.

Adaptation is merely the other side of the coin of differential elimination. That is, after all the variants incapable of living in the environment have been removed, the baramin is said to be "adapted to its environment". Adaptation, then, is the condition of the population (baramin) after all unfit variants have been eliminated.

Degeneration is the loss of variation (or potential for variation) within a baramin. Also, it is the loss of information or the inability to exchange information.

A *point mutation* is a genetic accident, an error of the DNA and is further defined in terms of its biochemistry. Also, it is a *change* of information. Thus a "good" mutation results in an increase of the information content of the baramin; a "bad" mutation results in a decrease of the information content; and a "neutral" mutation results in no change of information. Since there is no compelling evidence for a "good" mutation, and since the notion of neutral mutations is a moot question, the creationist may view point mutations as random noise, an interference of the signal, increasing entropy. It is an example of degeneration.

Evolutionists maintain that a mutation is not good or bad *per se*, but is good or bad depending on the environment. The famous peppered moth is frequently cited as such an example. Whether or not the difference in colouration is really due to a mutation is a point that can be challenged. Yet by defining mutations in this manner, the evolutionist is also challenged to show not merely that the alleged mutation survives, but more importantly that it has increased the information content of the organism or population *regardless of environment*.^{12,13}

Using the above definitions and features of the model, how might a baramin geneticist describe the history and present condition of the created kinds? What general picture or impression is given?

In the beginning God created at least one original stock for each baramin. Each of these stocks was endowed with the capacity for genetic variation, though some were given a greater capacity than others. Each baramin was intended to move toward maximum variation, i.e., to fully realize its genetic potential under the perfect Edenic conditions. In such an environment there was no differential elimination and therefore no adaptation. Nor were there any negative variants. Only maximum positive variation was to be achieved. Variation was, then, limited to *within* a created kind and could never occur *between* them. An unbridgable genetic gulf separated them.

With the Fall and the Curse, though fixity remained unchanged, realization of maximum variation became more difficult if not impossible. Negative variations began appearing due to the degenerative process of an imperfect world. Some degree of differential elimination and adaptation began. Degeneration of the genome, and hence of the gene pool, was most likely quite slow in the near perfect conditions of the antediluvian world. After the Deluge, however, the environment became even more restrictive and differential elimination and adaptation more pronounced. But the capacity

for variation was sufficient for most baramin to permit at least one variant (in most cases many more) to survive. This variational process did not require great spans of time but occurred rapidly as baramin dispersed from the ark throughout the world.

Today baramin are well distributed and in great variety. Their ability to adapt to a wide range of environments, despite increased degeneration, is a testimony to the wisdom and foresight of the Creator.

Some Advantages of the New Model

Are there any advantages to baramin genetics over its evolutionary counterpart? There are at least three such general improvements.

First, evolutionist population geneticists have not demonstrated, even theoretically, that populations evolve into higher, more complex groups.¹⁴ This is directly due to their application of the assumed principle of unlimited variation. Creationists need only show that baramin have limits and have already shown that to some extent¹⁵; that is, they apply the observed principle of limited variation. It would seem that the latter approach is also more testable and to that extent more scientific.

Second, the evolutionist population geneticist must try to find some way of reconciling evolution with entropy. (Although, this writer knows of no such serious effort.) Creationist population genetics is not only fully consistent with the Second Law, but actually formally includes that law by means of information theory.

Third, there are two major but rival theories in evolutionary genetics: the Balance Theory (BT) and the Neo-Classical Theory (NCT). Among other things the proponents of these two theories disagree on the role of "natural selection" (differential elimination). The former asserts that variation is destroyed by it. Surely part of the problem is philosophical, namely, the belief that populations "evolve" ever upward. This requires a strong causative agent and therefore the BT theorists turn to "natural selection" while the NCT theorists depend more on genetic drift; both must look, at least to some degree, to mutations as a positive source of change. The roles of these agents are predictably inflated.

The baramin geneticist does not encounter this problem; rather he predicts that both will happen. Though some positive variants may be filtered out, the negative variants are mostly the ones who are differentially eliminated. Such destruction of (negative) variations is predicted by the proponents of the NCT yet in so doing the population is driven toward (positive) horizontal variation as expected by the BT proponents.

Discussion

How should the baramin genetics model be developed further? What questions need research? It is hoped that the following suggestions will prove fruitful not only to baramin geneticists but to experimental creationists in general.

Is it not time for a creationist taxonomy? Need creationists be bound by the conventional categories and criteria? These points deserve serious evaluation and

clear answers from creationist biologists if progress is to be made. As Siegler stated:¹⁶

"Until we as creationists demonstrate that our concepts are applicable in practice, other scientists will have reason or at least excuse to ignore our findings.

One area in which creationism will eventually have to stand or fall exists in the field of plant and animal taxonomy."

How does the magnetic field affect baramin today? How did a stronger magnetic field affect them? What are the effects not only between baramin but within baramin? What are the combined effects of a higher pre-Flood atmospheric pressure with a stronger magnetic field?

Howe¹⁷ has recently reviewed a book on Dooyeweerd's scientific philosophy. Apparently Dooyeweerd had reason to believe that the cytoplasm is a complementary source of information to the DNA and in fact thought of the living cell as controlling its molecular substructure ("enkapsis"). Dooyeweerd's ideas warrant further consideration and experimental investigation. Indeed, the whole area of non-chromosomal heredity could be researched and utilized more fully by creationists than has heretofore been done.

Since baramin genetics is a mathematical discipline, researchers will require information on such matters as the rates of divergence, the rates of increasing variation and increasing reversion (throwbacks) which appear to be inversely proportional, and the functions describing these systems. (For a simple mathematical treatment of variations and fixity, the reader is referred to the appendix.)

Theoretical and experimental input from other non-biological areas could be used such as those from systems and computer engineers. An example would be the development of computer models to describe the behavior, distribution and variation of baramin. From physics more information on the nature of "proton tunnelling"¹⁸ in an electromagnetic field is required. From paleogeology questions pertaining to the identity and distribution of baramin in the pre-Flood world need answers. Biochemists may be able to recognize baramin chemically, i.e., molecular taxonomy.¹⁹

There are undoubtedly many useful results from population genetics that can be incorporated into this model. Promising areas of research include population equilibrium, stability, segregation, migration, fixation of mutations and so on.

Summary

A new model has been proposed, baramin genetics, that embraces and formalizes the most fundamental concepts of scientific creationism. The central feature of the discipline is that the created kind is the unit of investigation and applied to that unit is the principle of limited variation. Among its other features is a sort of dual character: results from biology in the form of genetics can be used and results from physics by means of information theory can be used. The created kinds are seen as diverging from their original perfect state, as degenerating from their initial capacity for maximum

variation. Baramin genetics already offers some advantages over its evolutionary counterpart but much more development is required. Suggestions for such improvement have been offered which involved results from several disciplines and which thereby demonstrated the utility of the model.

Acknowledgements

The author wishes to thank Dr. John N. Moore for his encouragement and advice in the preparation of this manuscript.

Appendix

A mathematical description of variation and fixity must conform to the biology of the matter. The biological descriptions emphasize an initial rapid generation of new variants followed by increasingly slower production of new variants until no more significant variations occur as the fixity, or limit, of the baramin is approached. Figure 1 is a graph of the function $f(x) = k[1 - \exp(cx)]$, where k is the limit, c is a negative constant characteristic of that particular baramin and x is the generation which represents the amount of genetic "mixing" or allelic combinations that has occurred within the baramin. This assumes, of course, a very large population with continuous random mating. By changing c the "speed" with which the function approaches its limit is changed. The higher the absolute value of c , the quicker the limit is approached; the smaller the absolute value of c , the slower the limit is approached. Figure 2 gives three different graphs for three different values of c .

If the shaded area of Figure 3 is taken to be the amount of old variants (throwbacks) and the dotted portion the amount of significant new variants, then the proportions of the total population constituted by the old and new variants can be ascertained. This is done by choosing a line $x = a$ after which no significant new combinations occur. That is, after a generations only trivial variations arise. The area occupied by the old variants is found by integrating $f(x)$ from 0 to a with respect to x which yields:

$$F(a) = ka - k/c(\exp(ca) - 1).$$

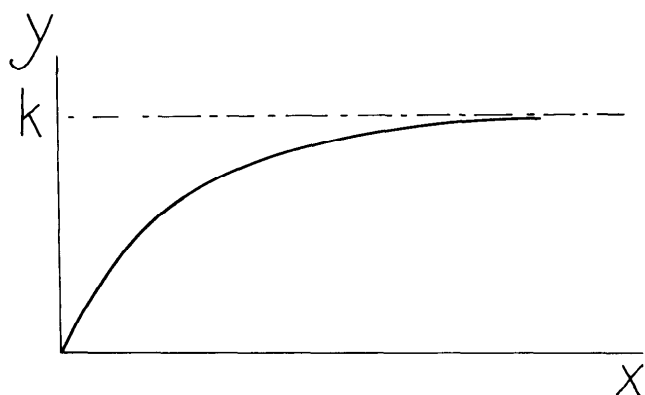


Figure 1. The function $y = f(x) = k[1 - \exp(cx)]$. Here k and x are greater than zero; c , less. The asymptote $y = k$, which the function approaches, is shown by a broken line. The applications of these mathematical expressions to the questions of genetics are discussed in the Appendix.

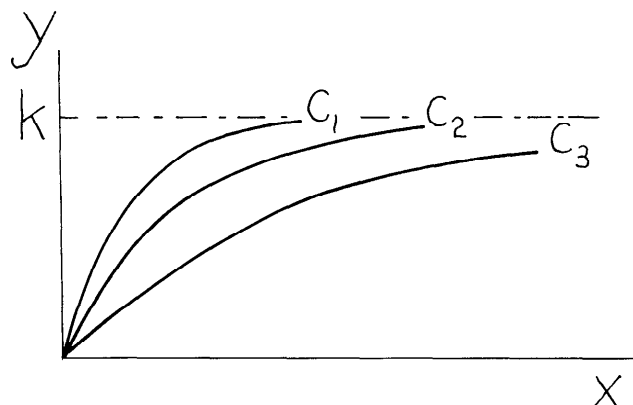


Figure 2. The function $y = f(x) = k[1 - \exp(c,x)]$ for different c 's; $i = 1, 2$, and 3. The greater the absolute value of c is, the more quickly the curve approaches the asymptote.

To be specific let $k = 1$, $a = 1$ and $c = (-3)$. Then,

$$F(1) = 1 + 1/3(\exp(-3) - 1) = 0.68.$$

The proportion of the total area occupied by the old variants is determined by dividing $F(1)$ over the total area, A , which is given by $af(a)$. Hence,

$$F(1)/A = .68/(1 - \exp(-3)) = .68/.95 = .72$$

This means that 72% of the new generation are old variations while 28% are new. Furthermore, it suggests that this baramin will quickly exhaust its variational potential.

For a second example let $c = (-1)$ and all other values remain the same. Then,

$$A = 1 - \exp(-1) = .63$$

$$F(1) = 1 + 1(\exp(-1) - 1) = 1/e = 0.37$$

Hence,

$$F(1)/A = .37/.63 = .59.$$

Therefore, 59% of the new generation are new variants while 41% have arisen previously. This baramin is ex-

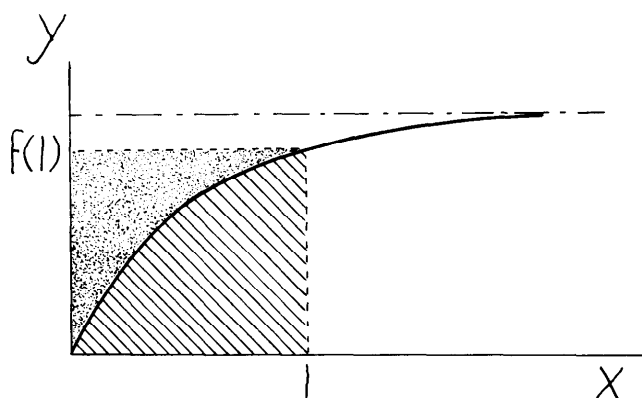


Figure 3. Populations are here represented by areas. The total population, being the sum of the new and the old variants, is indicated by the area of the rectangle bounded by the axes and the lines $x = a = 1$ and $y = f(1)$; so the total area involved is $a, f(a) = 1, f(1)$. The shaded area, representing old variants, is bounded by the x axis, the line $x = a$, and the curve $y = f(x)$. The dotted enclosed area, representing new variants, is bounded by the y axis, the line $y = f(1)$, and the curve $y = f(x)$.

ploiting its variational potential much more slowly than the one of the first example.

In addition to finding proportions of the population, the equations with $f(x)$ and $F(x)$ could also be used in the solution of problems dealing with the formation of intra-baramin taxa, dispersion, and adaptivity but only in connection with other equations which reflect some specific knowledge of baramin stability, equilibrium and so on. Much of the theoretical progress, then, will depend on research into baramin biology.

Finally, it should be realized that the foregoing is meant only to illustrate, in a simple and intuitive way, that creationist concepts pertaining to the created kind are susceptible of mathematical treatment. Many questions arise, such as the interpretation of the variable x and the calculation of the characteristic of variation c , which are properly the subjects of future research.

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EVOLUTION, RACE, AND EQUALITY OF INTELLIGENCE

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Received 28 August 1979.

Social scientists today almost universally believe that essentially, the races of men are largely equal in regard to intelligence. Although there is some disagreement, nonetheless, even among those who disagree, it is agreed that there is not more than approximately one standard deviation difference in the mean of intelligence between any two races. This fact though, is contrary to the basic assumptions of evolution. In order for selection to take place, differences must exist between individual organisms. Selection would then cause races to develop, a process which is called in Darwinian terms, speciation. The lack of important differences between races, especially in the crucial difference between men and "lower" forms of life, viz. intelligence, is seen as a serious difficulty for the evolutionary theory. In addition, the theory of evolution can also be seen as having been an important factor in the extreme forms of racism that existed at the turn of the century and for several years beyond, especially racism against blacks and Jews.

The theory of evolution teaches essentially that random mutations cause slight changes in the gene pool of a species. If random mutations produce a phenotype which confers upon the organism a slight survival advantage compared to species without it, the environment will affect the population in such a way that the organism (or organisms) with the slight advantage will have a greater chance of surviving and reproducing, and thus passing this characteristic on to its progeny.

Conversely, organisms without the advantageous characteristic will be less likely to survive so as to reproduce, and thus less likely to pass this characteristic on to its offspring. The result is that, in time, the organisms with the advantageous characteristic will increase in numbers, and the organisms without the advantageous characteristic will numerically decrease. Eventually the composition of the gene pool will

change, altering the characteristics of the population as a whole.

The key to the evolution theory, therefore, is *differences within the species*¹. If every member of a population had an identical genotype, evolution could not occur because evolution purportedly results from nature's selecting from *existing differences*. Without differences, one organism could not have an advantage over any other, and thus survival would depend totally upon fortuitous factors and not upon any innate advantage that the structure of the organism itself confers. For an organism to have an innate survival advantage compared to others, structural differences must exist. These differences are the key to current evolutionary theory. Of course it is possible that a mutation could occur in a population which is homogeneous for a trait, but this would, if the trait produced from this mutation was favorable, then begin to change the population. Because it would take a long time for the population to again become homogeneous for that trait, variety in

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traits would seem more common in the natural history of most animals.

An important requirement for evolution to occur is not only differences, but differences within a *specific group* or species. The evolutionary theory also requires continual change in the environment, which would produce increased adaptation by certain living things, which in turn often forces other living things to change in order to survive. Environmental changes include changes in the mean temperature, changes in the composition of the land, the type and distribution of the foliage, and the type of animals in any particular region.

The increasing adaptation of other animals causes them to increase in number and thus consume a greater supply of the available life support resources. For animals to survive, in accordance with evolutionary theory, they have to continually increase their level of adaptation and improve their survival techniques. Thus, the existence of differences within the gene pool is crucial to both the survival and evolution of an animal species. Differences are imperative in order for nature to have something to select from to improve the animal and thus enable it to continue to compete with the ever increasing complexity, and competition of the organisms within the animal's environment. And because of the recent drastic changes in the environment brought about by man, it would seem that evolution would be occurring at a more rapid pace today than in the past. The assumption that most animals have maximized their adaption and thus little evolution is occurring today seems to be more an effort to respond to difficulties in the theory than anything based on empirical evidence.

The Survival Advantage of Man

According to evolutionary theory, man's intelligence is the main quality which confers him his survival advantage over other animals.^{2,3,4} Physiologically, the most important difference between humans and animals is the brain. Humans are classified as a high level primate with a brain superior to all primates.⁵ Although mankind's upright posture, the development of his thumb and other characteristics differentiate him from other primates, the *crucial difference*, and the factor responsible for man's superior achievements compared to other primates, is clearly his brain.

It is hypothesized that the evolution of humans was the result of a fortunate set of conditions which, through the process of selection, caused some primates to develop a slightly higher intelligence than other primates. This slightly higher intelligence conferred upon these primates a clear survival advantage. Primates with the slightly higher intelligence had both a better chance of escaping other predators and of securing life support elements from the surrounding environment than their less fortunate relatives.^{6,7} To obtain food requires intelligent behavior, and thus the higher the intelligence of the animal, the more successful the organism would likely be in obtaining food. Further, it is reasoned, the higher the intelligence, in general the more capable the animal is in escaping predators. Intelligence enables one to learn methods and tricks from

experience both so as to escape, and to avoid, possible predators.

This survival advantage caused those primates with higher intelligence to increase in number. Primates with lower intelligence decreased in numbers. Eventually, a large group of primates came into existence resulting in a fairly defined group which was separated from others by a higher intelligence. Importantly, even within this fairly defined group, there existed individual differences in intelligence. These differences caused certain members of the group to be more likely to survive than other members of the group for the reasons discussed above. Thus, growing out of this defined group would be *another group*, again having a higher intelligence. In time, according to this evolutionary theory, through this technique, mankind as we know him today resulted.

Theoretically, this process will continue and man will evolve to new heights in the future. Even in the last few thousand years, it is said, persons with a greater intelligence have had a better chance of surviving. Not only is increased intelligence important, but an extremely rapid increase in intelligence is seen by many evolutionists as crucial to the evolutionary theory. For example, Smith stated,

The evolution of modern man from non-tool-making ancestors has presumably been associated with and dependent upon a large increase in intelligence, but has been completed in what is, on an evolutionary scale, a rather short time—at most a few million years. This suggests the transformation in the brain which provided the required increase in intelligence may have been growth in size with relatively little increase in structural complexity—there was insufficient time for natural selection to do more.⁸

Pilbeam added: "The expansion of the human brain is extraordinarily late in the humanoid story, occupying perhaps only the last 15% or so of the total time."⁹

In summary, for human evolution to occur, there has to be differences within the species "*homo-sapiens*". The crucial factor that gives humans their survival advantage is intelligence. Since as it has been hypothesized that this factor was important in man's numerical success, it would only follow that this factor would still be important today. Any structural differences in intelligence which give humans a survival advantage, and are genetically transmittable (even if they appeared in a single organism) would eventually spread to produce a defined group superior to that of the original group called a race.

The Notion of Race

Man is sometimes divided into groups called races. Biologically, "races" are able to inter-breed with other races. They are differentiated primarily by such characteristics as skin color, hair color, skull shape, etc.¹⁰ In evolutionary theory, the survival advantage factor is the chief explanation for the existence of most differences; therefore, because differences result from the survival advantage that they confer upon the organism, an evolutionist must assume that any dif-

ferences between, or within, a group have some inherent survival advantage. As the key survival advantage of man, over "lower animals" is his intelligence, it would be natural to suppose, then, that there are differences in intelligence between the races.

This is exactly what has been assumed by many eugenisists, evolutionists, sociologists, and psychologists both before and since the time of Darwin.^{11,12,13} This belief has justified a wide variety of governmental and scientific policies, not the least infamous of which was racial genocide, which will be discussed below.¹⁴

In Victorian times crude notions of social Darwinism were embraced by many scientists. The concept of race as we know it possibly has its roots here. An important argument Hitler used to support his programs of racial genocide of the Jews, Negroes and other groups was that they were genetically "inferior" and that interbreeding with the superior Aryan race would affect the gene pool, and thus lower the overall quality of the "pure race."^{15,16} As Himmelfarb notes:

From the 'Preservation of Favored Races in the Struggle for Life' (i.e., Darwin's subtitle to *Origin of Species*) it was a short step to the preservation of favoured individuals, classes or nations—and from their preservation to their glorification . . . Thus, it has become a portmanteau of nationalism, imperialism, militarism, and dictatorship, of the cults of the hero, the superman, and the master race . . . recent expressions of this philosophy, such as *Mein Kampf*, are, unhappily, too familiar to require exposition here.¹⁷

Hitler encouraged breeding only by those individuals he perceived as having Aryan traits, and discouraged "interbreeding," supposing that in time the entire race would improve. He believed that he was merely furthering evolution by deciding which traits were not beneficial and preventing the people with these traits from reproducing; and likewise by deciding which traits were beneficial, and encouraging those with the beneficial traits to reproduce. Instead of letting chance factors affect reproduction, Hitler attempted to influence reproduction so that the gene pool would shift in some desired direction. Man's success in breeding cattle, dogs and other animals and producing animals with desired characteristics, has given empirical (though specious) support to the concept of racial breeding as attempted by Hitler and others. This idea was part of the Eugenics Movement which was popular at the turn of the century. Eugenics, viz. the notion that man could improve the race by selective human breeding, was generally accepted by many of the educated public, especially in Europe and the Americas. Sir Arthur Keith, one of the leading evolutionary anthropologists of our century, concluded:

The German Fuhrer . . . has consciously sought to make the practice of Germany conform to the theory of evolution [by applying Eugenics to governmental policies].¹⁸

On the question of racism, as exemplified especially in Germany, Sir Arthur also concluded:

Christianity makes no distinction of race or of colour; it seeks to break down all racial barriers. In this respect, the hand of Christianity is against

that of Nature, for are not the races of mankind the evolutionary harvest which Nature has toiled through long ages to produce?¹⁹

The conclusion that evolution normally produced racial inequities, was exemplified in a number of references published around 1900. One popular high school biology textbook, George W. Hunter's *A Civic Biology*,²⁰ in the section on evolution under the subtitle "The Races of Man," stated that "at the present time there exists upon the earth five races or varieties of man, each very different from the other in instinct, social customs, and, to an extent, in structure." The five races are then listed, seemingly from the inferior to the superior, as follows:

There are the Ethiopian or Negro type originating in Africa; the Malayan or brown race from the islands of the Pacific; the American Indian; the Mongolian or yellow race including the natives of China, Japan and the Eskimoes; and finally, *the highest type of all*, the Caucasian, represented by the civilized, white inhabitants of Europe and America.²¹ (emphasis mine)

While not directly stating that the "Negroids" are lowest on the evolutionary scale, the quote does state that the "highest type" of all races is the Caucasians, and that Caucasians are "higher" developed in terms of "instincts, social customs, and . . . [physical] structure." This book was widely used in American schools for over thirty years. It was the book which John Scopes used when he was a substitute teacher in a biology class and was later convicted of violating the Butler Act (the law against teaching evolution in the public schools).

The article in the Encyclopedia Britannica, under the heading "NEGRO", stated:

. . . the [Africans] present almost a greater uniformity of physical and moral type than any of the other great divisions . . . this type occupies . . . the lowest position in the evolutionary scale . . . the cranial sutures . . . close much earlier in the Negro than in other races. To this premature ossification of the skull, preventing all further development of the brain, many pathologists have attributed the inherent mental inferiority of the blacks . . . the development of the Negro and White proceeds on different lines . . . in the former the growth of the brain is . . . arrested by the premature closing of the cranial sutures . . .

. . . the mental [differences] are at least as marked as the physical differences . . . No full-blooded Negro has ever been distinguished as a man of science, a poet, or an artist . . .²²

Moser argued that:

. . . as to whether the Negroes in America have produced any great men . . . [it] is stated in the Encyclopedia Britannica, edition of 1903 [that they have not]; the 1970 edition does [not] make this admission. . . . American Negroes have made contributions to various fields, sports, science, etc., but . . . It is only the Negro that has a mixture of white genes in his system that has risen to

the level where he has produced on the level with the white race.²³

Walbank and Taylor point out:

... Darwinism led to racism and anti-semitism and was used to show that only 'superior' nationalities and races were fit to survive. Thus, among the English-speaking peoples were to be found the champions of the 'white man's burden', an imperial mission carried out by Anglo-Saxons. ... Similarly, the Russians preach the doctrine of pan-Slavism and the Germans that of pan-Germanism.²⁴

The man mainly responsible for the widespread acceptance of evolution in the nineteenth century, Thomas Huxley, soon after the black slaves were freed, wrote:

No rational man, cognizant of the facts, believes that the average negro is the equal, still less the superior, of the white man. And if this is true, it is simply incredible that, when all his disabilities are removed, and our prognathous relative has a fair field and no favour, as well as no oppressor, he will be able to compete successfully with his bigger-brained and smaller-jawed rival, in a contest which is to be carried out by thoughts and not by bites.²⁵

Racist sentiments such as these were held by many 19th century evolutionists. A recent book has documented this beyond question.²⁶ In a review of this book, a writer says:

Ab initio, Afro-Americans were viewed by these [evolutionists] as being in certain ways unredeemably, unchangeably, irrevocably inferior.²⁷

Another reviewer added:

After 1859, the evolutionary scheme raised additional questions, particularly whether or not Afro-Americans could survive competition with their white near-relations. The momentous answer was a resounding no... The African was inferior—he represented the missing link between ape and Teuton.²⁸

Darwin was keenly aware of the implications of his theory of evolution on the races. In the sixth chapter of his *Descent of Man* he pointed out that survival of the fittest would eventually eliminate the black race, which he considered inferior. In addition, Darwin concluded:

I could show [that war had] done and [is] doing [much]... for the progress of civilization... The more civilized so-called Caucasian races have beaten the Turkish hollow in the struggle for existence. Looking to the world at no very distant date... an endless number of the lower races will have been eliminated by the higher civilized races throughout the world.²⁹

Morris notes that:

Charles Darwin selected as the sub-title for his book *Origin of Species* the phrase "The Preservation of Favoured Races in the Struggle for Life." It is clear from the context that he had races of animals primarily in mind, but at the same time it is also clear... that he thought of races of men in the same way.³⁰

That this concept is still held by some today is evident from the following words of the leading modern evolutionist, George Gaylord Simpson:

Races of men have, or perhaps one should say 'had', exactly the same biological significance as the sub-species of other species of mammals.³¹

One of the many examples which illustrates that the belief that "graduations in the evolutionary level of living man" has been a very important part of evolution for some time, is from the *Literary Digest* (February 16, 1929, pg. 28). This statement is in response to a theory by Dr. Clark which says that evolution proceeds in "jumps." Note the statement includes the Piltdown Man (now shown to be forgery), the Neanderthal Man and the Cro-magnon Man (now shown to be simply different races, and largely equal to man today).

Dr. Clark calmly reverses the old saying that nature never proceeds by leaps, and assures us that this is her only method of procedure. Yet man, as the skull history shows us so clearly, proceeded by slow steps from the Pithecanthropus, the Piltdown man, the Neanderthal Man, to the Cro-magnon Man, who distinctly represents the modern type. If nature were as broad as a jumper as Dr. Clark believes, the first man should have shown the high, civilized type of today. But we do not have to go back to fossils. *The lowest type of men now living, the Australian savages, are at a sufficiently great remove from the civilized type to overthrow Dr. Clark's theory*, which, instead of embodying the good points of the creational and developmental theories, actually combines the difficulties of both... (emphasis mine).

The foregoing should illustrate that it is a necessary assumption of the evolutionary theory that there are differences both between and within races, and that these differences give one race, or group, a survival advantage compared to other races or groups. The race with the survival advantage presumably will in time become dominant, numerically, compared to the race without this advantage. In summary, Morris concluded:

As the 19th century scientists were converted to evolution, they were thus also convinced of racism. They were certain that the white race was superior to other races, and the reason for this superiority was to be found in Darwinian theory. The white race had advanced farther up the evolutionary ladder and, therefore, was destined either to eliminate the other races in the struggle for existence or else to have to assume the "white man's burden" and to care for those inferior races that were incompetent to survive otherwise.³²

The two races that most often have been compared are the "Caucasian" and "Negroid" races, commonly called the "white" and "black" races. It has often been assumed that the white race is "superior" and the black race is "inferior," and more "apelike." This is illustrated in that most drawings of "ape-men," or ancient men show very strong Negroid characteristics.³³ In addition, the fact that some facial features of Negroids are closer to the facial characteristics of many of the primates (the flat-nosed and sloping forehead, as well as the cheek and jaw bones) has lent support to this

contention that Caucasians are more advanced in evolution than Negroids. According to this supposition, the Caucasian race would be, in evolutionary terms, the more "fit," or "superior," race. Especially in that the key survival factor in man's evolution is intelligence, the Caucasian race would be assumed to have a superior intelligence. The races would have to have differences in intelligence, for, as noted above, this is the key factor to man's evolution, because intelligence is a key factor to survival, and thus selection.

This belief has been predominant especially in whites' treatment of blacks, and has been used to justify social policies ranging from slavery to segregated schools. The assumption that blacks are innately inferior and less intelligent compared to whites has been an important factor in the racist policies of America and Europe for at least 100 years.³⁴ As noted above, a review of early literature written by whites about blacks shows that this feeling was prominent in most discussions of race up until very recently. Current research into the characteristics of the black population is *seriously questioning the validity of the commonly held assumption that blacks are intellectually and in other ways inferior to whites*. More and more research is supporting the contention that what differences exist are predominantly the effects of accumulated discrimination, poverty and cultural deprivation.^{35,36} It is now generally accepted that, on the whole, given equality of background, i.e. similarity of experience, blacks will equal whites in performance.

It is true that in the past blacks have had lower IQ and achievement scores than whites, but blacks have also usually been raised in very different social and cultural environments from whites, even if the parents have the same occupation and incomes. The dominant professional opinion, though, is that black-white cultural differences and past discrimination can largely explain the observed differences, although we have no way of measuring the exact effect of cultural differences. Impressive research has demonstrated that black-white cultural differences could easily explain the observed IQ difference, which is less than 15 points. For example, white school children in eastern Tennessee improved their average IQ score by almost this much between 1930 and 1940, apparently as a result of the introduction of schools, more outside stimulation, radios, etc.

An argument which is used to support the belief that, as a group, whites and blacks are for most traits innately equal (viz., the biological organism is equal) is the comparisons of northern blacks with southern whites. For example, a southern white from Mississippi according to the median scores of the army AEF intelligence test scored 41.25 compared to 49.50 for blacks from Ohio.^{37,38} And since the majority of blacks live in the south or under conditions where they have monetary, educational and cultural disadvantages, the difference would be, according to this evidence, not because of differences in the organism, but because of environmental differences. And many times these differences came about because of racial prejudice in the first place.

Increasingly, scholarly works are attempting to justify what is now prevailing opinion among

psychologists and scientists, i.e. that there is no innate difference between the intelligence of blacks and whites, allowance being made for environment.³⁹⁻⁴²

Regarding this, it was stated by Richard Leakey, the son of the famous anthropologist Lewis Leakey, that his father's

... life work, in fact, has made him impatient with those of narrow ethnic and national perspectives ... furthermore, he notes that racial differences, as they are commonly perceived, are a superficial and recent development having arisen only about 15,000 years ago. Says Leakey, 'I am aghast that people think they are different from each other. We all share a tremendous heritage, an exciting bond. We are all the same.'"⁴³

Yet, as noted above, the drawings which depict man's supposed immediate forerunners such as *Homo Erectus* and *Homo Habilis* have *very pronounced negroid features*, including dark skin, kinky hair, negroid lips, nose and other facial features.⁴⁴ Modern man (*Homo Sapiens*), though, is clearly pictured as a light skinned, straight hair, straight forehead, narrow nose and small lips.⁴⁵

The prominent anthropologist, Ruth Benedict stated under the topic 'One Human Race' that "the peoples of the earth are a single family and have a common origin." Elaborating on this concept, she continued:

Science describes the intricate makeup of the human body ... all its different organs cooperating keeping us alive, its curious anatomy that couldn't possibly have 'just happened' to be the same in all men if they did not have a common origin. Take the structure of the human foot, for instance. When you list all of the little bones and muscles and the joints of the toes, it is impossible to imagine that that would all happen twice. Or take our teeth ... so many front teeth, so many canines, so many molars. Who can imagine finding the same arrangements in two human species if they weren't one family? The fact of the unity of the human race is proved, therefore, in its anatomy ... no difference among human races has affected limbs and teeth and relative strength so that one race is biologically outfitted like a lion and another biologically outfitted like a lamb. All races of men either plow or fight, and all the racial differences among them are in nonessentials such as texture of head hair, amount of body hair, shape of the nose or head, or color of the eyes and the skin.⁴⁶

Benedict, in other words, believes that the differences that do exist do *not* confer a survival advantage of one race over another. She spends considerable time discussing the conception that the differences are what she calls the "non-essentials." Thus we have a state of affairs which cannot result in evolution. *Without any clear differences within man, there is nothing to select from. And without selection there is no evolution.* Presumably differences even within a very small group of people would confer to that group of people a survival advantage. Thus that group would become larger and larger and as selection continues to occur in that group, such would cause it to become more and more

discernible from the outside population. This, though, is not happening because the evidence is that there are *no major differences* to select from, nor do separate populations seem to be developing from the main populations as predicted by the evolutionary theory.

If, as most anthropologists acknowledge, "all . . . racial differences . . . are in non-essentials"⁴⁷ then, to repeat, there is nothing to select from. And the non-essentials, by definition, do not affect fitness but tend to be irrelevant to survival. Texture of hair, for example, does not affect survival but may, to some extent, affect one's comfort in varying types of climates, an affect which is easily offset by the invention of clothes and scissors. Since clothes have been part of man's culture since earliest recorded history, this trait would never had had a selection advantage.

For this reason, Benedict concludes, "The races of mankind are what the Bible says they are—brother. In their body is the record of their brotherhood."⁴⁸

Although most studies find that blacks score 10-15 points lower than Europeans, and orientals and Jews score 10 points higher, researchers have, as noted above, been trying to find a reason other than race why there is this difference. They look for a reason *other* than that there is an innate difference because few scientists accept the idea that there are genetic differences in intelligence between the races. (There are, it is true, some exceptions, such as Carleton Coon⁴⁹ and Arthur Jensen.⁵⁰) Most, however, believe that for instance "the differences are caused by early environmental deprivation" (this was behind beginning such programs as *Sesame Street* and the *Electric Company* and developing programs such as Head Start); or "the tests themselves are not valid" (which has prompted the legal banning of IQ tests in a number of areas of the United States; see footnotes 35 and 36.)

Probably the most commonly looked at difference between blacks and whites is skin color (thus the name "blacks" and "whites"). Dark skin of blacks may give them some protection against strong sunlight in the tropics, but whites can and do easily protect themselves by utilizing sun helmets, special clothes, and suntan oil. This protection will enable them to survive quite well in very warm areas. Black skin, if it is an advantage, is more for individual comfort rather than survival. Skin color is not a difference of quality but only quantity—the darker the person's skin the more melanin (the chemical which causes brown color) and the more yellow the skin the more the carotene (a chemical which gives skin the yellow tinge). Every person, however dark or light their skin (except albinos who lack coloring substances, and albinos appear among all races) is affected by the sun in much the same way. Again these qualities have little to do with survival and thus *cannot be accounted for by evolution*. The purpose of these differences seems to be primarily to increase the variety so evident in the creation today—variety which not only makes man's sojourn on the earth more enjoyable, but which also helps us to differentiate the scores of people alive today.

As for the brain, although the absolute average size of the brain varies from individual to individual, it tends to be correlated with body size. Anyway, the size of the

brain in man has little to do with intelligence (nor any other observable trait); so size of brain differences are evidently a non-functional characteristic, not affecting survival in any way. Some of the most brilliant men have had very small brains and likewise some men with large brains are mentally retarded.⁵¹

Other alleged racial differences include blood differences. Thus we have the expression "blood relations" and the old belief that there exists Aryan blood, Chinese blood, or Negroid blood. Actually, there are dozens of blood groups, but most of these are found in all races. For example, the A, B, AB, and O types of blood are present in all races, although in different percentages. This is why blood transfusions are given without regard to race—only a "blood type" match is necessary.

Responses to the Implications of This Paper

After consulting dozens of references relative to this problem, the writer found that none adequately deals with the issue this paper raises. The general arguments include the assumption that in the past selection was important, but because of the structure of our present society, "natural selection" is no longer as important. Another argument is that selection works at the *individual level*, not at the *species or subspecies* level. Yet, superior individuals become superior groups, and this process is central to evolution. The Neanderthals (and other groups) were said to not have survived *as a group* because supposedly they were inferior to other existing humanoid groups and thus, in the competition for survival, were eliminated.

Burt⁵² feels that genera spread over a wide area; then, after some individuals become highly successful (evolutionarily speaking), they evolve, eventually into a distinct species. A problem Burt notes is that there is only one surviving species of mankind. To explain this, he hypothesizes a "race-making period" where men scattered far and wide forming geographically isolated groups and "as a result of natural selection, became differently adapted to the different conditions"⁵³ that existed. Then, he hypothesizes, the migration started once again for what he attributes as the most common reason for all evolutionary changes, differences in climate and, later, interbreeding. The "ensuing recombination of different sets of genes produce still greater variations and therefore still greater adaptability."⁵⁴ Here, in essence, he is stating that differences existed at one time, but then later were obliterated through massive interbreeding. This is the reason why few differences exist today. Two pages later he argues for the belief that "there has been no appreciable change in man's innate constitution or in the general quality of his brain throughout the last 20,000 years."⁵⁵ Thus, in essence, evolution has stopped or, as Burt puts it, biological evolution has stopped but cultural evolution has continued.

These ideas may attempt to explain the failure to find innate differences in intelligence between races (although Burt's purpose here was not to argue for the belief that all races are equal); but they raise a number of questions if they are going to be used to attempt to counter the belief among scientists today that all races are essentially equal. These questions include:

1. Specifically, why has evolution evidently stopped for man in the last 20,000 years? Especially would the doctrine of uniformitarianism not accord with this.
2. What evidence is there for factors which would first disperse a race, and then cause the many separate races that developed to interbreed—in essence, uniting different groups?
3. What factors would cause men to leave the homeland they were adapted for, venture into other areas, and then marry their “long lost kin” (who now have evolved into distinct differing groups, although evidently not into a new species)?

It is difficult empirically to support Burt's arguments. Many of them assume a great deal; and some contradict others.

If several identical or similar mutations which would confer survival advantages on two or three individuals occurred, these traits would then numerically increase. The result would be a state of affairs such that we would not have one race which was superior to all others, but 3 small groups superior in at least *one way* to the members of the population not part of these three groups. Thus we would have three discernible groups which would eventually grow larger, as the beneficial trait spread throughout the population. Even here, though, we still would have a state of affairs in which there would be groups with discernible differences which would confer upon them a survival advantage compared to the population which was not part of the “better” group. Thus we would have, in essence, three superior races which would eventually predominate. Again, though, within each of these races, *we would have ongoing evolution*, and from these three groups evolution would cause *a discernible difference between the developing subgroups of one group*. And, presumably, so on to infinity.

So the theory would say. What are the facts?

IQ tests throughout the world have found that, with allowance for cultural differences, the IQ range is extremely close. The pygmy population of Africa is supposedly the most backward race extant today, but individuals have IQ's that are quite average when they are acclimated to Western life with its Western culture. We find few differences between second and third generation pygmies living in e.g. large Australian cities and the established European population. And this is *comparing supposedly the most backward group of people today* (aside from the Tasaday Indians which are very small and culturally primitive) *with those supposed the most advanced*, the white Anglo-Saxons. This shows that indeed we have a situation confirming the statements of Benedict quoted above that all races are essentially equal. As Benedict⁵⁶ concludes: “The most careful investigation shows there is no difference between the scores of blacks and whites even though it is difficult to control for the accumulative effects of deprivation.”

A number of researchers have recognized that the implications of the information we have outlined above apply not only to man, but to animals as well. For this reason, a number of leading biologists have proposed

that evolution as a whole presently has stopped. For example, the well-known French biologist, Pierre-P. Grasse, stated:

Biologists find it hard to admit that . . . present living beings differ at all from those of the past . . . But facts are facts; no new broad organizational plan has appeared for several hundred million years, and for an equally long time, numerous species, animals as well as plants, have ceased evolving. We have said that evolution in the present is difficult, [if not extremely difficult,] to observe. Some biologists maintain that they can not only observe it but also describe it in action; the facts that they describe, however, either have nothing to do with evolution or are insignificant. At best present evolutionary phenomena are simply slight changes of genotypes within populations, or substitutions of an allele by a new one.⁵⁷

Summary

The evolution theory requires differences within a species in order to progress forward. The raw material of evolution is *differences*—differences which natural selection can “select” from and in time, spread throughout the population. These differences are the *key* to evolution; without them evolution could not occur. In the case of mankind, research has strongly supported the belief that few significant differences exist between the various groups (races) of humans living today. If it can be shown, as seems to be true, that with the species the few differences that do exist do not confer any survival advantages, contemporary evidence for human evolution would be completely lacking.

Most importantly, this evidence argues against the “survival of the fittest” hypothesis, the cornerstone of the evolutionary theory. It is possible that at one time there were discernible differences among the different groups of mankind, but these differences were either eradicated; or they never existed; they have been hypothesized, not observed. Besides, man's environment was much more uniform throughout much of history than it has been in the past hundred to two hundred years. There was little difference between, for example, a man who lived in a cave and a man who lived in a castle; and historical study has shown that the man in the cave was in some ways better off, at least as regards certain health factors. There is, though, today a great difference between the life of Tasaday Indians in the Philippines and scientists living in a university town; but there is slight, if any, genetic difference. All available evidence indicates that differences which could conceivably confer a survival advantage to one group of humans over another do not exist. In other words, according to the evolutionary arguments evolution should now be proceeding more rapidly than it ever did in the past; but we do not observe it proceeding at all.

The fact that there are more differences within the races than between them does not support what we would expect to find if the evolutionary theory was operative upon humans. Even the few fairly clear differences between the races (differences which cause us to group in terms of races) are only differences of degree and frequency, not absolute differences. And these dif-

ferences are clearly non-essentials and are not important to survival.

It is also difficult to explain why (as evolutionists maintain) man's evolutionary tree shows many branches⁵⁸ and yet today only one branch, man, exists. One arguing for evolution must explain why, in this period of history, a state of affairs exists which is in so great a contrast to that for most of mankind's hypothesized evolutionary history.⁵⁹

Acknowledgements

I want to thank Mr. Matt Alfs for his help in this article.

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REPORT OF 1980 BOARD OF DIRECTORS MEETING

The annual meeting of the Board of Directors of the Creation Research Society was held on 18 and 19 April, at Concordia College, Ann Arbor, Michigan.

An open session for the presentation of papers was held on the afternoon of the 18th, as had been announced; and the following papers were presented: Clif-

ford Burdick, the Galapagos Islands; Jerry Bergman, Vestigial Organs; E. Theo Agard, Extrapolation; George Howe, Cultivated Plants do not Show an Evolutionary Ancestry; Russell Akridge, The 2.8° K Temperature of Free Space Indicates a Recent Creation; Ralph Ancill, A Proposal for a New Creationist

Discipline; and Emmett Williams, Laboratory Formation of Calcium Carbonate Structures. Howe's paper covered somewhat the same ground as the article by him and Lammerts in the *Quarterly* for June, 1980; and Ancil's was similar to his article in this issue of the *Quarterly*. It is planned to publish abstracts of the other articles, if available, in a subsequent issue of the *Quarterly*.

The business part of the meeting was opened at 18:00 hours by President Howe, who read from II Corinthians 5:16-17, and asked for a period of silent prayer. Present: H. Armstrong, T. Barnes, D. Boylan, C. Burdick, W. Frair, D. Gish, G. Howe, J. Klotz, R. Korthals, J. Meyer, J. Moore, G. Mulfinger, W. Rusch, H. Slusher, N. Smith, E. Williams, and P. Zimmerman. Absent: H. Morris, because of an administrative commitment. Visitors: W. Lammerts, W. Tinkle, and about 15 others. Mr. David Golisch, President of the Creation Science Association of the Greater Detroit Area, expressed his pleasure that members of that group could attend, and could host the C.R.S. with refreshments after the evening session.

The Secretary's report of the 1979 meeting was read and approved. He reported also that 229 votes were cast in the last election of Board members. Those elected for a term of three years were: H. Armstrong, T. Barnes, D. Boylan, D. Gish, E. Williams, and P. Zimmerman.

Treasurer Korthals presented the financial statement, showing for the fiscal year total expenditures \$45,788.34, and total income \$42,195.75. Total cash assets are \$50,093.90. High-yield certificates have been chosen for investment.

Membership Secretary Rusch reported 660 voting members, 1145 sustaining members, 377 student members, and 121 individual, 201 library, 25 school and 6 church subscriptions, giving a total of 2,535.

He reported also progress on the new biology textbook. Manuscripts are coming in; and it is desirable that they be checked by knowledgeable members. There is still a need for clear photographs, suitable for the book. It is requested that such be sent to him.

Editor Armstrong reported that he plans to continue to have about the same number of pages in the *Quarterly* (Volume 16 had 236) and the emphasis on scientific and experimental material. Members commented on the importance of the reviewing process.

Meyer reported that advertisement does not seem to be as effective in obtaining new members for C.R.S. as the publicity which results when the Society is mentioned in news stories. Thus it is desirable that items calling attention to the C.R.S. be submitted to magazines, journals, and newspapers.

Barnes reported that the committee for Openness as a Principle of Science is continuing. Over 750 scientists have signed the statement.

Mulfinger reported that some of the books which it had been proposed to reprint have been found to be still available elsewhere.

Williams reported that the technical monograph on thermodynamics, which he is editing, is coming along; and there is also one on astronomy, by Mulfinger. He pointed out also the savings possible by bulk orders, of at least five copies, of *Why Not Creation*.

Slusher reported that there are now Student Chapters of the C.R.S. at the University of Texas at El Paso, The University of Prince Edward Island, and a new one at Christian Heritage College, having as Staff Adviser Ted Rybka, Professor of Physics.

Klotz reminded members that the services of the Clearing House for employment, as announced in the *Quarterly*, are still available.

The theme chosen for the June, 1981, Annual issue of the *Quarterly* is Creationism: a Scientific Reconstruction. Historical matter concerning Christian scientists of earlier times would be appropriate under that heading.

Creationist work by other organizations was remarked on, including the following. The Missouri Association for Creation is working on an annotated bibliography. Another bibliography, of published articles and books critical of the neo-Darwinian view, is being prepared; and items for it, or requests for a complete list, may be sent to:

Elizabeth M. Zipf, Ph.D.
316 Kingston Avenue
Barrington, New Jersey 08007.

Also, the activity of the Creation Social Science and Humanities Society was commented on.

It was decided to hold the Annual Meeting for 1981 on 17 and 18 April, at Concordia College, Ann Arbor, Michigan. (See the notice of an open meeting elsewhere in this issue.)

The following motions were carried, during the session on 19 April:

1. That Gish's offer to carry an advertisement for the C.R.S. in *Acts and Facts* be accepted;
2. that funds up to \$1000 be authorized for the production of each of the first three C.R.S. monographs;
3. that no further action be taken on the reprint series at this time;
4. that reimbursement of 20¢ per mile be authorized for driving expenses incurred in attending meetings;
5. that the dues be raised by \$2.00 for all categories of membership and subscriptions;
6. that the new biology textbooks be considered a third edition, subject to clarification of contracts with Zondervan and Mott publishers;
7. that the final disposition of equipment, purchased with C.R.S. funds for use in projects supported by the C.R.S., be negotiated in each case by the Research Committee;
8. that all members of the Board of Directors whose terms were expiring be re-nominated. Other nominations were made; a complete list will be found elsewhere in this issue.
9. that the present officers be re-elected;
10. that Wilbert Henry Rusch, Sr., be nominated to the status of Fellow;
11. that we accept the offer of a committee headed by Moore to study the feasibility of a Newsletter, and to produce a pilot publication.

Wayne Frair, Secretary

SPECIAL NOTICE

The following candidates have been nominated to the board of Directors to serve for a three-year term beginning in 1981.

G. Russell Akridge
Clifford L. Burdick
Wayne Frair
George F. Howe
John R. Meyer
John N. Moore
George Mulfinger, Jr.
Erich A. von Fange

Six members are to be elected to the Board. It should be remembered that the elections are staggered, one third of the members of the Board being elected annually. Thus, if a certain member of the Board is not listed here, that does not necessarily mean that he is leaving the Board.

The date of the annual election is 1 March, 1981. Biographical information on each nominee will be distributed with the ballots.

EXCERPTS FROM THE BYLAWS

Article III — Election of Directors

Section 1. The date for the annual election of directors shall be set by the secretary, but in no case shall it be later than March 1.

Section 2. The Board of Directors shall annually nominate at least one candidate for each vacancy on the Board of Directors, said candidate to have agreed to serve on the Board of Directors. The secretary shall report the names of those nominated by the Board of Directors together with the date of the election to all voting members not less than 120 days prior to the election.

Section 3. Any voting member may nominate one candidate for election to the Board of Directors by presenting a petition signed by not less than 25 voting members of the Society, said petition to list the name and address of the candidate, indicate the qualifications of the candidate in not more than 50 words, list the name of the individual nominating him, bear the certification of the nominator as to the authenticity of the signatures on the petition, and contain a statement by the nominator that the individual nominated is willing to serve on the Board of Directors. This petition must be mailed to the secretary and must be postmarked not less than 60 days prior to the election. On receipt of the petition, the secretary shall ascertain that at least 25 of the signers of the petition are voting members in good standing.

PANORAMA OF SCIENCE

A Philosophical Look at Species vs. Kinds

A recent article in the journal *Philosophy of Science* has discussed the question, whether classification into species is arbitrary, or whether it conforms (or should conform) to some underlying reality.¹ Creationists, while they may not share the authors' presuppositions, are certainly interested in this question, because they want to resolve the connections and distinctions between the species, as they are conventionally listed, and the Genesis kinds.

Actually, here the authors are hampered by their evolutionary presuppositions; for they have to allow that one kind, species, or whatever, merges into another with time. A saltationist would not have that problem, of course; and certainly a Creationist does not.

The conclusion, however, seems to be that there is something more than just convention: that, of a species: "... members share an underlying trait ...". This seems to be rather like the conclusion which Strickling has proposed, on quite different grounds.²

There remains, of course, the practical problem: how to recognize kinds? The authors' conclusion seems to be much like Aristotle's: that: "... we must ... attempt to recognize the natural groups, following the indications afforded by the instincts of mankind, which led them for instance to form the class of Birds ...".³

Ancient Cereals?

In Africa, and in many other places too, more or less spherical stones, sometimes obviously artificially shaped, have been found among prehistoric remains, dated by conventional methods as far back as 15,000 B.C. or even earlier. These have been called bolas, and maybe some of them were; but it is suggested that at least some were milling stones, used in crushing cereals to make it easier to eat them.⁴

The use of cereals growing wild seems to have been envisaged; but one might wonder whether the supply of such would be enough to make it worth while to have special tools for preparing them. (The article hints also at stone knives, which might have been used as sickles.) Is it possible that here is some evidence for ancient agriculture? A Creationist would not be surprised; he would believe, as Tyler has put it, that it is the absence of evidence of agriculture among the remains of early cultures, not its presence, which needs explanation.⁵

Geographical Names Evidence of Dispersion?

It has been shown that much overlapping of geographical, and also of family, names, can be found in Europe, Asia, and Africa. To illustrate the point, lists

(Continued on page 105)

BOOK REVIEWS

Earth Science for Christian Schools, by G. Mulfinger, Jr., and D. E. Snyder. 1979. Bob Jones University Press, Inc. Greenville, South Carolina 29614. 469 pages + x. Price \$12.00.

Reviewed by Douglas E. Cox*

A comprehensive earth science text book for Christian high schools has been long overdue, and this book is an excellent and welcome contribution.

The book is attractively illustrated with over 700 photographs and drawings. Many of the photographs are in full colour.

The text is clearly written in an interesting fluid style. There is an emphasis on definitions and on explaining basic concepts throughout.

At the outset the authors state the subject of origins is outside the realm of science, and show the relationship between science and the Bible, from the point of view of a Christian who is guided by Scripture.

There are six chapters dealing with astronomy, covering such topics as telescopes, the movements of the earth, the history of both the heliocentric and geocentric theories, and proofs of the earth's rotation and orbital motion.

Atmospheric science is covered in 3 chapters; there are 7 chapters dealing with geology, mineralogy and geomorphology; a chapter on each of glaciation and oceanography, and a conclusion.

In each chapter, the Bible is related to the subject in some way. There are questions, suggestions for experiments and projects, and lists of terms included with each chapter.

The creationist point of view is affirmed throughout the book. The creation is seen as an *ex nihilo* creation with appearance of age. The features of the earth show design by the Creator. The authors suggest that some chemically precipitated rocks, which remain problematic in creationist interpretations, were created *in situ*.

The chapter on glaciation treats the theory of a glacial period after the flood as a fact, although this is presently a topic of controversy.

The basics of each topic are thoroughly covered for the grade 9 level. A student would learn a great deal about the earth sciences from this book without having his faith in Genesis intimidated.

I believe that the book will help to stimulate an interest in earth science among students, which is a vital attribute of a good text book. This book would be valuable to *all* Christian students and parents.

Science and Creation by Stanley L. Jaki (Distinguished Professor, Seton Hall University.). Scottish Academic Press, 1974. viii + 367 pp. 4.50 Pounds†

Review prepared by John N. Moore.*‡

In *Science and Creation* Prof. Jaki seeks to answer the question why science failed to emerge until rather

recently in mankind's history. Many important scientific discoveries were made before the birth of modern science, but these discoveries came to nothing.

Jaki shows that in every case where science was stillborn, the culture was dominated by a pantheistic concept of the universe in which the universe was held to go through eternal cycles, whereas science actually developed in a culture in which it was believed that the world was created a contingent entity.

Most historians of science do not discuss the culture of the Old Testament, because the scientific attainments of the Hebrews were practically non-existent. Jaki, however, argues that the Biblical concepts of the reasonableness of the Creator, monotheism and the consistency of nature were of great importance for the development of science.

The author's encyclopedic knowledge permits him to have a commanding view of many different cultures—Aztec, Babylonian, Chinese, Egyptian, Greek, Hindu, Inca and Maya. The discussion of early Chinese science is of particular interest, for in the field of geology the Chinese made some astonishing anticipations of modern scientific thought, but the leads were never followed up.

Jaki quotes with approval the conclusion of J. Needham, the leading Western historian of Chinese science and an avowed Marxist, that it was the a-theological orientation of traditional Chinese thought that prevented the emergence of science in China. Reluctantly, Needham contrasts this with the situation in Europe where all the early scientists drew courage for their pioneering efforts from their belief in a personal and rational Creator. The handiwork of such a God had to be rational and therefore investigable in a manner satisfying to reason. Such a belief did not exist in China.

Jaki discusses Muslim science and shows how progress came to a standstill as Muslim scholars came increasingly under the influence of Aristotelian thought. He also describes modern attempts to revive the cyclic theory of the universe by, amongst others, Kant, Engels (who called Newton "an inductive ass") and some of our contemporaries.

The author indicates a number of areas where further work needs to be done by historians of science, but his book should be studied not only by the specialist, for, as he himself says, the studied failure to consider why science developed so late is "intellectual smugness at best and mental cowardice at worst". His thesis is supported by an impressive number of quotations. It is surprising that this important book does not have a subject index.

*John N. Moore, M.S., Ed.D., is Professor of Natural Science, Michigan State University, East Lansing, Michigan 48824.

†This book is available also from Science History Publications, 156 Fifth Avenue, New York 10074, at \$15.00.

‡This review is taken from one by Michael J. Collis, published in the *Christian Graduate*, (England), 1977.

*Mr. Douglas E. Cox's address is P.O. Box 18, Petersburg, Ontario, Canada.

LETTERS TO THE EDITOR

Objections to an Ice Canopy

I would agree with Mr. Westberg¹ that a canopy of water vapor will not solve the problems associated with the flood. However, the canopy described by Mr. Westberg won't solve them either. I am uncertain whether he is proposing a solid ice canopy or a canopy of ice crystals in orbit. Neither situation is physically stable.

If he is advocating a solid ice canopy, then the density of the ice in his canopy is 3.78×10^{-7} g/cm³, given the amount of water and the dimensions cited. That is physically unrealistic.

If he is proposing a canopy of ice crystals in orbit, there are several problems. First, the plane of the orbit of each particle must pass through the center of the earth. This means that an ice crystal in a polar orbit will be traveling at right angles to one in an equatorial orbit. If the particles are at the same altitude, they would collide, lose orbital velocity and fall to the earth, within a few orbits, not the approximate 1600 years between the creation and the flood. Secondly, due to the difference in the velocity needed to maintain orbit between the inner and outer portion of the canopy, it would be impossible to keep the particles aligned with the earth's surface. Thus, even if the transmission coefficients are such that the light could pass through 19,000 miles of ice, the particles would become randomly oriented within a few orbits. The light piping would then be useless.

Finally, he claims that the light could traverse many miles of ice, "as in the new applications of fiber optics to telephone service." Currently, the maximum distance that light can be transmitted without amplification is 14 kilometers.² It is very doubtful whether ice crystals could do any better.

References

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²Boyle, W.S., 1977. Light-wave communications. *Scientific American* 237(2):40-48. See especially P. 47.

In Christ,
Glenn R. Morton
3313 Claymore
Plano, Texas 75075

Received 31 January, 1980

Reply to Morton

In answer to your kind comments on Floodtime changes relating to lighting, I suggest that the canopy was formed on the second day of Creation, when perhaps a goodly portion of the water exploded into steam, and, shooting radially skyward, formed ice spears which expanded to interlock as a structure. As I qualified the estimate of 22,000 miles for the top of the canopy by the "conditions under which the rain-water fell"; a more stable structure would result if we assume that the warm air escaping under the perimeter melted a canopy of only a few miles thickness.

Possibly the canopy started to deteriorate at Adam's sin (Genesis 3:17-19), melted through at the equator, (Genesis 7:4), and ended with the wind (Genesis 8:1) as the separated polar halves settled to earth. As these caps fell, the air moved from below them to above. Observations today which lend support to this idea include the finding of quick-frozen mammoths standing upright, fresh-water pingos on the Arctic shelf, and mammoth fossils at 600 feet depth on the continental shelf, in submerged Hudson and Chesapeake valleys. The absence of large boneyards and canyons indicate that the terrain north of the ice-cave areas was frozen in place by the polar ice caps as they fell.

The transmission of light by fiber optics is perhaps not as critical as modulated light wave communications. The best comparison to pre-Flood lighting might be found in planetariums, where a general lighting of less than 5 foot-candles is found to be adequate. At present noonday sunlight gives perhaps 10,000; and 50,000 at 3,000 miles. Thus there could have been a 10,000 to 1 absorption before the Flood, and the illumination would still have been adequate.

At this point, incidentally, we must give praise to our Creator for the fantastic range of adjustment, for varying levels of illumination, which He built into the eye. Such a range was needed when the canopy collapsed. Today, it lets one go from outdoor daylight into the unmeasurable glow worm lighting of the Waitomo caves in New Zealand. And owls, and other night hunters, may have an even wider range of adjustment.

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Received 26 February, 1980.

A Note on the Upcoming Triple Conjunction of Jupiter and Saturn

Since the days of Kepler a number of Bible commentators and critics have maintained that the Star of Bethlehem was in actual fact a triple conjunction between Jupiter and Saturn in the constellation of Pisces. That triple conjunction occurred in 7 B.C. and at the time the two planets never approached each other any closer than about one degree as seen from earth. A degree in the sky is about twice the apparent diameter of the sun or moon. All in all a triple conjunction of the type that occurred in 7 B.C. is neither auspicious nor is it all that uncommon. Now another, even more spectacular triple conjunction between the same two planets is set to occur starting at the end of this year.

During the last part of December Jupiter will approach Saturn, reaching a closest approach about 28 December; the first of the three conjunctions, with a separation of about a degree. This makes it very similar to the conjunctions of 7 B.C. The second of the conjunctions will occur about 11 March when the separation between the two planets will amount to an angle of 0.89 degrees. Through the second conjunction the events will be quite similar to the 7 B.C. conjunctions.

CREATION RESEARCH SOCIETY

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creationism, with a current membership of over 600 voting members (with graduate degrees in science) and over 1800 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as probably 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.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$12.00 (\$13.00 U.S. for overseas) per year and may be sent to Wilbert H. Rusch, Sr., Membership Secretary, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. 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 \$12.00 (\$13.00 U.S. for overseas) per year and includes subscription to the Annual Issue and 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: \$15.00 (\$16.00 U.S. for overseas.)

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms.

We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan Publishing House, Grand Rapids, Michigan 49506. Subsequently a Revised Edition (1974), a Teachers' Guide and both Teachers' and Students' Laboratory Manuals have been published by Zondervan Publishing House. All members of the Society subscribe to the following statement of belief:

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

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

3. The great Flood described in Genesis, commonly referred to as the Noachian Flood, was an historic event worldwide in its extent and effect.

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

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The last of the 1981 conjunctions will far outdo any of the 7 B.C. conjunctions, however, since on 19 July the two planets will be about 0.40 degrees apart; about one apparent lunar diameter. All three of the conjunctions will take place in the constellation of Virgo.

Incidentally, earlier this year there was an even more spectacular triple conjunction of Mars and Jupiter and Mars and Regulus, all happening about the same time in the constellation of Leo. At that time almost all the conjunctions were well within a couple of degrees of each other, appearing high in the sky while Venus was the evening star.

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Received 16 May, 1980

PLACEMENT SERVICE

Do you know of academic vacancies to which creationists might be directed? The Creation Research Society would like to be in the position to inform creationist scientists of such vacancies. If you know of such positions will you please inform Dr. John W. Klotz, 5 Seminary Terrace North, St. Louis, MO 63105 describing the position, the academic requirements and training required and any other information that might be available. You will be helping provide students with information on the question of origins which you yourself share.

Graduate students interested in placement may also write to Dr. Klotz who will provide them with information on available positions as they are known to the CRS.

\$4⁹⁵

Why Not Creation?

Selected articles from the
Creation Research Society Quarterly
(Volumes I-V, 1964-1968)

Edited by

WALTER E. LAMMERTS

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5093 WILLIAMSPORT DRIVE, NORCROSS, GA. 30071

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The books listed above are all available from Zondervan Publishing House, Grand Rapids, Michigan.

Reprint

A Decade of Creationist Research, by Duane T. Gish. Reprinted from the *Quarterly* for June, 1975. 16 pp., 75 cents postpaid, 50 cents each for orders of 100. Order from the College Bookstore of Concordia College, 4090 Geddes Road, Ann Arbor, Michigan 48105.